

C. D. LEONARD.
SMOKE CONSUMER.
APPLICATION FILED JUNE 21, 1910.

983,503.

Patented Feb. 7, 1911.

4 SHEETS-SHEET 1.

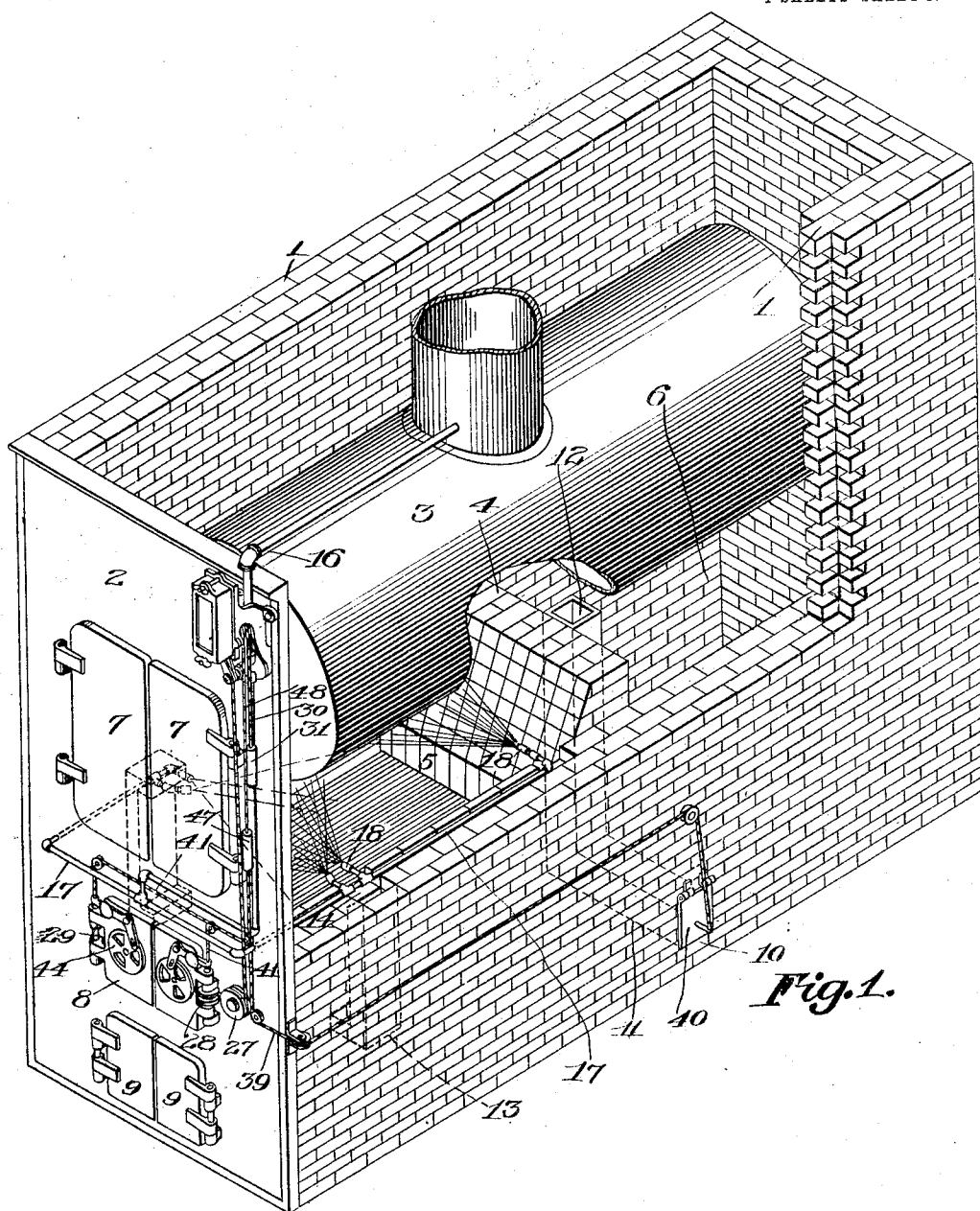


Fig. 1.

