No. 803,284. PATENTED OCT. 31, 1905.

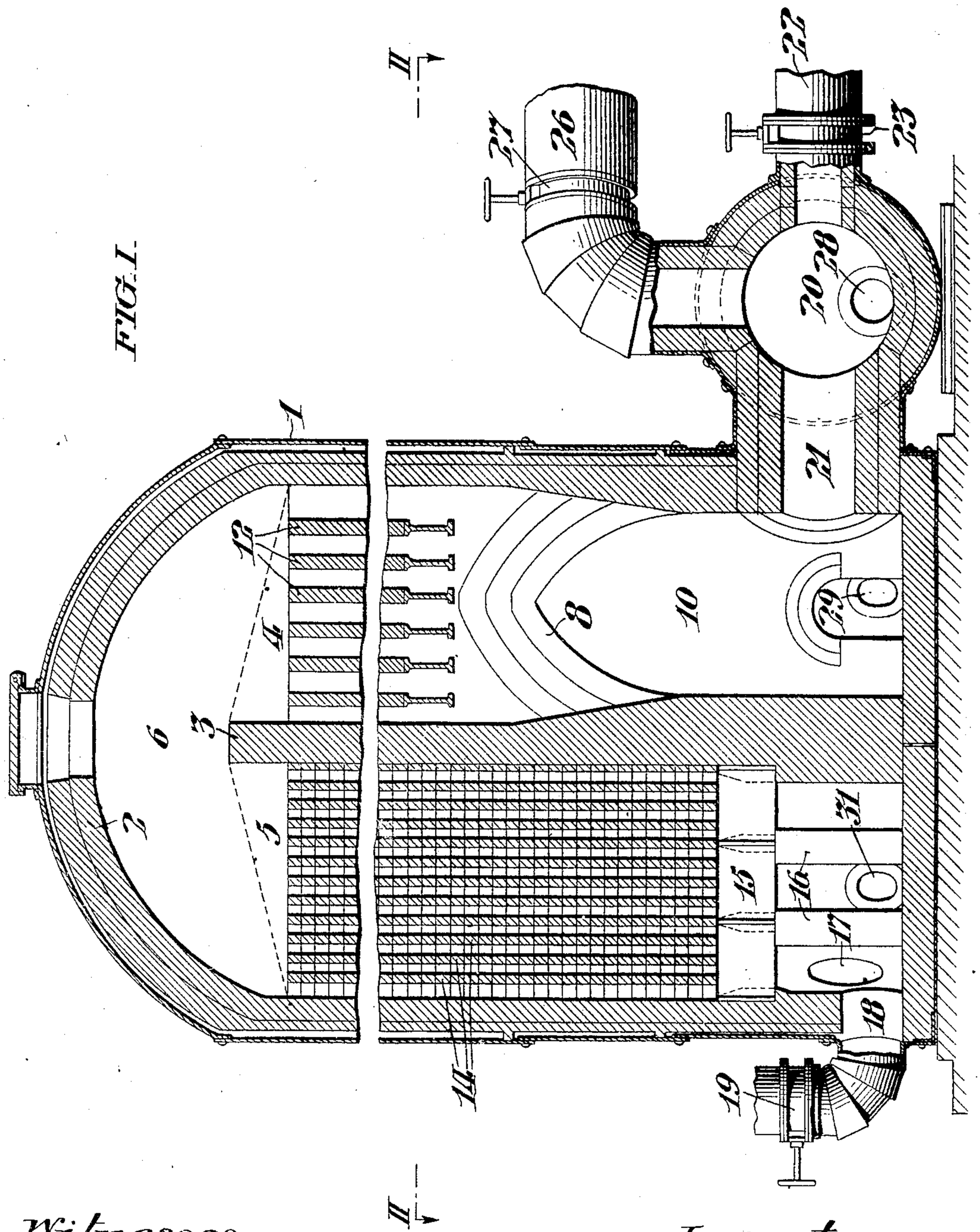
J. M. HARTMAN & J. S. KENNEDY.

REGENERATIVE STOVE.

APPLICATION FILED JAN. 3, 1905.

2 SHEETS—SHEET 1.

FIG. I.




Witnesses:
Clifton C. Hallowell
John C. Burgner.

Inventors:
JOHN M. HARTMAN
AND
JOHN S. KENNEDY,
by Paige, Paul & Foley,
Attys.

No. 803,284. PATENTED OCT. 31, 1905.

