J. C. CROMWELL.

REVERSING VALVE AND OPERATING MECHANISM THEREFOR.

APPLICATION FILED OCT. 7, 1907.

1,002,968. **Patented Sept. 12, 1911.**

2 SHEETS—SHEET 1.

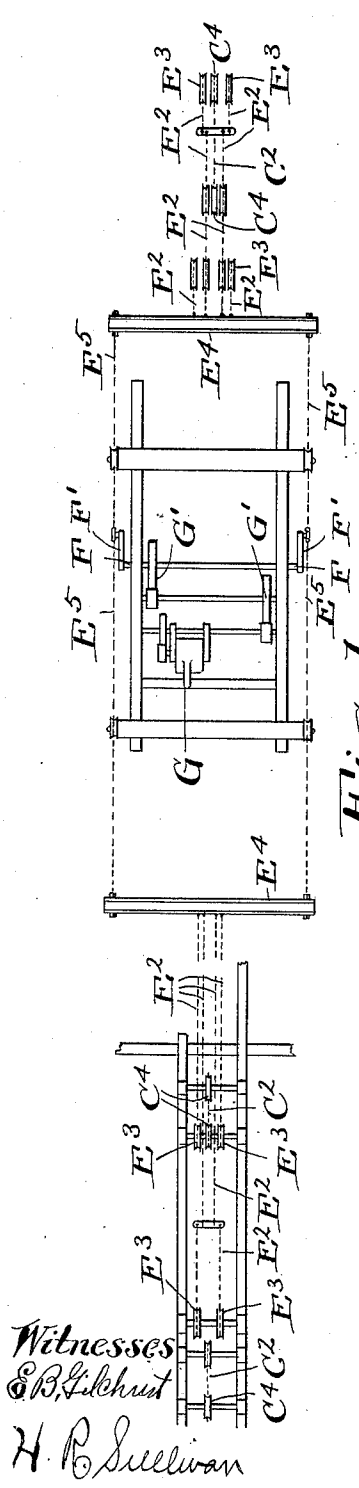

Fig. 1.

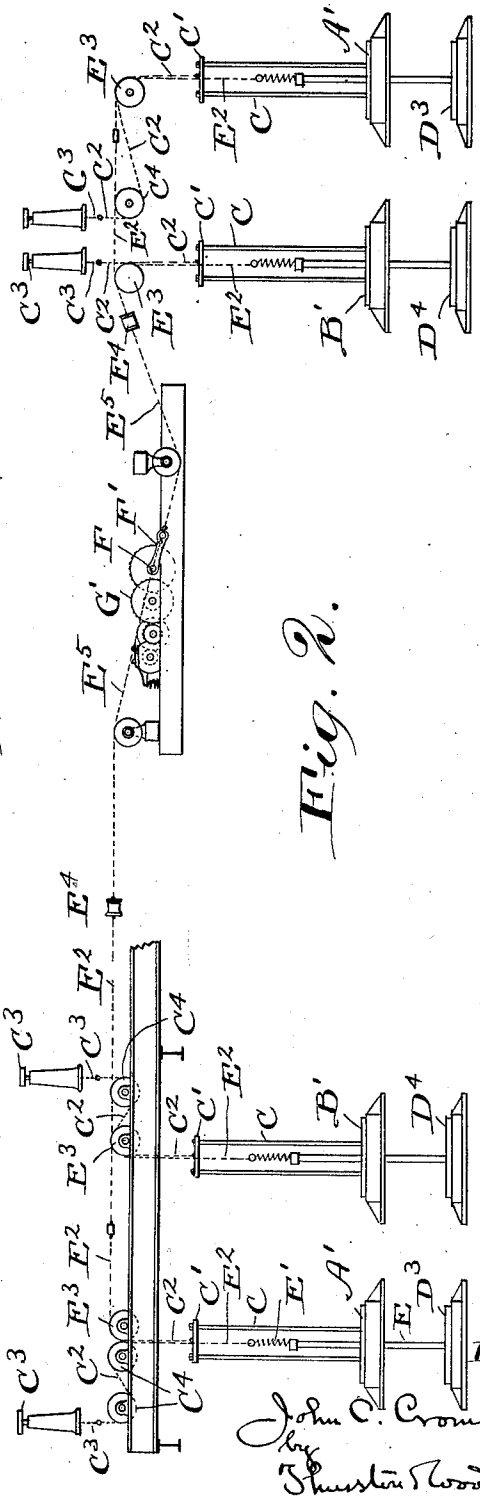

Fig. 2.

