B. L. AMES.

SMOKE PREVENTER.

APPLICATION FILED MAR. 20, 1914.

1,166,880.

Patented Jan. 4, 1916.

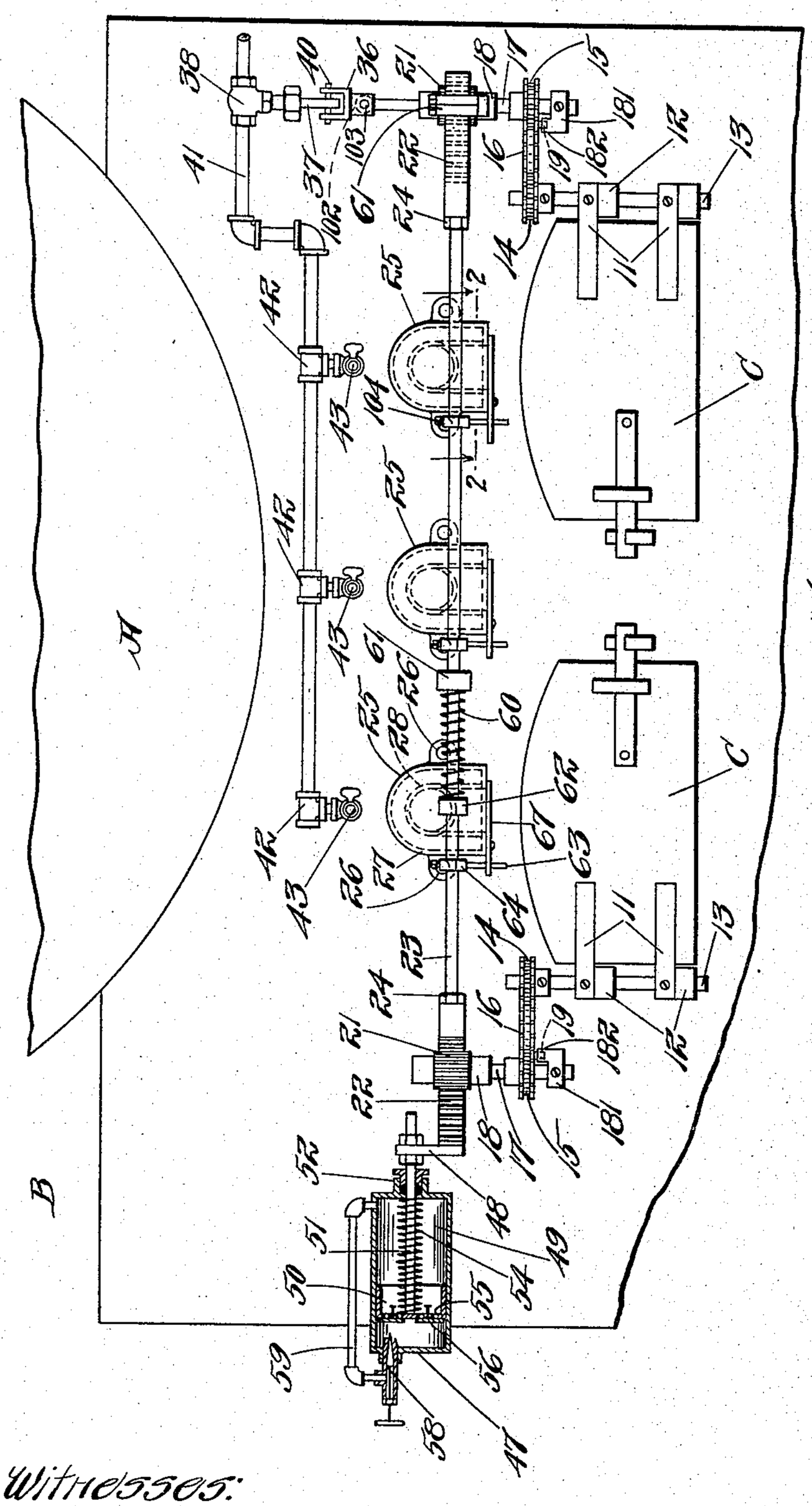

Fig. 1.

