W. T. PECK.

BLOWER VALVE.

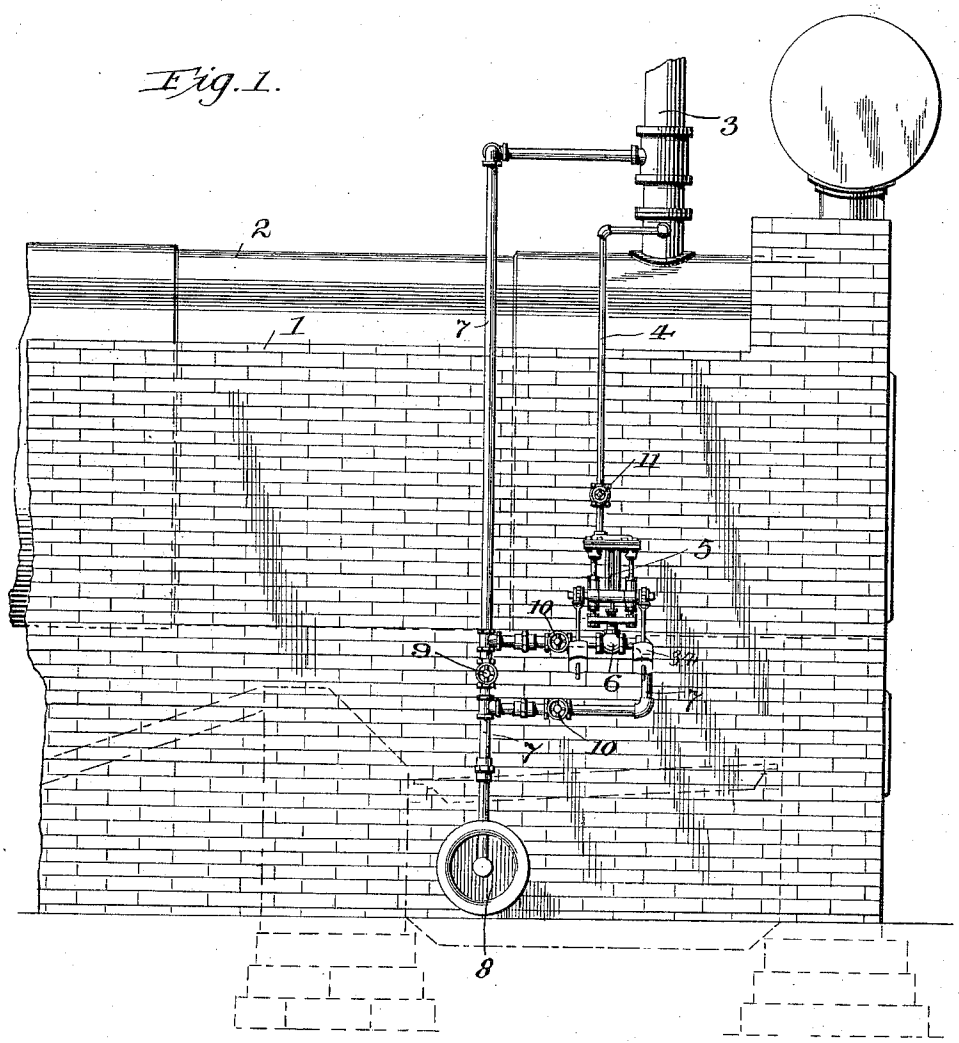
APPLICATION FILED APR. 18, 1910.

1,018,847.

Patented Feb. 27, 1912.

3 SHEETS—SHEET 1.

Fig. 1.



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3 SHEETS—SHEET 2.

