

(No Model.)

G. WESTINGHOUSE, Jr.

REGULATOR FOR GAS AND AIR SUPPLY TO FURNACES.

No. 318,839.

Patented May 26, 1885.

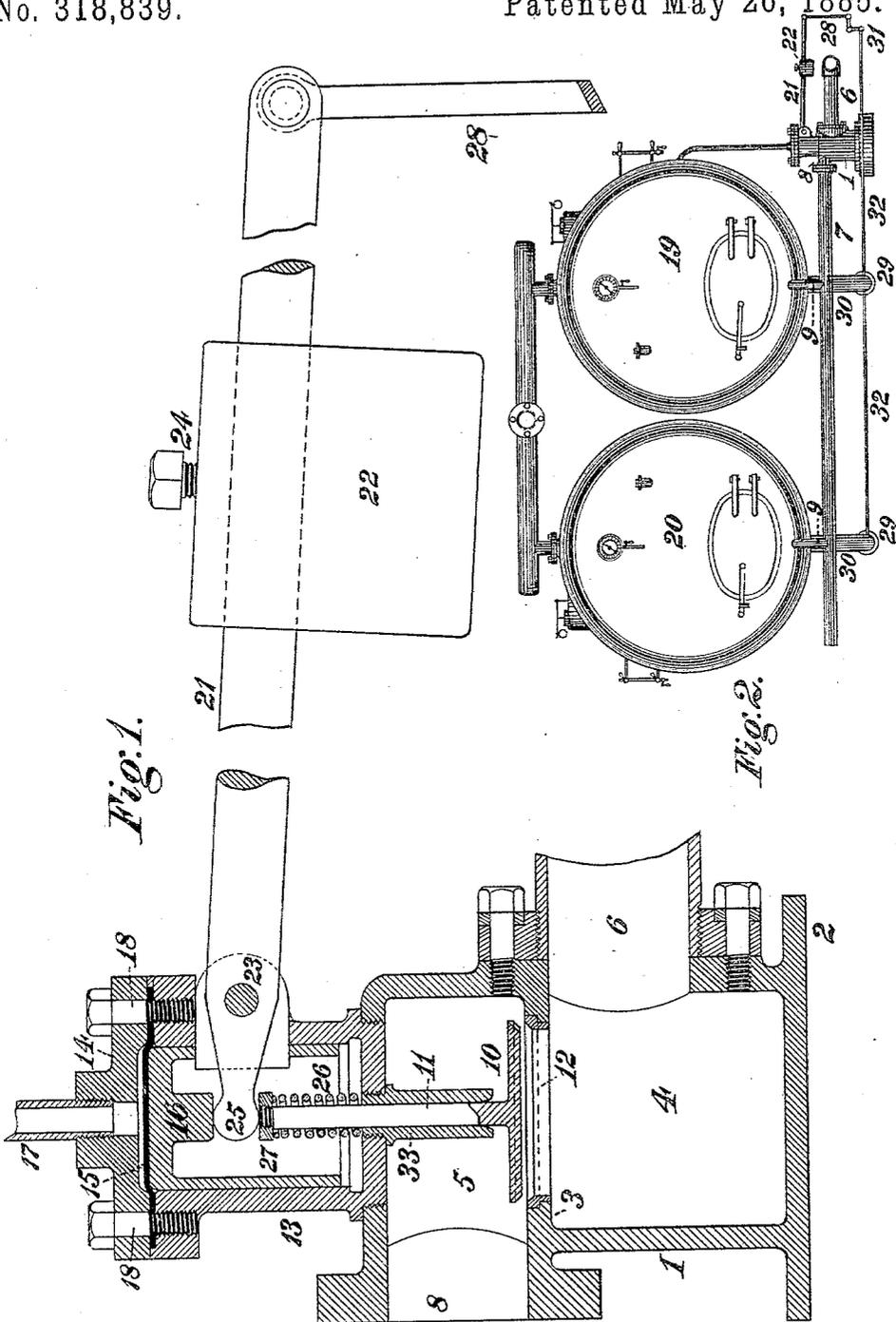


Fig. 1.

