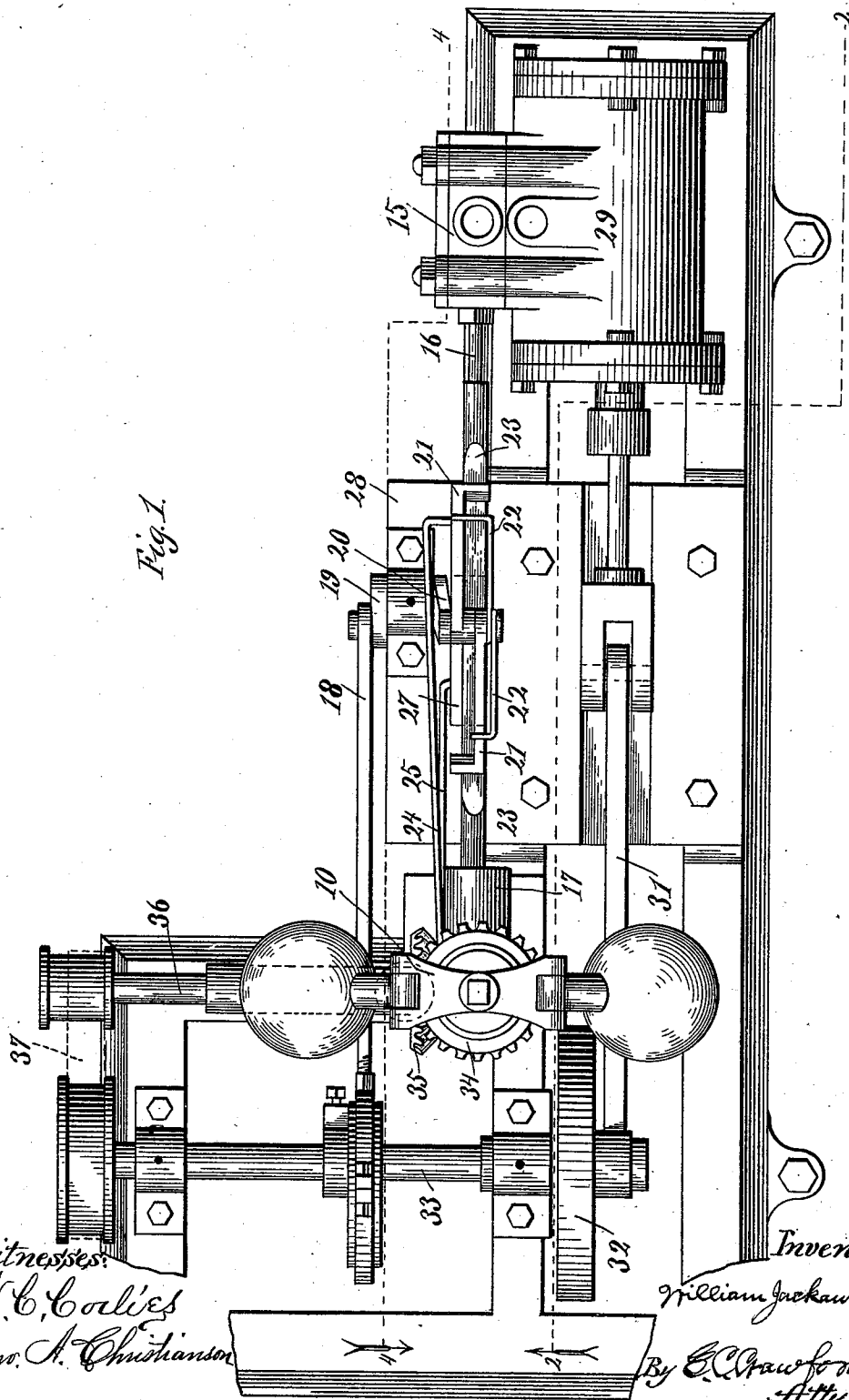


W. JACKAWAY.
CUT-OFF FOR STEAM ENGINES.

No. 521,714.

Patented June 19, 1894.

Fig. 1.



