No. 665,447. Patented Jan. 8, 1901.

F. L. LANE & W. RAINFORTH.

SAFETY ENGINE STOP.

(Application filed Aug. 27, 1900.)

(No Model.) 4 Sheets—Sheet 1.

Fig. 2.

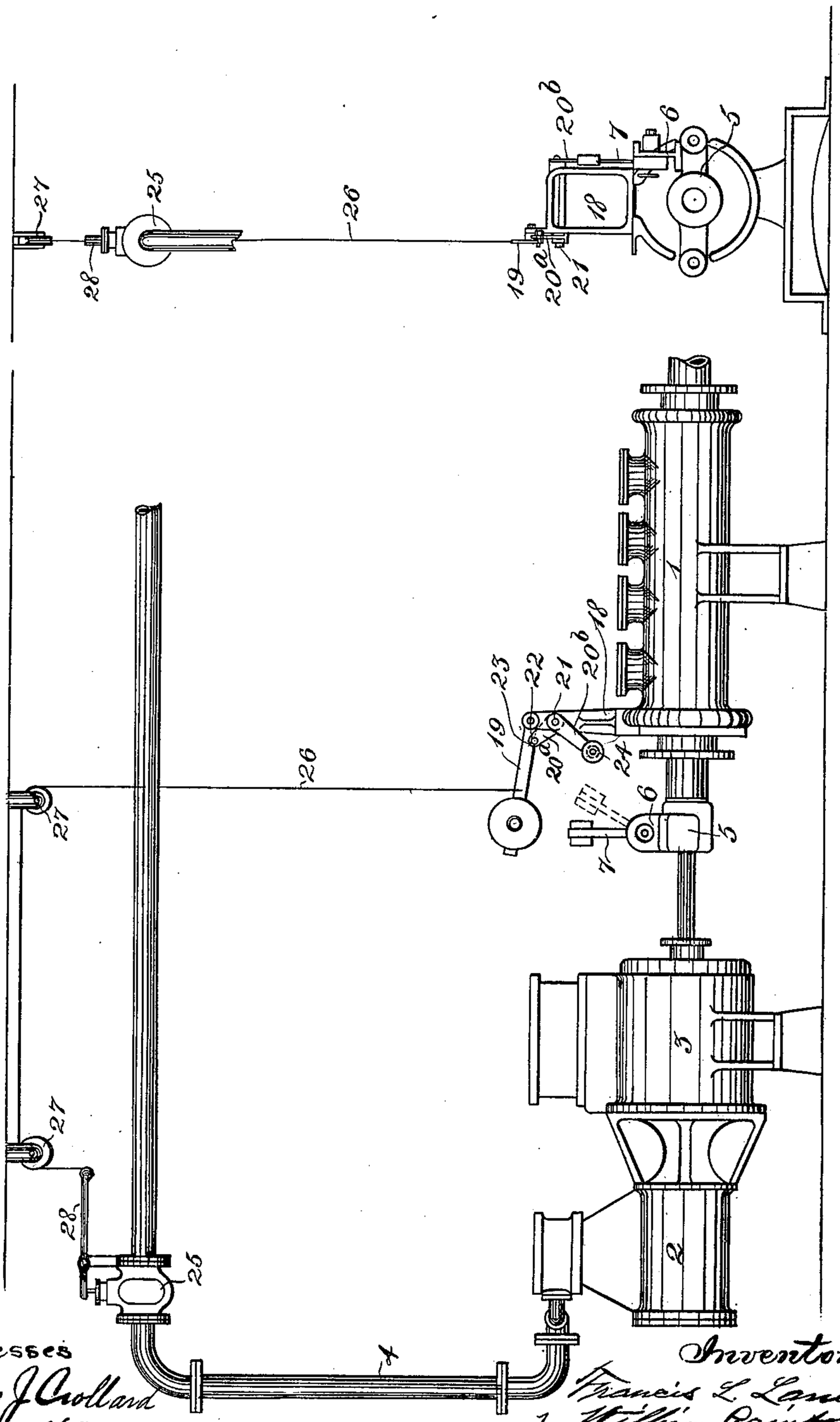

Fig. 1.

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(No Model.) 4 Sheets—Sheet 2.

Fig. 3.