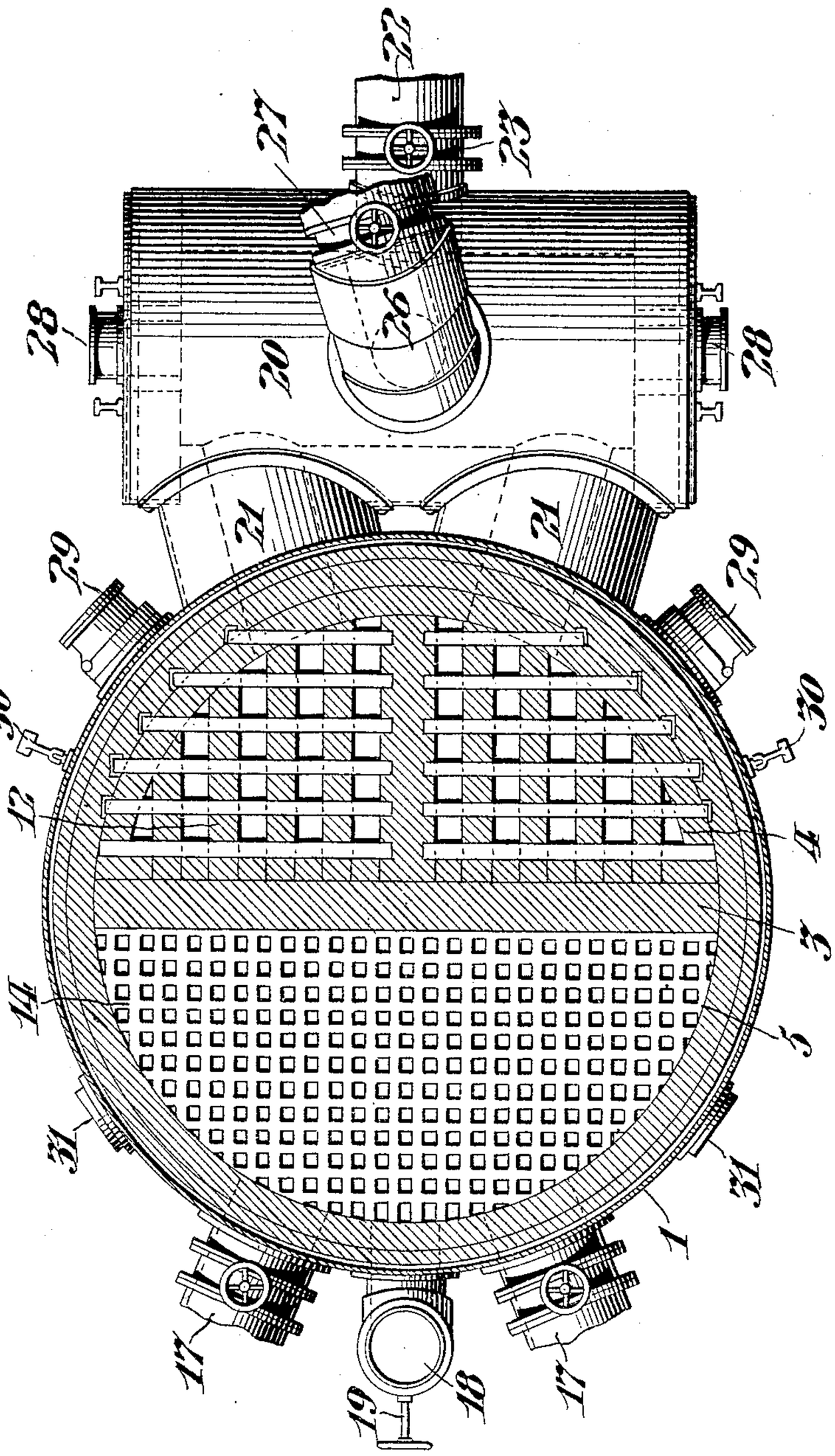
J. M. HARTMAN & J. S. KENNEDY.

REGENERATIVE STOVE.

APPLICATION FILED JAN. 3, 1905.

2 SHEETS—SHEET 2.

FIG. II




Witnesses:

Clifton C. Halloweld

John C. Burgner.

Inventors:

JOHN M. HARTMAN
AND
JOHN S. KENNEDY,

by Bugg, Paul & Talley,

Attys.

# UNITED STATES PATENT OFFICE.

JOHN M. HARTMAN, OF PHILADELPHIA, PENNSYLVANIA, AND JOHN S. KENNEDY, OF STANHOPE, NEW JERSEY.