Witnesses
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Russell B. Siffert

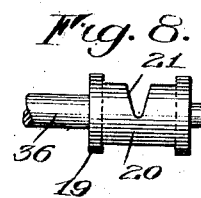
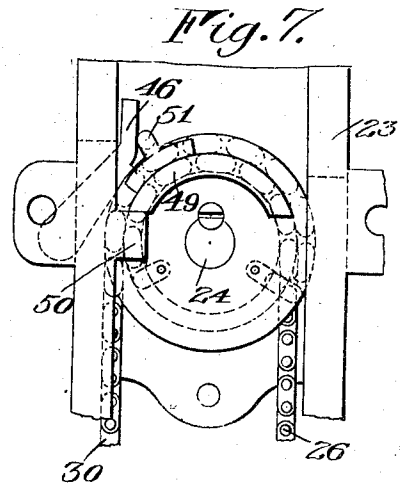
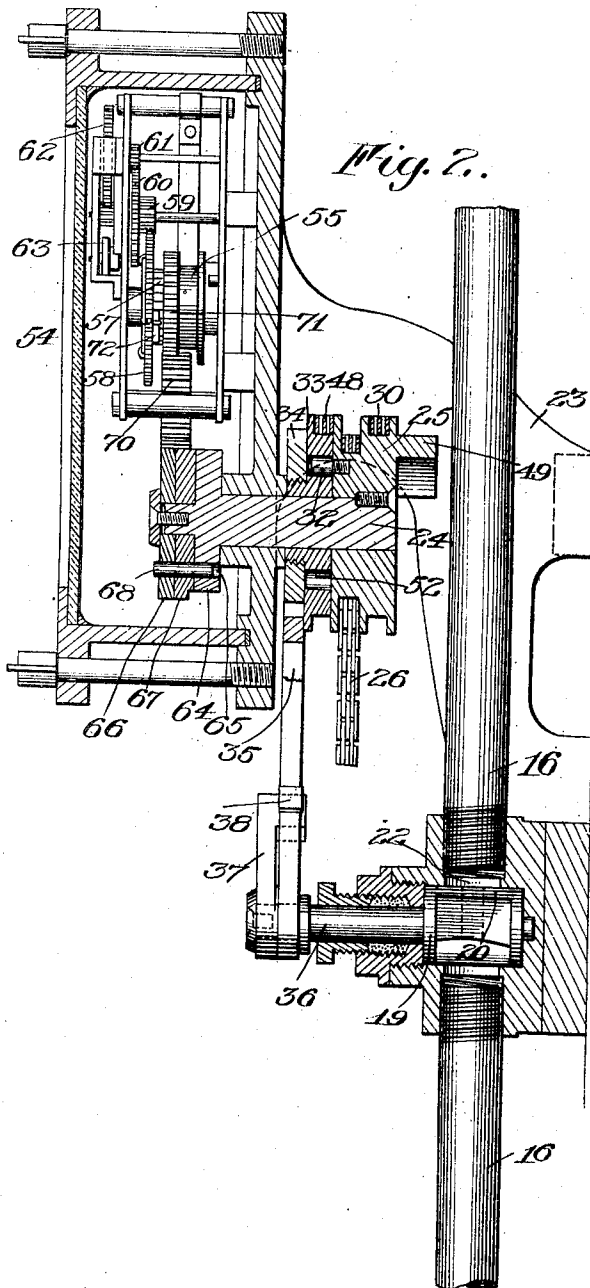
Inventor
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4 SHEETS-SHEET 2.



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4 SHEETS—SHEET 3.

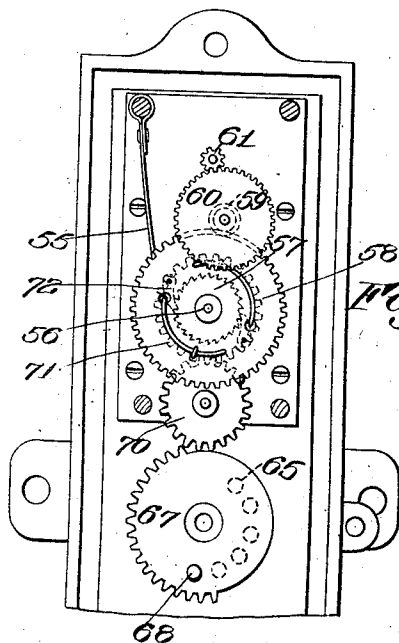


Fig. 4.

