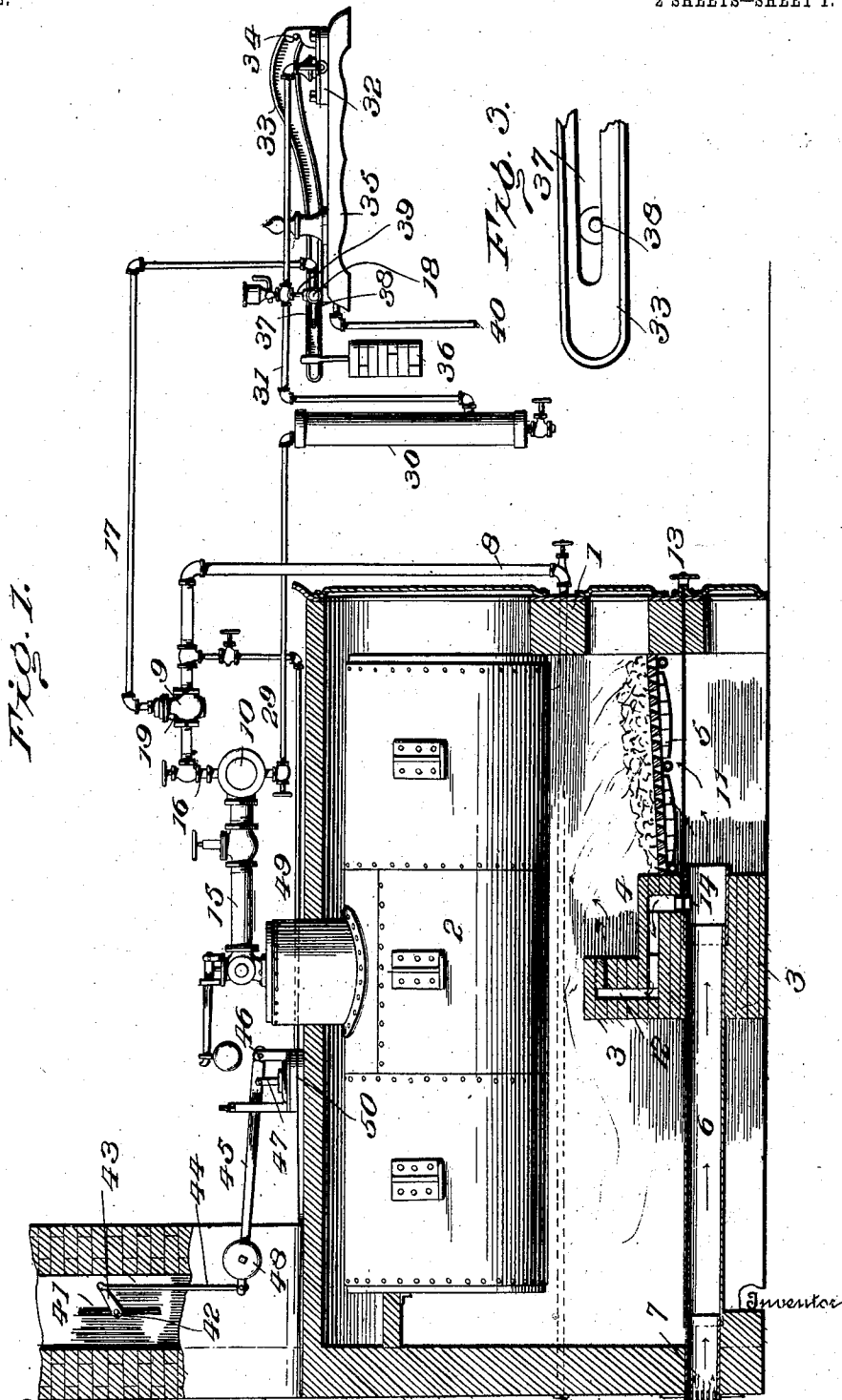


H. E. PARSON.
AUTOMATIC FORCED DRAFT REGULATOR.

APPLICATION FILED MAY 3, 1902.

NO MODEL.

2 SHEETS—SHEET 1.



Witnesses

For Invention
George H. Hays

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No. 742,128.