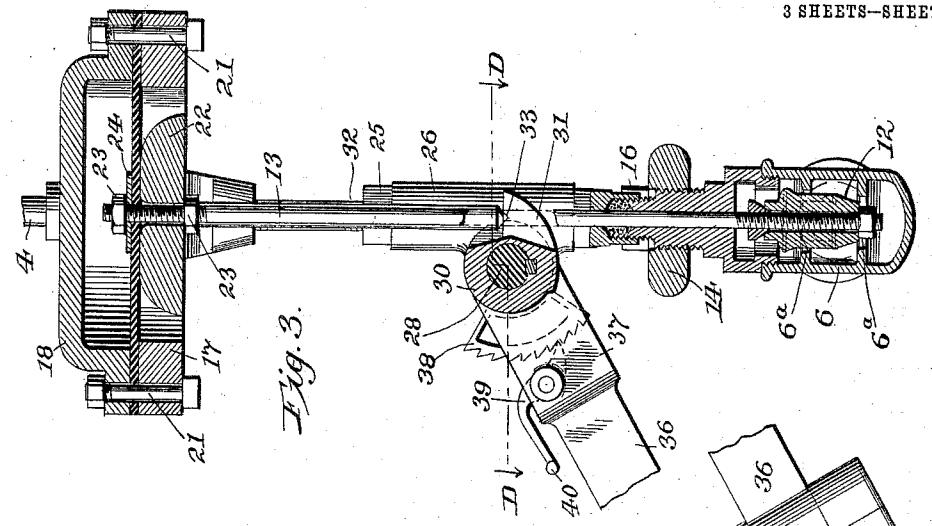

Fig. 3.

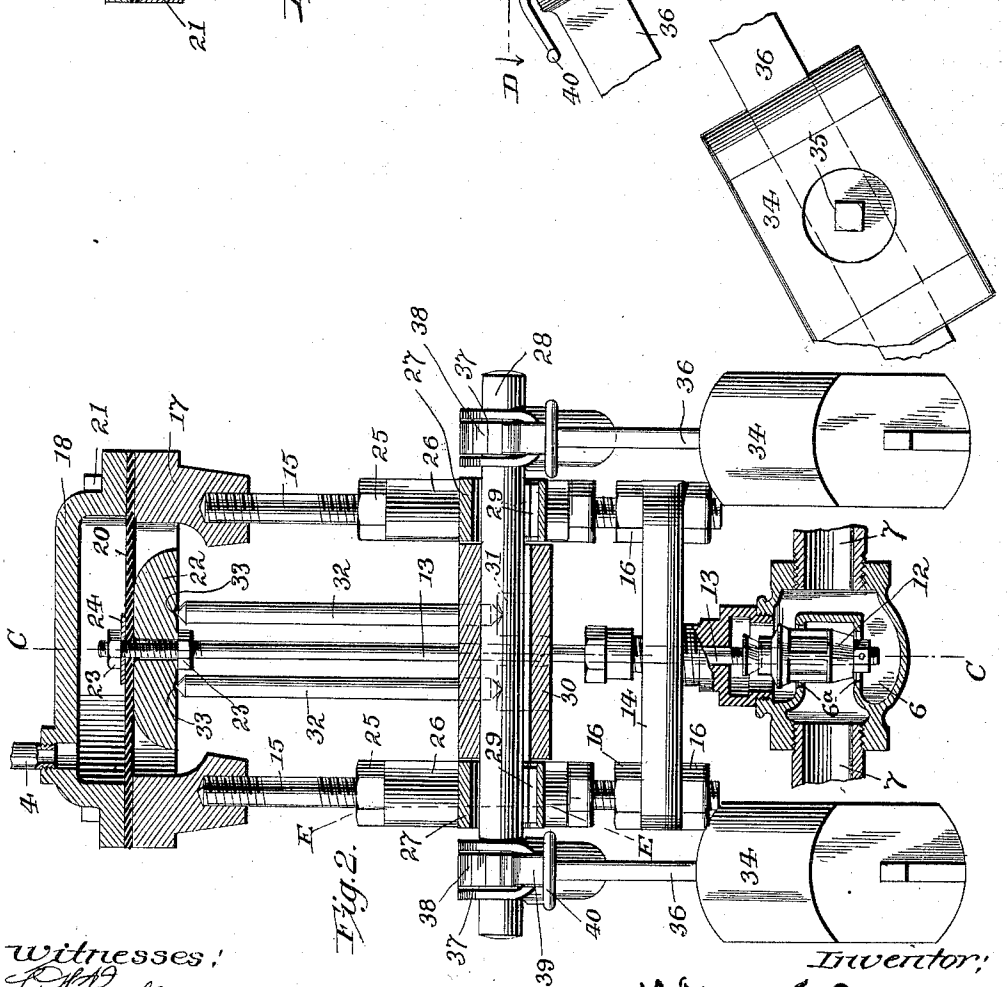

Fig. 2.

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3 SHEETS—SHEET 3.