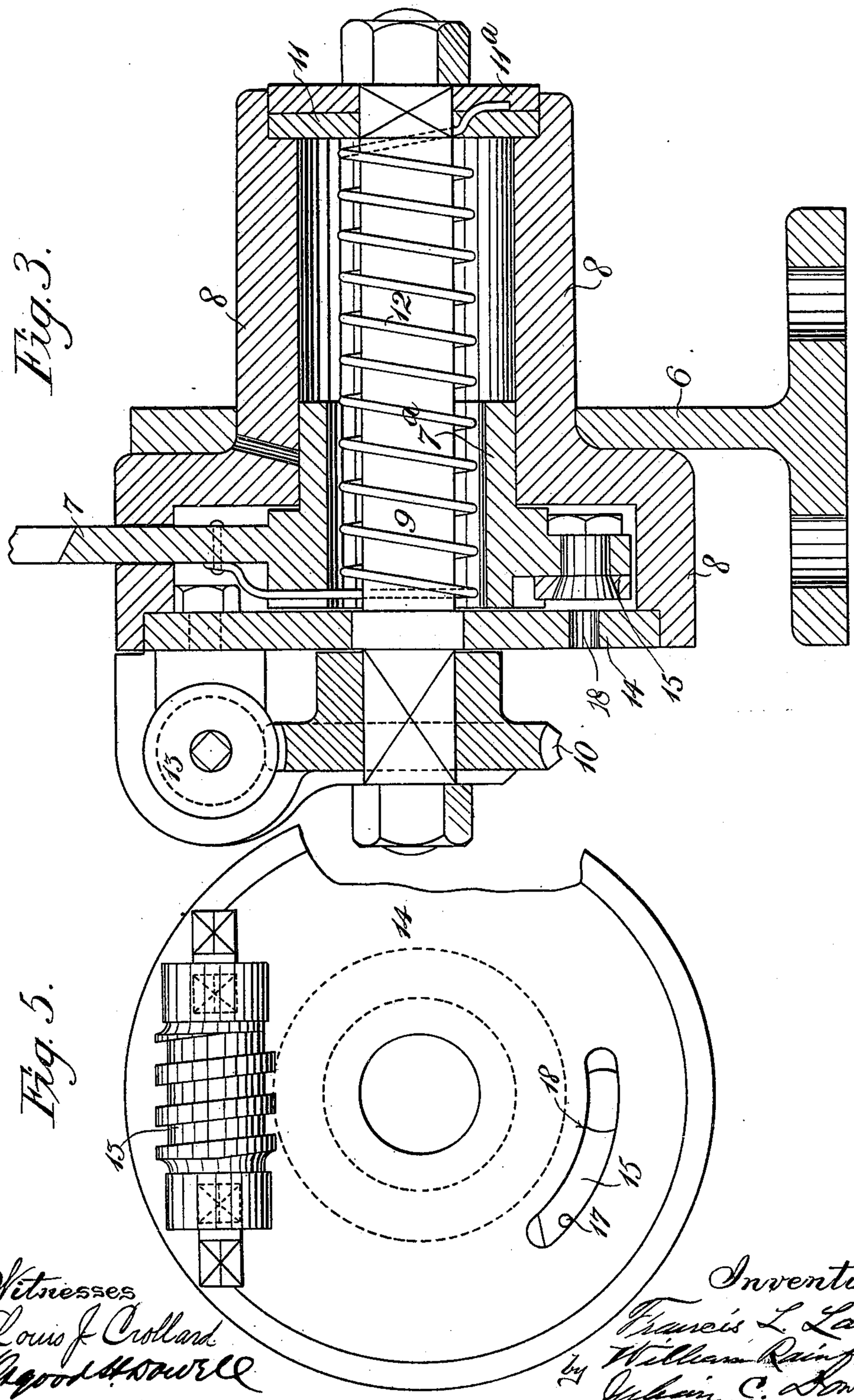

Fig. 5.

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(No Model.) 4 Sheets—Sheet 3.

