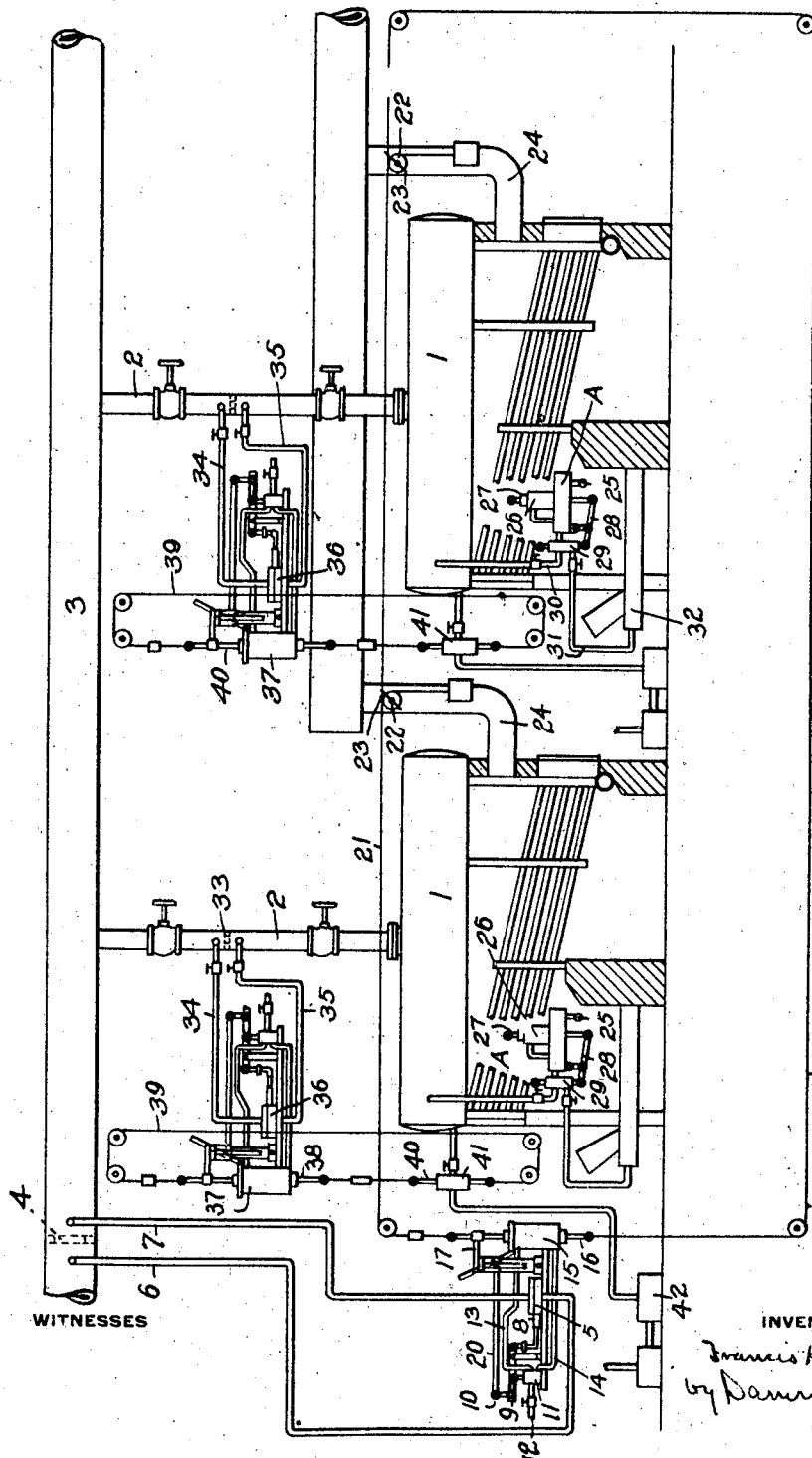


F. H. BROWN.
CONTROLLING COMBUSTION IN A PLURALITY OF GENERATORS.
APPLICATION FILED OCT. 9, 1917.

1,338,897.

Patented May 4, 1920.



UNITED STATES PATENT OFFICE.