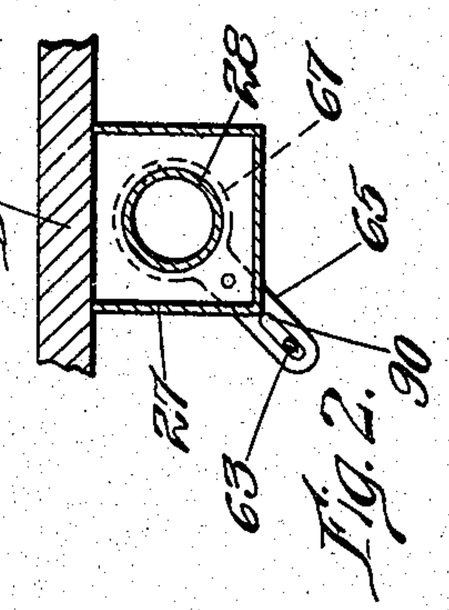

Fig. 2.

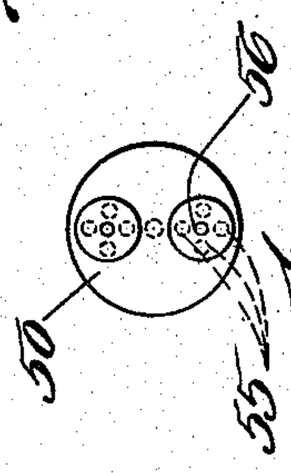

Fig. 3.

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UNITED STATES PATENT OFFICE.

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SMOKE-PREVENTER.

1,166,880. Specification of Letters Patent. Patented Jan. 4, 1916.

Application filed March 20, 1914. Serial No. 826,118.

To all whom it may concern:

Be it known that I, BRADFORD L. AMES, citizen of the United States, residing at Boston, county of Suffolk, State of Massachusetts, have invented a certain new and useful Improvement in Smoke-Preventers, of which the following is a specification, reference being had therein to the accompanying drawings.

My invention relates to smoke preventers of the type employed in connection with coal fed boilers to prevent the formation of smoke and excess gas which arises immediately after firing.

The smoke preventer embodying my invention is of that class which is operated by opening the furnace doors. It is particularly adapted to be attached to any well known type of boiler and is especially constructed and arranged so that it may be readily connected to the ordinary furnace door.

My device is further provided with other new and useful improvements all of which will be fully understood from the following description taken in connection with the accompanying drawings and the novel features will be pointed out and clearly defined in the claims at the close of the specification.

In the drawings, Figure 1 is an elevation of the front wall of a fire-box showing my improved device secured thereto. Fig. 2 is a section on line 2—2 of Fig. 1. Fig. 3 is a detail of the check valve.

Having reference to the drawings there is shown at A the lower portion of a boiler of well known form and construction supported on a fire-box having a front wall B provided with fire doors C. The doors C are of the well known hinged type and are each equipped with hinge members 11 which coöperate with hinge members 12 secured to the front wall B of the fire-box, said members being pivotally secured together by means of a vertical rod 13 which is fast to the hinge member of the door and turns with it. The rods 13 are provided preferably on their upper ends with the sprockets 14 which are connected with other sprockets 15 by means of sprocket chains 16 all as clearly appears in Fig. 1. The sprockets 15 are each loosely mounted near the lower end of shafts 17 mounted in the bearings 18 secured to the front wall B. Fast on each of the shafts 17 is a collar 181 carrying a nub or projection 182 which engages one side of a corresponding projection 19 secured to the sprocket 15. The relation of the collar and sprocket is such that the projection 19 engages the nub 182 when the door C is closed. Therefore, while a door is being opened the lug 19 on the sprocket 15 engages the lug 182 on the collar 181 and rotates the shaft 17; while the door is being closed, the loosely mounted sprocket 15 turns back to its former position on the shaft without affecting the position of the shaft. The result is that the shafts 17 are turned in one direction by the opening of the door, but are not affected by the closing of the door.

The shafts 17 are preferably placed on opposite sides of the front wall B and are each provided on their upper ends with a pinion 21 which engages a rack 22 secured to each end of the horizontal slide rod 23. Provision is made for adjustment of the racks relatively to the slide rod by a threaded connection with each end of the slide rod together with a set nut 24. The racks 22 and the slide rod 23 are movably mounted in bearings 61 and one of the pinions 19 is arranged to operate on the rear side of a rack while the other is arranged to operate on the front side so that the opening of either one of the doors C will slide the rod to the right as shown in Fig. 1.