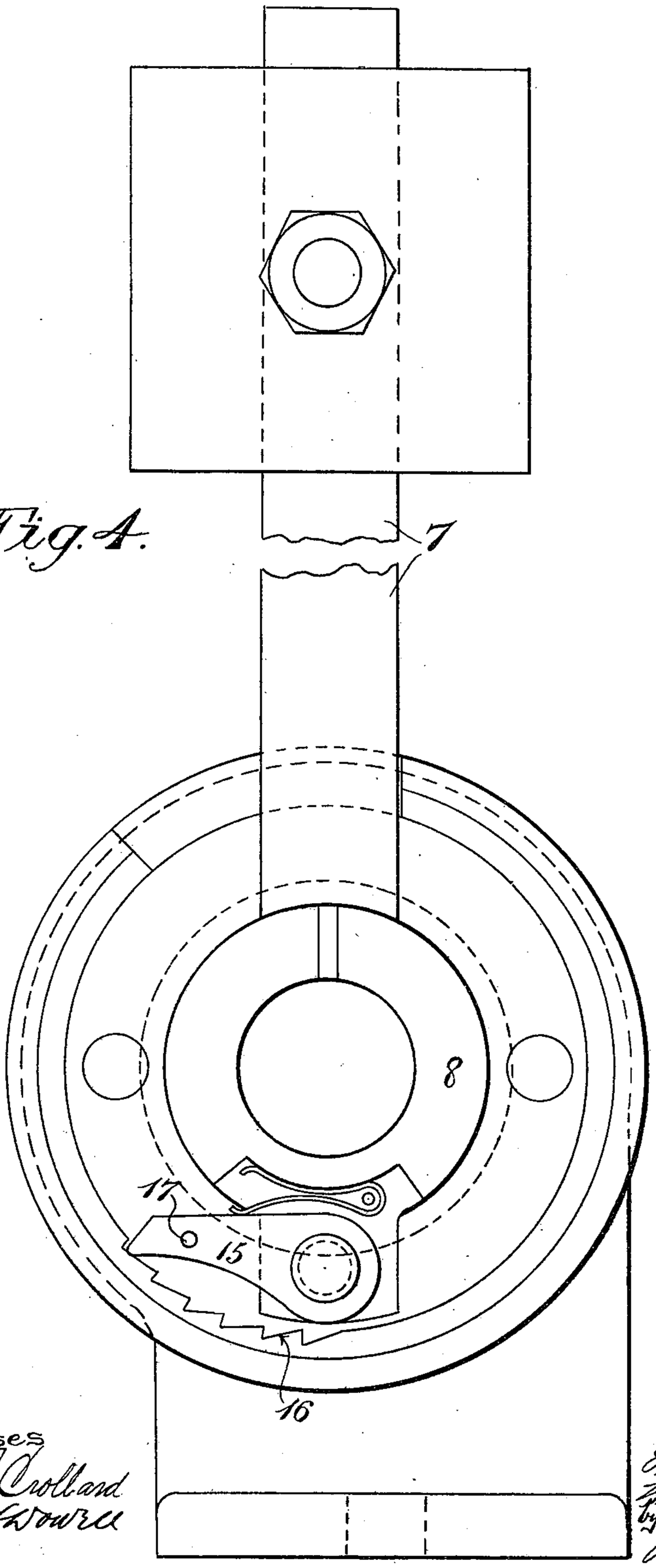

Fig. 4.

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No. 665,447 Patented Jan. 8, 1901.

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SAFETY ENGINE STOP.

(Application filed Aug. 27, 1900.)

(No Model.) 4 Sheets—Sheet 4.

Fig. 6.

