(No Model.) 2 Sheets—Sheet 1.

W. W. HAILSTONE.

ELECTRO MAGNETIC STOP MOTION FOR STEAM ENGINES.

No. 469,471. Patented Feb. 23, 1892.

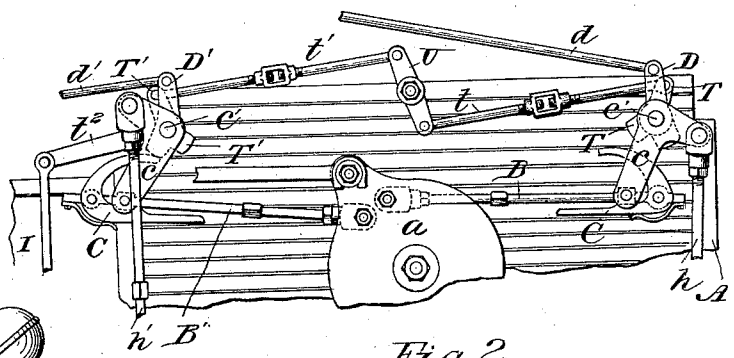

Fig 2

Fig. 1.

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(No Model.) 2 Sheets—Sheet 2.

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Fig. 3.

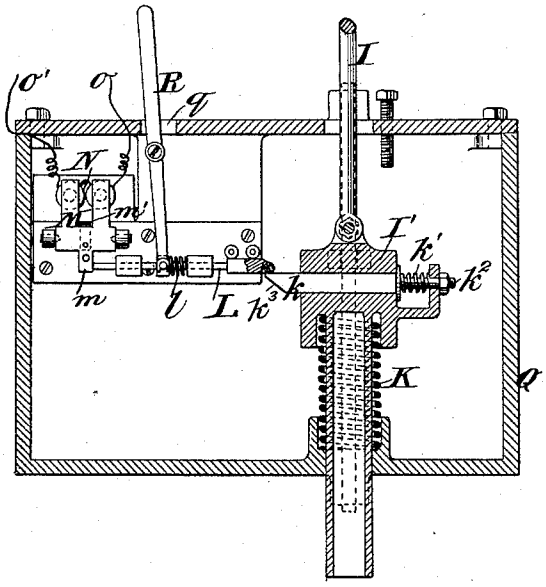


Fig. 4.

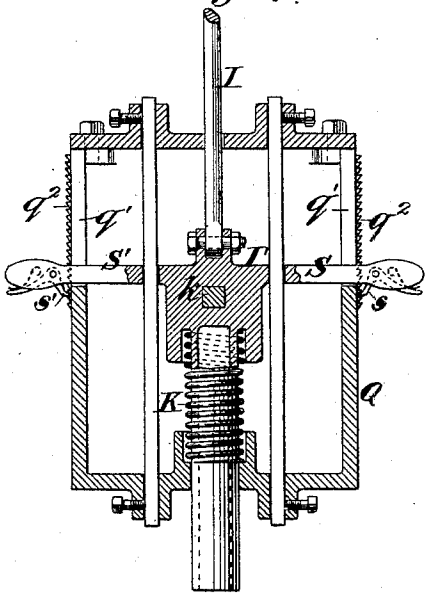


Fig. 5.

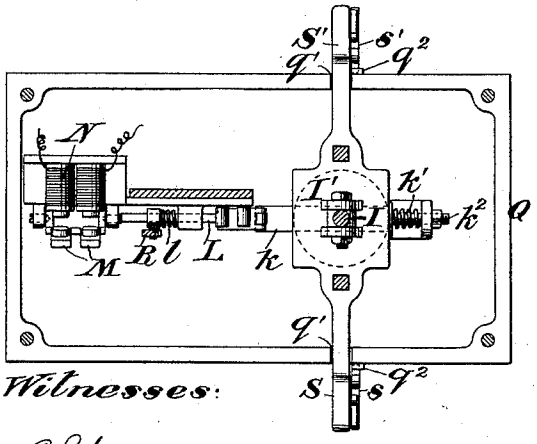
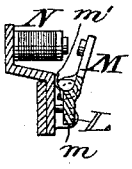


Fig. 6.



Witnesses:

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UNITED STATES PATENT OFFICE.

WILLIAM W. HAILSTONE, OF LONG ISLAND CITY, NEW YORK.

ELECTRO-MAGNETIC STOP-MOTION FOR STEAM-ENGINES.

SPECIFICATION forming part of Letters Patent No. 469,471, dated February 23, 1892.

Application filed June 2, 1891. Serial No. 394,838. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM W. HAILSTONE, of Long Island City, in the county of Queens and State of New York, have invented a new and useful Improvement in Stop-Motions for Steam-Engines, of which the following is a specification.

