B. L. AMES.

TIME OPERATED SMOKE PREVENTER.

APPLICATION FILED OCT. 17, 1908.

932,667.

Patented Aug. 31, 1909.

2 SHEETS—SHEET 1.

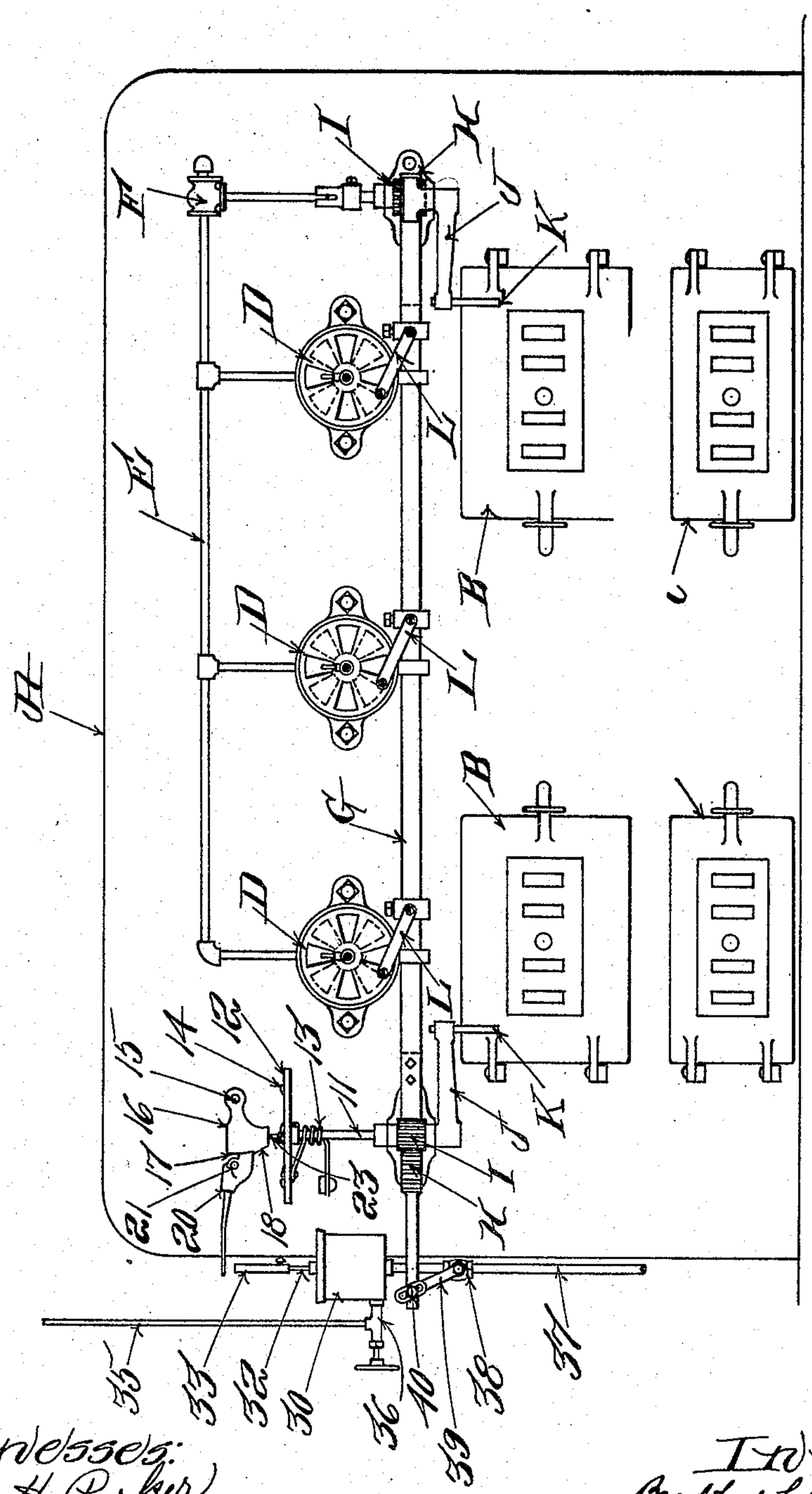

Fig. 1.