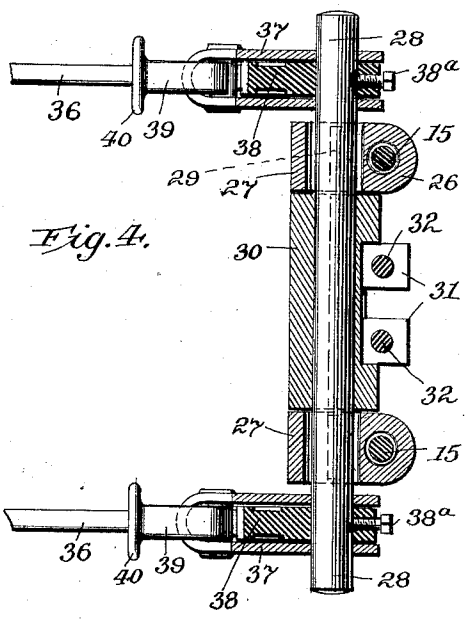

Fig. 4.

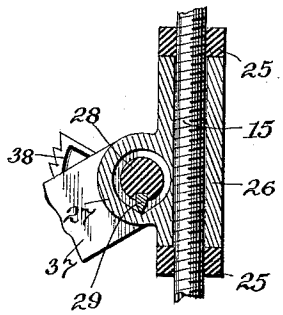

Fig. 5.

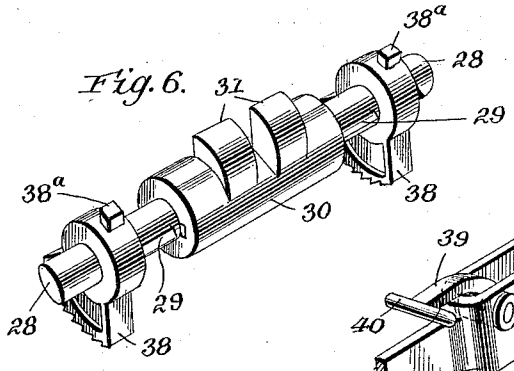

Fig. 6.

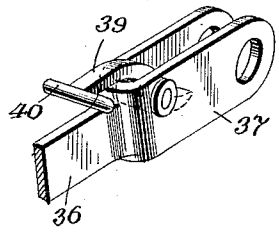

Fig. 7.

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UNITED STATES PATENT OFFICE.

WILLIAM T. PECK, OF LYNCHBURG, VIRGINIA, ASSIGNOR TO THE UNITED CIGARETTE MACHINE COMPANY, LT'D., OF LYNCHBURG, VIRGINIA, A CORPORATION OF GREAT BRITAIN.

BLOWER-VALVE.

1,018,847. Specification of Letters Patent. **Patented Feb. 27, 1912.**

Application filed April 18, 1910. Serial No. 556,033.

To all whom it may concern:

Be it known that I, WILLIAM T. PECK, a citizen of the United States, residing at Lynchburg, in the county of Campbell and State of Virginia, have invented certain new and useful Improvements in Blower-Valves, of which the following is a specification.

This invention relates to automatic control valves for blowers such as are used to furnish forced draft for boiler furnaces, the valve being subject to boiler pressure and operating to maintain this pressure at a constant value. In the valves of this type in the forms now in common use, the action of the blower is caused to be periodic or intermittent, the valve moving relatively suddenly between the open and closed position as boiler pressure fluctuates past the determined value. There are thus but two conditions of the draft; that with the blower operating and that with the blower shut down. Consequently the fire is alternately forced to undue intensity, and allowed to fall unduly low; a mode of operation that hinders intelligent firing and causes needless waste of fuel. Where the boiler load is relatively constant, and this is commonly the case, there is no necessity for this intermittent action, as a mean intensity of fire may be had and maintained and need be departed from only very slightly to accommodate the fluctuations in load. Since the intensity of blowing action determines the intensity of the fire, this amounts to saying that the blowing action should be gradually variable through the ordinary range of the boiler load, so that the blower may be constantly in operation throughout this range, or that, if these conditions cannot be realized at any rate the blower should be shut off gradually, thus giving a varying effect through a considerable range.

To secure this desirable range of variation and also to secure a progressively varying rate of such variation is the purpose of my invention, and I accomplish the result by the use of counterweights swinging in an arc of a circle, so that the turning moment due to these weights is subject to a gradual progressive change. The angular position of the counterweights is adjustable to change the rate of variation and its general character.