Witnesses
E. B. Gilchrist
H. P. Sullivan

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John C. Cromwell
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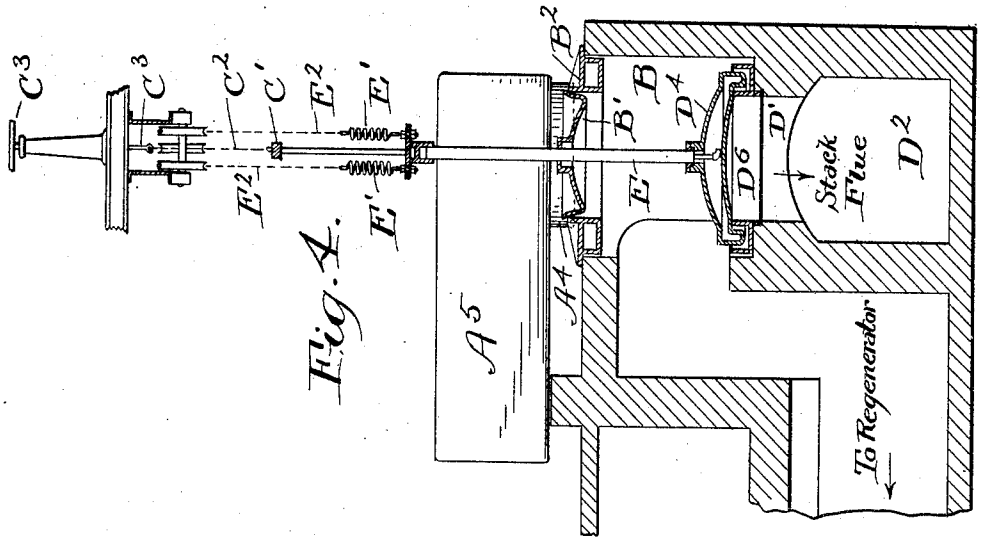

Fig. 4.

