No. 638,621. Patented Dec. 5, 1899.

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

SAFETY DEVICE FOR CORLISS ENGINES.

(Application filed Aug. 16, 1898.)

(No Model.) 2 Sheets—Sheet 1.

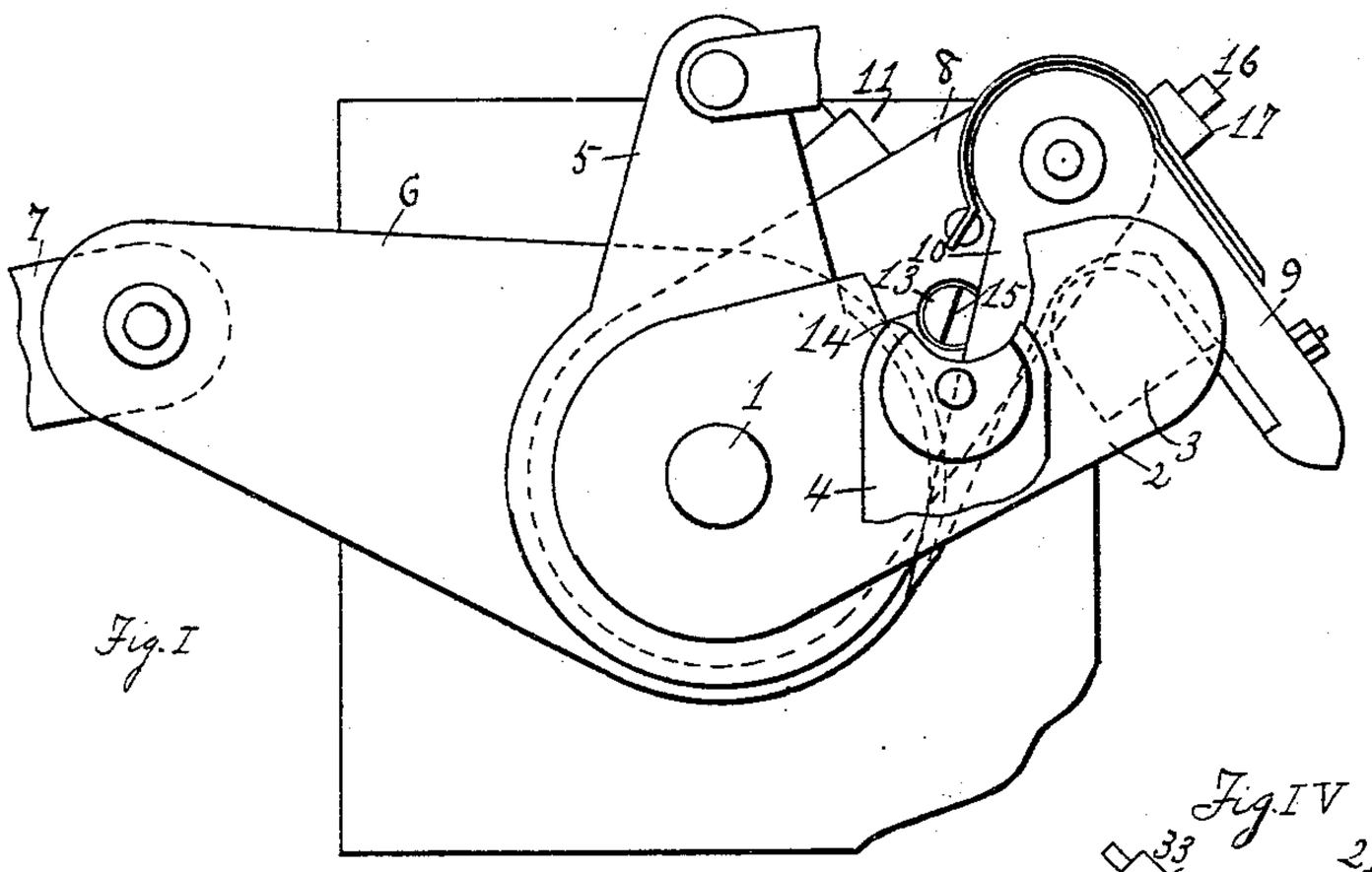

Fig. I

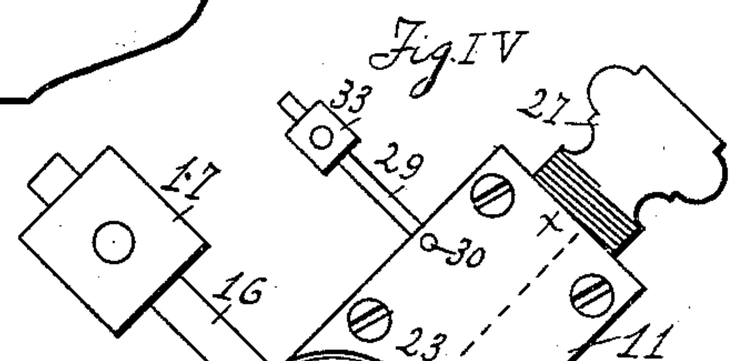

Fig. IV

