C. R. WELCH.

CONTROLLING APPARATUS FOR HOISTING ENGINES.

APPLICATION FILED AUG. 13, 1914.

1,150,722.

Patented Aug. 17, 1915.

2 SHEETS—SHEET 1.

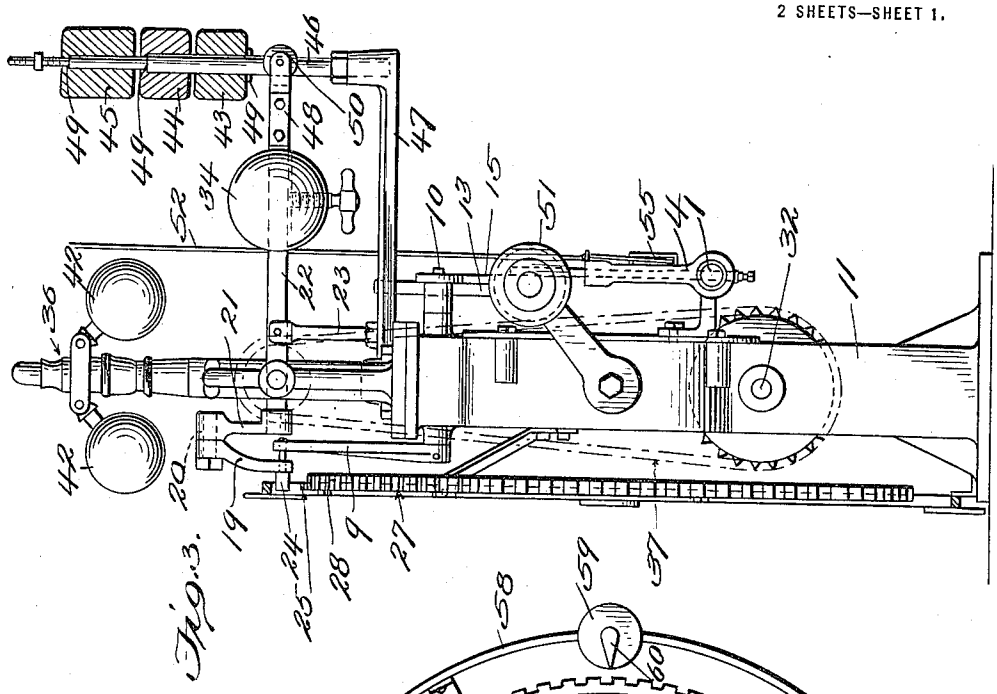

Fig. 3.