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R. Wallace.

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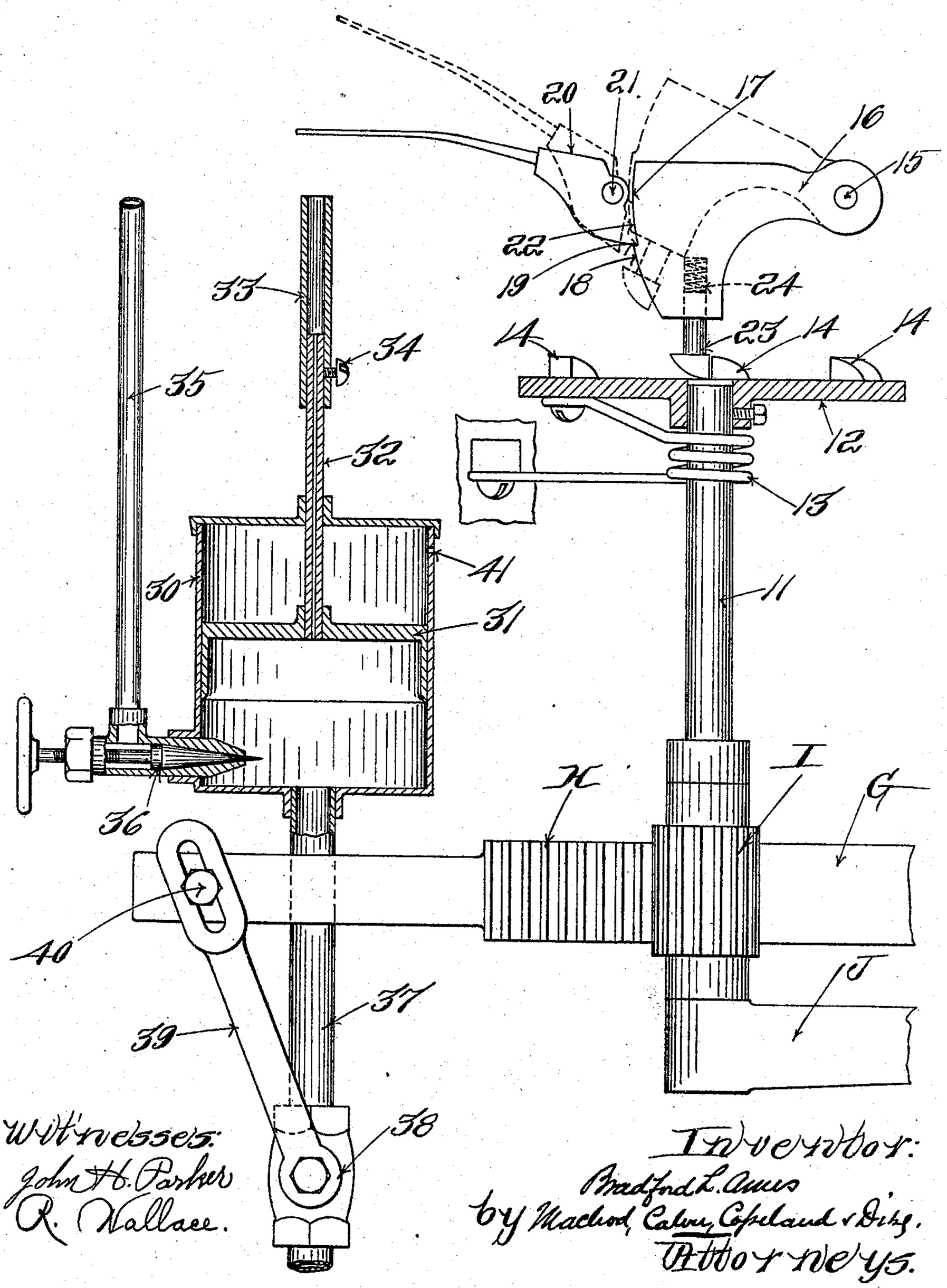
2 SHEETS—SHEET 2.