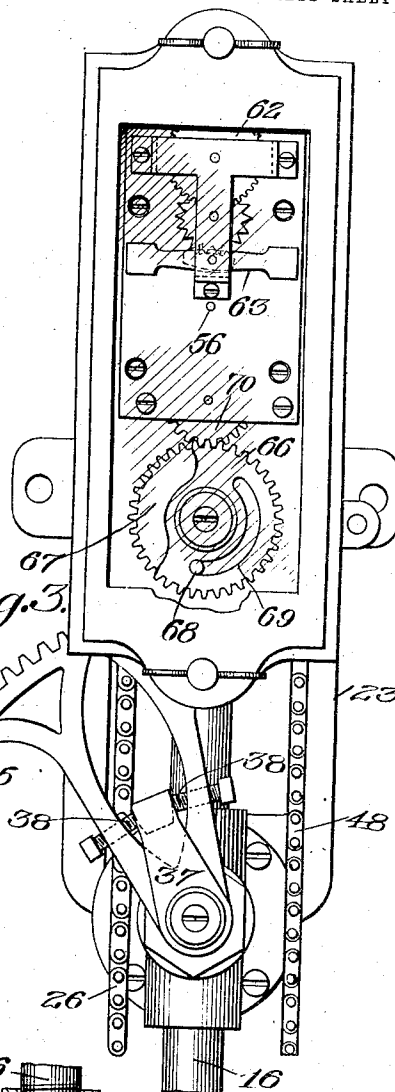


Fig. 3.

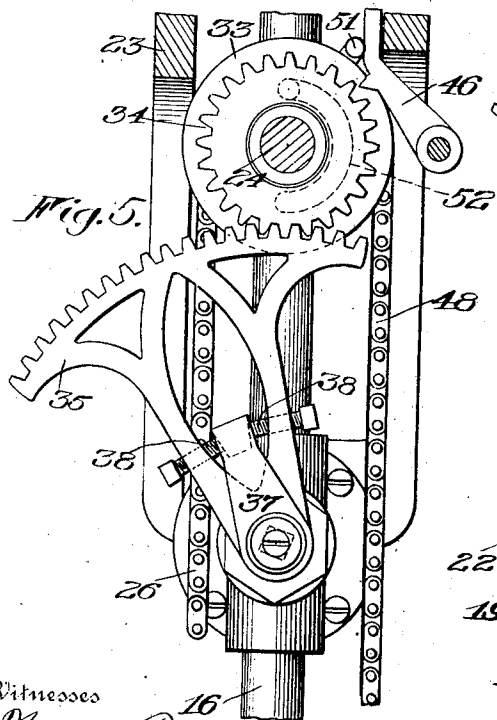


Fig. 5.

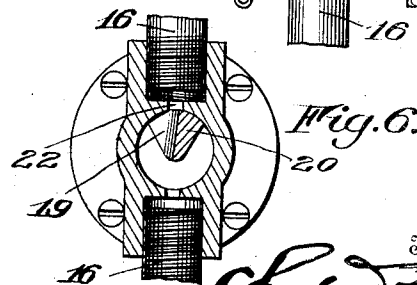


Fig. 6.