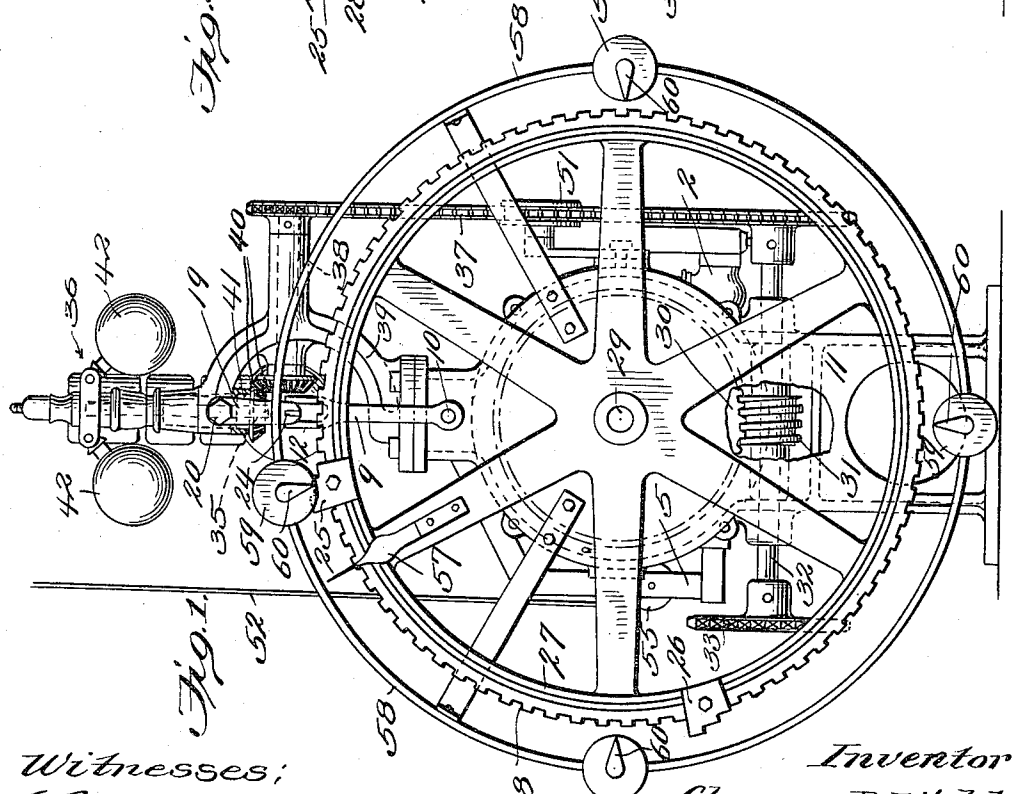

Fig. 1.

Witnesses;
C. Kesler
H. C. McCartney

Inventor
Clarence R. Welch
by James L. Norris,
Attorney.

C. R. WELCH.

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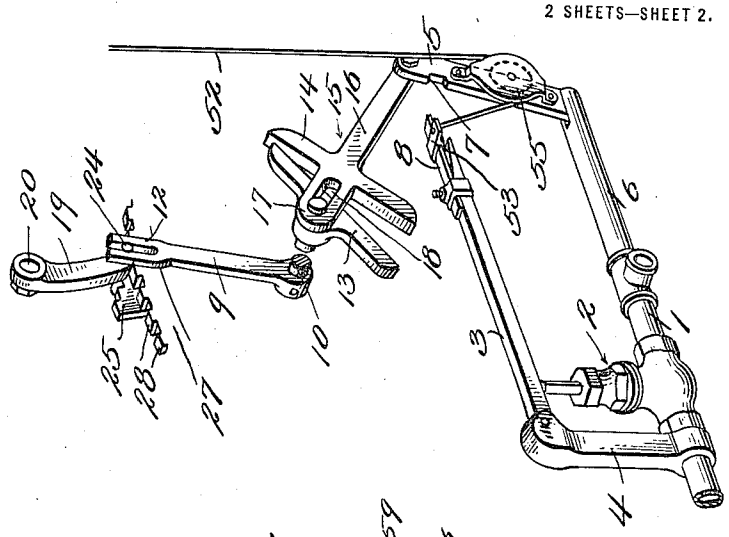

Fig. 4.