FRANCIS H. BROWN, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR TO JOHN M. HOPWOOD, OF PITTSBURGH, PENNSYLVANIA.

CONTROLLING COMBUSTION IN A PLURALITY OF GENERATORS.

1,338,897.

Specification of Letters Patent.

Patented May 4, 1920.

Application filed October 9, 1917. Serial No. 195,626.

To all whom it may concern:

Be it known that I, FRANCIS H. BROWN, residing at Philadelphia, in the county of Philadelphia and State of Pennsylvania, a citizen of the United States, have invented or discovered certain new and useful Improvements in Controlling Combustion in a Plurality of Generators, of which improvements the following is a specification.

In an application filed August 3, 1917, Serial No. 184,260 is described a method of controlling the operations on which the generation of steam or other fluid under pressure is dependent, by and in accordance with the flow of steam from a boiler. In the embodiment of the invention set forth in said application, the discharge of products of combustion is controlled by the flow of steam through the outlet pipe from the generator, the inflow of air to compensate for the outflow of gases and consequent loss of pressure, resulting from natural draft or such draft augmented by any suitable means known in the art.

The invention described herein relates to the regulation of such operations as supplying air and regulating the feed of fuel primarily by and in accordance with the rate of flow of steam through the outlet of each individual unit of the battery, such initial step producing such conditions of pressure in the furnace as will result in the proper adjustment in the feed of fuel. The invention is hereinafter more fully described and claimed.

In the accompanying drawing forming a part of this specification, is shown diagrammatically two boiler units with their settings combined with mechanism or devices whereby the rate of flow of steam from a common conduit connected to the generators, primarily controls the operations involved in the regulation of combustion and the consequent generation of steam or fluid under pressure.

In the practice of the invention, the generators or boilers 1 are connected by pipes 2 to a common header or conduit 3 adapted to conduct the fluid generated to the point or points of use. A fluid pressure actuated motor is so connected by suitable means to the conduit as to be operated by the difference of pressure between the static pressure of the fluid and the static pressure as affected positively or negatively by the velocity of the fluid flowing through the header.

In the construction shown, the conduit 3 is provided with a contracted portion which may be formed in any suitable manner, as for example, that shown *i. e.*, by the insertion of a disk 4 in the conduit or header having an opening therethrough of less diameter than the internal diameter of the header, which is connected at points on opposite sides of the disk to a suitable motor, as for example, a diaphragm motor 5 by pipes 6 and 7 which are connected to the shell of the motor on opposite sides of the diaphragm or movable element of the motor. A lever 8 which is operatively connected to the movable element of the motor, has its free end connected to the frame 9 by a turn buckle or other suitable means and on this frame is pivotally mounted a bell crank lever 10 having one arm connected to the valve rod of the valve mechanism 11. This valve mechanism is adapted to control the flow of fluid under pressure from the pipe 12 through the pipes 13 and 14 leading to opposite ends of a fluid pressure motor preferably consisting of a cylinder 15 having a piston arranged therein. The piston rod 16 of this cylinder is connected by an arm 17 to a frame on which is adjustably mounted an angularly arranged arm 18 adapted to slidably engage a shoe secured to the pivotally mounted standard 19 which is connected by a rod 20 to the bell crank lever 10. In the operation of this mechanism, the valve mechanism 11 will be shifted proportionally to the variations in the rate of flow through the conduit 3 and the movement of the diaphragm will shift the frame 9 which, operating through the bell crank lever, will so move the movable element of the valve mechanism 11 as to admit fluid pressure to one or the other end of the cylinder 15 dependent upon an increase or decrease in the rate of flow of steam along the conduit 3. The movement of the piston in the cylinder 15 consequent on the admission of fluid under pressure thereto, will through the medium of the arm 17 shift the angularly arranged rod 18 and the movement of this rod through the shoe will move the pivotally mounted standard 19 which in turn will shift the bell crank lever 10 independent of the frame 9, reversing the movement imparted to the valve mechanism 11 by the movement of the frame 9, as stated. The piston rod 16 of the cylinder 15 is connected by any suitable means, as for example, a

cord 21 to drums 22 on the shafts of the dampers 23 in the gas outlet conduits 24 of the units composing the battery, and hence any movement of the piston and cylinder 15, due to variations in the rate of flow in the conduit 3 will turn the dampers 23 toward open or closed position dependent upon the direction and variations in the rate of flow in the conduit 3. As in this case, the supply of air to support combustion in the fire boxes or furnaces of the generator results from and is proportional to the escape of gases and products of combustion from the fire boxes, a shifting of the means employed for regulating the rate of discharge of products of combustion from the fire boxes will be followed immediately by a change in the rate of inflow of air and a restoration of the pressure therein to normal conditions.