My invention relates to an improvement in stop-motions for steam-engines in which the admission of steam to the cylinder may be stopped by means of an electric current under the control of one or more circuit-closers located at a distance from the engine, or by the failure of the governor to perform its work.

A practical embodiment of my invention is represented in the accompanying drawings, in which—

Figure 1 represents the stop mechanism applied to the ordinary valve-regulating mechanism in connection with the governor. Fig. 2 represents a special valve-regulating mechanism under the immediate control of the stop mechanism. Fig. 3 is an enlarged view in vertical section, partly in elevation, of the stop-actuating mechanism under the control of the electro-magnet. Fig. 4 is a transverse section through such mechanism. Fig. 5 is a top plan view of the same; and Fig. 6 is a view in detail, in transverse section, through the electro-magnet and its armature.

I have shown in the present instance the application of my stop-motion to a Corliss engine, in which the valves are of the rocking or rolling type, and are opened by rods in connection with a wrist-plate and closed by means of rods leading to dash-pots.

A represents the cylinder, *a* the wrist-plate for opening the valves and exhaust-ports, B and B′ the valve-operating rods having well-known crab-claw connections C, with the angle-levers *c* attached to the valve-stems *c′*. The cam-levers D and D′ for disconnecting the crab-claws from the abutments on the valve-operating rods are mounted concentric with the valve-stems *c′*, and are connected by rods *d* and *d′* with the opposite arms E and E′ of a three-armed lever mounted in proximity to the governor-standard F, the third arm *e* being connected to the governor-sleeve *f*. The governor is denoted by G, the dash-pots by H H′, and the rods leading from the valve-operating levers *c* to the plungers within the dash-pots are represented by *h h′*. The several parts thus far referred to are those which may be found in common use in connection with the Corliss engine and their operation is well known.

In the form shown in Fig. 1, I provide the three-armed lever in connection with the governor-sleeve with a fourth arm *e′*, extending in substantially the same direction as the arm *e* and projected beyond the governor-standard F for the purpose of imparting motion to the three-armed lever independent of that which may be communicated to it by the rise and fall of the governor-sleeve under the influence of the governor G. An operating-rod I has a vertically-sliding connection with the end of the arm *e′*, the collar or other suitable stop *i* being fixed upon the rod I at a point below its connection with the arm *e′*, so that when the rod I is moved upwardly it will force the arm *e′* upwardly with it, and thereby rock the connecting-rods *d* and *d′* in a direction to swing the cam-levers D D′ into such a position with respect to the crab-claws as to hold them out of position to engage the abutments on the valve-operating rods B B′, and so prevent the opening of the valves.

The rod I is held depressed against the tension of a spring K by means of a latch *k*, in engagement with a longitudinally-sliding catch bar or rod L. The bar L is held in position to engage the latch *k* against the tension of a spring *l* by means of a projection *m* on the swinging armature M of an electro-magnet N. The electro-magnet N is in circuit with a battery O, the opposite poles of which are connected by conductors *o* and *o′* with suitable contact-plates P P′, located at any point within the building where it may be desired for stopping the engine. A suitable circuit-closer *p* of any well-known or approved form is employed in connection with the contact-plates P P′ to close the circuit when desired. When the electro-magnet remains in its normal condition—that is, not energized—the armature M will be held away from the electro-magnets by means of a suitable spring *m′*, and the projection *m* on the armature will then be in position to engage the end of the sliding bar or rod L and pre-

vent it from moving endwise under the impulse of the spring l, so as to release the latch k, and thereby allow the rod I to slide upwardly under the impulse of the spring K; but when the circuit is closed and the electro-magnet N thereby energized the rocking of the armature M into contact with the electro-magnets will free the projection m from the end of the sliding rod or bar L, and the latter will slide endwise under the impulse of the spring l, thereby releasing the latch k, and the rod I will slide upwardly and rock the three-armed lever and stop the engine.

I find it desirable to locate the electro-magnet, the sliding bar or rod L, the latch k, and the springs for operating the several parts within a suitable box or casing Q. To reset the bar L, I provide a hand-lever R, the handle of which projects upwardly through a slot q in the casing, the opposite end having a loose connection with the bar or rod L. I also find it desirable to make the latch k yielding longitudinally against the tension of a spring k' in engagement with a stem-extension k^2 and to provide its end in engagement with the bar L, with a beveled under face k^3, so that after the bar L has been set and is engaged by the projection m on the end of the armature the rod I may be set by depressing it against the tension of the spring K, the latch k yielding endwise by the engagement of its beveled end k^3 with the end of the bar L, so as to allow the latch k to pass the bar L and then spring into position underneath the end of the bar L, as shown in Fig. 3.