Witnesses:

W. C. Corlies

Jno. A. Christianson

Inventor:

William Jackaway,

By E. Crawford
Atty.

(No Model.)

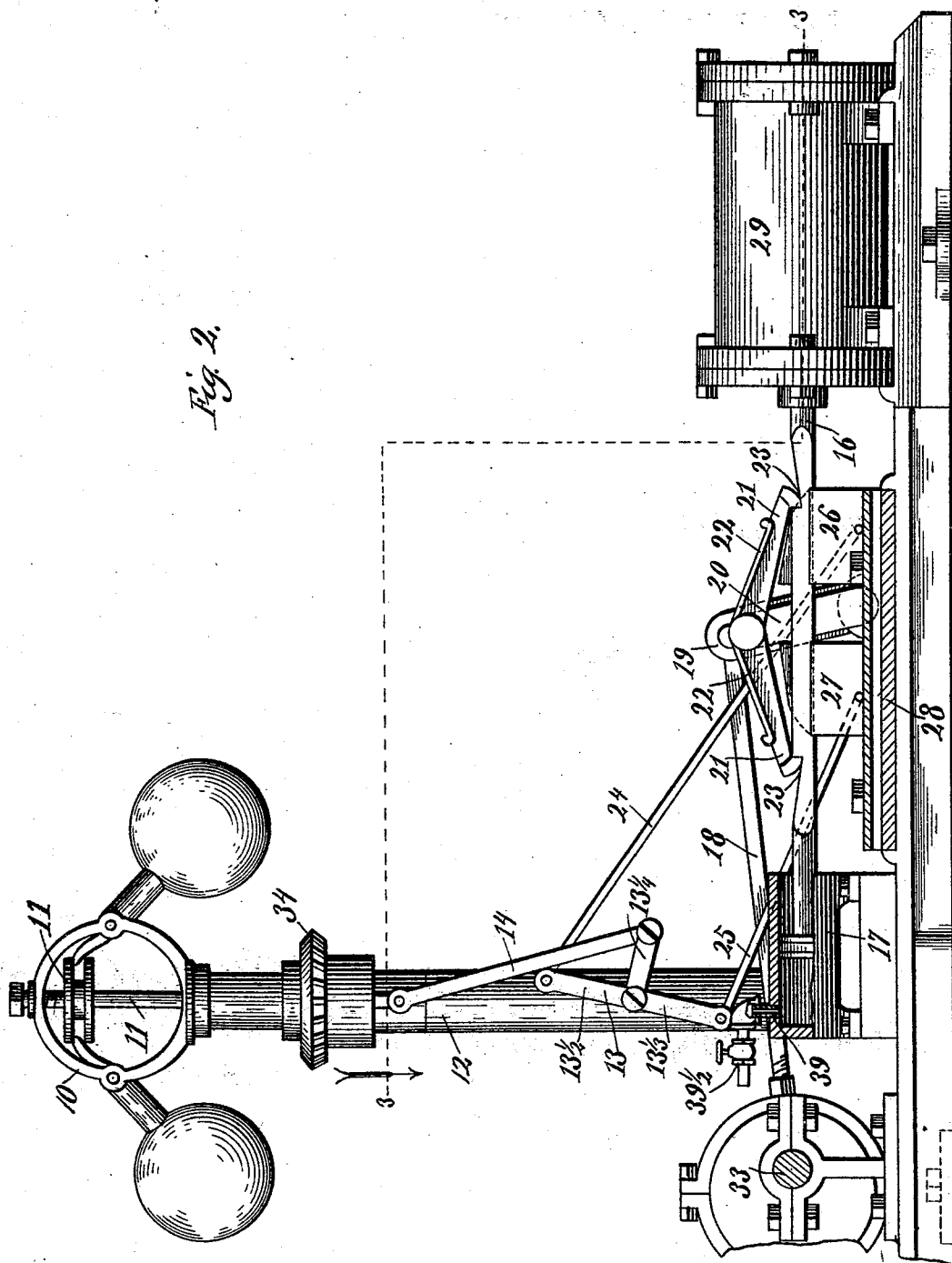
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W. JACKAWAY.
CUT-OFF FOR STEAM ENGINES.

