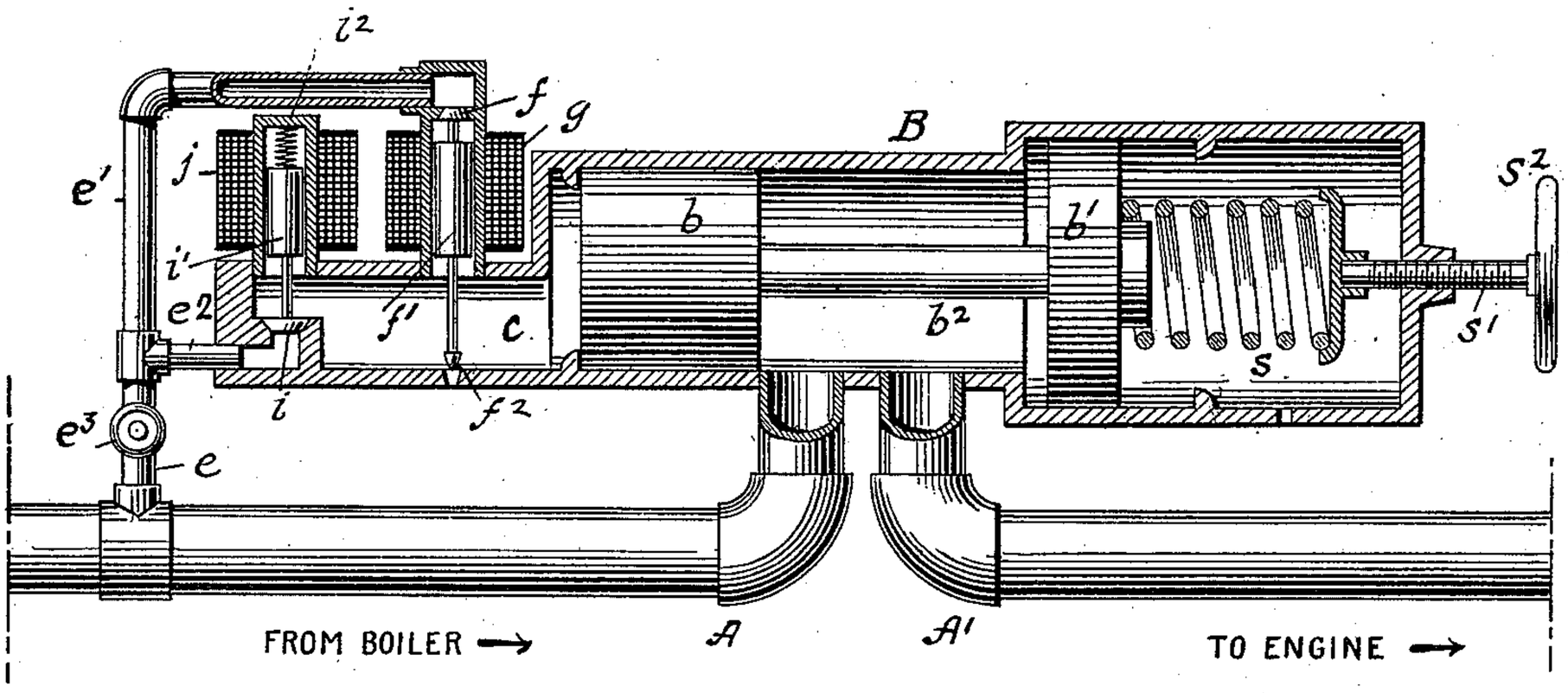
No. 685,741. Patented Nov. 5, 1901.

W. H. CLARKE.

VALVE CONTROLLER.

(Application filed May 10, 1900. Renewed Mar. 2, 1901.)

(No Model.)



WITNESSES:

Frank O. Abner.

Jas. Thomas Donnelly

INVENTOR

Wm. H. Clarke

BY

Wm. A. Rosenbaum

ATTORNEYS

UNITED STATES PATENT OFFICE.

WILLIAM H. CLARKE, OF NEW YORK, N. Y.

VALVE-CONTROLLER.

SPECIFICATION forming part of Letters Patent No. 685,741, dated November 5, 1901.

Application filed May 10, 1900. Renewed March 2, 1901. Serial No. 49,644. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM H. CLARKE, a citizen of the United States, residing at the city of New York, in the borough of Brooklyn and State of New York, have invented certain new and useful Improvements in Electromagnetic Valve-Controllers, of which the following is a full, clear, and exact description.