PATENTED OCT. 20, 1903.

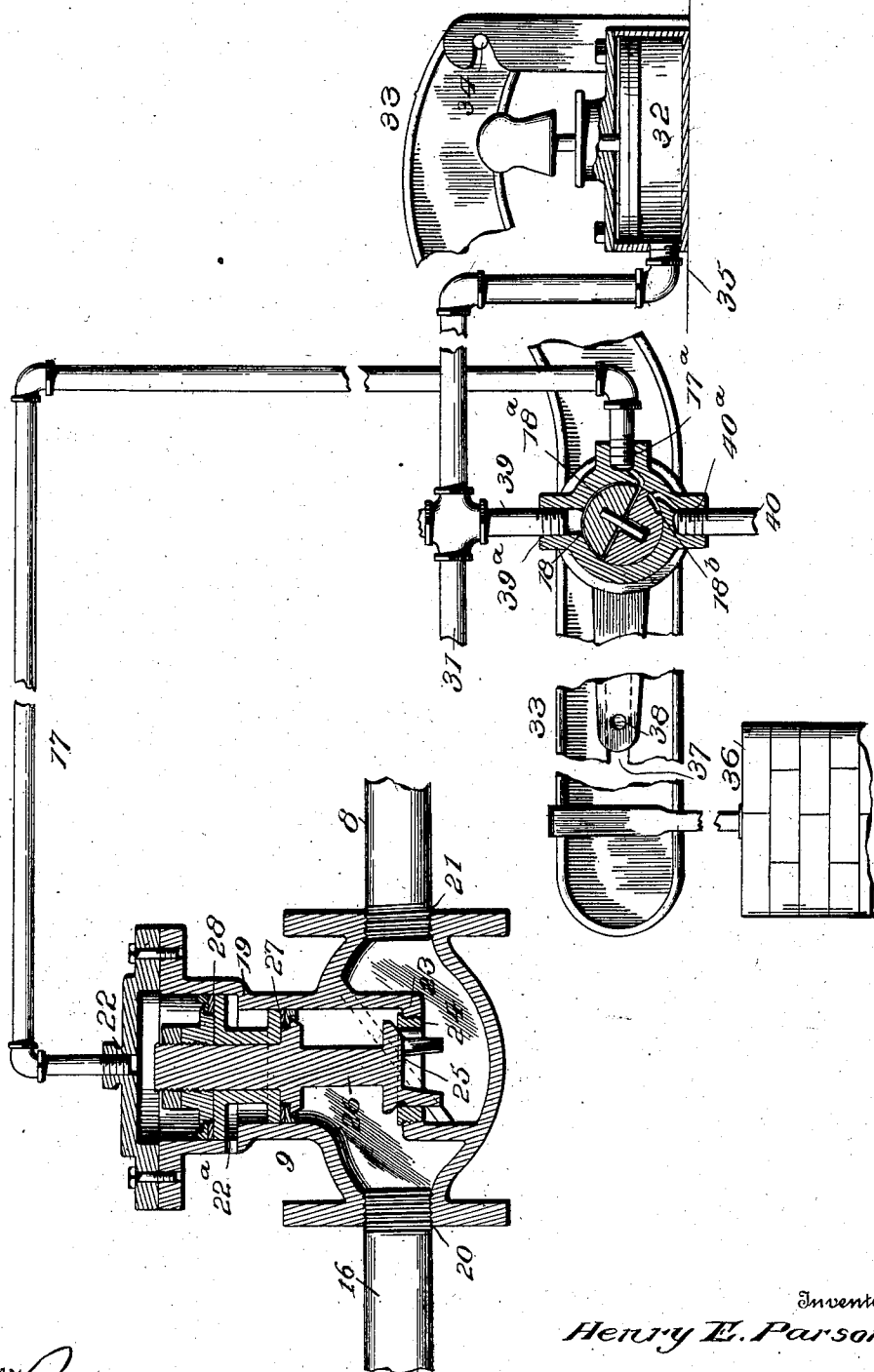
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2 SHEETS—SHEET 2.

Fig. 2.



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UNITED STATES PATENT OFFICE.