Various concrete embodiments of the principle are possible, but I shall describe it in detail with reference to a preferred structure illustrated in the accompanying drawings, wherein:—

Figure 1 is a side elevation of a boiler and setting showing the mode of applying a valve embodying my invention; Fig. 2 is an elevation, partly sectional, of my controlling valve mechanism; Fig. 3 is a section on the line C—C of Fig. 2. Fig. 4 is a section on the line D—D of Fig. 3. Fig. 5 is a section on the line E—E of Fig. 2. Fig. 6 is a perspective view of the counterweight shaft, and Fig. 7 is a perspective view of a portion of a counterweight arm.

In Fig. 1, 1 represents the setting of the boiler 2, from the main steam pipe 3 of which, there leads a pipe 4 to the operating end of the valve controlling mechanism 5, later to be described in detail. This mechanism controls a valve 6 on a pipe 7 leading from the main steam pipe 3 to the blower 8. A valved by-pass 9 and cut-out valves 10 permit the cutting out of the automatic control valve if desired. A valve 11 is also provided to permit the removal of the device for cleaning and repair while the boiler is under pressure, or for use in the event of leakage at the diaphragm end or the like.

Referring now to all the figures, and particularly to Figs. 2 and 3, it will be observed that the valve 6 is of the balanced puppet type having seats 6^a, a vertically movable valve member 12 and a valve rod 13 attached to the member 12. Obviously any form of balanced valve, capable of operation in a similar manner might be substituted for the valve 6, a balanced valve being preferable because easier operated and free from the effects of pressure in pipe 7. To the valve shell is attached a yoke 14 carrying two upstanding threaded rods 15 held by nuts 16. The upper ends of these rods are threaded into a casting 17 which with the casting 18 forms the diaphragm chamber with which the pipe 4 communicates. The castings 17 and 18 and a diaphragm 20 are held together by bolts 21, as shown. The diaphragm 20 is provided with the usual reinforcing plate 22 and is connected to the valve rod 13 by nuts 23, a washer 24 being used to secure a tight joint. Held on the middle portion of each of the rods 15, by nuts 25 are the bearing brackets 26 in the eyes 27 of which is mounted the counterbalance shaft 28. The shaft 28 rocks on hardened steel knife-edge

bearings 29 mounted in the shaft. A sleeve 30 is keyed on the shaft 28 and carries the arms 31 and between these and the reinforcing plate 22 are inserted the thrust rods 32 whose conical ends rest in indentations 33 in the plate 22 and arms 31. Thus sliding friction is minimized. Resistance to the rotation of the shaft 28 under the pressure exerted by the diaphragm 20 through the rods 32 is secured by the use of counterweights 34 adjustably mounted by means of set screws 35 on the arms 36. These arms are pivoted on the shaft 28 and are forked at their ends as at 37 to straddle a ratchet sector 38 held by set screws 38[a] to shaft 28. Dogs 39 having arms 40 are carried by the arms 36 and engage the teeth on the ratchet sectors 38, so that the counterweight arms move with the shaft and may readily be adjusted in their angular relation thereto.

From the above described construction it will be apparent that an increase in pressure in the boiler will cause an increased pressure to be exerted on diaphragm 20, moving this downward and tending to close valve 6 and reduce the flow of steam to the blower. This movement tends to rotate shaft 28 in a clockwise direction as viewed in Fig. 3 and to raise the weights. If the arms 36 are so adjusted angularly with reference to the shaft 28 that they never swing above a horizontal position, then the retarding moment due to these weights will increase at a rate which itself rapidly increases as the horizontal is approached. In this way the valve is much more sensitive to fluctuations of boiler pressure in its open position than when nearly closed and hence the required sensitiveness under normal conditions of operation can be combined with a considerable resistance to complete closure when the pressure becomes abnormal. Another desirable feature secured follows from the converse of the above statement. As the pressure falls and nears the desired minimum the blower is turned on with increasing rapidity thus tending to hasten the desired restoration of pressure.

As the angular range of motion of the arms 36 is relatively limited they may be adjusted in several angular positions to secure various degrees of variation of the retarding moment, this property of variation decreasing and becoming negligible as the mean position of the arms is made to approach the horizontal. It has been found that when this limit has been reached the blower operates intermittently or periodically. By adjusting the arms so as to swing through a range above the horizontal, a reversal of the variable moment effect may be secured. It will be apparent that as the angular position of the arms is adjusted a readjustment of the positions of the weights will become necessary to compensate for changes in turning moment incident to the changed angular position. The weights 34 are therefore adjustable readily upon the arms 36. This adjustment is also useful for the purpose of varying the pressure for which the valve is set.