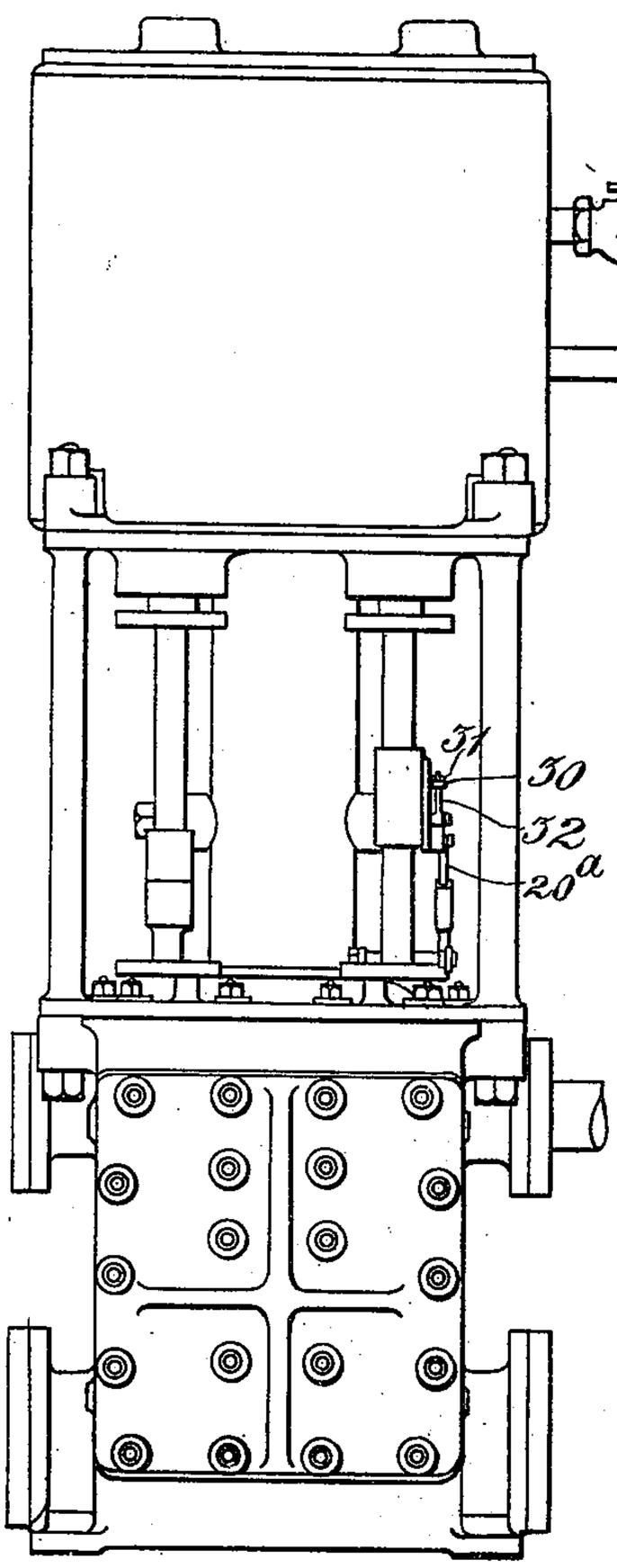
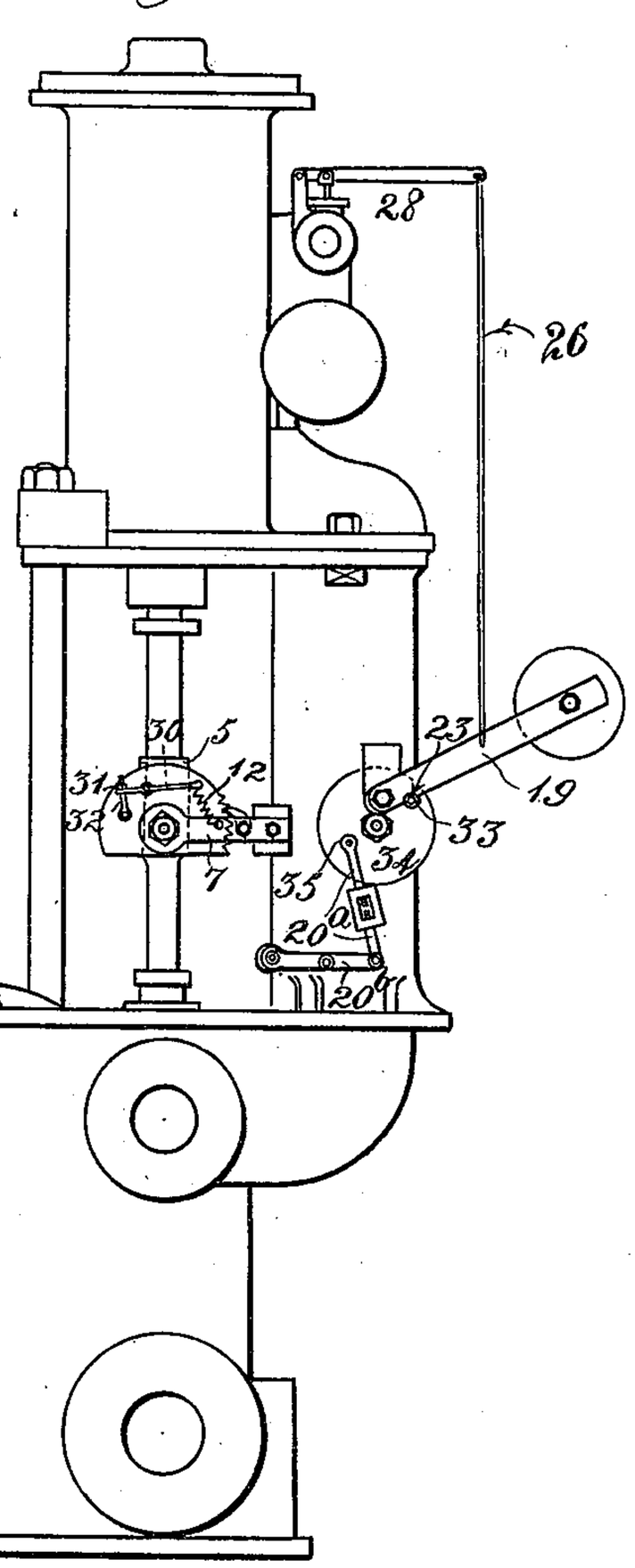