HENRY E. PARSON, OF BROOKLYN, NEW YORK, ASSIGNOR, BY MESNE ASSIGNMENTS, TO PARSON MANUFACTURING COMPANY OF NEW YORK, A CORPORATION OF NEW YORK.

AUTOMATIC FORCED-DRAFT REGULATOR.

SPECIFICATION forming part of Letters Patent No. 742,128, dated October 20, 1903.

Application filed May 3, 1902. Serial No. 105,810. (No model.)

To all whom it may concern:

Be it known that I, HENRY E. PARSON, a citizen of the United States of America, and a resident of Brooklyn, county of Kings, State of New York, have invented certain new and useful Improvements in Automatic Forced-Draft Regulators, of which the following is a specification.

My invention relates to an automatic device for regulating the intensity of the fire used for heating water in a steam-boiler. It is an improvement upon the devices which are the subject-matter of Letters Patent of the United States Nos. 681,456 and 681,457, which have been issued to me heretofore on the 27th day of August, 1901.

The purpose of the present apparatus is to simplify the devices employed in the patents referred to and to increase the positiveness of their operations.

In this structure I have dispensed entirely with the rope or wire connections and counterbalancing-weights and perform all the necessary operations by positive steam or water pressure through the medium of properly-constructed valves.

In the drawings the same numbers represent the same parts in all figures.

Figure 1 is a part section and part vertical elevation of my improved fire and boiler pressure regulator. Fig. 2 is a detail of the two-way-valve-regulating levers. Fig. 3 is a view illustrating the valves in the position assumed when the steam has reached the desired pressure.

Referring to the drawings, Fig. 1 is the combustion-chamber, in which there is mounted a boiler 2. 3 is a bridge-wall, and 4 a banking-platform constructed in connection with the bridge-wall. 5 is a grate-platform constructed in the usual way in which I construct my grate-platforms. The grate is constructed of sections of cast-iron plates provided with conical holes larger on the lower side and smaller on the upper side of the grate. 6 is a forced-draft tube. 7 is a forced-draft blower. 8 is the steam-pipe by which the blower is supplied with steam. It passes through the wall of the fire-chamber and is connected through the

valve 9 with the main steam-pipe 10. The ash-pit 11 is closed and no air is admitted to it except through the forced-draft pipe 6. The space above the grate 5 is a combustion-chamber, where the gases produced from the fire meet a suitable supply of air coming from the bridge-wall and are burned. 12 are channels in the bridge-wall, through which a part of the air entering through the forced-draft pipe 6 is permitted to pass, is heated, and is then admitted into the combustion-chamber in the presence of the gases of combustion from the fire. Thus the fire is regulated both as to the amount of air-supply below the grate and the amount of air-supply above the grate. 13 is a valve-stem, and 14 a valve by which the amount of air to be admitted to the channels 12 may be regulated. The main steam-supply pipe 10, connected with the dome of the boiler by means of the steam-pipe 15, has branches from its top and lower sides. The top branch 16 is connected to one side of the valve 9, while the steam-pipe 8, which supplies steam to the blower, is connected to the opposite side of the valve 9. To the top of the valve 9 is connected a steam-pipe 17, which extends from the valve 9 down to a valve 18. This valve consists of a valve proper, 18^a, rotatably mounted in the casing 18, and is provided with a groove 18^b, designed to register with the port 17^a and the exhaust-port 40^a to relieve the pressure at the top of the piston of valve 25 when the pressure of steam is lowered. The valve 18^a fits the casing 18 loosely at the top to form communication between port 39^a and the port 17^a when the steam reaches the predetermined pressure. The valve 9 is shown in vertical section in Fig. 3. 19 is the valve-casing, having two main openings 20 and 21 on opposite sides, 20 connected to the steam-pipe 16, 21 connected to the steam-pipe 8. At the top of the valve-casing there is an opening 22, to which is connected the steam-pipe 17. On the side of the casing there is an opening 22^a, which is connected to exhaust and which exhausts the space between the two pistons in the cylinders formed by the casing. The interior of the casing is divided by a partition 23, which