The shaft 17 on the right hand side of the front wall B, as seen in Fig. 1, extends upwardly above the pinion 21 and carries on its upper end a bifurcated member 36 to which it is secured by the ball and socket connection 102 and the pin 103. The bifurcated member 36 is in turn connected to the stem 37 of the valve 38 by means of a pin 40 placed at right angles to the pin 103. This construction obviates any possibility of the valve 38 becoming cramped due to the non-alinement of the stem 37 and the shaft 17. The valve 38 is located on a steam pipe 41 secured to the front of the boiler as shown and provided with pipe fittings 42 each of which is connected with a nozzle 43 which extends through the front wall of the fire-box. Nozzles 43 coöperate with air ducts not shown to introduce air over the top of the fire by means of the suction created by the steam which passes through the nozzles when the valve 38 is open.

The parts are so arranged that the move-

ment of the rod 23 to the right as seen in Fig. 1 caused by opening one of the doors C, opens the valve and the movement of the rod in the opposite direction, closes it as will now be explained. The movement of the rod in the opposite direction, or to the left as seen in Fig. 1 is controlled by an automatic control 47 which is connected with it by means of a member 48 secured to the rack 22 at the left-hand end of the rod.

The automatic control 47 consists of a hollow cylinder 49 which, as shown, is horizontally disposed on the front wall of the boiler and is provided with a suitable piston or plunger 50 having therein a check valve to permit the flow of liquid through the piston in one direction only. A stuffing box 52 surrounds the piston rod 51. The inner portion of the piston rod is surrounded by a helical spring 54 which abuts the end of the cylinder 49 and the piston 50 and tends to move the piston toward the left as shown in Fig. 1. In the face of the piston is a series of holes 55 which are automatically closed by the check valves 56. These check valves conveniently consist of flat plates guided on a stem sliding in a hole in the piston head, as shown in Figs. 1 and 4. The cylinder is provided with a by-pass comprising a pipe 59 connecting the opposite ends of the cylinder and provided with a valve 58 by means of which the flow through the by-pass may be regulated. The horizontal slide rod 23 which is connected with the plunger 50 as described is normally actuated toward the left by the spring 54 which surrounds the plunger. In order to aid the spring 54 I prefer to employ another spring 60 which is interposed between the center bearing 61, in which the slide rod 23 is mounted, and a collar 62 fast on the slide rod. While I prefer this construction it is obvious that any yielding means for actuating the slide rod in the manner described may equally well be employed. The slide rod is also provided with depending members 63 which may be secured to it in any suitable manner as by collars 64 held fast on the rod by set screws 104. The depending members 63 are each arranged to engage a slot 90 in the end of a horizontal arm 65 operating the air damper 67 pivoted at 66 on the bottom of the respective air-boxes as seen in Fig. 2. The movement of the slide rod 23 swings the dampers 67 to open or close the air ducts, as the case may be.

The cylinder 49 of the automatic control 47 is preferably filled with oil or other suitable liquid. When either or both of the furnace doors are opened the slide rod 23 is moved to the right as seen in Fig. 1 by the action of the sprockets 14, 15 and chains 16, and the valve 38 is thereby opened allowing steam to pass through the pipe into the nozzles 43 described above. At the same time, the depending members 63 swing the air dampers 67 thereby permitting a current of air to be injected into the fire-box by the steam and distributed over the fire thus introducing the required amount of oxygen to prevent the formation of smoke.

When either one of the doors is opened, the device is set in operation and it continues in operation as long as the door remains open. If the door is closed the device continues in operation for a pre-determined time thereafter. However, if the second door is opened, the operation of the device will be continued until after the expiration of this pre-determined length of time after the closing of the second door. It therefore, results that the additional blast of air is introduced during the time that either door is open and for a pre-determined time after the closing of the door which was closed last. The result of this construction is that the air blast is on just as long as the fireman is working on the fire, and always continues to blow for the pre-determined time after he closes the last door. When the last door is closed, the springs 54 and 61 begin to move the piston and slide rod back into the starting position just as fast as the oil flows through the valve 58 and the by-pass 59 to the other end of the cylinder, thus gradually cutting down and finally completely shutting off the supply of air and steam. This is important for by this construction the fire obtains at all times the exact supply of oxygen necessary to prevent the formation of smoke.