Fig. 7.



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UNITED STATES PATENT OFFICE.

FRANCIS LAWRENCE LANE AND WILLIAM RAINFORTH, OF LEEDS, ENGLAND.

SAFETY ENGINE-STOP.

SPECIFICATION forming part of Letters Patent No. 665,447, dated January 8, 1901.

Application filed August 27, 1900. Serial No. 28,234. (No model.)

To all whom it may concern:

Be it known that we, FRANCIS LAWRENCE LANE, residing at Headingly, Leeds, and WILLIAM RAINFORTH, residing at Armley, Leeds, in the county of York, England, subjects of the Queen of Great Britain and Ireland, have invented Improvements in Safety Devices for Stopping Pumping-Engines, Motors, and other Machines, of which the following is a specification.

This invention has reference to improvements in safety devices for stopping pumping-engines, motors, and other machines (hereinafter referred to as "engines") as soon as they commence to run too fast, so as to prevent damage and breakdowns, and is more particularly designed for use with hydraulic plants. For this purpose a reciprocating part of an engine is provided with a weight that is held in an inoperative attitude or position while the speed of the engine is normal by a spring adapted, on the speed of the engine becoming excessive, to yield, owing to the resistance offered by the weight to the more sudden transfer to it through the spring of the rapid motion of the reciprocating part. The weight then assumes such an attitude or position that on the return stroke of the reciprocating part the weight will act as a tappet upon a lever or other device, the displacement of which causes the supply of motive fluid to be cut off.

Safety devices according to this invention can be constructed in various forms and can be applied to various machines having reciprocating parts. Such a device may be fixed horizontally, vertically, or inclined at an angle to suit the machine to which it is to be applied, subject to such modifications in the details as may be necessary to carry the invention into effect on any particular machine.

Figure 1 is a side elevation of a horizontal pumping-engine fitted with a safety device according to this invention; Fig. 2, an end view thereof; Figs. 3, 4, and 5, detail views hereinafter more particularly referred to. Figs. 6 and 7 are elevations at right angles to each other of a vertical pumping-engine fitted with a modified arrangement of safety device.

In the arrangement illustrated in Figs. 1 to 5, inclusive, 1 is the pump-barrel; 2 and 3, the high and low pressure steam-cylinders of the engine; 4, the steam-supply pipe, and 5 the cross-head to which the pump-plunger and piston-rod are attached. Upon the cross-head 5 a bracket 6 is bolted and has mounted upon it a weighted lever 7, which may conveniently be formed with a tubular boss 7^a, as seen clearly from Fig. 3, which is a sectional view of the bracket and lever 7 drawn to a larger scale. The boss 7^a works in a suitable bearing 8, secured in the bracket 6, and forms the fulcrum of the lever. Through the boss extends a spindle 9, to one end of which a worm-wheel 10 is secured, and to the other end are secured two disks 11 11^a, which rest in a recessed end of the bearing 8 and which clamp between them one end of a spiral spring 12, encircling the spindle, and having its other end secured to the lever 7, as shown. The worm-wheel 10 gears with a worm 13, that is carried by an end or cover plate 14, secured to the bearing 8. Fig. 4 is a view at right angles to Fig. 3 with the cover-plate 14 removed, and Fig. 5 shows the cover-plate detached. The tension of the spring can be adjusted by actuating the worm, which is formed with squared ends to enable this to be readily effected by a spanner or key.