separates the inlet 20 from the outlet 21. In the center of the partition 23 there is a valve-seat 24, upon which is seated a valve 25, by which the communication between the inlet 20 and the outlet 21 is controlled. On the stem 26 of the valve 25 there are two pistons 27 and 28. The upper portion of the valve-casing 19 is cylindrical and is formed in two diameters, one larger than the other. The lower one forms a cylinder for the piston 27. The upper one forms a cylinder for the piston 28. The pistons 27 and 28 are rigidly secured upon the stem 26 and move together. It will be noticed that the area of the piston 27 is greater than the area of the valve 25, and consequently when boiler-pressure is admitted at inlet 20 and relieved from the cylinder above the piston 28 the piston 27 will be forced up by the steam and the valve 25 will be opened. If, on the contrary, the same boiler-pressure which is admitted by inlet 20 is also admitted by inlet 22, it will fill the cylinder in which moves the piston 28, and because of the greater area of the piston 28 will force that piston down and with it the piston 27 and the valve 25 and maintain the valve 25 upon its seat. Pressure is applied to the top of the larger piston 28 by means of the steam-boiler pressure admitted to the condenser 30 and the train of pipes connecting it to the top of the casing by the inlet 22; but this train of connection after passing the condenser is filled with water formed by condensed steam. If the piston 28 should leak and the space between the pistons become filled with water and there is no exhaust for the water, the motion of the larger piston would be blocked and it would be impossible to close the valve 25. Therefore it is that the exhaust 22^a is provided, so as to carry off any leakage that may escape into the interspace between the pistons 27 and 28.

Referring to Fig. 1, it will be seen that connected to the bottom of the main steam-pipe 10 there is a pipe 29, which connects with the condenser 30, which is in its turn connected by a pipe 31 with a cylinder 32, in which there moves a piston (not shown in the drawings) which will be raised or lowered as steam-pressure is admitted to or cut off from the cylinder 32. The piston-rod connected to the piston within the cylinder 32 rises through the center of the head of the cylinder. 33 is a lever pivoted at 34 on the head of the cylinder 32 and extending to the left beyond a stand 35, on which the cylinder 32 is mounted, and resting on the upper end of the piston-rod. On the end of the lever 33 is suspended a weight 36. The lever 33 is slotted at 37, the slot being quite wide. The valve heretofore referred to is mounted on the end of the stand 35 and consists of a rotating two-way valve, moved by the stem, which protrudes axially through the valve-chest and has upon its end a lever 38, which is connected by means of a turn-nut in the slot 37 with the lever 33 and is moved by the lever 33 as it rises and falls.

By reference to Fig. 4 it will be seen that the bolt in the end of the lever 38, which passes through the slot 37 in the lever 33, is of much less diameter than the slot 37. Hence the lever 33 will be permitted to move a distance equal to this difference of diameter before moving the lever 38 or the valve 18. The lost motion thus provided for plays an important part in the regulation of the boiler-pressure. If the engine is working hard and drawing heavily on the boiler, the boiler-pressure will be perceptibly lessened. With each stroke of the engine there will be a corresponding change in the conditions affecting the automatic valve, and the drop of boiler-pressure, if low enough, will actuate the main valve and start the blower. It may be, however, that the rate at which steam is being generated by the existing fire is sufficient to supply the demands of the engine in a few seconds and that there is no necessity for starting the blower. If this be the case, the lever 33 will vibrate under the influence of fluctuation of steam-pressure without moving the valve-lever 38 or affecting the valve, due to the lost motion in the slot 37. If the drain upon the boiler is faster than the generation of steam, the vibration of the lever 33 will take place through the same arc; but the arc will gradually move down and the lever 33 will hammer with each vibration upon the bolt in the end of the lever 38 until it has moved it far enough to close the valve 18 to steam and open it to exhaust. Then as the steam-pressure rises the lever 33 will still vibrate under the engine's drain upon the boiler and will first vibrate without touching the bolt of lever 38 and will then hammer upon it until the valve 18 is again opened and the forced draft stopped. This operation of hammering the lever 38 little by little as the lever 33 vibrates until the valve 18 is either opened or closed produces most satisfactory regulation—much more satisfactory than the too sudden opening or closing of the main valve, and consequent starting or stopping of the blower.