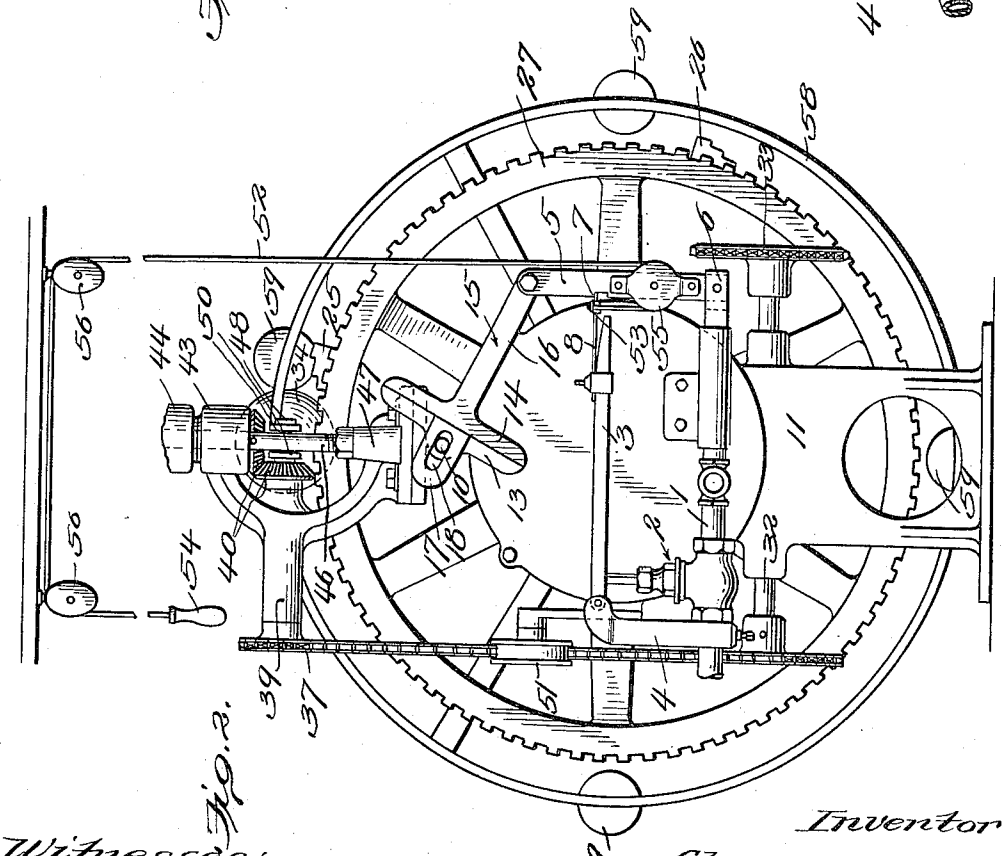

Fig. 3.

Witnesses:

H. C. Wescott

H. C. Wescott

Inventor

Clarence R. Welch

by

James L. Norris

Attorney

COLUMBIA PLANOGRAPH CO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

CLARENCE R. WELCH, OF PITTSBURGH, PENNSYLVANIA.

CONTROLLING APPARATUS FOR HOISTING-ENGINES.

1,150,722. Specification of Letters Patent. Patented Aug. 17, 1915.

Application filed August 13, 1914. Serial No. 856,707.

To all whom it may concern:

Be it known that I, CLARENCE R. WELCH, a citizen of the United States, residing at Pittsburgh, in the county of Allegheny and State of Pennsylvania, have invented new and useful Improvements in Controlling Apparatus for Hoisting-Engines, of which the following is a specification.

The present invention has reference to controlling apparatus for hoisting engines, and it proposes certain hereinafter-described improvements in or relating to the construction and arrangement of the mechanism for actuating the trip which controls the passage of the motive fluid to the brake-setting appliances.

The invention further aims to provide an extremely simple and effective device by means whereof the trip, after having been actuated, may be readily and quickly re-set by the engineer without the latter having to leave his place at the engine, and finally, it comprehends the attachment of an indicator to the main operating element of the afore-mentioned mechanism, which indicator shall specify at all times the precise position of the cage within the shaft, so that the engineer may ascertain such position by merely glancing at the apparatus.

An embodiment of the invention is illustrated in the accompanying drawing, of which:—

Figures 1 and 2 are front and rear elevations, respectively, of the improved apparatus; Fig. 3 is a side elevation; and Fig. 4 is a perspective view of the trip and the parts directly associated therewith.