Fig. 2.

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# UNITED STATES PATENT OFFICE.

GEORGE WESTINGHOUSE, JR., OF PITTSBURG, PENNSYLVANIA.

## REGULATOR FOR GAS AND AIR SUPPLY TO FURNACES.

SPECIFICATION forming part of Letters Patent No. 318,839, dated May 26, 1885.

Application filed July 1, 1884. (No model.)

*To all whom it may concern:*

Be it known that I, GEORGE WESTINGHOUSE, Jr., a citizen of the United States, residing at Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented or discovered certain new and useful Improvements in Regulators for Gas and Air Supply to Furnaces, of which improvements the following is a specification.

In the accompanying drawings, which make part of this specification, Figure 1 is a vertical central section through a gas and air supply regulator embodying my invention, and Fig. 2 a front view in elevation of a battery of steam-boilers, illustrating an application of the same.

The object of my invention is to attain a higher degree of effectiveness and economy in the utilization of gas as fuel for the generation of steam, by the provision of means for automatically regulating the supply of gas and air to a steam-boiler furnace, in accordance with and proportionately to variations in the pressure of steam therein, in order to maintain such pressure uniformly at the normal degree required.

For the economical use of gaseous fuel it is requisite that gas and air shall be supplied in fixed relative proportions of respective volumes—as, for example, with certain kinds of natural gas from six to seven volumes of air to one of gas have been found to be proper and desirable. The degree of heat necessary to be applied being obviously a variable one under the varying requirements of the duty of the boilers, corresponding regulation of the supply of fuel to the furnaces must consequently be effected from time to time, and such regulation, if made by an attendant, is not only open to the objection of liability to negligence or inaccuracy in the relative apportionment of the volumes of gas and air delivered, but also involves substantial difficulty, even with careful manipulation, in effecting proper and timely relative adjustment for the constantly-varying conditions of the delivery of steam from boilers.

My invention is designed to substitute an automatic and conjoined regulation of gas and air supply in lieu of manual and independent adjustment, as heretofore employed.

The improvements claimed are hereinafter fully set forth.

In the practice of my invention I provide a chest or casing, 1, having a lower flange or base-plate, 2, through which it may be secured to any suitable support in convenient proximity to the steam boiler or boilers in connection with which the apparatus is to operate. The chest 1 is divided by a transverse partition, 3, into a supply-chamber, 4, and a delivery-chamber, 5. A gas-supply pipe, 6, leading from a gas-generator, gas-well pipe-line, or other source of supply, is connected to and communicates with the chamber 4, and a gas-delivery pipe, 7, connected to a flanged opening or nozzle, 8, on the chamber 5, conveys gas therefrom to branch pipes 9, leading to burners of any suitable construction in a steam-boiler furnace or furnaces.

The specific devices employed for burning the gas do not form part of my present invention, and are not, therefore, herein set forth; but a form of burner adapted for properly mixing and delivering air and gas for combustion will form the subject of a separate application for Letters Patent by me. A gas-regulating valve, 10, fixed upon a stem, 11, is fitted to seat upon an opening, 12, in the partition 3, and to govern the supply of gas passing through said opening from the supply-pipe 6 to the delivery-pipe 7. The stem 11 of the regulating-valve passes freely, but so as to be gas-tight, through a guide or socket, 33, secured to the top of the chamber 5 into a pressure-chamber, 13, which is closed at its top by a head or cap, 14, below which a flexible diaphragm, 15, extends across the chamber, being secured thereto adjacent to its periphery by the bolts 18 of the cap. A pressure-pipe, 17, connected to the cap, establishes communication between the space within the chamber above the diaphragm and the steam-boiler 19 (or one of the battery of boilers) to the furnaces, or furnaces of which gas is supplied, the connection being made by preference with the steam-space of the boiler, to enable the diaphragm to be covered by water of condensation and protected thereby from the direct access of steam. A piston or pressure-plate, 16, is fitted to move freely in the chamber 13, its upper face abutting against the di-