The steam-pipe 17, which is connected with the top of the main valve 9, enters the side of the valve-chest 18. Into the top of the same valve-chest enters a branch pipe 39 from the steam-pipe 31.

40 is a drain-pipe.

The two-way valve 18 is so constructed that in one position of the lever 38 a communication will be established between the steam-pipe 31 and the steam-pipe 17, and in the other position of the lever 38 that communication will be cut off and a communication established between the steam-pipe 17 and the drain-pipe 40. When the steam-pressure in the boiler rises to a point high enough to cause the piston of the cylinder 32 to force its piston-rod upward beneath the lever 33 and raise that lever sufficiently to release the arm 38 and the valve 18 and open communication between the steam-pipe 31 and the

steam-pipe 17, then steam or water will be admitted to the top of the valve 9 into the cylinder in which moves the piston 28 and the piston 28 and valve 25 will be moved
 5 downward until the valve meets its seat 24 and closes the communication between the steam-inlet 20 and the steam-pipe 8, the blower of the forced-draft device will be stopped, and the intensity of the fire checked.
 10 With the checking of the intensity of the fire the amount of steam generated will be lowered and the boiler-pressure will consequently be lowered, both by reduction of temperature and work cast upon the boiler. As
 15 soon as the boiler-pressure drops sufficiently to allow the weight 36 to draw the lever 33 downward and turn the arm 38 and the valve 18 to a position where it will cut off steam-pressure from the steam-pipe 17 and the top
 20 of the valve 9 it will at the same time open communication between the steam-pipe 17 and the drain-pipe 40, which will at once drain the steam-pipe 17 of whatever steam or water may be in it and relieve the pressure
 25 from the top of the piston 28, which is holding the valve 25 down upon its seat. Immediately the steam-pressure of the boiler, which is constantly below the piston 27, will force that piston up and raise the valve and again
 30 admit steam to the steam-pipe 8 and start the forced-draft blower. It will thus be seen that when the pressure in the boiler reaches the desired degree the forced-draft apparatus will be stopped automatically, and when
 35 it falls below that degree the forced draft will again be started and the fire will be maintained at such a degree of intensity as to constantly keep the boiler-pressure up to a desired level.
 40 In addition to the regulation of the forced-draft blower it is desirable to regulate the fire to some extent by means of a damper in the chimney.
 Referring again to Fig. 1, 41 is the damper, suitably mounted in the chimney upon a
 45 shaft 42, which protrudes through the wall of the chimney and has upon its end a crank 43, to which is connected a rod 44, secured to the end of a lever 45. The lever 45 is pivoted at 46 upon the top of the boiler and
 50 upon the side of a cylinder in which there is a piston. (Not shown in this drawing.) 47 is the piston-rod, protruding through the head of the cylinder and connected to the lever 45. 48 is a weight upon the end of the
 55 lever 45. The tendency of the weight 48 is to draw the lever 45 downward and close the damper 41 in the chimney. The effect of the piston-rod 47 and its piston is to hold the lever 45 up under boiler-pressure and prevent the closing of the damper 41. 49 is a
 60 steam-pipe connected to the steam-pipe 8 beyond the valve 9 and at its other end to the cylinder 50, in which reciprocates the piston and piston-rod 47. It will be seen that when the steam is admitted to the steam-pipe 8 it will also enter the steam-pipe 49, raise the

lever 45, and open the damper 41. This will augment the draft and increase the fire. When the steam is cut off of the steam-pipe 70 8, it will also be cut off of the steam-pipe 49 and from the cylinder 50, and the weight 48 will draw the lever 45 down and turn the damper 41, so as to partially close the chimney-aperture, thus reducing the draft and 75 the fire. This automatic damper-regulator can be used with or without the forced-draft apparatus.

Having thus described my invention, what I claim as new, and desire to secure by Letters 80 Patent, is—

1. In an automatic forced-draft apparatus, the combination of a boiler, a combustion-chamber, a grate, a blower, a steam-pipe supplying steam to the blower, a valve in the 85 steam-pipe, said valve consisting of a valve and valve-seat, two cylinders, each of different size, and each containing a piston, both pistons connected to and movable with the valve, one piston operating to open, and the 90 other piston operating to close the valve, and automatic means for admitting and cutting off steam from the larger cylinder, the smaller cylinder being in open communication with the steam-pipe leading from the boiler, sub- 95 stantially as described.