To the lever 7 is attached a spring-pressed pawl 15, that engages with a circular or curved rack 16, formed on the inner surface of an enlarged part of the bearing 8, as shown, the arrangement being such that the weighted lever can only move in one direction and that when its attitude is changed it cannot return to its normal attitude until released by the person in charge. To enable the pawl 15 to be readily disengaged from the rack, it is provided with a pin or peg 17, which extends outwardly through a slot 18 in the cover-plate.

To the pump-barrel 1 or other conveniently-situated stationary part of the pump is fixed a bracket or standard 18, in which are pivoted, one above the other, a weighted lever 19 and a lever comprising two arms 20^a and 20^b, connected by a rock-shaft 21. The arm 20^a is provided with a pin 22, that engages in a notch 23 in the weighted lever 19 in such a way that the latter is thereby supported, and the other arm 20^b is provided with a cushion 24, of leather or other suitable material, for the

lever 7 to strike against when the speed of the pump becomes excessive, and the lever 7 is thereby thrown forward. The axis of the fulcrum or pivot of the lever 19 is in the same vertical plane as its supporting two-armed lever, but above it, and the notch in the lever 19 is so shaped and arranged that the arm 20^a, which engages with it, acts as a strut, the weight being thereby transmitted to the shaft 21, and little force is required to be applied by the lever 7 to the arm 20^b to liberate the lever 19. The weighted lever 19 is connected to the stop-valve 25 of the engine by any suitable means, such as a wire or rope 26, passing over guide-pulleys 27 and attached to a lever 28, acting on the spindle of the valve 25, which is conveniently of the equilibrium type.

By adjusting the tension of the spring 12 the device may be set so that the weighted lever 19 will come into operation and cut off the supply of motive fluid at any desired engine speed. A pointer may be attached to the worm-wheel 10 and an index provided on the outside circumference of the end plate 14, so as to indicate the speed at which the pump is set to work.

The operation of the apparatus is as follows: When the engine is running at its normal speed, the weighted lever 7 is carried to and fro in a vertical attitude and just clears the cushion 24 on the arm 20^b. Immediately the engine commences from any cause—for instance, owing to the bursting of a pressure-pipe—to run at a greater speed than that to which the apparatus has been set the weighted lever 7 does not receive the same acceleration as the piston, and therefore slips and takes up a different attitude—for instance, that shown in dotted lines in Fig. 1, in which it is firmly locked by the pawl 15 engaging the rack 16. On the return of the piston the lever 7 comes into contact with the cushion 24 and knocks the arm 20^b downward and backward, thereby moving downward the arm 20^a and disengaging the pin 22 from the notch 23 in the lever 19, with the result that the weighted lever 19 is liberated and falling by gravity closes the stop-valve 25 through the medium of the wire or rope 26, shutting off the supply of steam and stopping the engine.

In the modified arrangement, suitable for vertical pumping-engines, illustrated in Figs. 6 and 7, the weighted lever 7 is pivoted to the pump cross-head 5 and the spring 12 is attached at one end to it and at the other end to a lever 30, capable of adjustment by means of a nut 31, screwed onto a swing-bolt 32, which extends through the lever 30. The stationary weighted lever 19 is supported by a crank-pin 33, that extends from a disk 34, mounted beneath it, engaging with its notch 23, a second crank-pin 35, extending from the disk 34, being linked to one arm 20^a of a lever, the other arm 20^b of which is provided with a cushion, as above mentioned.

In another modification a flexible spring to which a weight is attached may be used with any suitable catch and regulating arrangement, and, again, a weight sliding in a box with suitable regulating arrangements may be used.

In some cases the fall of the weighted lever 19 may cause the completion of an electric circuit, so as to ring a bell to warn the attendant that the engine is stopped.

What we claim is—

1. A safety device for engines comprising a movable weight carried by a reciprocating part of the engine, means adapted to hold said weight in its inoperative attitude or position while the speed of the engine is normal but to yield under the action of the weight when the speed becomes excessive and an abutment in connection with a motive-fluid-supply device, said abutment being located in the path of the weight when the said weight is moved into its operative attitude or position and capable of being thereby displaced and stopping the supply of motive fluid as set forth.

2. A safety device for engines comprising a weight carried by a reciprocating part of the engine, a spring adapted to hold said weight in its inoperative attitude or position while the speed of the engine is normal but to yield under the action of the weight when the speed becomes excessive, means for adjusting the tension of said spring, and an abutment in connection with a motive-fluid-supply device, said abutment being located in the path of the weight when in its operative attitude or position and capable of being thereby displaced and stopping the supply of motive fluid, as set forth.