No. 521,714.

Patented June 19, 1894.

Fig. 2.



Witnesses:
W. C. Corlies
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Att'y.

(No Model.)

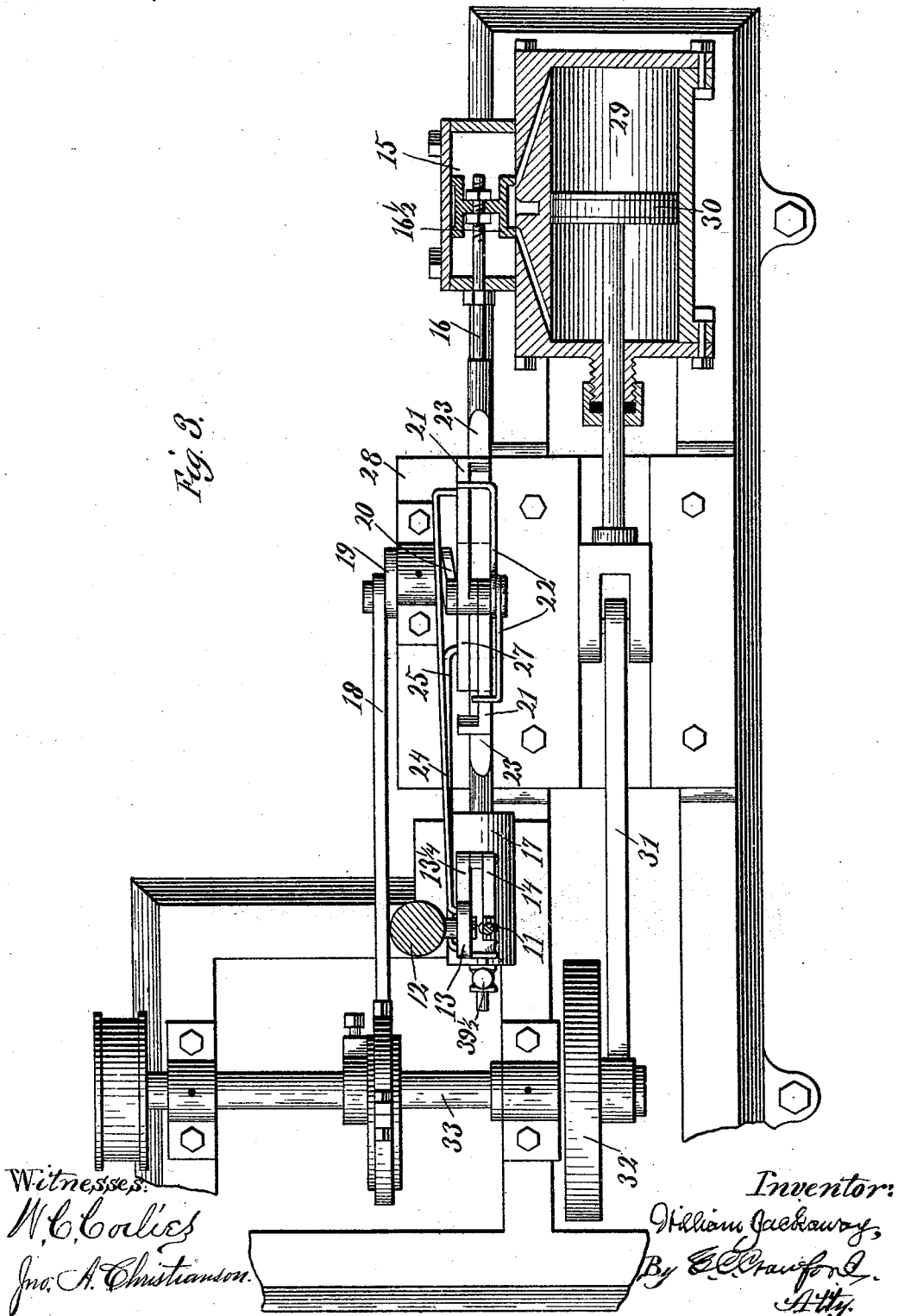
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W. JACKAWAY.
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Fig. 3.