Witnesses
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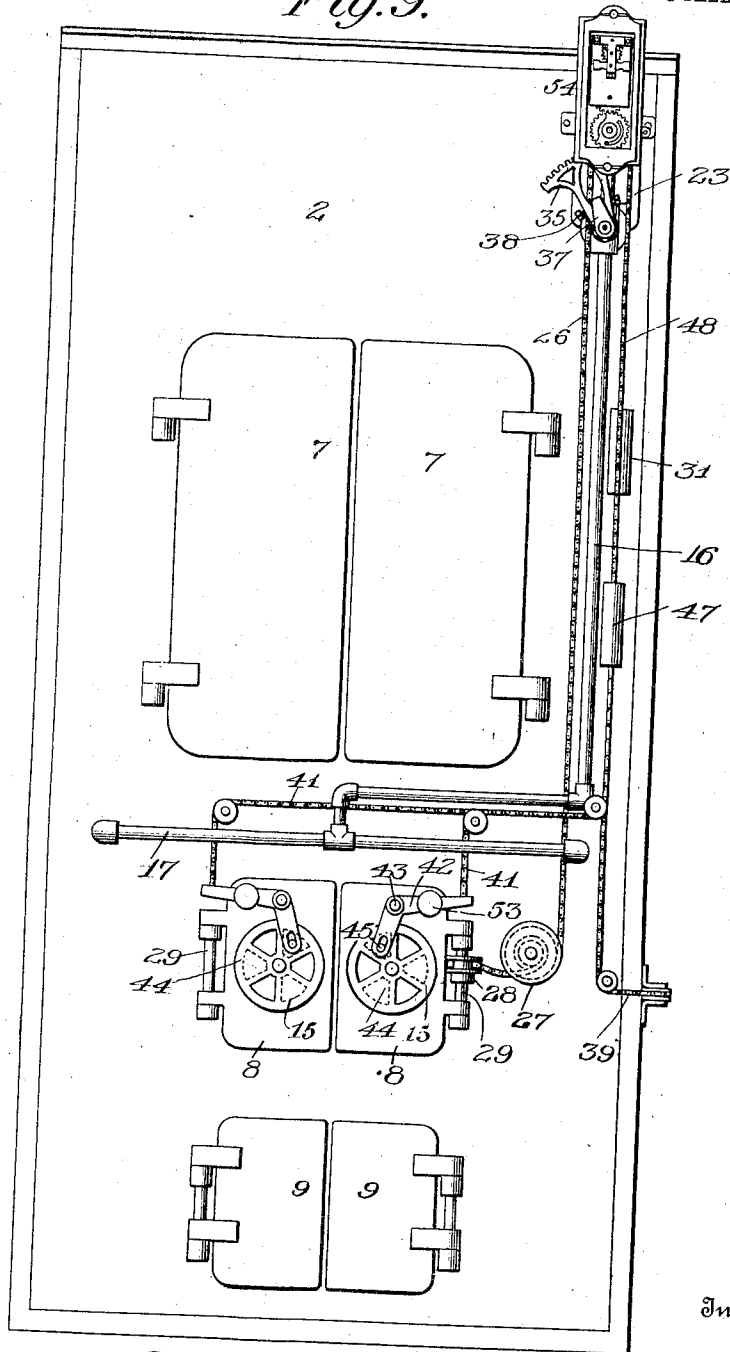
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4 SHEETS—SHEET 4

Fig. 9.



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UNITED STATES PATENT OFFICE.

CHARLES D. LEONARD, OF ROCHESTER, NEW YORK.

SMOKE-CONSUMER.

983,503.

Specification of Letters Patent.

Patented Feb. 7, 1911.

Application filed June 21, 1910. Serial No. 568,089.

To all whom it may concern:

Be it known that I, CHARLES D. LEONARD, of Rochester, in the county of Monroe and State of New York, have invented certain new and useful Improvements in Smoke-Consumers; and I do hereby declare the following to be a full, clear, and exact description of the same, reference being had to the accompanying drawings, forming a part of this specification, and to the reference-numerals marked thereon.

The present invention relates to furnaces and stoves and it has for its object to provide an efficient smoke consumer for use in connection therewith operating on the principle in which air and steam are injected into the combustion chamber to form a combustible mixture with the smoke and gases before reaching the chimney, the improvements being directed in part toward perfecting the mechanism whereby the injection is automatically controlled as to the quantity and duration of the feed.

To these and other ends the invention consists in certain improvements and combinations of parts all as will be hereinafter more fully described, the novel features being pointed out in the claims at the end of the specification.

In the drawings: Figure 1 is a perspective view of a furnace fitted with a smoke consumer constructed in accordance with and illustrating one embodiment of my invention, parts of the furnace wall being broken away to reveal the interior; Fig. 2 is a central section through the time mechanism, steam valve and the operating devices for the latter; Fig. 3 is a front elevation of the parts shown in section in Fig. 2; Fig. 4 is a detail elevation of the time mechanism; Fig. 5 is a detail elevation of the valve actuating and controlling parts; Fig. 6 is a detail section through the valve member; Fig. 7 is a detail rear elevation of the valve operating shaft and connected parts; Fig. 8 is a detail elevation of the valve member, and Fig. 9 is an elevation of the furnace front and smoke consumer mechanism.

Similar reference numerals throughout the several figures indicate the same parts.