2. In an automatic forced-draft apparatus, the combination of a boiler, a combustion-chamber, a grate, a blower, a steam-pipe supplying steam to the blower, and connected 100 to the boiler, a valve in the steam-pipe, said valve consisting of a valve and seat, and two pistons mounted on the valve-stem, one piston being larger than the other, and both reciprocating with the valve, a cylinder for 105 each piston in which it is fitted, and automatic mechanism controlled by boiler-pressure and operating to control the movement of said valve, substantially as described.

3. In an automatic forced-draft apparatus, 110 the combination of a boiler, a fuel-chamber, a grate, a blower, a steam-pipe supplying steam to operate the blower, and connected to the boiler, a valve in the steam-pipe, consisting of a valve and a valve-seat, and two pistons 115 mounted on the valve-stem, one of the pistons being larger than the other, two cylinders in which the pistons fit and reciprocate, each of which is supplied with boiler-pressure, a branch from the main steam-pipe, a 120 cylinder, piston and lever operating a two-way valve, the cylinder being supplied with steam by the branch from the main steam-pipe, a two-way valve also supplied with steam by the branch from the main steam- 125 pipe, a branch connected to the two-way valve, and to the larger of the cylinders of the valve, and connections from the two-way valve to exhaust.

4. In an automatic forced-draft apparatus 130 the combination of a boiler, a fuel-chamber, a grate, a blower, a steam-pipe for operating the blower, a valve in said steam-pipe, said valve consisting of a valve and valve-seat, and two

pistons mounted on the valve-stem, one larger than the other, and each reciprocating in the cylinder in which it fits, each cylinder having a connection to boiler-pressure, a branch from the main steam-pipe between the valve and the boiler, which is connected to the larger one of the cylinders of the valve, a two-way valve located in this branch pipe, and means for opening and closing said valve as the boiler-pressure rises or falls above or below a desired degree.

5. In an automatic forced-draft apparatus, the combination with a boiler and a blower for the fuel-chamber, of a pipe connecting the boiler and blower, a valve in said pipe normally opened by boiler-pressure below a predetermined point, to supply the blower, and means to admit boiler-pressure to the valve to close it when said boiler-pressure exceeds said predetermined point.

6. In an automatic forced-draft apparatus the combination of a boiler, a fuel-chamber, a blower, a pipe supplying steam to the blower, a valve in the pipe, two cylinders of different sizes, each containing a piston, both pistons connected to the valve, one operating to open, and the other to close it, pipe connections from each cylinder to the boiler, and a valve located in the supply-pipe in the larger of the cylinders, with means for opening or closing said valve operating by boiler-pressure, said means constructed with a calculated amount of lost motion, whereby it is permitted to move or vibrate through a certain amplitude before affecting the valve, substantially as described.

7. In an automatic forced-draft apparatus, the combination with a boiler and a blower for the fuel-chamber, of a pipe connecting the boiler and blower, a valve in said pipe normally opened by boiler-pressure below a predetermined point to supply the blower, means to admit boiler-pressure to the valve to close it when said boiler-pressure exceeds such predetermined point, and means for automatically controlling said latter means.

8. In an automatic forced-draft apparatus, the combination with a boiler and a blower for the fuel-chamber, of a pipe connecting the boiler and blower, a valve in said pipe normally opened by boiler-pressure below a predetermined point to supply the blower, means to admit boiler-pressure to the valve to close it when said boiler-pressure exceeds such predetermined point, and means to shunt the valve-closing pressure from the valve when the boiler-pressure falls below the predetermined point.

9. In a device for automatically controlling steam-pressure, a boiler, a fire-box, a steam-pressure pipe, a valve in said pipe arranged to be constantly fluttered under the influence of the boiler-pressure between certain predetermined pressure-points and allowed to close or be forced open as the boiler-pressure exceeds or falls below such predetermined points.