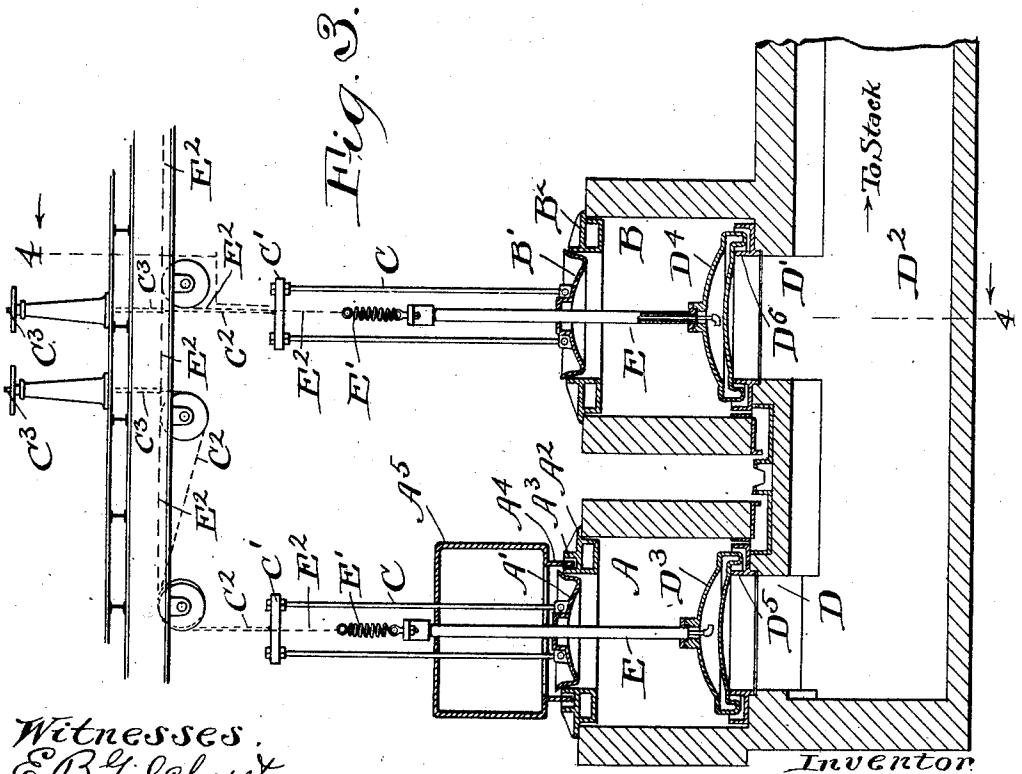

Fig. 3.

Witnesses.
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Thurston & Woodward

UNITED STATES PATENT OFFICE.

JOHN C. CROMWELL, OF CLEVELAND, OHIO, ASSIGNOR, BY DIRECT AND MESNE ASSIGNMENTS, OF ONE-HALF TO THE GARRETT-CROMWELL ENGINEERING COMPANY, OF CLEVELAND, OHIO, A CORPORATION OF OHIO, AND ONE-HALF TO JOHN W. SEAVER, OF CLEVELAND HEIGHTS VILLAGE, OHIO.

REVERSING-VALVE AND OPERATING MECHANISM THEREFOR.

1,002,968. Specification of Letters Patent. **Patented Sept. 12, 1911.**

Application filed October 7, 1907. Serial No. 396,217.

To all whom it may concern:

Be it known that I, JOHN C. CROMWELL, a citizen of the United States, residing at Cleveland, in the county of Cuyahoga and State of Ohio, have invented a certain new and useful Improvement in Reversing-Valves and Operating Mechanism Therefor, of which the following is a full, clear, and exact description.

The object of the present invention is to provide improved reversing valves for regenerator furnaces and mechanism for operating the same which shall possess advantages of readiness and effectiveness in action not hitherto known. There are numerous types of these valves and coöperating mechanisms in the literature of the art, but these are either complicated in that they require a number of valves in excess of that which I employ or have an undesirable intricacy of operating arrangement where the number of valves is diminished. Further, the operating mechanism for many of the prior structures is of such a nature that they require, when in use, the constant and careful attention of the operator, neglect on whose part frequently results in subjecting the valves to strains and disturbances which materially decrease their effectiveness. These and other advantages will appear from the following specification, reference being had to the accompanying drawings, in which—

Figure 1 is a plan of an embodiment of my invention showing the operating mechanism. Fig. 2 is a side elevation of the same. Fig. 3 is an enlarged vertical section showing a pair of valves controlling the air and gas ports. Fig. 4 is a section on the line 4—4 of Fig. 3 looking to the left.

From the drawings it will be seen that the gas inlet A and the air inlet B are provided respectively with throttle valves A′, B′ which are fitted to the upper side of suitable seats A^2, B^2, respectively,—the seat A^2 of the gas throttle being provided with a seal A^3, into which is fitted a depending skirt A^4 from the gas conduit A^5. Each of the throttles has, extending upwardly, suitable devices, such as rods C and cross-heads C′, to which is attached the lifting mechanism, the connection in the present instance being flexible chains C^2, which are run to reciprocating screw rods C^3 mounted in suitable stands on the floor, guide sheaves C^4 being used for the chains where necessary.

Below the aforesaid throttles and controlling the ports D and D′ connecting the stack flue D^2 with the conduits that lead to and from the regenerators, are water cooled valves D^3 D^4 shaped to fit, on their under side the seats D^5 D^6, about the openings D D′ connecting the conduits with the stack flue, and shaped, on their upper side, to fit the lower side of the seats A^2 B^2 about the inlet openings. When the flow takes place through the air and gas inlets and conduits to the generators, these valves D^3 D^4 will, of course, rest against the seats D^5 D^6 about the ports D D′ leading into the stack flue D^2, but when the flow is from the regenerators through the same conduits to the stack flue, the valves will be lifted to bear against the lower side of the seats A^2 B^2 about the inlet ports, so as to seal them effectively. For the purpose of operating these valves, they have connected thereto lifting devices consisting in each case, in the present instance, of a central stem E extending upwardly through the throttles, a yielding spring E′ secured to each stem and flexible chains E^2 secured to the springs and extending over guide sheaves E^3 and attached to a properly located cross-head E^4.