Fig. 2.



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UNITED STATES PATENT OFFICE.

BRADFORD L. AMES, OF BOSTON, MASSACHUSETTS.

TIME-OPERATED SMOKE-PREVENTER.

932,667. Specification of Letters Patent. Patented Aug. 31, 1909.

Application filed October 17, 1908. Serial No. 458,203.

To all whom it may concern:

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

My present invention has to do with smoke preventers of that type in which air is introduced into the furnace directly over the fire by means of jets of steam from steam nozzles, the introduction of the air taking place for a limited period of time immediately after fresh coal has been placed upon the fire.

My present invention has for its object improved means for controlling the supply of air to the furnace, said means being adapted to begin the introduction of air into the furnace when the fresh coal is placed upon the fire and to stop it automatically at the expiration of a predetermined period of time, by operating the air dampers of the smoke preventers, and the valve controlling the supply of steam to the steam jets.

My present invention affords means for accomplishing these desirable ends which are simpler than any heretofore employed, so far as is known to me, and said means are surer to operate perfectly and require less attention and adjustment than the means heretofore employed. As my present invention does not employ electric energy, the renewal of batteries and the troubles and annoyances due to the imperfect operation of the batteries is completely eliminated.

The devices comprising my present invention include spring operated means which is set by the opening of the furnace door and released by the operation of a motor-cylinder to which a small stream of water under pressure is constantly supplied. The length of time during which the introduction of air into the furnace continues is regulated by regulating the size of the stream of water introduced into the motor cylinder and also by adjusting the length of the piston-rod which determines the length of stroke of the motor-cylinder.

The device embodying my invention has very few parts and said parts are so constructed and located that they are completely and easily accessible in case any derangement or any obstruction occurs.

The invention will be fully understood from the following description taken in connection with the accompanying drawings, and the novel features are pointed out and clearly defined in the claims at the close of the specification.

In the drawings,—Figure 1 is a front elevation of a portion of a boiler provided with smoke preventers and operating means therefor embodying my invention. Fig. 2 is a detailed view on a much enlarged scale of the operating mechanism for the smoke preventer.

Referring now to the drawings,—At A is indicated the front of the boiler; at B the furnace doors and at C the ash-pit doors. Above the furnace door B are placed rotary air dampers D, one for each smoke preventer, controlling the supply of air which is introduced into the furnace by the smoke preventer. Steam is supplied to the smoke preventers through the pipe E, the supply thereof being controlled by the valve F. Across the front of the furnace is located a sliding rod G on each end of which is a rack H engaged by a pinion I. The pinion I is caused to rotate by the opening of the corresponding furnace door by means of an arm J carrying on its end a pin K contacting with the furnace door. A connection to the air damper D is formed by the link L while the spindle of the steam valve F is connected to one of the pinions I and rotates therewith. When either of the furnace doors B is opened, the rod G is slid longitudinally and the steam valve F and air dampers D are opened, thus setting the smoke preventer in operation. From the foregoing it will be seen that the air dampers and steam valve which constitute the operating means for the smoke preventers are actuated in one direction by the previously described door-operated means. The devices thus far described are old and well known in this art, and my present invention has to do with new and improved devices by means of which the said parts are restored to their normal position and the steam valve and air