The apparatus represented in the said drawing is utilized in connection with a fluid-actuated brake-setting mechanism, the arrangement of which is such that the supply of motive fluid thereto is normally cut off, but is opened automatically when the cage, (not shown), approaches either end of travel in the shaft, or the like, and, also, when the speed at which the engine is running becomes excessive. This mechanism may be of any desired type, as, for instance, that shown and described in my prior Patent No. 965,779, granted July 26, 1910, which consists of a cylinder containing therein a piston connected to the brake-operating lever, and it may be either single or duplex; but since it forms no specific part of the present invention, which is directed primarily to the trip, the actuating means therefor and the trip-resetting means, illustration is considered unnecessary and is, accordingly, omitted. For all present purposes, it is, therefore, deemed sufficient to state that the motive fluid is supplied to the aforesaid cylinder through the pipe line 1, which contains a controlling valve 2, the latter being itself controlled by the trip mechanism through the agency of a bar 3 that extends across the upper end of the valve stem and is pivoted to an upstanding bracket 4, fixed to the pipe line. The bar 3 is normally engaged by the trip, as in the patented construction, and, when so engaged, serves to hold the valve in depressed or closed position, the release of said bar and, consequently, the opening of the valve, taking place upon the actuation of the trip.

In the illustrated embodiment of the invention, which may be considered as preferred, the trip consists, as shown, of a rocking bar, link or lever 5 that is pivoted at its lower end to an extension 6 of the pipe line and is provided upon its inner edge, adjacent the upper end thereof, with a shoulder 7, adapted to engage the terminal of a finger 8 adjustably clamped to the outer end of bar 3, the arrangement being such that the said bar and the trip occupy a common vertical plane, and that the latter moves toward and from the former. The actuation of the trip takes place at the times and under the conditions previously specified, and is produced by the movement of an operating member 9, which is connected with the trip, as hereinafter described. This member is preferably in the nature of a rocking lever, which is secured at its lower end to the front end of a short, horizontal rock shaft 10, journaled and supported in the frame 11 of the apparatus, and provided at its upper end with a fork 12. To the rear end of shaft 10 there is fixed a presser-head or cam 13 which co-acts with the similarly-shaped head 14 of a T-shaped lever 15, the terminal of whose stem 16 is pivoted to the upper end of the trip, the parts 10, 13 and 14 thus constituting the intermediate or transmission connections, above referred to, between the operating member and the trip, as will be understood. The lever head 14 is provided with a central projection 17 having a longitudinal slot 18 therein through which the adjacent end of shaft 10 extends, such arrangement permitting the requisite play of the lever incidental to the actuation of the trip, while, at the

same time, preventing displacement of said lever relative to the head 13.

When the parts thus far described are in normal position, (Fig. 2), the two heads 13 and 14, which are disposed at an angle to the horizontal, have their confronting faces in contact, as will be observed, while the trip 5, at such time stands vertically, the end of shaft 10 being then situated toward the inner or lower end of slot 18. The release of the trip is produced by a clockwise rocking movement of shaft 10, as subsequently explained, and when such movement takes place, the head 13 will be turned in the same direction, whereupon its upper end will press against the head 14 of lever 15 and will force the latter, and with it, the trip, to move toward the right into the position depicted in Fig. 4, thus disengaging the trip from the valve-controlling bar.

The actuation of shaft 10 occurs both when the cage approaches the limit of its travel in either direction, and, when the speed of the engine reaches the danger mark, at any intermediate point between said limits, such actuation being automatic under all conditions and being produced by the movement of a single element which is engaged with the rocker 9. The said element is here shown as consisting of a crank or lever 19 suspended pivotally from a pin or stud 20 mounted in the upper end of a second vertical crank 21, the latter being affixed at its lower end to the front end of a lever 22, which is fulcrumed intermediate its ends upon a bracket 23 mounted upon the top of frame 11. The crank 19 is provided at its lower end with a cross-pin 24 whose rear arm is straddled by the branches of fork 12, in consequence whereof, the rocking movement of the said crank will be transmitted to the rocker 9, with the result that shaft 10 is rocked and the trip released, as above described.