In order to regulate the feed of fuel in accordance with the quantity of steam required, a secondary means which, however, is dependent for its operation on the primary means hereinbefore described, is employed for regulating the feed of fuel to the fire box. In the embodiment of the invention shown herein, each of the fire boxes of the battery is connected by conduits 25 to pressure actuated devices A, which may be of any suitable type or construction but preferably that shown and described in Letters Patent No. 1,247,215 granted November 20th 1917. As shown in said Letters Patent, the pressure of gases is transmitted from the fire boxes to suitable mechanisms whereby the flow of fluid pressure to one or the other end of cylinders 26 is controlled, so that the piston in said cylinder will move up or down in accordance with variations of pressure in the fire boxes, due to shifting the draft controlling means in the conduits 24. The piston rod 27 of this cylinder has one end connected to a lever 28 which is also connected to the valve rod of the valve mechanism 29 adapted to control the flow of steam through the pipes 30 and 31 to the motor of a suitable stoking mechanism indicated at 32. As will be readily understood, the rate of feed of fuel to each of the fire boxes of the battery, will be dependent upon the pressure of gases in the respective fire boxes, the higher the pressure therein, the lower the feed of fuel and vice versa.

Experience has shown that the several units of a battery will not supply the same quantity of steam to a header and hence the supply of water or other liquid to the several generators should be made dependent upon the rate of flow of steam from the respective generators. To this end, mechanisms operative by and in accordance with the rate of flow of steam from each unit to the conduit 3 is employed for regulating the

feed of water to each unit. It is preferred to employ a mechanism substantially similar to that shown and described herein for controlling the escape of products of combustion from the fire boxes of the generators by and in accordance with the rate of flow of steam along the conduits or headers 3. Generally stated, these mechanisms consist of disks 33 arranged in the outlet pipes 2 of the several units and having openings therethrough of diameters less than the internal diameters of the pipes 2. Pipes 34 and 35 have one end connected to the pipes 2 on opposite sides of the disks 33 and the opposite ends connected to fluid pressure motors 36 at points on opposite sides of the movable elements of such motors. The movements of these elements of the motors are imparted as hereinbefore described, to suitable valve mechanisms whereby the flow of fluid pressure to opposite ends of a fluid pressure cylinder 37 is controlled and the movements of the pistons or movable elements in the motors 37 are regulated by suitable compensating mechanisms, as described, so that such movements will be incremental and not total. The piston rods 38 of the cylinders 37 are connected by any suitable means, as for example, cords 39 to the rods 40 of the valve mechanisms 41, whereby the flow of water from any suitable source, as the pump 42, to the several units is so regulated as to be proportional to the rate of flow of steam through the outlet pipes 2 of such units.

I claim herein as my invention:

1. The method herein described which consists in regulating the flow of products of combustion from each of the furnaces of a plurality of generators by and in accordance with the rate of flow of the generated fluid from all the generators and regulating the feed of fuel to the several furnaces by and in accordance with the pressure in the respective furnaces as affected by the outflow of products of combustion therefrom.

2. The method herein described which consists in regulating the flow of products of combustion from each of the furnaces of a plurality of generators by and in accordance with the rate of flow of the generated fluid from all the generators and regulating the feed of fuel to the several furnaces by and in accordance with the pressure in the respective furnaces as affected by the outflow of products of combustion therefrom, and controlling the feed of water to the respective generators by and in accordance with the rate of flow of the generated fluid from such generators.

In testimony whereof I have hereunto set my hand.

FRANCIS H. BROWN.