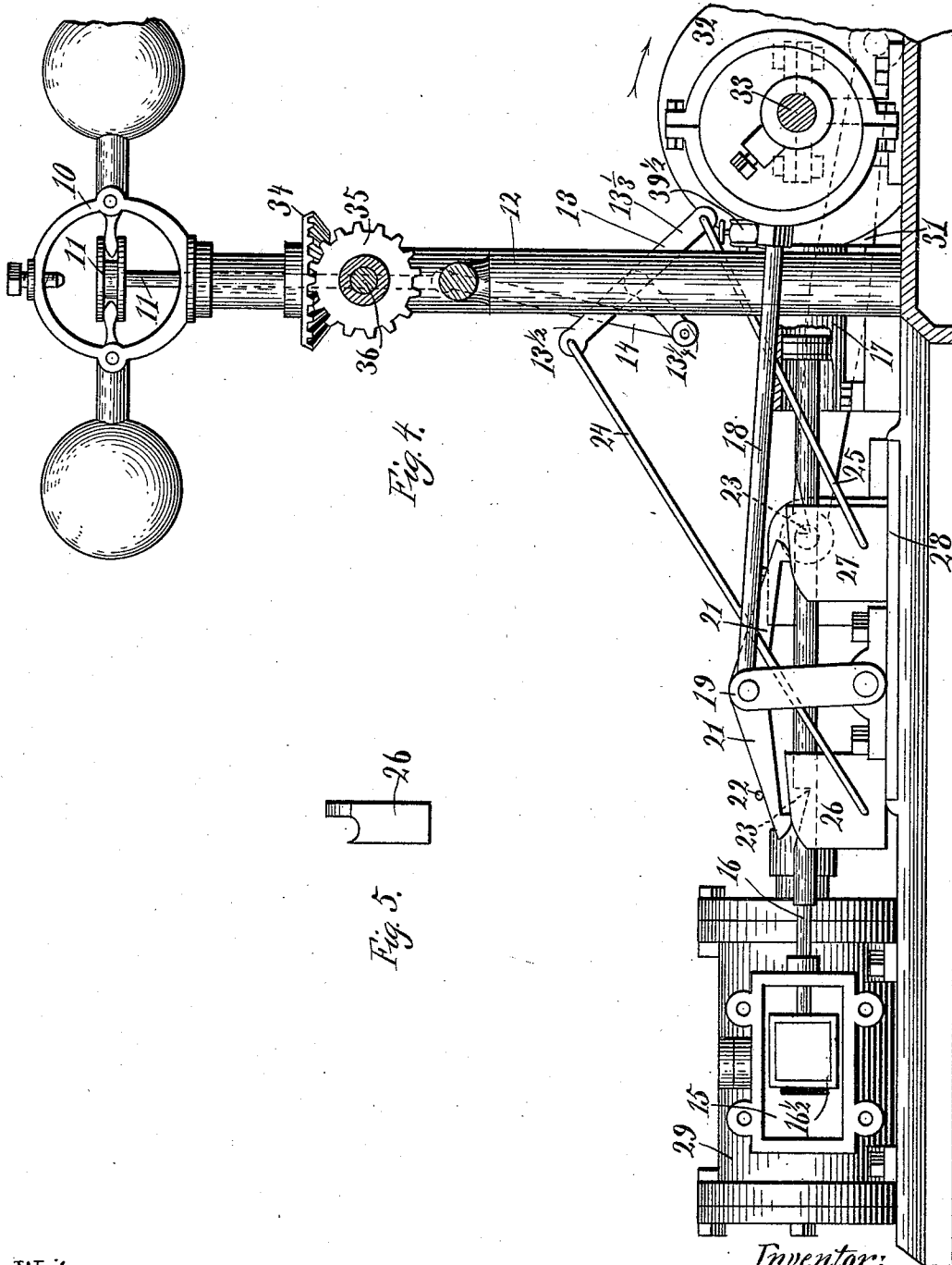
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W. JACKAWAY.
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Patented June 19, 1894.