## REGENERATIVE STOVE.

No. 803,284. Specification of Letters Patent. Patented Oct. 31, 1905.

Application filed January 3, 1905. Serial No. 239,285.

*To all whom it may concern:*

Be it known that we, JOHN M. HARTMAN, of Philadelphia, in the State of Pennsylvania, and JOHN S. KENNEDY, of Stanhope, in the State of New Jersey, have invented certain new and useful Improvements in Regenerative Stoves, whereof the following is a specification, reference being had to the acpanying drawings.

Our invention relates to apparatus comprising brickwork which is alternately traversed by the hot gaseous products of combustion from a blast-furnace and by the cold-air blast before its introduction to the furnace, so as to utilize the heat from said gas which would otherwise be wasted.

Ordinarily such stoves are made with two parallel vertical passes inclosing brick checker-work, and the combustion of the waste gases occurs in the chamber in the stove at the bottom of the first pass, from which chamber the products of combustion rise through that pass and descend in the other pass to a chimney-vent at the bottom of the stove. Said chamber being arched at the top to support the checker-work must be of excessive height, for unless said arches are sufficiently remote from the region of the extreme temperature of combustion in said chamber they are rapidly disintegrated, for the flue-dust being deposited on and above said arches melts, scorifies the brickwork, and forms a liquid cinder which falls to the bottom of the chamber and there congeals and must be subsequently broken up with sledges and bars to remove it.

It is the object of our invention to render a greater portion of the height of the first pass in such a stove available for heating brickwork and to render the latter more durable by locating the combustion-chamber exterior to the stove, so that the temperature of the gas is lowered by expansion before its contact with the brickwork in the stove, and the solid products of combustion are deposited in said exterior combustion-chamber, where they are readily accessible for removal.

It is characteristic of our invention, as hereinafter described, that the air-blast to be heated passes both through the stove and through the combustion-chamber and that the conduits connecting the combustion-chamber with the stove are valveless, the flow of both the gas and air being controlled by valves exterior to said conduits.

Our invention comprises the various novel features of construction and arrangement, hereinafter more definitely specified.

Figure I is a vertical sectional view through the stove conveniently embodying our improvements. Fig. II is a plan sectional view taken on the line II II in Fig. I.

In said figures, 1 is the circular casing of the stove, provided with the dome 2 and having the central vertical partition 3, forming the two vertical parallel passes 4 and 5, which are connected by the opening 6 under said dome. Said pass 4 is the one first traversed by the hot gases, and the arches 8 therein form the top of the distributing-chamber 10, from which the gases are distributed through the brick checker-work 12, supported by said arches. The checker-work 14 in the pass 5 is supported by the transverse beams 15 and pillars 16.

The lower end of the pass 5 is provided with vents 17, through which the products of combustion of the gas are discharged to the chimney. Said pass 5 is also provided with a cold-air inlet 18, controlled by the alve 19.

The combustion-chamber 20 is located exterior to the stove-casing 1, and its interior communicates with said distributing-chamber 10 through a plurality of conduits 21, which insure a more equal distribution of the hot gas than if a single conduit were employed. Said combustion-chamber 20 is provided with the hot-gas inlet 22, controlled by the valve 23, and it is to be understood that said inlet 22 is in communication with a source of gas-supply—for instance, a blast-furnace. Said combustion-chamber 20 is also provided with air-inlets 28 and with the hot-air outlet 26, controlled by the valve 27, connected with a blast-furnace to furnish a hot-air blast thereto.

Valved openings 29 and eyesights 30 may be provided near the bottom of the distributing-chamber 10 and also cleaning-doors 31 at the lower end of the pass 5.

The apparatus aforesaid is operated as fol-

lows: The cold-blast-inlet valve 19 and the hot-blast-outlet valve 27 being closed and the gas-inlet valve 23 being open, the gas flows through the combustion-chamber 20, where its combustion is completed by means of air entering at the inlets 28, so that practically all of the flue-dust is deposited therein. Of course burning the gas in the combustion-chamber increases its volume and correspondingly lowers its temperature, although it does not decrease the total heat carried thereby to the stove, and on entering the distributing-chamber 10 the greater volume of gas distributes itself more uniformly through the brickwork in the pass 4, through which it rises, and thence descends through the pass 5 to the chimney-vents 17, through which it escapes. The flow of the hot gas having been maintained through the stove, as described, until the brickwork 12 and 14 in the passes 4 and 5 is sufficiently heated, the gas is diverted to another stove, the valve 23 and the air-inlets 28 are closed, and the valves 19 and 27 are opened, so that cold air enters through the inlet 18, rises through the hot brickwork 14, descends through the hot brickwork 12 to the chamber 10, and flows thence through the conduits 21 into the combustion-chamber 20, from which it is discharged as hot blast to the furnace through the hot-air outlet 26.