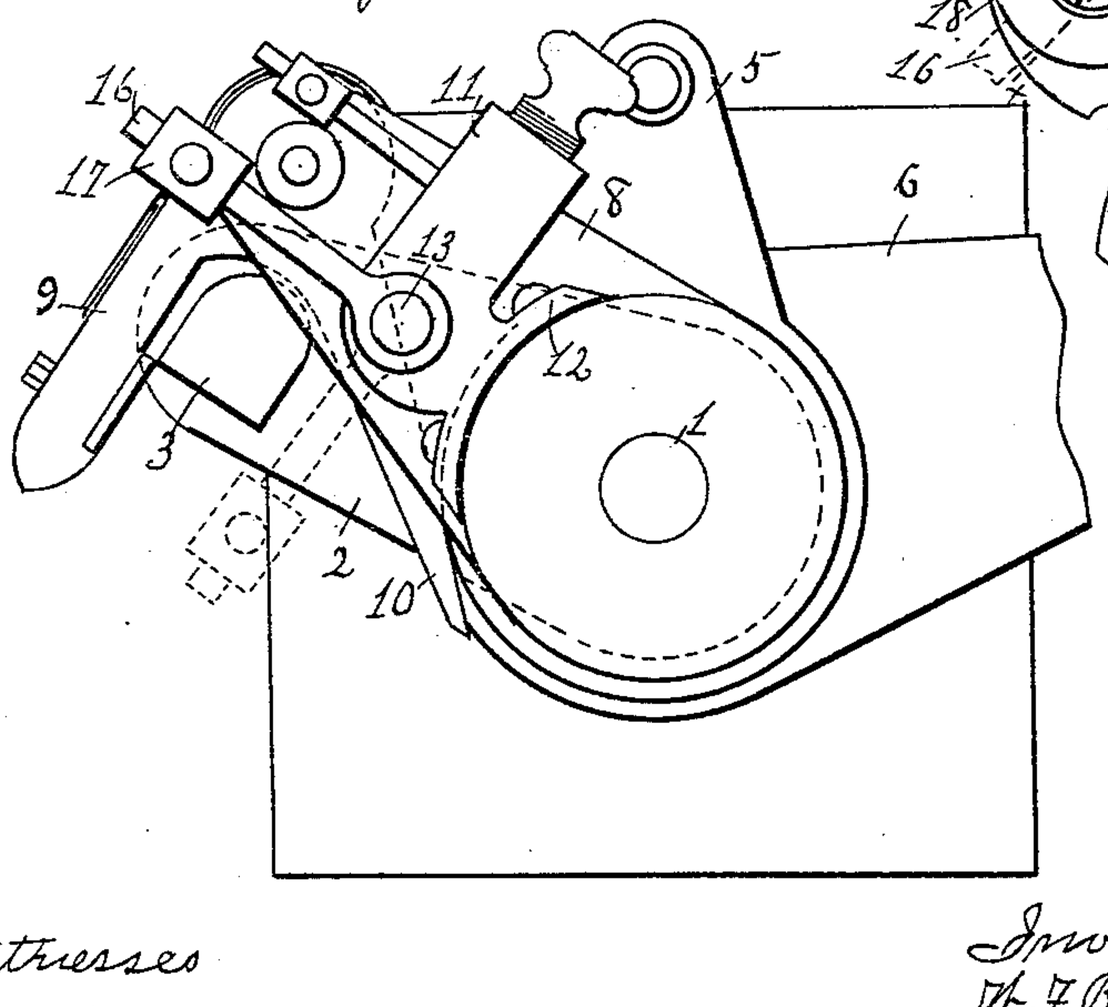

Fig. II

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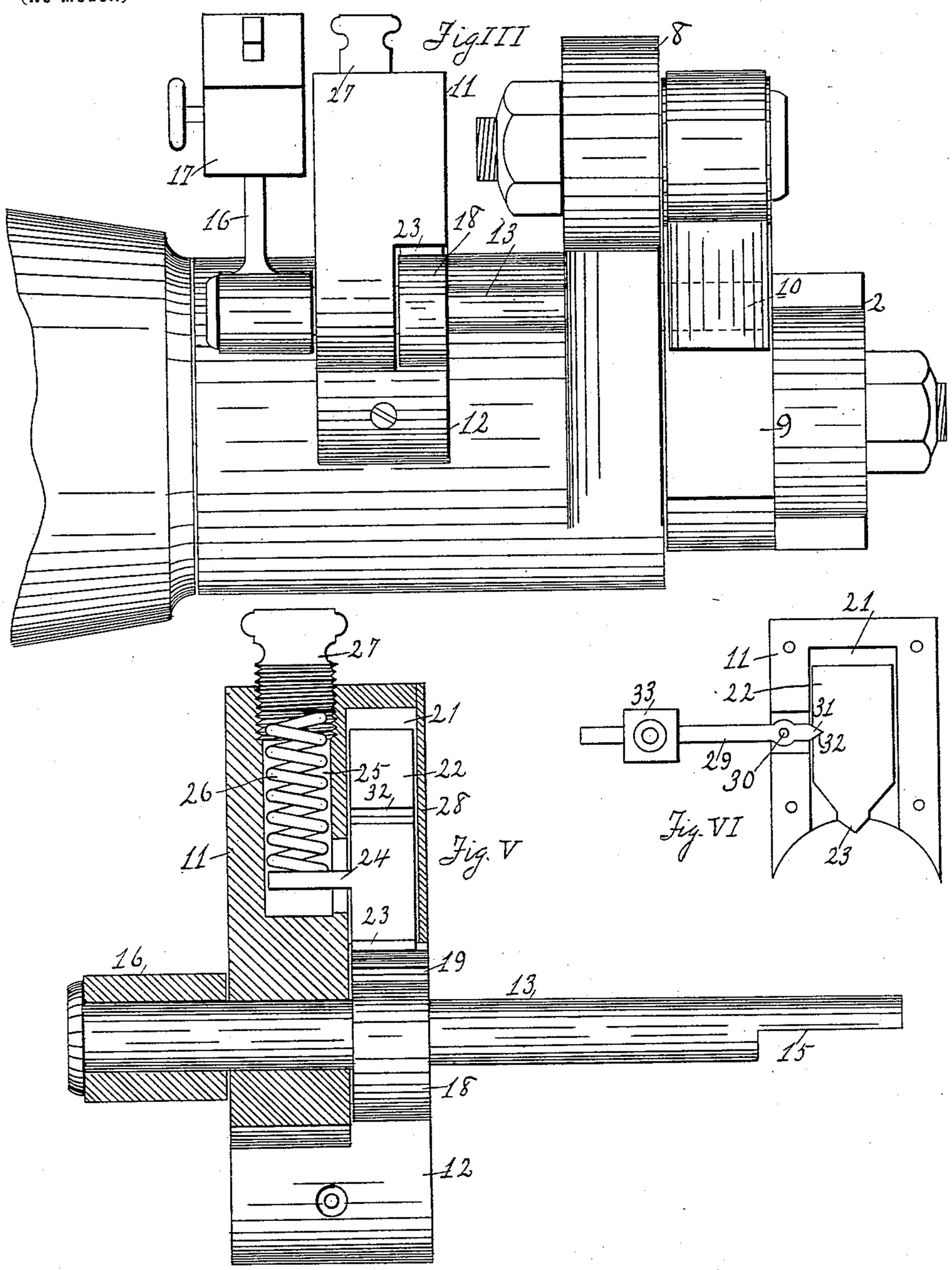