The movement in question is effected by the engagement of the cross-pin 24 with primary and secondary contacts or shoulders, the latter of which are normally operative and act, alternately, as terminal stops, while the former serves as a speed stop and is operative only when the engine is running too fast. The secondary stops are carried by the element upon which the primary stops are provided, so that in this way the construction of the apparatus is simplified and the number of supporting parts or carriers for the stops is reduced. Referring to Fig. 1, it will be seen that the two terminal or secondary stops 25 and 26 are attached to an element 27 provided with a series of rack teeth 28, which element is preferably in the form of a wheel or ring, as shown, and is mounted upon the front end of a horizontal shaft 29, journaled in frame 11. The said stops 25 and 26 are constituted by stepped plates and are adjustably secured to the front face of ring 27 which is itself so positioned that said plates are caused to strike against pin 24 during the rotation of the said ring, the adjustable mounting of the plates enabling them to be arranged at distances conforming to the depth of the cage shaft. Ring 27 rotates at a speed which is directly proportional to that of the cage, and, accordingly, the elements comprising its driving gear are proportioned and timed with this end in view, such elements consisting, for example, of a worm wheel 30, fixed to shaft 29 in mesh with a worm 31 carried by a horizontal shaft 32 mounted in frame 11 below, and at right angles to the former shaft and having a chain-and-sprocket connection 33 with the engine shaft, (not shown).

The crank 19, which carries the cross-pin 24, is suspended from the upper end of crank 21, as previously stated, the latter being affixed to the lever 22, so as to participate in the movements thereof. This lever is so arranged that the said pin normally lies in the path of the highest tooth or step of each of the two stops 25 and 26, and does not project, under ordinary circumstances, into position for engagement by any of the remaining steps or teeth, for which purpose the rear arm of said lever is equipped with an adjustable weight 34. The weight is counter-balanced by the pressure imposed upon the front arm of the lever by the rod 35 of a governor 36 which is likewise mounted upon the top of the frame and driven at a speed directly proportional to that of the engine, the driving means being here shown as comprising a chain-and-sprocket connection 37 between the main shaft 32 of the apparatus and a horizontal shaft 38 mounted in a bracket 39 also affixed to the frame top, and a gear connection 40 between the last-named shaft and the hollow governor shaft 41.

The rod 35 is controlled by the weighted governor arms 42 in the usual manner, the arrangement being such that when the engine is running at normal speed the lever 22 is maintained in the position above indicated; but should such speed increase, the pressure exerted upon the front arm of the lever by the centrifugal action of the governor arms will serve to force said lever arm downward, thereby bringing the cross-pin into position for coaction with one or another of the lower steps of the terminal stops, with the result that the actuation of the trip will take place slightly in advance of its ordinary time. The governor is also utilized as the means whereby the primary stops are rendered operative or brought into play, this being effected through the agency of the lever 22, but only when the engine is running at a speed higher than that required

to lower pin 24 into position to engage the bottom steps of the terminal stops, or, in other words, a speed so high as to enable the said pin to engage the teeth 28 on ring 27, these teeth thus constituting the primary stops, as will be understood. Accordingly, the weighted rear arm of the lever 22 is designed to coact with a series of auxiliary weights 43, 44 and 45, which are mounted in superposed relation upon a vertical standard or carrier 46 attached to a bracket 47 that is secured to the frame top, as clearly shown in Fig. 3. The lower portion of the weight carrier is straddled by a fork 48 on the rear end of the lever, and the arrangement of the weights is such as to provide for their successive independent movement, the said standard being equipped for this purpose with supporting shoulders 49, spaced at the proper distances apart, whereon the weights rest. Thus, when the speed of the engine increases to a point where the action of the governor overcomes the load of the main weight 34, the fork will rise and lift the lowermost auxiliary weight 43, without, however, at once affecting the next higher weight 44; upon a further increase in speed, weight 43 will contact with and lift weight 44, and when the speed rises still higher, weight 44 will engage the top weight 45 and all three weights will be raised at which time pin 24 will be engaged with the ring teeth 28 and the trip will be released. The two lower weights 43 and 44 are preferably raised when the pin engages the lower steps on the terminal stops, and to facilitate the lifting action the branches of the fork 48 are furnished with rollers 50. (Figs. 2 and 3). The sprocket chain constituting one element of the governor drive 37 is preferably engaged by a grooved take-up and guide pulley 51, suitably attached to the frame.