dampers closed at the end of a predetermined period of time. One of said pinions I is provided with a shaft or spindle 11 on the upper end of which is mounted a stop-disk 12 which is caused to rotate whenever the pinion I is moved. A spring 13 tends to restore the stop-disk to its normal position after it has been rotated by the movement of pinion I. The upper surface of the stop-disk 12 is provided with a series of cam-shaped projections 14 and above said stop-disk 12 is pivoted at 15 a locking piece 16 provided with a substantially circular surface of two different curvatures as shown at 17 and 18, said surfaces of different curvatures being separated by a very small notch 19. A trigger 20 pivoted at 21 and provided with a surface 22 concentric with the surface 17 has a point which engages the notch 19 when the parts are in the position shown in full lines in Fig. 2, and keeps the locking piece 16 from rotating about its pivot so long as the trigger 20 remains in the position shown. From the lower side of the locking piece 16 projects a pawl 23 provided with an inclined bottom and slidably mounted in the said locking piece 16. The said pawl 23 is yieldingly pressed down upon the stop-disk 12 by means of the spring 24 so that it is allowed to yield upwardly and ride over the cam pieces 14 as the stop-disk 12 is rotated by the shaft 11. When the parts are in the position shown in full lines in Fig. 2, one of the projections 14 is held against the pawl 23 by means of the spring 13 and the parts remain in the position there shown until the trigger 20 is moved. When the trigger 20 is moved, the point of the trigger is released from the notch 19 and the pressure upon the pawl 23 causes the locking piece 56 to fly up into the position shown in dotted lines and thereby release the stop-disk and allow the spring 13 to rotate it into its original position.

The fluid pressure motor by means of which the trigger is lifted at the end of the predetermined interval of time to restore the parts to normal position will now be described. At 30 is shown a motor-cylinder within which operates a piston 31 attached to the tubular piston-rod 32. The hole in said piston-rod is a very small one and is calculated to allow the air under the piston to escape and thus prevent the formation of an air-cushion. Said tubular piston-rod 32 is made adjustable in length by means of a tube 33 slipped over the end of the piston-rod 32 and adjustably located thereon by means of the set screw 34.

Water under pressure from a suitable source of water supply is furnished constantly to the motor-cylinder 30 through the water supply pipe 35, the amount delivered to the motor cylinder 30 being regulated by means of the needle-valve 36. The amount required to operate the motor is very small, being under ordinary circumstances not over one quart per hour and only a small pressure is required, a head of seven feet being found sufficient.

An exhaust pipe 37 leads away from the lower end of the motor-cylinder 30 and is furnished with an exhaust valve 38 of the well known straight-way kind. The said exhaust valve 38 is operated by means of a valve lever 39, the upper end of which is attached by means of a pin and slot connection 40 to the end of the rack rod G which lies across the front of the furnace. The exhaust valve 38 is so constructed that when the parts are in the position shown in Fig. 2, it is open sufficiently to allow all the water entering the motor-cylinder through the control valve 36 to trickle out without producing any pressure in the motor-cylinder, and when the furnace doors are opened, the movement of the rack G will move the valve lever 39 to the right and close the exhaust valve 38, thereby preventing the escape of the water from the motor-cylinder and causing the same to exert a pressure against the piston 31 in the motor-cylinder.

The opening through the tubular piston rod 32 is very small, but is sufficient to allow the escape of air contained in the motor-cylinder 30 beneath the piston 31, so that no air-cushion shall be formed, and the entire space beneath the piston 31 will be filled with water before the piston starts to move. A port or hole 41 permits any air or any water which has leaked by the piston to escape.

The operation of the hereindescribed device embodying my invention is as follows: When the fireman opens the furnace door B, to place fresh coal upon the fire, the movement of the door acting through the crank arm J and pinion I moves the rack G to the right, thereby opening the air damper D and turning on the steam valve F. The parts remain in this position until the expiration of the predetermined period of time. During this period of time air is being introduced through the air damper D by means of the jet of steam.

The movement of the rack G causes the stop plate 12 to rotate against the action of the spring 13 and the pawl 23 attached to the locking piece 16 rises and falls as it passes over each of the cam projections on the stop plate 12. The pawl 23 prevents the stop disk 12 returning to its original position until the locking piece 16 is released by the trigger 20. The same movement of the rack G which turns the stop disk 12 also moves the lever arm 39 to the right and moves the exhaust valve 38, thereby closing

the normally open way through the fluid pressure motor. When the exhaust valve 38 is closed, the water which is constantly flowing into the cylinder 30 from the pipe 35 accumulates under the piston 31 and lifts the piston until the upper end of the piston rod 33 strikes the trigger 20 and lifts it, releasing the locking piece 16. The spring 13 then acts to return the stop disk 12, rack G and connected parts to their original position, closing the steam valve F, air damper D and again opening the exhaust valve 38.