3. A safety device for engines comprising a weight carried by a reciprocating part of the engine, a spring adapted to hold said weight in its inoperative attitude or position while the speed of the engine is normal but to yield under the action of the weight when the speed becomes excessive, means for preventing the return of the weight to its inoperative attitude or position and an abutment in connection with a motive-fluid-supply device, said abutment being located in the path of the weight when in its operative attitude or position and capable of being thereby displaced and stopping the supply of motive fluid, as set forth.

4. A safety device for engines comprising a weight carried by a reciprocating part of the engine, a spring adapted to hold said weight in its inoperative attitude or position while the speed of the engine is normal but to yield under the action of the weight when the speed becomes excessive, means for adjusting the tension of said spring, means for preventing the return of the weight to its inoperative position, and an abutment in connection with a motive-fluid-supply device, said abutment being located in the path of the weight when

in its operative attitude or position and capable of being thereby displaced and stopping the supply of motive fluid, as set forth.

5. A safety device for engines comprising a weighted lever pivoted to a reciprocating part of the engine, a spring adapted to hold the said weighted lever at an angle to the path of said reciprocating part while the speed of the engine is normal but to yield under the action of the weighted lever when the speed becomes excessive, and an abutment in connection with a motive-fluid-supply device, said abutment being located in the path of the weighted lever when in its operative attitude or position and capable of being thereby displaced and stopping the supply of motive fluid, as set forth.

6. A safety device for engines comprising a weighted lever pivoted to a reciprocating part of the engine, a spring adapted to hold the said weighted lever at an angle to the path of said reciprocating part while the speed of the engine is normal but to yield under the action of the weighted lever when the speed becomes excessive, a pawl carried by the weighted lever and engaging a curved rack carried by the reciprocating part, and an abutment in connection with a motive-fluid-supply device, said abutment being located in the path of the weighted lever when in its operative attitude or position and capable of being thereby displaced and stopping the supply of motive fluid, as set forth.

7. A safety device for engines comprising a weighted lever pivoted to a reciprocating part of the engine, a spring adapted to hold the said weighted lever at an angle to the path of said reciprocating part while the speed of the engine is normal but to yield under the action of the weighted lever when the speed becomes excessive, a pawl carried by the weighted lever and engaging a curved rack carried by the reciprocating part, and an abutment in connection with a motive-fluid-supply device, said abutment being located in the path of the weighted lever when in its operative attitude or position and capable of being thereby displaced and stopping the supply of motive fluid, as set forth.

8. A safety device for engines comprising a weight carried by a reciprocating part of the engine, a spring adapted to hold said weight in its inoperative attitude or position while the speed of the engine is normal but to yield under the action of the weight when the speed becomes excessive, a weight connected to the stop-valve of the engine, and displaceable means for supporting said weight in a position corresponding to the open position of said valve, said means being provided with an abutment located in the path of the weight carried by the reciprocating part of the engine when said weight is in its inoperative attitude or position, as set forth.

9. A safety device for engines comprising a weight carried by a reciprocating part of the engine, a spring adapted to hold said weight in its inoperative attitude or position while the speed of the engine is normal but to yield under the action of the weight when the speed becomes excessive, a weighted lever pivoted to a fixed part and connected to the stop-valve of the engine, a second lever also pivoted to a fixed part and provided with an abutment located in the path of the weight carried by the reciprocating part of the engine when said weight is in its inoperative attitude or position, and means whereby the said two levers are coupled in such a way as to prevent the fall of the former until the latter is displaced, as set forth.

10. In a safety device for engines, the combination of a weighted lever pivoted to a reciprocating part of the engine, a spring tending to maintain said lever at an angle to the path of said reciprocating part, means for adjusting tension of said spring, a rack and pawl one carried by said lever and the other by the reciprocating part, a stationary weighted lever, means for connecting it to the stop-valve of the engine, a stationary lever carrying an abutment, and means for coupling said two stationary levers so as to prevent the fall of the former until the latter is displaced as set forth.

Signed at Leeds, in the county of York, England, this 14th day of August, 1900.

FRANCIS LAWRENCE LANE.
WILLIAM RAINFORTH.

Witnesses:
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W. H. MCELLROY.