When the trip mechanism has been actuated, the component elements thereof are in the positions depicted in Fig. 4, and to reset the trip proper 5, it is ordinarily necessary for the engineer to leave the platform where the brake-setting levers are mounted and himself manually press down the bar 3 and reëngage it with the shoulder 7 on the trip. As this occasions delay in running the cage, besides the inadvisability of having the engineer leave his post, it is the purpose of the present invention to provide a suitable device which is connected both with the bar and with the trip and is operative from the platform for effecting the re-setting. In the construction illustrated, such device is shown as embodying a rope, cable or other flexible element 52, which is connected at one end to a clamp 53 secured to the finger 8, and terminates at its other end at a point adjacent the engineer's post or stand on the platform, being provided at the latter end with a handle 54. On its way to the platform, the said rope first passes beneath and around a pulley 55 mounted on the trip and then over a number of depending pulleys 56 attached to the ceiling of the room wherein the apparatus is installed. Consequently, a downward pull upon the handle 54 will produce a downward movement of bar 3 and an inward movement of the trip, as will be apparent.

The invention finally comprehends the provision of means for indicating at all times to the engineer the exact position of the cage in the elevator shaft. Such means may advantageously consist of a pointer or indicator 57 attached to the ring 27, which latter, as already stated, moves at a speed directly proportional to that of the cage. In the present construction, this indicator is secured radially to the said ring, and its outer end coöperates with a second ring 58, or other fixed part of the apparatus, the last-named ring encircling the rotating ring and being arranged concentrically therewith and fastened to frame 11 in any desired manner. The ring 58 is provided with a series of adjustable dials 59 having indicating hands or marks 60 thereon, these dials being positioned to conform to the top and bottom of the shaft and the intermediate landing or landings in the shaft.

The entire operation is believed to be apparent from the foregoing, and may be briefly stated as follows:—When the cage is in motion, assuming that the trip has been set, the wheel 27, which is so proportioned as to make slightly less than a complete revolution during the hoisting period, will rotate at a speed directly proportional to that of the cage, the governor will be driven at a similar speed and the indicator will show the precise position of the cage in the shaft. As the cage approaches one end of its travel, the top, for example, the terminal stop 25, moves toward the cross-pin 24, and, if the engine is running at normal speed, or at a speed lower than normal, the two lower steps on said stop will pass beneath the pin, and the latter will be engaged only by the highest step, whereupon the crank 19 and lever 9 will be rocked, the rock shaft 10 will be turned, the head or cam 13 will press against the head 14 of lever 15, and the said lever will be forced downward at an angle to the trip and will disengage its shoulder 7 from the finger 8 on bar 3, the bar then rising and freeing valve 2 which opens the pipe line 1 and permits motive fluid to pass into the devices which apply the brakes and shut off the power. The engineer then re-sets the trip by pulling downward upon handle 54. If the speed at which the engine is running is above normal, the governor will act to lower the front end of the lever 22, thus bringing the pin into position to engage one or the other of the lower steps on the stop,

according to the extent of the increase in speed, the time of actuation of the trip in such instance being slightly advanced. Finally, if the speed of the engine reaches the danger point, the governor rod will depress the lever end to an extent sufficient to engage the pin 24 with the teeth 28 on the wheel, the three weights 43, 44 and 45 being lifted, in such instance, in addition to the main weight 34.

I claim:—

1. In an engine-controlling apparatus, the combination, with a trip, and a forked operating element connected therewith; of a shiftable member having a pin engaged in the fork of said operating element for actuating the same; and a movable element provided with a pair of alternately-acting stops arranged to strike against said pin and shift it and said operating element.