Witnesses:

W. C. Corlies
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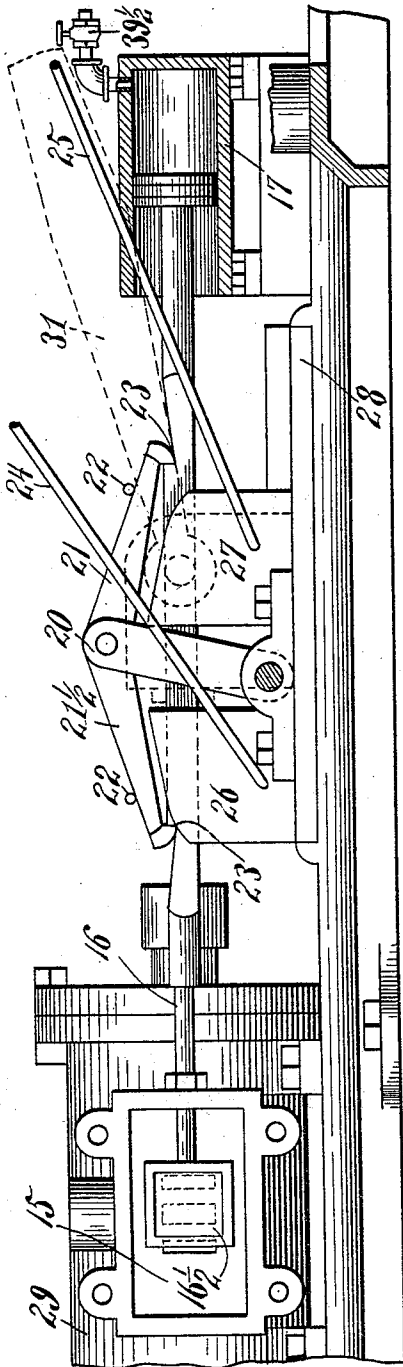
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W. JACKAWAY.
CUT-OFF FOR STEAM ENGINES.

No. 521,714.

Patented June 19, 1894.



Witnesses:

Enoch Harpole
Jnr. S. Christianson.

Fig. 6.

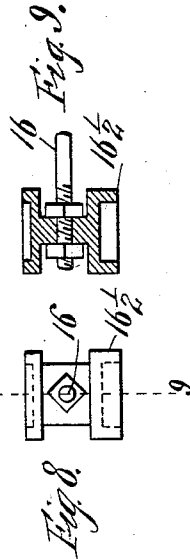
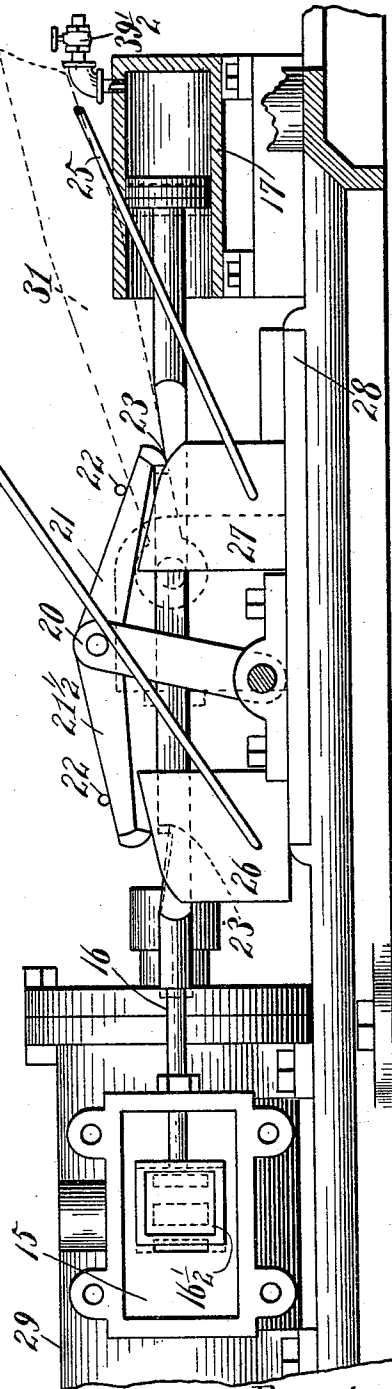


Fig. 8.