The particular furnace shown in the present embodiment of the invention comprises an outer wall 1 provided with a front 2 and inclosing the boiler 3 which spans the bridge wall 4 that separates the forwardly arranged

fire-box or coal combustion chamber 5 and the gas combustion chamber 6 in the rear from which latter the chimney draws. The front 2 is fitted, as usual, with flue doors 7, coal doors 8 and ash doors 9, the latter opening into the ash pit (not shown) beneath the fire-box.

The principle of operation of smoke consumers of the type indicated being well known it is not thought necessary to describe it herein. Suffice it to say that with the air and steam feed system which I prefer to employ I introduce outside air at 10 through a suitable duct 11 discharging it at 12 just in rear of the bridge wall 4, while ducts 13 leading from the ash pit discharge at 14 at the sides of the fire-box and draft openings 15 in the coal doors 8 admit outside air to the front of the fire-box. The dry steam is led from a suitable point in the boiler 3 through a supply pipe 16 having branches 17 and discharged above the fire in a plurality of jets from nozzles 18 preferably in the region of the discharge from the air ducts to induce the currents through the latter.

The supply pipe is fitted with a valve 19 (Figs. 2, 6 and 8) having a solid portion 20 provided with a transverse V-shaped slot 21 in line with the movement of the valve across the valve passage 22. In practice, the valve is halted during its closing movement at such point that the end of the slot 21 is in register, to a greater or less extent, with the valve passage 22 merely restricting the latter rather than closing it so that a limited flow of steam is allowed at all times and the branches 17 of the supply pipe are kept filled whereby an immediate and full discharge is injected into the fire-box instantaneously upon the opening of the valve.

Journalled in a suitable supporting frame 23 preferably mounted on the furnace front 2 is a shaft 24 carrying a fixed pulley 25 over which is passed a chain or flexible connector 26 that leads downwardly around a pulley 27 on the furnace front 2. From thence it is wound upon a drum 28 carried on the pintle 29 of the hinge of one of the coal doors 8 in such manner that when the latter is opened for the entrance of fuel the shaft 24 is rotated in one direction to a given extent. Immediately after it is opened, whether or not it is quickly closed again, a second chain 30, passed over the pulley 25 in the opposite direction and provided with a weight 31, tends

to rotate the shaft backward to its original position.

A forwardly projecting pin or abutment 32 on the pulley 25, locks the pulley during the first mentioned rotation of the shaft to a loose pulley 33 thereon which is also in the nature of a gear having teeth 34 that mesh with and actuate a toothed segment 35 loosely mounted on the stem 36 of the valve 19 to control the movements of the latter. It is locked to the stem through the medium of a dog 37 fixed to the latter and engaged on both sides by a pair of adjustable abutments 38 on the segment by the manipulation of which the valve may be opened or closed to a greater or less degree with a given throw of the segment.

With this chain of connections, upon opening the coal doors 8 the shaft 24 is turned through the pulley 25 which operates the actuating gear 33 and throws the segment 35 to open the valve 19 and allow a blast of steam to be injected into the fire-box through the nozzles 18. A locking pawl 46, pivoted to the frame 23 engages the actuating gear 33 to hold the valve in its open position against the tendency of a weight 47 connected to a chain 48 passed over the gear or pulley 33.

The shaft 24 is slowly returned to its initial position under the control of time mechanism that will be later described, by the chain 30 and weight 31 passed over the pulley 25, a stop 49 on the latter engaging an abutment 50 on the frame to limit the movements of the shaft in both directions. When it has fully returned, a projection 51 (Figs. 5 and 7) on the pulley trips the locking pawl 46 and allows the actuating member 33 and valve controlling segment 35 to return quickly under the influence of the chain 48 and weight 47 so that the valve 19 is closed and the steam shut off instantaneously. The locking of the actuating member 33 does not prevent the slow backward rotation of the shaft 24 as the pin 32 operates in a slot 52 in the gear or pulley 33, as shown in dotted lines in Fig. 5. By these arrangements a full blast of steam is instantly turned on and, after a period predetermined by the necessities of the particular furnace, instantly turned off.

Simultaneously with the opening of the valve a branched chain 39, connected to the weight 47 on the chain 48 which is, of course, raised when the shaft 24 is first rotated, opens a closure 40 and allows the entrance of outside air through the duct 11 to the rear of the bridge wall at 12. Also, a second branch 41 of the chain (Figs. 1 and 9) connected to bell crank levers 42, pivoted at 43 on the coal doors 8, opens rotary closures 44 for the draft openings 15 to which closures the opposite arms of the bell crank are connected at 45.