This invention relates to automatic controllers for steam or other fluid-pressure motors adapted to drive dynamo-electric machines.

The primary object of the invention is to provide means for stopping the engine in case a break occurs in the circuit of the dynamo and for slowing down and stopping the engine, if necessary, in case the electromotive force of the dynamo rises above the normal or above a predetermined maximum.

Another object of the invention is to provide, in conjunction with the above-mentioned features, a pressure-controlling valve which will maintain a constant pressure of the steam supplied to the engine regardless of variations of the boiler-pressure.

A further object of the invention is to provide a regulating apparatus of this character which shall be simple and cheap to construct and certain in its action.

According to my invention the engine is controlled by an electromagnetic-valve apparatus introduced in the steam-pipe connecting the boiler with the engine. Two electromagnets are used whose armatures are connected with valves controlling the access of steam to a throttling or cut-off valve, said magnets being in the circuit of the dynamo and their armatures being so adjusted that in the one case the magnet being constantly energized will hold the valve closed, while a break in the circuit would allow the valve to open, and in the other case the magnet being constantly energized to the normal extent will allow the valve which it controls to remain closed until its magnetism becomes excessive, when the added lifting power will unseat the valve. When either valve is opened in the manner described, steam is admitted to a piston-valve which throttles or cuts off the steam to the engine either sufficiently to reduce its speed to reëstablish the normal condition of the circuit or sufficiently to stop the engine.

Another feature of my invention is a differential piston-valve combined with an adjustable spring arranged to maintain a constant pressure of steam-supply to the engine regardless of variations of the boiler-pressure.

The invention will be described in detail with reference to the accompanying drawing, in which the figure represents a longitudinal section and partial side elevation of my improved controller.

A and A′ indicate, respectively, steam-pipes leading from the boiler and to the engine and connecting with each other by means of the chamber inside of the valve-casing B, into the side wall of which both of them open. The valve-casing contains two pistons *b* and *b′*, the latter occupying an enlarged portion of the casing, as shown, and being of the greater area. The two pistons are connected together by a rod b^2, and the space between them is the chamber through which the pipe A and A′ communicate. Behind the piston *b′* is a spring *s*, adapted to be adjusted by means of a screw *s′*, carrying a cross-head s^2. Back of the piston *b* the valve-casing has an extension forming a steam-chamber *c*. This steam-chamber is connected with the steam-pipe A or the boiler by a pipe *e*, containing a valve e^3, and which branches into two pipes *e′* and e^2, leading into the chamber *c* at two different points. The branch pipe *e′* contains a valve *f*, attached to the armature *f′*, adapted to slide in the pipe as a guide, there being sufficient clearance between the armature and the pipe to allow of the flow of steam through the pipe. To this armature is also attached another valve f^2, which controls a restricted escape-passage for steam and water condensation. Surrounding the branch pipe *e′* is an electromagnetic coil *g*, located within range of the armature *f′* and in such relation thereto that when it is energized the armature is held in a position to close the valve *f* and open the valve f^2. The branch pipe e^2 is controlled by a valve *i*, attached to an armature *i′*, located in a tubular extension i^2 from the chamber *c*. This extension opens into the said chamber, but is closed at its outer end, and it is surrounded by an electromagnetic coil *j* within attractive range of the

armature i', but so related thereto that under ordinary magnetic conditions the weight of the armature will serve to keep the valve i closed, while under excessive magnetism the armature will be lifted and the valve opened. This valve may also be provided with a spring, as shown, to resist the pressure of steam when closed. It will be seen that from this construction of electromagnetic valves I am able to obtain a reciprocating movement of the armatures and valve-stems without the necessity of providing stuffing-boxes or packings to avoid leakage.