When it is desired that less time shall elapse after the furnace door is opened before the action of the smoke preventer is stopped, I lengthen the piston-rod 32 by moving the tube 33 thereon, so that the piston 31 is required to travel a less distance to bring the upper end of the piston-rod into contact with the trigger 20. This forms a simple and convenient means of regulating the period of time during which the smoke preventer operates. If, however, further adjustment is required, it may be accomplished by opening or closing slightly the needle valve 36 which controls the amount of water supplied to the motor-cylinder 30. By making the piston-rod adjustable in length as described, a smaller flow of water is used as it would otherwise be necessary to increase the flow of the water to shorten the time the smoke preventer is in operation.

I claim as my invention:

1. In a smoke preventer and in combination with operating means therefor, door operated means for actuating said operating means in one direction, a spring for actuating said operating means in the other direction, a fluid pressure motor to release said spring, an inlet therefor constantly open and supplying fluid under pressure to said fluid pressure motor from an independent source of supply, a normally open exhaust valve, and means to close said valve and cause the said fluid pressure motor to act to release the said spring.

2. In a smoke preventer and in combination with operating means therefor, door operated means for actuating said operating means in one direction, a spring for actuating said operating means in the other direction, a fluid pressure motor to release said spring, an inlet therefor constantly open and supplying fluid under pressure to said fluid pressure motor from an independent source of fluid supply, a normally open exhaust valve, and connections from said valve to said door operated means whereby the said valve is operated simultaneously with said door operated means.

3. In a smoke preventer and in combination with operating means therefor, door operated means for actuating said operating means in one direction, a spring for actuating said operating means in the other direction, a catch and trip to hold and release the spring, a piston and cylinder having a piston rod which actuates the said trip, a constantly open inlet supplying fluid under pressure to said cylinder from an independent source of fluid supply, a normally open exhaust valve and connections from said valve to said door operated means whereby said valve is closed by the movement of said door operated means and opened by the movement of said door operated means in the other direction.

4. In a smoke preventer and in combination with operating means therefor, door operated means for actuating said operating means in one direction, a spring for actuating said operating means in the other direction, a fluid pressure motor to release said spring receiving water under pressure from an independent supply and having a normally open way therethrough through which the fluid under pressure flows, and a valve to close said way and cause the said fluid pressure motor to act to release the said spring.

5. In a smoke preventer and in combination with operating means therefor, door operated means for actuating said operating means in one direction, a spring for actuating said operating means in the other direction, a fluid pressure motor to release said spring said motor receiving water under pressure from an independent supply and having a piston-rod which is adjustable in length to determine the length of stroke of the said motor said motor also having a normally open way therethrough through which the fluid under pressure flows, and a valve to close said way and cause the said fluid pressure motor to act to release the said spring.

6. In a smoke preventer and in combination with operating means therefor, door operated means for actuating said operating means in one direction, a spring for actuating said operating means in the other direction, a trigger controlling said spring, a fluid pressure motor having a moving member to engage said trigger to release the spring said motor receiving water under pressure from an independent supply and having a normally open way through which the fluid under pressure flows, means for adjusting the length of said moving member and consequently the length of time taken by the fluid pressure motor to release the spring, and a valve to close said normally open way, and operative connections between said valve and said door operated means.

7. In a smoke preventer and in combination with operating means therefor, door operated means for actuating said operating means in one direction, a spring for actuat-

ing said operating means in the other direction, a fluid pressure motor to release said spring, an inlet therefor constantly open and supplying fluid under pressure to said fluid pressure motor from an independent source of supply, a valve in said inlet to regulate the constant supply of fluid, a normally open exhaust valve, and means to close said valve and cause the said fluid pressure motor to act to release the said spring.

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

BRADFORD L. AMES.

Witnesses:
GEORGE P. DIKE,
ALICE H. MORRISON.