When the weight 47 drops after the release of the actuating gear 33 from the pawl 46,

the entrance of air to all points is cut off, the tension on the branch chains 29 and 41 being released. The closure 40 drops of its own weight while a weight 53 on each bell crank 42 rotates the closures 44 of the draft openings 15 in the coal doors to closed position.

The time mechanism that controls the duration of the injection of both steam and air is inclosed within a casing 54 on the frame 23, into which casing the outer end of the shaft 24 projects. The mechanism includes a main spring 55 on a shaft 56 carrying a ratchet wheel 57 fixed thereon and a pinion 58 loose thereon, which latter, through a chain of gearing 59, 60, 61, 62 operates an escapement mechanism of any suitable type, indicated generally by 63 in Fig. 3.

Communication of movement between the shaft 24 and the time mechanism is obtained in such a way that the time mechanism will maintain its control over the injectors for a long or short period. To this end the end of the shaft 24 which projects into the casing 54 is provided with a face plate 64 having a series of openings 65 therein, shown in dotted lines in Fig. 4. Fixed to the shaft is an outer segmental gear 66, while loosely mounted thereon is an intermediate segmental gear 67 having a pin 68 therein, one end of which occupies selectively the opening 65 in the face plate to change the locked relation between said gear and the face plate, while the other end projects into a slot 69 in the outer fixed segment 66, one end of which slot forms an abutment for locking the two segments for joint movement in one direction. The outer segment 66 meshes with a driving gear 70 that rotates the main shaft 56 of the time mechanism through a gear 71 fixed thereto. The ratchet wheel 57, which is also fixed on the shaft 56, communicates motion to the pinion 58 only when turned in one direction, which is the direction of tendency of the spring 55, this being accomplished through the medium of spring pawls 72 carried on the pinion. Thus, when the shaft 24 is initially rotated through the opening of the furnace doors, the segmental gears 66 and 67, both of which mesh with the gear 70, wind up the spring 55 without being impeded by the escapement 63 as the ratchet 57 is being turned in the wrong direction to operate the pinion 58 through the pawl 72, but when this action is terminated and the influence of the spring 55, at one end of the gearing and the weight 31 at the other, becomes effective the segments 66 and 67 allow the return of the shaft 24 only under the control of the escapement.

With the adjustments afforded by the pin 68, occupying the recesses 65 in the face plate 64 and the slot 69 in the outer segment 66, it will be seen that the superposed relationship of the two segments may be so altered that they jointly form a segment of

greater or less proportion remaining for a correspondingly long or short period in mesh with the gear 70 connected with the time mechanism whereby the duration of the latter's influence over the return movement of the shaft 24 is made easily adjustable.

I claim as my invention:

1. In a smoke consumer, the combination with a steam injector adapted to deliver steam into the combustion chamber of the furnace and a valve therefor, of a toothed controlling member for the valve, a shaft, an actuating gear loosely mounted thereon and meshing with the controlling member, a locking pawl cooperating with one of said parts for holding the valve in open position, means normally tending to rotate the actuating member to close the valve, a pulley fixed on the shaft, and interlocking with the actuating gear when turned in one direction to open the valve, a chain running from the pulley and adapted to be connected to the coal door of the furnace to turn the pulley in said direction with the opening movement of the door, means acting under the control of time mechanism for returning the pulley independently of the actuating gear and an arm carried by the latter to release the locking pawl and allow the instan-

taneous closing of the valve when the pulley has returned to set position.

2. In a smoke consumer, the combination with a steam injector adapted to deliver steam into the combustion chamber of the furnace and a valve therefor, of a shaft for operating the valve, means connected with the shaft and adapted for connection with the coal door of the furnace for turning the shaft to open the valve with the opening movement of the door, means tending to rotate the shaft in the opposite direction to close the valve, a face plate on the shaft having a series of openings therein, a time mechanism embodying a driving gear, a segmental gear loose on the shaft meshing with said driving gear and provided with a pair of abutments, and a second loose segmental gear on the shaft also meshing with the driving gear intermediate the first and the face plate and having a pin extending therethrough with one end arranged to engage the abutments on the first mentioned gear and the other to engage the apertures of the face plate for the purpose described.

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Witnesses:

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