10. In a device for automatically control-

ling steam-pressure, a boiler, a fire-box, a steam-pressure pipe, a valve in said pipe, means to close said valve, and means to open the valve, the variations between predetermined points of boiler-pressure constantly affecting the operation of each of said means and fluttering the valve, an increase or decrease of such predetermined boiler-pressure positively opening or permitting the closing of the valve.

11. In an automatic steam-pressure controller, the combination with a boiler, and a fire-box, of a steam-pressure pipe, a valve therein, a lever arranged to constantly flutter under impulses of the steam-pressure between predetermined points, and connections between the valve and lever, to permit a movement of the lever to open or close the valve as the boiler-pressure exceeds or falls below such predetermined points.

12. In an automatic steam-pressure controller, the combination with a boiler and a fire-box, of a steam-pressure pipe, a valve therein, a lever formed with a slot, said lever being constantly fluttered by impulses of the steam-pressure between predetermined points, a valve-arm for moving the valve, and a pin projecting from the arm and loosely seated in the slot in the lever, whereby the fluttering lever may constantly move the valve, the effective movement being in one or two directions according as the pressure exceeds or falls below such predetermined points.

13. In an automatic forced-draft apparatus, the combination with a boiler and a blower for the fuel-chamber, of a pipe connecting the boiler and blower, a valve therein admitting power to the blower and opened by a predetermined boiler-pressure, means for admitting boiler-pressure to the valve to close it when said pressure exceeds such predetermined point, and means automatically controlled by boiler-pressure for shunting the valve-closing pressure when the boiler-pressure has fallen below such predetermined point.

14. In an automatic forced-draft apparatus, the combination with a boiler and a blower for the fuel-chamber, of a pipe connecting the boiler and blower, a valve therein admitting power to the blower and opened by a predetermined boiler-pressure, means to admit the boiler-pressure to close the valve when the boiler-pressure exceeds the predetermined point, and means automatically controlled by definite points of boiler-pressure for regulating the valve-closing pressure.

15. In an automatic forced-draft apparatus, the combination with a boiler and a blower for the fuel-chamber, of a pipe connecting the boiler and blower, a valve therein admitting power to the blower and opened by a predetermined boiler-pressure, a regulator for admitting the boiler-pressure when above the predetermined point to close the valve, and means for controlling said regulator.

16. In an automatic forced-draft apparatus, the combination with a boiler and a blower for the fuel-chamber, of a pipe connecting the boiler and blower, a valve therein admitting power to the blower and opened by a predetermined boiler-pressure, a regulator for admitting boiler-pressure to the valve to close it when the pressure exceeds such predetermined point, and means controlled by predetermined points of boiler-pressure for governing the regulator.

17. In an automatic forced-draft apparatus, the combination with a boiler and a blower for the fuel-chamber, of a pipe connecting the boiler and blower, a valve therein admitting power to the blower and opened by a predetermined boiler-pressure, a regulator for admitting boiler-pressure to the valve to close it when the pressure exceeds such predetermined point, said regulator comprising a valve constantly fluttered between predetermined pressure-points and fully opened or closed at pressure-points above or below such predetermined pressure-points only.

18. In an automatic forced-draft apparatus, the combination with a boiler and a blower for the fuel-chamber, of a pipe connecting the boiler and blower, a valve therein admitting power to the blower and opened by a predetermined boiler-pressure, a regulator for admitting boiler-pressure to the valve to close

it when the pressure exceeds such predetermined point, said regulator comprising a valve, a lever constantly fluttered between predetermined points of boiler-pressure, and connections between the valve and lever to move the valve when the pressure falls below or exceeds such predetermined pressure-points.

19. In an automatic forced-draft apparatus, the combination with a boiler and a blower for the fuel-chamber, of a pipe connecting the boiler and blower, a valve therein admitting power to the blower and opened by a predetermined boiler-pressure, a regulator for admitting boiler-pressure to the valve to close it when the pressure exceeds such predetermined point, said regulator comprising a valve, a slotted lever constantly fluttered between predetermined points of boiler-pressure, a valve-arm for moving the valve, and a pin projecting from the arm and loosely entering the slot in the lever, said lever being moved to operate the valve when the pressure exceeds or falls below such predetermined points.

Signed by me at New York, N. Y., this 5th day of March, 1902.

HENRY E. PARSON.

Witnesses:

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