In order that the rod I may be held firmly in position to continue the closure of the valves after it has once been swung upwardly under the impulse of the spring I, I provide laterally-extending arms S S', fixed to or formed integral with the head I', in which the latch k is seated. The arms S S' project outwardly through vertical slots q' in the sides of the casing Q and carry on their outer ends spring-actuated pawls $s\,s'$, adapted to engage rack-bars q^2, fixed to the sides of the casing Q in proximity to the slots q'. The pawls $s\,s'$ are so set with respect to the rack-bars q^2 that as the arms S S' are carried upwardly under the impulse of the spring K they will slide freely over the rack-teeth, but will engage the teeth and prevent a downward movement of the said arms, and hence of the head I' and rod I, unless positively held out of engagement with the teeth when it is desired to reset the rod.

For the purpose of closing the circuit and stopping the engine in case of the breaking of the governor-belt I provide a pair of contacting-plates $p'\,p^2$, having an electric connection with the conductors $o\,o'$ and themselves removably connected with the top of the governor-standard F—as, for example, by placing them over the pins f', as herein shown—so that when the governor-sleeve falls to an abnormal position it will bring a collar f^2, fixed thereon, into contact with the plates p' p^2 and thereby close the circuit. When it is desired to stop the engine for the night or for an intermission, the contact-plates $p'\,p^2$ may be removed and the falling of the governor-sleeve will then no longer effect a closing of the circuit.

In the form shown in Fig. 2, instead of connecting the rod I with an arm on the ordinary three-armed lever, I provide a special set of cam-levers on the valve-stems and connect it directly with these, as follows: In addition to the ordinary cam-levers D D', I provide another set T T' of substantially the same form and connect them by means of rods $t\,t'$ with the opposite arms of a centrally-located lever U. I further provide the cam-lever T' with an operating-arm t^2, with the end of which the operating-rod I is connected. The levers T and T' are so set upon the valve-stems that when the rod I is elevated it will throw the lever T' into position to prevent the connection of the crab-claw with the valve-operating rod B', and at the same time, through the connection of the cam-lever T' with the cam-lever T, will simultaneously rock the cam-lever T into position to prevent the crab-claw at that end from engaging the abutment on the valve-operating rod B.

It is evident that slight changes might be resorted to in the form and arrangement of the several parts described without departing from the spirit and scope of my invention. Hence I do not wish to be limited strictly to the construction herein set forth; but

What I claim is—

1. The combination, with an engine-cylinder, valves for the admission of the motive force thereto, valve-operating mechanism, and cams for disengaging the valve-operating mechanism from the valves at predetermined intervals, of a lever for controlling the position of the said cams, a lever-operating rod for operating said lever independently of the governor, and an electric circuit, including an electro-magnet for actuating the said lever, operating to throw the cams into position to prevent connection between the valve-operating mechanism and valves, substantially as set forth.

2. The combination, with a lever for controlling the opening of the valves, of an operating-rod engaged with the lever, the said rod being held under tension tending to throw it in the direction to prevent the opening of the valves, an electric circuit, an electro-magnet included in the circuit, and a catch under the control of the armature of the magnet to release the operating-rod when the armature is rocked, substantially as set forth.

3. The combination, with the lever for controlling the opening of the valves and the operating-rod engaged with the lever and held under tension, tending to throw the lever in the direction to prevent the opening of the valves, of a spring-actuated catch for holding

the operating-rod under tension, an electric circuit, and an electro-magnet included in the circuit, the armature of the magnet forming a stop to prevent the movement of the spring-actuated catch to release the operating-rod, substantially as set forth.

4. The combination, with the lever for controlling the opening of the valves and the operating-rod connected with the lever and held under tension, tending to throw it in the direction to rock the lever and prevent the valves from opening, of a yielding latch in connection with the operating-rod, a spring-actuated catch, an electric circuit, and an electro-magnet included in the circuit, the armature of the said magnet forming a stop to hold the catch in engagement with the latch, substantially as set forth.

5. The combination, with the spring-actuated operating-rod and the spring-actuated catch for holding the operating-rod under tension, of the electric circuit, the electro-magnet included in the circuit, its armature forming a stop for the spring-actuated catch, and the lever for setting the spring-actuated catch, substantially as set forth.

6. The combination, with the spring-actuated operating-rod, the means for releasing it, and the valve-controlling lever with which it is connected, of a rack-and-pawl connection between the operating-rod and a fixed support in proximity thereto, whereby the rod is held in its adjustment to rock the lever to prevent the opening of the valves, substantially as set forth.

7. The combination, with the valves and their actuating mechanism and their ordinary connection with the governor, of additional cam-levers, a centrally-located lever the arms of which are connected to the said cam-levers by rods to operate the levers in unison to prevent the opening of the valves, an operating-rod connected with one of the cam-levers, an electric circuit, and an electro-magnet included in the circuit for controlling the operating-rod, substantially as set forth.

In testimony whereof I hereunto sign my name in the presence of two subscribing witnesses.

WILLIAM W. HAILSTONE.

Witnesses:
FREDK. HAYNES,
GEORGE BARRY.