Fig. III

Fig. V

Fig. VI

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UNITED STATES PATENT OFFICE.

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SAFETY DEVICE FOR CORLISS ENGINES.

SPECIFICATION forming part of Letters Patent No. 638,621, dated December 5, 1899.

Application filed August 16, 1898. Serial No. 688,669. (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 a certain new and useful Safety Device for Corliss Engines, 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 a new and useful safety device for Corliss engines for controlling and stopping the engine when a determined speed above the normal working speed is reached. We are aware that a number of devices have been placed before the public notice for controlling and stopping an engine and preventing "running away;" but heretofore all such devices have been connected with the governor or controlled and put into operation by the governor or governor mechanism and may or may not act within the safety limit of speed.

The object of our invention is to provide a safety device connected directly with and put in operation and controlled by the action of the valve mechanism, so that so long as the valve mechanism is in operation the device will be in operative relation therewith and controlled thereby regardless of other parts and mechanism, it being apparent that when the valve mechanism stops no safety device is needed, and a device capable of such adjustment that when a determined speed above normal is reached the engine will be at once stopped; and to attain this object our invention consists of certain features of novelty hereinafter described, and pointed out in the claims.

Figure I represents an end elevation of the valve mechanism of a Corliss engine provided with our safety device. Fig. II represents an end elevation of the same viewed from the opposite side. Fig. III represents a side elevation of the same. Fig. IV represents a detail elevation of our safety device. Fig. V represents a view, partly in cross-section, on the line *x x* of Fig. IV. Fig. VI represents a view showing relation of auxiliary weight.

Similar numerals refer to similar parts throughout the several views.

1 represents the valve-stem. 2 represents the valve-stem crank, on which are mounted the catch-block 3 and the dash-pot rod 4, Fig. I. 5 represents the governor-crank. 6 represents the wrist-plate crank connected by the rod 7 with the wrist-plate. (Not shown.) 8 represents the crab-claw crank carrying the latch 9 and the trip-arm 10. In relation to these parts, common to all Corliss engines, our device consists of a block 11, mounted by means of the plate 12 upon the sleeve of the bell-crank, so that the block is given an oscillating movement corresponding to the oscillations of the crank. In said block 11 is journaled a shaft 13, the outer end of which passes through an opening 14 in the crab-claw crank. Beyond said crank a portion (substantially half) of the shaft is removed, providing a flat face 15 on the diameter of the shaft, arranged closely adjacent to the face of the trip-arm 10 when the latch is in engagement with the catch-block 3. On said shaft 13 is fixedly mounted an arm 16, on which arm is adjustably mounted a weight 17, in such relation that when the weight is in its elevated position, as shown in heavy lines in Fig. II, the flat face 15 of the shaft is in line with the face of the trip-arm 10, as above stated. To retain the shaft in the position designated against the action of the weight in a recess in the block 11, a disk 18 is fixedly mounted on the shaft, provided with the V-shaped indentation 19 and the square-shouldered indentation 20, and in another and longitudinal recess 21 in the block is provided a catch 22, having a V-shaped extremity 23, arranged to take in the V-shaped indentation 19 in the disk. To retain said catch in engagement with the disk, on said catch is provided a stud 24, extending into an adjacent recess 25, in which is located a coiled spring 26, arranged to bear on said stud, the tension of said spring being controlled and regulated by the screw-plug 27, bearing thereon. A plate 28 is provided to close the recess 21. 29 represents a lever fulcrumed at 30 in the side of the block adjacent to the catch-recess, one arm of said lever ter-