The operation is as follows: The pressure from the boiler, which enters the casing B, tends to move the pistons $b\,b'$ to the right on account of the larger area of piston b'; but this tendency is resisted by the spring s, which is set at such a tension that the port or pipe A is open to the proper extent to maintain the pressure supplied to the engine always just sufficient to drive the dynamo under maximum load. Any increase from the boiler will result in a compression of the spring s and movement of the pistons to the right, which will throttle the steam-passage A and correspondingly reduce the pressure passing to the engine to the normal. A diminution of the boiler-pressure will result in a movement of the pistons to the left under action of the spring, which will further uncover the pipe A and maintain the same normal pressure in the engine. It will be observed that this differential action is obtained by the difference in areas of the two pistons acting in conjunction with the spring and that the pressure delivered to the engine can be predetermined by the adjustment of the spring. The magnet-coils g and j are supposed to be connected in circuit with the dynamo and are energized so long as the circuit is intact and the dynamo running. Magnet g is wound to maintain its armature in its elevated position, as shown, while magnet j is wound to have no effect upon its armature until the current or the electromotive force of the circuit rises beyond the normal, the armature at all other times remaining down in the position shown. In case the load on the dynamo is entirely thrown off or the circuit is broken the magnet g will become de-energized and allow its armature to fall, thus closing the escape-port f^2 and opening the valve f', admitting steam to the chamber c. The pressure thus brought upon the back of the piston b equalizes the pressure on the front of the same piston, so that the pressure on the larger piston will be sufficient to throw the pistons to the extreme position to the right, in which position the supply-pipe from the boiler will be entirely covered, and the engine will be stopped. The operator should then close the main steam-valve in pipe A at the boiler and valve e^3 in pipe e. The absence of pressure in the valve-casing permits the spring to move the piston to the left ready for another start when the circuit has been repaired. The repair having been accomplished, steam is again turned on and the dynamo started. When the circuit is closed, magnet g lifts its armature, closes valve f, and the pressure and water of condensation in the chamber c pass through the escape f^2. Valve e^3 may then be opened. In case of the speeding up of the engine, due to partial throwing off of the load or from other cause, the magnet j will become excessively energized and will lift its armature and open valve i, which also admits steam to the chamber c. This moves the piston to the right and throttles the pipe A, slowing down the engine proportionately. When the engine is again running at normal speed and the magnet j weakened correspondingly, the armature falls and valve i is again closed. When the valve i opens, its capacity being much greater than that of port f^2, the pressure will accumulate in chamber c sufficiently to move the pistons to the right, notwithstanding the escape at the port.

Having described my invention, I claim—

1. The combination of a valve-casing, two pistons of different areas located in the same chamber therein and connected together, a port in the casing admitting pressure between the two pistons, a spring acting to force the pistons in one direction and means for equalizing the pressure on one of the pistons.

2. The combination of a valve-casing, two pistons located in the same chamber therein and connected together, a port admitting pressure between the pistons, a spring acting to force the pistons in one direction and an electromagnetically-operated valve controlling the equalization of pressure on the opposite sides of one of the pistons.

3. The combination of a valve-casing, two pistons of different areas located in the same chamber therein and connected together, a port in the casing admitting pressure between the two pistons and governed by one of them and means for forcing the pistons in one direction.

4. The combination of a valve-casing, two pistons located in the same chamber therein and connected together, a port admitting pressure between the pistons, a spring acting to force the pistons in one direction, and means for equalizing the pressure on one of the pistons, substantially as described.

5. The combination of a valve-casing, two pistons located in the same chamber therein and connected together, a port in the casing admitting pressure between the pistons, another port in the casing admitting pressure behind one of the pistons, a spring behind the other piston and a valve controlling the last-mentioned port, substantially as described.

6. The combination of a valve-casing, two pistons located in the same chamber therein and connected together, a port in the casing admitting pressure between the pistons, another port in the casing admitting pressure behind one of the pistons, a spring behind the

other piston, and an electromagnetic valve controlling the last-mentioned port, substantially as described.

7. The combination of a valve-casing, two pistons located in the same chamber therein and connected together, a port admitting pressure between the pistons, a spring tending to force the pistons in one direction, a port admitting pressure to the back of one of the pistons and an electromagnetically-operated valve controlling said port, substantially as described.

8. In a fluid-pressure controller, two connected pistons of different area subjected to the same fluid-pressure on their adjacent faces tending to move them in opposite directions, means for opposing the resultant motion of the pistons and means for equalizing the fluid-pressure on the opposite faces of one of the pistons, substantially as described.

9. The combination of a valve-casing, a piston movable therein, a port admitting pressure to one side of said piston and controlled by the piston, a valve in said casing controlling the admission of pressure to the other side of said piston, an armature attached to the valve and also located inside of said casing, and an electromagnetic coil surrounding that portion of the casing containing the armature, as and for the purpose set forth.

In witness whereof I subscribe my signature in presence of two witnesses.

WILLIAM H. CLARKE.

Witnesses:
WM. A. ROSENBAUM,
JAS. A. DONNELLY.