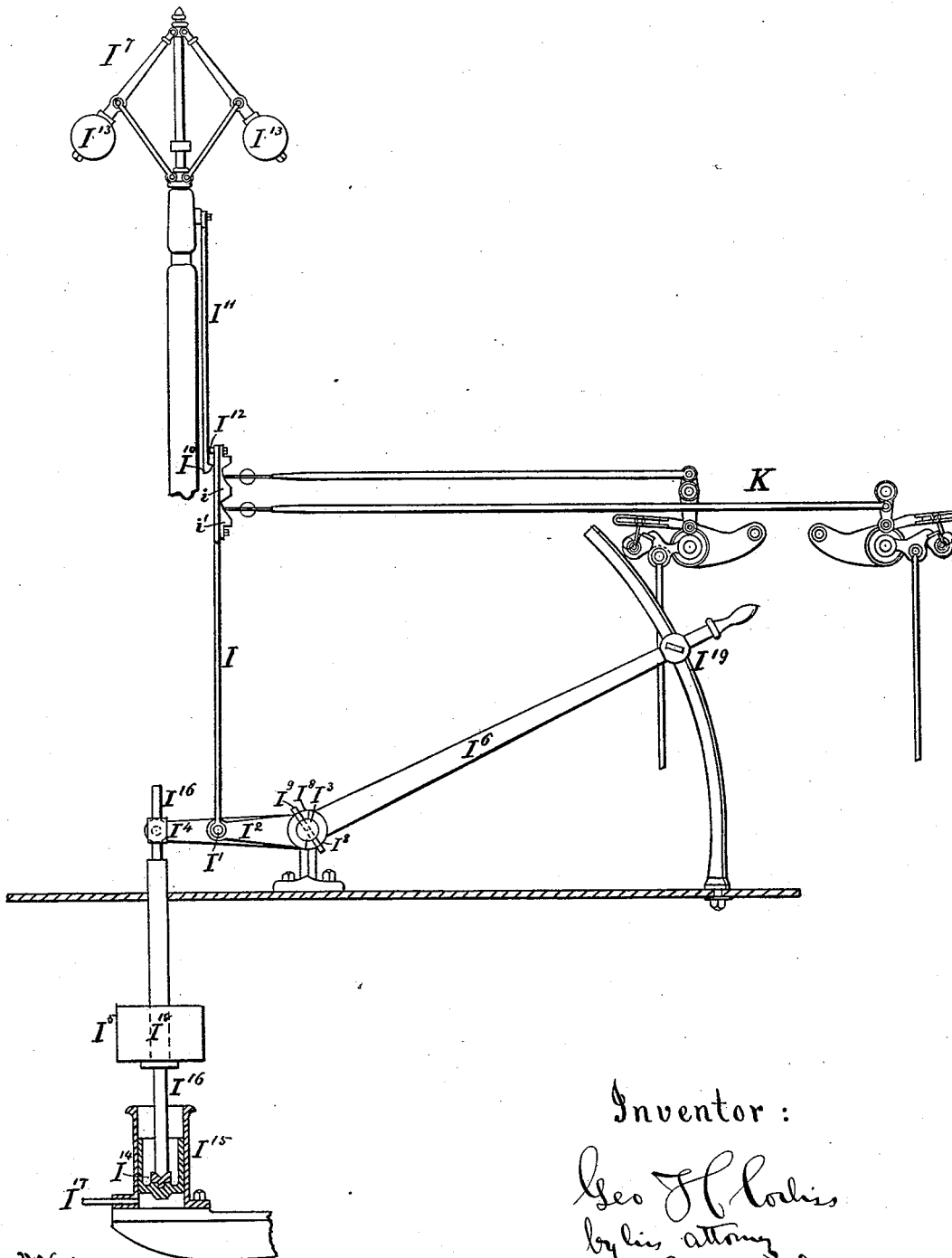


G. H. CORLISS.
Steam Pumping-Engines.

No. 215,802.