minating in a V-shaped nib 31, engaging a V-shaped notch 32 in the side of the catch, and the other arm having adjustably mounted thereon the weight 33, the function of which will appear.

In operation by the action of the wrist-plate in operating the valve mechanism an oscillating movement is given to the crank-arms 6 and 8 and a coincident and corresponding oscillating motion is given to the block 11 and the weight 17, mounted on the shaft 13, journaled in said block, the weight being held in position by engagement of the catch 22 in the V-shaped notch in the disk 18, as above stated. By this oscillating motion due to the oscillating action of the cranks a certain momentum is generated in or given to the weight and the degree of this momentum, as is apparent, is dependent upon the rapidity of oscillation of the cranks, such oscillation of course corresponding to the speed of the engine. The tendency of this momentum generated in the weight is to cause the shaft 13 to turn and to disengage the catch from the notch in the disk. To resist this impulse due to the momentum of the weight and retain the weight in position at normal speed, the tension of the spring 26 is set by the screw-plug 27 to such degree that the catch is held in the notch with sufficient force to prevent escape and hold the weight up at normal speed; but when the speed increases above normal to a desired and determined point within the limit of safety the momentum of the weight will overcome the restraining force of the spring, the disk will escape from the catch, and the weight will be thrown down until the catch engages the shouldered notch 20, as shown in dotted lines in Figs II and IV. By this action of the weight the shaft is turned quarter round, and in so turning the quadrant adjacent to the trip-arm of the latch acts as a trip to engage the latch trip-arm, throwing the latch out of engagement with the catch-block and preventing further engagement therewith, and thereby instantly and completely cutting off further admission of steam to the engine. The tension of the spring in relation to the momentum of the weight may be adjusted to a very great nicety, it being found in practice that such adjustment can be made so that in an engine running normally at ninety revolutions two revolutions above normal will cast the weight and shut off the steam. To assist in raising the catch 22 to release the weight 17, we provide the weight 33 on the lever 29, this weight having a momentum similar to that of weight 17 and acting to raise the catch. The lever is also useful to raise the catch from the shoulder notch 20 to restore the weight 17 to position.

We preferably use the weight, as above described, impelled by the momentum derived from the oscillation of the valve-gear to operate the trip and release the latch. It is, however, apparent that other means may be used independent of the governor and governor mechanism to operate such trip without departing from the principle of our invention, the principle of our invention being the application of a power or force to release and control the latch actuated and controlled by means independent of the governor and governor mechanism.

Having thus fully described our safety device, what we claim as our invention, and desire to secure by Letters Patent, is—

1. A safety device for Corliss engines 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, and means connected with and arranged to control said trip until such speed limit is reached; substantially as set forth.

2. A safety device for Corliss engines 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, and a catch connected with and arranged to control said trip until such speed limit is reached, substantially as set forth.

3. A safety device for Corliss engines 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, and a spring-controlled catch connected with and arranged to control the trip until such speed limit is reached; substantially as set forth.

4. A safety device for Corliss engines consisting of the combination with the valve-operating mechanism, of a trip mounted on the bell-crank sleeve arranged to act upon the crab-claw, a weight connected with and arranged by its oscillating momentum at a certain predetermined speed limit to operate said trip, and means connected with and arranged to control said weight until such speed limit is reached, substantially as set forth.