Fig. 9.

Fig. 7.



Inventor:

William Jackaway,
By S. Stanford,
Att'y.

UNITED STATES PATENT OFFICE.

WILLIAM JACKAWAY, OF WAUKEGAN, ILLINOIS, ASSIGNOR OF ONE-HALF
TO CHRISTIAN L. BOSLER, OF SAME PLACE.

CUT-OFF FOR STEAM-ENGINES.

SPECIFICATION forming part of Letters Patent No. 521,714, dated June 19, 1894.

Application filed August 21, 1893. Serial No. 483,641. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM JACKAWAY, a citizen of the United States, residing in Waukegan, Lake county, State of Illinois, have invented a new and useful Automatic Cut-Off for Steam-Engines.

The following is a complete specification of my invention above named.

My invention relates to means employed to automatically cut off steam from the cylinder of an engine whenever the speed has become too great. This object is accomplished by certain mechanism connected with the valve-stem and the governor. Such mechanism, and the parts of an engine required to show the operation of the same, are illustrated in the accompanying drawings, in which—

Figure 1 is a plan view of an engine embodying my automatic cut-off. Fig. 2 is a vertical longitudinal section of the same taken on line 2—2 of Fig. 1. Fig. 3 is a horizontal plan section of the same taken on the broken line 3—3 of Fig. 2; showing the eccentric and valve moved to their inner extreme limit. Fig. 4 is a vertical section of the same taken on the broken line 4—4 of Fig. 1, showing the engine with the valve-stem and the valve cut off from the automatic device. Fig. 5 is a detail edge elevation of one of the cams of the automatic device, detached. Fig. 6 is a detail section of the engine taken on the line 4—4 in Fig. 1, showing the dogs in such positions as they occupy from time to time when the engine is running at normal speed. Fig. 7 is a similar view taken on the same lines in Fig. 1, showing the dog $21\frac{1}{2}$ disengaged and permitting the valve-stem to be actuated by the piston of the dash-pot, as indicated by the dotted lines in Fig. 7; and Figs. 8 and 9 are details of a balance-valve which may be used in connection with my cut-off mechanism.

Like numerals refer to like parts throughout the several views.

Referring to the drawings, 10, is the governor; 11, its axis; 12, the main-stand supporting the governor; 13, a crank pivoted on the inner side of the main-stand. This crank is formed with three arms, $13\frac{1}{2}$, $13\frac{1}{3}$, and $13\frac{1}{4}$, the two former being nearly in a vertical line

and the latter in a line at right angles to the former.

14 is a lever pivoted to the lower end of the axis, 11, and to the end of the arm, $13\frac{1}{4}$.

15 is the steam-chest; 16, the valve-stem which operates the balance-valve, $16\frac{1}{2}$, in the steam-chest. (The distance between the laps of this valve must be slightly greater than the distance between the ports of the steam-chest.)

17 is the dash-pot; 18, the eccentric-rod; and 19 and 20, two parallel arms of a crank, the former of which is pivoted to the end of the eccentric-rod. Two dogs, 21, and $21\frac{1}{2}$ and two springs, 22, are pivoted on the arm, 20, the ends of the springs pressing down on the dogs. Notches, 23, are formed in the upper side of the valve-stem, with which the dogs engage. The rods, 24 and 25, are pivoted respectively to the ends of the arms, $13\frac{1}{2}$ and $13\frac{1}{3}$; and the cams, 26 and 27, are pivoted respectively to the lower ends of the rods, 24 and 25. These cams are so placed as to slide under and in contact with the lower ends of the dogs, and their upper edges are beveled in opposite directions, toward their outer corners. They move on the bed-plate, 28. It will be seen that when the crank, 13, turns, these cams will move apart and thus may raise the dogs and disengage them from the notches, 23. If the cams do not act upon the dogs, the latter, by engaging with the notches in the valve-stem and being connected with the crank operated by the eccentric-rod, will operate the valve-stem and thus admit steam into the cylinder, 29; and the piston, 30, will be thus actuated, and through the connecting-rod, 31, the fly-wheel, 32, and the main-shaft, 33, will drive the machinery. But the governor is connected with the cog-wheel, 34, meshing with the cog-wheel 35, on the end of the shaft, 36, and the latter is connected by a belt, 37, or any other suitable means, with a wheel on the main shaft; and hence the governor attains a velocity corresponding to the velocity of the main shaft. As its velocity increases, its arms rise, and its axis, and lever, 14, are depressed; by such action the cams are moved apart, and when sufficient velocity has been attained to raise the arms