2. In an engine-controlling apparatus, the combination, with a trip, and a forked operating element connected therewith; of a shiftable member having a pin engaged in the fork of said operating element for actuating the same; and a rotatable element provided with a pair of alternately-acting stops arranged to strike against said pin and shift it and said operating element.

3. In an engine-controlling apparatus, the combination, with a trip; of a trip-operating element; connections between said element and said trip embodying a pair of co-acting presser members, one connected with said element for actuation thereby, and the other with said trip to actuate the same; and mechanism for automatically actuating said operating element under predetermined conditions.

4. In an engine-controlling apparatus, the combination, with a trip; of a trip-operating element; connections between said element and said trip embodying a cam connected with said element for actuation thereby, and a headed member pivoted to said trip to actuate the same and in engagement with said cam to be operated thereby; and mechanism for automatically actuating said operating element under predetermined conditions.

5. In an engine-controlling apparatus, the combination, with a trip; of a trip-operating element; a rock-shaft whereon said element is mounted; connections between said element and said trip embodying a cam affixed to said shaft, and a T-shaped lever having its stem pivoted to said trip and its head in engagement with said cam, said lever having a loose connection with said shaft; and mechanism for automatically actuating said operating element under predetermined conditions.

6. In an engine-controlling apparatus, the combination, with a trip, a movable trip-operating element remote from said trip, and a connection between said element and said trip for transmitting the movement of the former to the latter; of a supporting element having a depending member pivoted to one end thereof to swing relatively to said supporting element, said member being directly engaged with said operating element to move the same; and a movable controlling element having means thereon for directly engaging and swinging said pivoted member, thereby to move said operating element.

7. In an engine-controlling apparatus, the combination, with a trip, a movable trip-operating element remote from said trip, and a connection between said element and said trip for transmitting the movement of the former to the latter; of a supporting element having a depending member pivoted to one end thereof to swing relatively to said supporting element, said member being directly engaged with said operating element to move the same; and a rotatable controlling element having means thereon for directly engaging and swinging said pivoted member, thereby to move said operating element.

8. In an engine-controlling apparatus, the combination, with a trip, and a movable trip-operating element connected with said trip; of a supporting element having an independently-movable depending crank pivoted to one end thereof, said crank having a pin secured to it and directly engaged with said operating element; and a movable controlling element having means thereon arranged to strike directly against said pin to shift it and said operating element.

9. In an engine-controlling apparatus, the combination, with a trip, and a movable trip-operating element connected with said trip; of a supporting element having an independently-movable depending crank pivoted to one end thereof, said crank having a pin secured to it and directly engaged with said operating element; and a rotatable controlling element having means thereon arranged to strike directly against said pin to shift it and said operating element.

10. In an engine-controlling apparatus, the combination, with a trip, and a forked operating element connected therewith; of a shiftable member having a pin engaged in the fork of said operating element for actuating the same; a movable, toothed element having stop means thereon for engaging and shifting said pin and said operating element; a lever to which said member is pivotally connected having weighting means for normally holding said pin in inoperative position with relation to the teeth on said movable element; and a governor for rocking said lever into position to engage said pin with said teeth.

11. In an engine-controlling apparatus, the combination, with a trip, and a forked

operating element connected therewith; of a shiftable member having a pin engaged in the fork of said operating element for actuating the same; a rotatable, toothed ring having stop means thereon for engaging and shifting said pin and said operating element; a lever to which said member is pivotally connected having weighting means for normally holding said pin in inoperative position with relation to the teeth on said ring; and a governor for rocking said lever into position to engage said pin with said teeth.