Although we prefer to employ two conduits 21 between the exterior combustion-chamber 20 and the interior distributing-chamber 10 of the stove, it is to be understood that a single conduit may be employed in the smaller sizes of apparatus.

It is to be noted that the interior of the conduits 21, which are maintained at extremely-high temperature, are valveless and that the alternate flow of the gas and air through the apparatus always traverses both stove and combustion-chamber and is controlled solely by valves exterior to said conduits. Attention is particularly invited to this feature of the construction for the reason that unsuccessful attempts have been made to control the flow of heated gases in apparatus of this kind by means of valves located in the region of extreme temperature, with the result that such apparatus is rendered impracticable by the almost immediate destruction of such valves.

We do not desire to limit ourselves to the precise details of construction and arrangement herein specified, as it is obvious that various modifications may be made therein without departing from the essential features of our invention.

We claim—

1. In a regenerative stove, the combination with a casing inclosing brickwork, and having a cold-air inlet and a chimney-vent; of a combustion-chamber exterior to said casing, having a hot-gas inlet an air-inlet and a hot-air outlet; a conduit between said combustion-chamber and said casing; and means, exterior to said conduit, controlling the flow therethrough, substantially as set forth.

2. In a regenerative stove, the combination with a casing inclosing brickwork, and having a cold-air inlet and a chimney-vent; of a combustion-chamber exterior to said casing, having a hot-gas inlet an air-inlet and a hot-air outlet; a conduit between said combustion-chamber and said casing; and means, exterior to said conduit, controlling the flow of hot gas and hot air alternately therethrough, substantially as set forth.

3. In a regenerative stove comprising two passes inclosing checker-work; a cold-air inlet and a chimney-vent in the lower portion of one of said passes; a distributing-chamber in the lower portion of the other pass; a combustion-chamber external to said stove; a conduit connecting said combustion-chamber with said distributing-chamber; a gas-inlet and an air-inlet to said combustion-chamber; a hot-air outlet from said combustion-chamber; and, valves exterior to said conduit, controlling the alternate flow of gas and air therethrough, substantially as set forth.

4. In a regenerative stove, comprising two vertical passes, inclosing checker-work; a cold-air inlet and a chimney-vent in the lower portion of one of said passes; a distributing-chamber in the lower portion of the other pass; a combustion-chamber external to said stove; a conduit connecting said combustion-chamber with said distributing-chamber; a gas-inlet and an air-inlet to said combustion-chamber; a hot-air outlet from said combustion-chamber; and, valves, exterior to said stove, conduit, and combustion-chamber, independently controlling said gas-inlet and hot-air outlet, substantially as set forth.

5. The combination with a regenerative stove comprising passes having a cold-air inlet and chimney-vent at one end and a distributing-chamber at the other end; of a combustion-chamber external to said stove; a conduit connecting said combustion-chamber with said distributing-chamber; a gas-inlet and an air-inlet to said combustion-chamber; a hot-air outlet from said combustion-chamber; and, valves, exterior to said conduit, independently controlling said gas-inlet and hot-air outlet; whereby, air may be conducted from said cold-air inlet through said stove, conduit and combustion-chamber, and discharged through the hot-air outlet of the latter, substantially as set forth.

6. The combination with a regenerative

stove; of an external combustion-chamber; a conduit between said stove and chamber; and, means arranged to alternately direct hot gas through said combustion-chamber, conduit and stove in one direction, and, air through said stove, conduit, and combustion-chamber in the opposite direction, substantially as set forth.

In testimony whereof we have respectively signed our names, at Philadelphia, Pennsylvania, this 24th day of December, 1904, and at Stanhope, New Jersey, this 28th day of December, 1904.

JOHN M. HARTMAN.
JOHN S. KENNEDY.

Witnesses re John M. Hartman:
ARTHUR E. PAIGE,
ANNA F. GETZFREAD,
Witnesses re John S. Kennedy:
J. J. SHAW,
E. R. HERRICK.