of the governor to a horizontal position, the dogs are raised by the cams out of their notches, the valve-stem ceases to move, leaving the valve in the center of the steam-chest, and steam is thus cut off completely. But before the arms of the governor are thus raised, the dogs will be disengaged and will re-engage with the notches, alternately, once in each revolution.

The outer lap on the balance-valve must stop exactly over the corresponding port in the steam-chest. To secure this result, the dash-pot, 17, is provided with a small tube, 39, let into its upper part near its end farthest from the steam-chest, and the regulating valve, 39 $\frac{1}{2}$, is secured in the top of this tube for the purpose of admitting a little air into and exhausting the same from the dash-pot at each stroke of the piston. The object of this is to prevent the creation of a complete vacuum in the dash-pot to admit just enough air to cause the piston in the dash-pot to stop at such points in its stroke as will make the outer laps on the balance-valve stop exactly over the corresponding steam ports in the steam chest, so that steam shall be cut off in turn from each end of the cylinder. The proper points in its stroke where the piston in the dash-pot must stop to accomplish above result, is found by experiment, that is, by manipulating the regulating valve admitting air into the dash-pot, (the engine running slowly,) until just the right quantity of air has been admitted to cause the piston to move far enough to place the outer laps, successively, directly over the respective steam ports. When the piston in the dash-pot is at the end of its outer stroke, the dog 21 $\frac{1}{2}$ is disengaged by the action of the governor and its connections; but the compressed air in the dash-pot expands and forces the piston back a little distance, thus preventing a dead stop before the dog by the completed revolution of the governor, re-engages with the valve-stem; and when the piston in the dash-pot stops at the outer end of its stroke the dog 21 is disengaged and the partial vacuum in the dash-pot permits the atmospheric pressure to force the piston inward until this dog re-engages with the valve stem. Thus, while the movement of the

valve-stem is retarded at each stroke, it does not wholly cease until the arms of the governor have risen so high as to disengage both dogs together. It is obvious that the last condition having been reached, the velocity of the machinery will be quickly so diminished that the arms of the governor will descend and the dogs will re-engage with the valve-stem, and the latter will resume its action.

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

1. In a steam engine, the combination, of the governor, a three-armed crank pivoted on the main-stand supporting the governor, the valve-stem having two notches in its upper side, a two-armed crank operated by the eccentric-rod, two dogs pivoted on the inner arm of said crank so as to engage with the notches, cams connected by rods with the two opposite arms of the three-armed crank so as to slide under the lower ends of the dogs, substantially as and for the purpose specified.

2. In a steam engine, the combination of the governor, a three-armed crank pivoted on the main-stand supporting the governor, the valve-stem having two notches in its upper side, a two-armed crank operated by the eccentric-rod, two dogs pivoted on the inner arm of said crank so as to engage with the notches, cams connected by rods with the two opposite arms of the three-armed crank so as to slide under the lower ends of the dogs, the dash-pot, 17, having in it the tube, 39, and the regulating valve, 39 $\frac{1}{2}$, secured in said tube, substantially as and for the purpose specified.

3. In a steam engine the combination of the governor; the main-stand, 12; the three-armed crank, 13; the valve-stem, 16, having the two notches, 23, in its upper side; the arm, 20, of the two armed crank; the two dogs, 21 21 $\frac{1}{2}$; the cams, 26, and 27; the rods, 24 and 25; the tube, 39, in the dash-pot; the regulating valve, 39 $\frac{1}{2}$; and the springs, 22, substantially as and for the purpose specified.

WILLIAM JACKAWAY.

Witnesses:

C. S. MOODY,
E. C. ALFORD.