The period for which it is desired to have the additional supply of air injected into the fire-box may be varied by the valve 58 and thus the supply of oxygen may be regulated to meet the requirements in each case. When the plunger 50 is moved to the right by opening one of the doors C the check valves are opened by the pressure of the oil and the oil flows freely through the piston to the other end of the cylinder.

It will be noted from the construction hereinabove described that the device embodying my invention is readily adapted to be placed upon a boiler front. The attachment to the valves is so arranged that if the parts are slightly out of line as is apt to be the case the operation of the valve will not be affected. The device may be connected with the furnace doors through the sprocket and chain connection described by merely substituting for the old hinge rods the rods shown in the drawings. My device therefore is essentially flexible that is it is so constructed that it may be readily attached to practically any well known type of boiler.

What I claim is:

1. In a smoke preventer, the combination of a furnace door, a valve for controlling the supply of steam, a sprocket operatively connected with the valve member of

said valve and with said door by which the valve is caused to open by opening the door, said sprocket being loosely mounted to freely rotate without moving said valve member while said door is being closed, and automatic means for closing said valve.

2. In a smoke preventer, the combination of a furnace door, a valve for controlling the supply of steam, a pair of connecting sprockets, one rotatably mounted in connection with the valve member of said valve, the other rotatably mounted in connection with the door, one of said sprockets being arranged to actuate the valve member while being rotated in one direction and to move freely relatively thereto while being rotated in the opposite direction, and automatic means for actuating the valve member in the opposite direction.

3. In a smoke preventer the combination of a furnace door, a valve for controlling the supply of steam, a slide rod operatively connected with the valve, a sprocket connection by which the slide rod is moved in one direction by opening the door, said sprocket being loosely mounted to freely rotate without moving said rod while said door is being closed, and automatic means for moving said rod in the opposite direction.

4. In a smoke preventer the combination of a furnace door, a valve for controlling the supply of steam, a slide rod operatively connected with said valve, a pair of connecting sprockets one rotatably mounted in connection with the rod and the other rotatably mounted in connection with the door, one of said sprockets being arranged to move with the rod in one direction and freely relatively thereto in the opposite direction, and automatic means for moving the slide rod in the opposite direction.

5. In a smoke preventer the combination of a furnace door, a valve controlling the supply of steam, a slide rod operatively connected with said valve, a sprocket connecting the slide rod with the door by which the slide rod is moved in one direction by opening the door, said sprocket being loosely mounted to freely rotate without affecting said rod while said door is being closed, and automatic means for moving said rod in the opposite direction.

6. In a smoke preventer the combination of a furnace door, a valve for controlling the supply of steam, a slide rod operatively connected with said valve, a sprocket actuating said rod when rotated in one direction, said sprocket being loosely mounted to freely rotate in the other direction without actuating said rod, a second sprocket connected with said first sprocket and mounted on the axis of said furnace door, and automatic means for moving said rod in the opposite direction.

7. In a smoke preventer the combination of a furnace door, a valve controlling the supply of steam, a slide rod operatively connected with said valve, a sprocket connected with said rod, a second sprocket operating said first mentioned sprocket mounted on the hinge pin of said door, one of said sprockets being adapted to rotate with its mounting in one direction and to rotate freely thereon in the other direction, and automatic means for moving said slide rod to cause the said valve to be closed.

8. In a smoke preventer the combination with a furnace door, a valve controlling the supply of steam, a slide rod operatively connected with said valve, a rack on said slide rod engaged by a pinion, a rod rigidly connected with said pinion having a lug secured thereto, a sprocket loosely mounted on said rod, a pin on said sprocket adapted to engage said lug, a second sprocket connected with said first sprocket mounted upon the axis of said furnace door, said mechanism being adapted to move said rod in one direction when said door is opened, and automatic means for moving said rod in the other direction.

9. In a smoke preventer the combination of a furnace door, a valve controlling the supply of steam, a slide rod operatively connected with said valve, a rack and pinion connection for operating said slide rod, a sprocket adapted to engage said pinion while being rotated in one direction and to rotate freely in the other direction without affecting said pinion, a second sprocket connected with said first sprocket, a hinge pin for said door upon which said second sprocket is mounted whereby the opening of said door causes the said slide rod to be moved in one direction, and automatic means for moving said slide rod in the other direction.

In testimony whereof I affix my signature, in presence of two witnesses.

BRADFORD L. AMES.

Witnesses:

GEORGE P. DIKE,
ALICE H. MORRISON.