In order that each pair of valves may be simultaneously and effectively operated after the manner contemplated by me, the two cross-bars E^4, to which the separate pairs of valves are connected, are each pivotally connected to and operated by a common rotatable member for example the crank shaft F, after the manner shown in Figs. 1 and 2. Referring to these figures, it will be seen that I have mounted on a suitable supporting frame an electric motor G which is capable of transmitting motion through a train of reducing gears G′ to the rotatable crank shaft F. To the cranks F′ on this rotatable shaft are pivotally and eccentrically attached devices, such as the flexible chains E^5 shown, connecting the two cross-bars therewith. By this arrangement, the operator having the motor under control may simultaneously and with certainty shift all the valves according to the necessities of the case without the necessity of altering the position of

the throttles and without going to further effort than to merely shift the controller of the motor. As one pair of valves are allowed to descend to their respective seats over the ports leading into the stack flue, the other pair of valves will be raised each to fit its top side against the under side of the seat about the inlet port. The connections are such between the valves, their crossheads and the point of eccentric pivotal connection to the rotating shaft, that, when the said eccentric pivotal point has been shifted to its extreme position in drawing the valves upward, the springs E′ interposed in the connection will exert a yielding pressure on the valves to hold them closely against their seats, while at the same time the connections to the other pair of valves will be let out sufficiently to allow the latter to rest properly upon the lower seats. A proper amount of latitude may be given the connection so that the one pair of valves will rest upon the lower seats through an appreciable distance of movement on the part of the said eccentric pivotal point, during which time the other pair of valves will be held against the upper seats with more or less pressure according to the varying tension on the springs interposed in the connection. Should the operator, through negligence or ignorance, fail to stop the motor at the proper point, no harm will result to the apparatus, since a continued movement on the part of the motor will merely result in releasing the raised valves and allowing them to lower, and, at the same time, raising the valves which were previously lowered,—this operation proceeding indefinitely and without injury to the parts until the operator corrects his mistake.

The above recited and other advantages will be apparent to those skilled in the art, as will also be certain modifications of structure which may be made without departing from the spirit of the invention.

Having thus described my invention, I claim:

1. A pair of oppositely moving reciprocating furnace-reversing valves, a common motor for actuating the valves, and actuating connections between the valves and the motor having means for permitting the movement of the motor to be continued indefinitely beyond its normal operating movement without injury to said valves and their connections, substantially as described.

2. A set of vertically reciprocating reversing valves connected to a common motor, said connections being flexible and permitting the uninterrupted operation of the motor and reciprocation of the valves.

3. A set of vertically reciprocating reversing valves connected to a common motor, said connections permitting the uninterrupted operation of the motor, and a cushion spring interposed in said connection.

4. A pair of reciprocating furnace-reversing valves, each valve being arranged to seat at both limits of its movement, a motor common to both valves, a rotatable member drawn by the motor and having an actuating connection with both valves, said connections effecting a reverse movement of the two valves, and having means whereby a movement of said member beyond its normal operating movement may be continued indefinitely without injury to the parts, substantially as described.

5. In a regenerating furnace having flues operating alternately with individual vertically-reciprocating valves for controlling said flues and contacting with valve seats at each end of their reciprocal movements, the combination of a pair of valves oppositely movable between their respective top and bottom seats, a rotatable member suitably connected to said valves and adapted by a rotary movement not exceeding a half revolution to reverse the working positions of the valves, with an elasticity in the connections of the valves to the said rotary member whereby one valve may be seated on the upper seat and held thereon under tension before the other valve is seated.

6. The combination with two pairs of reversing valves, and each having a valve seat at each end of its movement, of a single motor for operating all of said valves, and flexible actuating connections between the motor and valves to permit the actuating movement of the motor to be indefinitely continued beyond its normal extent without injury to the valves, substantially as described.

7. A reciproating reversing valve having a seat at both limits of its movement, an actuating motor therefor, and a flexible cushioned connection between the valve and the motor, substantially as described.

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

JOHN C. CROMWELL.

Witnesses:
HORACE W. LASK,
WILLARD BROWN.