Patented May 27, 1879.



Witnesses:
W. Colborne Brooks
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Inventor:
Geo H Corliss
by his attorney
Thomas D. Stetson

UNITED STATES PATENT OFFICE.

GEORGE H. CORLISS, OF PROVIDENCE, RHODE ISLAND.

IMPROVEMENT IN STEAM PUMPING-ENGINES.

Specification forming part of Letters Patent No. **215,802**, dated May 27, 1879; application filed January 6, 1879.

To all whom it may concern:

Be it known that I, GEORGE H. CORLISS, of Providence, in the State of Rhode Island, have invented certain new and useful Improvements relating to Steam Pumping-Engines; and I do hereby declare that the following is a full and exact description thereof.

The invention is intended more especially for the large engines employed in pumping water for the supply of towns and cities.

It relates to the mechanism for controlling the cut-off, by which I mean the liberation and closing of the steam-inlet valves.

The following is a description of what I consider the best means of carrying out the invention.

I use circular sliding valves with a liberating valve-gear—that is, a valve-gear in which the steam-inlet valves are severally opened by the proper mechanism, and are closed automatically on being detached from the mechanism which opens them, a sufficient force (as gravity, a spring, or the action of steam or air upon a piston) being made available to urge the valves toward the shut positions.

The mechanism engages and disengages at each stroke.

I place the cut-off mechanism under the control of three different forms of regulation—first, a hand-lever for adjustment by the attendant; second, a fly-ball or other suitable governor, acting through and by changes in the velocity of the engine; third, a pressure-governor, which acts only when the water-pressure is in excess of a fixed amount. These three separate means of regulation are so combined that they act in harmony upon the same cut-off mechanism, each being perfectly free to operate whenever the contingency which it is intended to meet shall arise, while neither can interfere with the operation of the other excepting when it is so called into action.

The accompanying drawing forms a part of this specification. It is an elevation, partly in section, showing the novel parts, with so much of the ordinary parts as is necessary to show their relation thereto.

The cut-off mechanism is controlled by the rod I, carrying two cam-shaped surfaces, *i i'*. This rod is guided at its upper end so that it is capable only of a vertical movement. Elevating this rod shortens the cut-off by causing

the valves to be liberated earlier in the stroke. The extreme upward movement of this rod entirely shuts off the steam. Lowering this rod allows steam to follow farther, and in the extreme position allows the steam to follow full stroke. I connect this cam-rod I to the arm I² of the rocker-shaft I³. This shaft has another arm, I⁴, connected with the pressure-governor I⁵. The rocker-shaft I³ also carries a lever, I⁶, for hand adjustment, so connected with it that whatever may be the position of the hand-lever I⁶ the rocker-shaft I³ remains free to move in the direction to shut off the steam, but not in a contrary direction beyond the point fixed by the said lever I⁶. Thus, while either the speed-governor I⁷ or pressure-governor I⁵ may at any time interpose to shorten the cut-off, neither can in any circumstances lengthen it beyond the point fixed by the hand-lever I⁶.

The arrangement of parts by which I secure this interdependent operation of the speed-governor I⁷, pressure-governor I⁵, and hand-lever I⁶ is fully shown in the drawing.

It will be observed that the rocker-shaft I³, carrying the fixed arms I² I⁴, is free to move through a portion of its circle independently of the hand-lever I⁶, the extent of this independent movement being limited by the form of the double slot I⁸ I⁹ in the sleeve of the hand-lever I⁶ and the position of the pin I⁹ in the rocker-shaft I³.

Assuming that the speed of the engine is a little less than that called for by the speed-governor I⁷ as adjusted, it is evident that the hook I¹⁰ on the governor-rod I¹¹ will stand below its point of engagement, I¹², on the cam-rod I, rendering the speed-governor inoperative for the time, and leaving the valve mechanism under the control of the hand-lever adjustment I⁶.