5. A safety device for Corliss engines consisting of the combination with the valve-operating mechanism, of a trip mounted on the bell-crank sleeve arranged to act upon the crab-claw, a weight connected with and arranged by its oscillating momentum at a certain predetermined speed limit to operate said trip, and a catch connected with and arranged to control said weight until such speed limit is reached, substantially as set forth.

6. A safety device for Corliss engines consisting of the combination with the valve-operating mechanism of a trip mounted upon the bell-crank sleeve arranged to act upon the crab-claw, a weight connected with and

arranged by its oscillating momentum at a certain predetermined speed limit to operate said trip, and a spring-controlled catch connected with and arranged to control said weight until such speed limit is reached substantially as set forth.

7. A safety device for Corliss engines consisting of a block mounted on the bell-crank sleeve, a shaft journaled in said block arranged to trip the crab-claw, a weight mounted on said shaft arranged to operate the trip, and a spring-catch arranged to control the weight when the parts are so arranged that the oscillating momentum of the weight controls the trip; substantially as set forth.

8. A safety device for Corliss engines consisting of a block mounted on the bell-crank sleeve, a shaft journaled in said block arranged to trip the crab-claw, a weight mounted on said shaft arranged to operate the trip, and a spring-catch arranged to control the weight, when the parts are so arranged that at a certain speed the oscillating momentum of the weight will overcome the resistance of the catch and operate the trip; substantially as set forth.

9. A safety device for Corliss engines consisting of the combination with the valve-operating mechanism, of a block mounted on the bell-crank sleeve, a shaft journaled in said block arranged to trip the crab-claw, a weight mounted on said shaft arranged to operate the trip, and a spring-catch arranged to control the weight, when the parts are so arranged that the oscillations of the bell-crank beyond a certain speed limit will cause the release of the weight and the operation of the trip; substantially as set forth.

10. A safety device for Corliss engines consisting of a block mounted on the bell-crank sleeve, a shaft journaled in said block arranged to trip the crab-claw, a weight mounted on an arm fixed on said shaft, a disk having suitable notches in its periphery mounted on said shaft, and a spring-catch arranged to take in said notches; substantially as and for the purposes set forth.

11. In a safety device for Corliss engines, a block mounted upon the bell-crank sleeve, a shaft journaled in said block having at one end a flattened face arranged to trip the crab-claw, and means for controlling and operating said shaft; substantially as set forth.

12. A safety device for Corliss engines consisting of a block mounted on the bell-crank sleeve, a shaft journaled in said block arranged to trip the crab-claw, a weight mounted on an arm fixed on said shaft, a disk having suitable notches in its periphery mounted on said shaft, a spring-catch arranged to take in said notches, and a weighted lever fulcrumed in said block arranged to act on said catch against the tension of its spring; substantially as set forth.

13. A safety device for Corliss engines consisting of a block mounted on the bell-crank sleeve, a shaft journaled in said block arranged to trip the crab-claw, a weight adjustably mounted on an arm fixed on said shaft, a disk having suitable notches in its periphery mounted on said shaft, and a spring-catch arranged to take in said notches; substantially as and for the purpose set forth.

14. In a safety device for Corliss engines, a spring-catch consisting of a block having suitable adjacent recesses, a catch arranged in one of said recesses, a stud on said catch extending into the other recess, a spring in said recess arranged to bear on said stud, and a screw-plug arranged to control the tension of said spring; substantially as set forth.

15. A safety device for Corliss engines consisting of a block mounted upon the bell-crank sleeve, a shaft journaled in said block arranged to trip the crab-claw, a weight mounted on said shaft arranged to operate the same to trip the crab-claw at a certain predetermined speed limit, and a catch connected with and arranged to control said weight until such speed limit is reached, substantially as set forth.

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