It will be seen from the above statements that I secure a valve adjustable through a considerable range, and tests show that it is possible to operate the blower practically constantly, the intensity of the blower action being varied by the device, in accordance with the fluctuations of load, so that a continuous blowing action varying in intensity is had in all normal ranges of operation.

Having thus described my invention, what I claim is—

1. The combination of a boiler; a furnace; a blower for furnishing air to the furnace; a valve controlling the supply of motive fluid to the blower; an abutment subject to the pressure in the boiler, tending to close said valve; and a counterweight acting in opposition to the abutment to open the valve and so mounted as to have an increasing component of motion in opposition to gravity, as the valve approaches a closed position.

2. The combination of a boiler; a furnace; a blower for furnishing air to the furnace; a valve controlling the supply of motive fluid to the blower; an abutment subject to the pressure in the boiler, tending to close said valve; a counterweight mounted to have an increasing component of motion in opposition to gravity as the valve approaches a closed position, said counterweight acting to open the valve; and means for varying the path of said counterweight to change its retarding effect.

3. The combination of a boiler; a furnace; a blower for furnishing air to the furnace; a valve controlling the supply of motive fluid to the blower; an abutment subject to the pressure in the boiler, tending to close said valve; a shaft rocked by the motion of the abutment; and a counterweight mounted to turn with said shaft, to act in opposition to the abutment, and to have an increasing effective moment arm as the mechanism moves toward valve closing position.

4. The combination of a boiler; a furnace; a blower for furnishing air to the furnace; a valve controlling the supply of motive fluid to the blower; an abutment subject to the pressure in the boiler, tending to close said valve; a shaft rocked by the motion of said abutment; an arm; means for adjusting said arm in various angular relations with said shaft, and a counterweight adjustably mounted on the arm.

5. The combination of a boiler; a furnace; a blower for furnishing air to the furnace; a valve controlling the flow of

motive fluid to the blower; a diaphragm subject to boiler pressure and urging said valve to its closing position; a shaft rocked by motion of the diaphragm; arms carried by said shaft; and counterweights adjustably mounted on the arms, the whole mechanism being so arranged that the weights oppose the closing of the valve and shall never rise to a point higher than the axis of the shaft in the operation of the device.

6. In combination with a valve, and a diaphragm operating under fluid pressure to close the valve; a counterweight structure resisting such closure, comprising a counterweight shaft; a ratchet fast on the shaft; an arm loosely mounted on the shaft; a pawl on the arm and coacting with the ratchet; and a counterweight adjustably mounted on the arm.

7. In an automatic valve mechanism the combination of a valve body; a movable valve member in the valve body; a supporting frame attached to the valve body; a diaphragm chamber mounted on said frame; a diaphragm in the chamber; a valve rod connected to the diaphragm and to the valve member; a rock shaft carried by the frame to one side of the valve rod; knife edge bearings for said shaft; thrust arms on the shaft; thrust rods bearing on the thrust arms and operatively connected to the valve rod; a ratchet attached to the shaft; a counterweight arm loose on the shaft; a pawl carried by the counterweight arm and adapted to coact with said ratchet; and a counterweight adjustably mounted on the counterweight arm.

8. In an automatic valve mechanism a valve body; a movable valve member in the valve body; a supporting frame attached to the valve body; a diaphragm chamber mounted on said frame; a diaphragm in the chamber; a valve rod connected to the diaphragm and to the valve member; a rock shaft carried by the frame to one side of the valve rod; bearings for said shaft; thrust arms on the shaft; thrust rods bearing on the thrust arms and operatively connected to the valve rod; a ratchet attached to the shaft; a counterweight arm loose on the shaft; a pawl carried by the counterweight arm and adapted to coact with the ratchet on the shaft; and a counterweight on the counterweight arm.

9. The combination of a boiler; a furnace; a blower for furnishing air to the furnace; a valve controlling the supply of motive fluid to the blower; an abutment subject to the pressure in the boiler tending to close said valve; a shaft rocked by the motion of said abutment; a pendant arm turning with said shaft; and a counter-weight carried by the arm, the apparatus being so arranged that the arm assumes an approximately vertical position when the valve is open and approaches a horizontal position as the valve is closed.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

WILLIAM T. PECK.

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