If, now, the resistance offered to the engine by the water-pressure in the pumps is lessened, or if the boiler-pressure is increased, the increased speed of the engine will cause the governor I⁷ to raise the rod I¹¹; and if this continues, the hook I¹⁰ will engage the pin I¹² upon the cam-rod I, and thereupon the speed-governor I⁷ will assume its function of controlling the action of the valve-gear K by determining the point of cut-off.

If, now, the water-pressure in the pumps or

main (not represented) is increased, thereby increasing the load on the engine and calling for a lengthened cut-off, the diminished speed of the engine will cause the governor-rod I¹¹ to fall. The hook I¹⁰ will disengage itself from the pin I¹², and the speed-governor I⁷ will become inoperative, and the valve-gear K will thus be restored to the control of the hand-lever I⁶.

The power of the speed-governor I⁷ to lengthen the cut-off (or even to cause the engine to follow full stroke) to meet the resistance offered by an increased water-pressure is thus rendered inoperative, while its power to shorten the cut-off to check an increasing speed due to diminished water-pressure remains unimpaired.

The piston I¹⁴ of the pressure-governor I⁵ is connected by its rod I¹⁶ with the arm I⁴, and is put in communication with the water-pressure by a pipe, I¹⁷. The weight I¹⁸ being just sufficient to counterbalance the regular working water-pressure, the apparatus will remain inoperative until the water-pressure is increased beyond the amount fixed upon for ordinary working. The piston I¹⁴ will then rise, carrying through intermediate mechanism the cam-rod I, and, without deranging the hand-lever adjustment I⁶, will shorten the cut-off, and before the pressure can be increased to a dangerous extent the pressure-governor I⁵ will shut off the steam altogether. The extraordinary pressure being removed, the weight I¹⁸ will restore the parts to their ordinary positions, and the engine will again pass under the control of the hand-lever adjustment I⁶, subject to the discretion of the attendant.

Modifications may be made in the form of many of the parts of the mechanism described. The form of the hand-lever and the means of clamping it in any required position may be varied.

In place of the fly-ball governor herein shown, any regulator may be substituted that derives its power to act from changes in velocity. The pressure-governor may act by receiving the pressure of the water through a

flexible diaphragm instead of through the piston I¹⁴.

The mechanism herein shown for tripping the valves is made the subject of a separate application for patent.

I claim as my improvement in steam-engine regulation—

1. The hand-lever I⁶, with suitable holding means, I¹⁹, and having a slotted bearing, I³, in combination with a speed-governor and the valve-gear of a steam-engine, so that when the hand-lever is clamped the speed-governor may independently act to shorten the cut-off, but cannot lengthen it beyond the point fixed by the hand-lever, as herein specified.

2. The hand-lever I⁶, with suitable holding means, I¹⁹, and having a slotted bearing, I³, in combination with a pressure-governor and the valve-gear of a steam-engine, so that when the hand-lever is clamped the pressure-governor may independently act to shorten the cut-off, but cannot lengthen it beyond the point fixed by the hand-lever, as herein specified.

3. The hand-lever I⁶, with suitable holding means, I¹⁹, and having a slotted bearing, I³, in combination with the valve-gear of a steam-engine, and with both a speed-governor and pressure-governor, so that when the hand-lever is clamped either of the governors may independently act to shorten the cut-off, but neither can lengthen it beyond the point fixed by the hand-lever or by the other governor, as herein specified.

4. The combination, with the valve-gear of a steam pumping-engine, of a speed-governor and a pressure-governor so combined that either governor may shorten the point of cut-off independently of the other, as herein specified.

In testimony whereof I have hereunto set my hand this 19th day of December, 1878, in the presence of two subscribing witnesses.

GEO. H. CORLISS.

Witnesses:

JESSE WALRATH,
GEO. W. KENNEDY.