12. In an engine-controlling apparatus, the combination, with a trip, and a forked lever connected with said trip for operating it; of a swinging member provided with a pin directly engaged in the fork in said lever for actuating the latter; a lever to which said member is pivoted for independent movement; a rotatable, toothed ring having stop means thereon to engage said pin and rock the same and the first-named lever; means associated with the second-named lever for normally holding said pin in inoperative position with relation to the teeth on said ring; and a governor for rocking said second-named lever to bring said pin into position to engage said teeth.

13. In an engine-controlling apparatus, the combination, with a movable trip, and a movable member normally engaged therewith; of mechanism for releasing the trip; and a device connected with said trip and said member for reëngaging the same.

14. In an engine-controlling apparatus, the combination, with a movable trip, and a movable member normally engaged therewith; of mechanism for releasing the trip; a guide carried by said trip; and a flexible element engaged with said guide and connected to said member for reëngaging the same.

15. In an engine-controlling apparatus, the combination, with a pivotally-mounted trip provided with a shoulder, and a movable member having a terminal finger normally engaged with said shoulder; of means for releasing said trip from such engagement; and means connected with said member and said trip for reëngaging said finger with said shoulder.

16. In an engine-controlling apparatus, the combination, with a pivotally-mounted trip provided with a shoulder, and a movable member having a terminal finger normally engaged with said shoulder; of means for releasing said trip from such engagement; and a flexible element attached at one end to said finger and loosely engaged adjacent to said end with said trip, for reëngaging said finger with said shoulder.

17. In an engine-controlling apparatus, the combination, with a trip; of a trip-operating element; a rock-shaft to which said operating element is affixed; connections between said operating element and said trip embodying a cam affixed to said shaft, and a member engaged by said cam and connected to said trip, to release the latter during the movement of the cam; and mechanism for automatically actuating said operating element under predetermined conditions, to rock said shaft.

18. In an engine-controlling apparatus, the combination, with a trip; of a forked operating element therefor; connections between said operating element and said trip embodying a rock-shaft to which said operating element is secured, a cam affixed to said shaft, and a member engaged by said cam and connected to said trip, to release the latter during the movement of the cam; a pin engaged in the fork of said operating element; a shiftable member carrying said pin; and a movable member arranged to strike against said pin and shift the same and said operating element, to actuate the said operating element.

19. In an engine-controlling apparatus, the combination, with a trip, and a forked operating element connected therewith; of a shiftable member having a pin extending into the fork of said operating element and arranged to move longitudinally of said fork; a controlling element movable with relation to said member and having teeth adapted to engage said pin and shift it and said operating element; a rocking lever to which said member is pivoted having weighting means for normally holding said pin in a position in said fork in which it is remote from said teeth; and a governor for rocking said lever to move said pin into a position in which it engages said teeth.

20. In an engine-controlling apparatus, the combination, with a trip, and a forked operating element connected therewith; of a shiftable member having a pin extending into the fork of said operating element and arranged to move longitudinally of said fork; a rotatable controlling element having teeth adapted to engage said pin and shift it and said operating element; a rocking lever to which said member is pivoted having weighting means for normally holding said pin in a position in said fork in which it is remote from said teeth; and a governor for rocking said lever to move said pin into a position in which it engages said teeth.

21. In an engine-controlling apparatus, the combination, with a trip, a rocking trip-operating element, a rock shaft to which said operating element is fixed, and a connection between said shaft and said trip; of a supporting element having a depending member pivoted to it, said member being directly engaged with said operating element to rock the same and thereby operate said trip; and a movable controlling element

having means thereon for directly engaging and swinging said pivoted member.

22. In an engine-controlling apparatus, the combination, with a trip, a rocking trip-operating element, a rock shaft to which said operating element is fixed, and a connection between said shaft and said trip; of a supporting element having a depending member pivoted to it, said member being directly engaged with said operating element to rock the same and thereby operate said trip; and a rotatable controlling member having means thereon for directly engaging and swinging said pivoted member.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

CLARENCE R. WELCH.

Witnesses:
C. M. WARDBY,
CHARLES D. HOYT, Jr.