ayhragm 15. A double-armed lever, 21, having a counterbalance-weight, 22, connected adjustably, as by a set-screw, 24, to its outer arm, is pivoted by a pin, 23, to the pressure-chamber 13, and a bearing, 25, on the inner arm of the lever 21, is interposed between and bears against a projection on the under side of the pressure-plate 16 and the top of the regulating valve-stem 11, which is held in contact with the bearing 25 by a spring, 26, acting against a collar or abutment, 27, on the valve-stem. The valve-stem may, if preferred, be connected directly to the pressure-plate, a suitable opening being provided for the reception of the lever-bearing 25; but the construction shown is preferable in the particular of admitting of the more convenient construction and adjustment of the parts. The outer end of the lever 21 is connected by a rod or bar, 28, with an air-supply valve, 29, governing a pipe, 30, through which air is supplied to the boiler-furnace, the opening and closure entirely, and to greater or less degrees, of said valve, being effected by the upward and downward movements of the outer end of the lever 21.

The apparatus is illustrated in Fig. 2 as applied in connection with a battery of two boilers, 19 20 and the connection of the rod 28 with the air-supply valves 29 of the boiler-furnaces is effected through the intermediation of a bell-crank lever, 31, and connecting-rods 32; but any suitable form of connection may be employed as the relative positions of the parts may render convenient and desirable.

In operation the pressure of the steam in the boiler, acting through the pipe 17 on the flexible diaphragm 15 and pressure-plate 16, tends to move the gas-supply valve 10 downwardly toward its seat and to elevate the outer end of the lever 21, and thereby to close the air-supply valve 29 connected thereto. The downward pressure of the steam is opposed by the gravity of the counter-balance 22, which tends to elevate the inner and depress the outer end of the lever 21, and thereby to open the gas and air supply valves. By suitable adjustment of the counter-balance 22 equilibrium between the opposing forces of pressure and gravity will be established when the lever stands in such a position as to effect the opening of the gas and air supply valves to the degree proper for maintaining the desired

boiler-pressure, and upon increase or diminution thereof the resultant movements of the lever will coincidently and correspondingly decrease or increase the degree of opening of the gas and air supply valves, and consequently the evolution of heat in the furnace, so as to maintain the steam-pressure at the point desired and provided for by the adjustment of the counter-balance, such variation of supply being made without affecting, to any material degree, the established relative proportions of air and gas admission.

I claim herein as my invention—

1. The combination of a valve-casing, a gas-supply and a gas-delivery opening communicating therewith on opposite sides, respectively, of a partition therein, a gas-supply valve governing an opening in said partition and having a stem extending into a pressure-chamber, a piston or pressure-plate fitting said chamber, a steam-pressure supply-pipe connected to said chamber above the pressure-plate, a double-armed lever pivoted to said chamber and having a bearing on one of its arms abutting against the pressure-plate and gas-supply valve-stem, a counterbalance-weight connected adjustably to the opposite arm, and a rod adapted to connect the counterbalance-arm with an air-supply valve, substantially as set forth.

2. The combination of a valve-casing, a pressure-chamber connected thereto, a valve governing an opening in a partition therein and having its stem extended into the pressure-chamber, a flexible diaphragm extending across said pressure-chamber, a piston or pressure-plate fitting the chamber below the diaphragm, double armed lever pivoted to the pressure-chamber and having a bearing on its inner arm fitting between the pressure-plate and the valve-stem, a counterbalance-weight connected adjustably to the opposite arm of said lever, and a spring bearing against a collar or stop on the valve-stem and tending to maintain the same in contact with the bearing on the lever-arm, substantially as set forth.

In testimony whereof I have hereunto set my hand.

GEO. WESTINGHOUSE, JR.

Witnesses:

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