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PATENTED JUNE 23, 1903.

W. K. CLARK & J. S. DU QUESNE.
SMOKE CONSUMING FURNACE.

APPLICATION FILED JAN. 15, 1903.

NO MODEL.

2 SHEETS—SHEET 1.

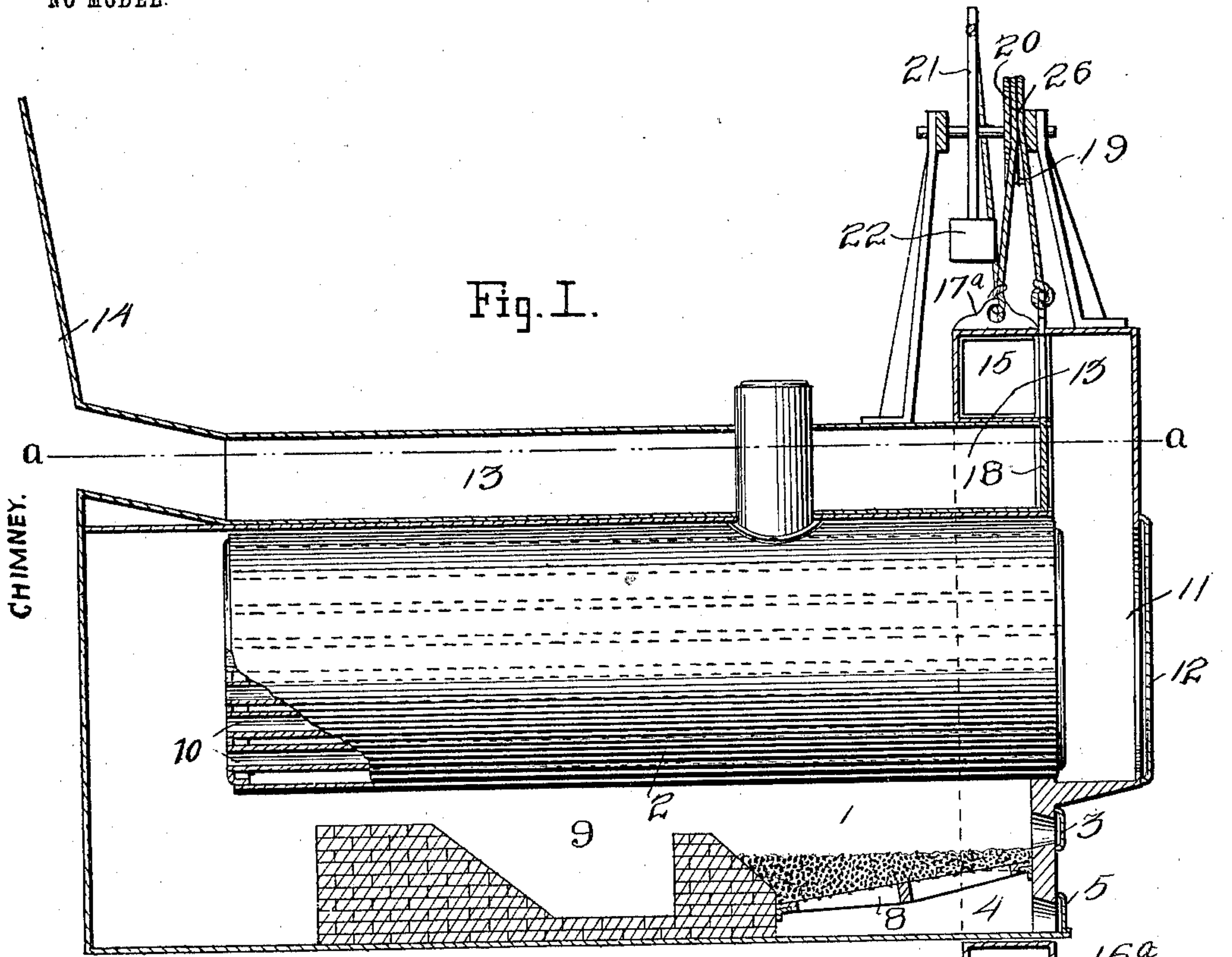
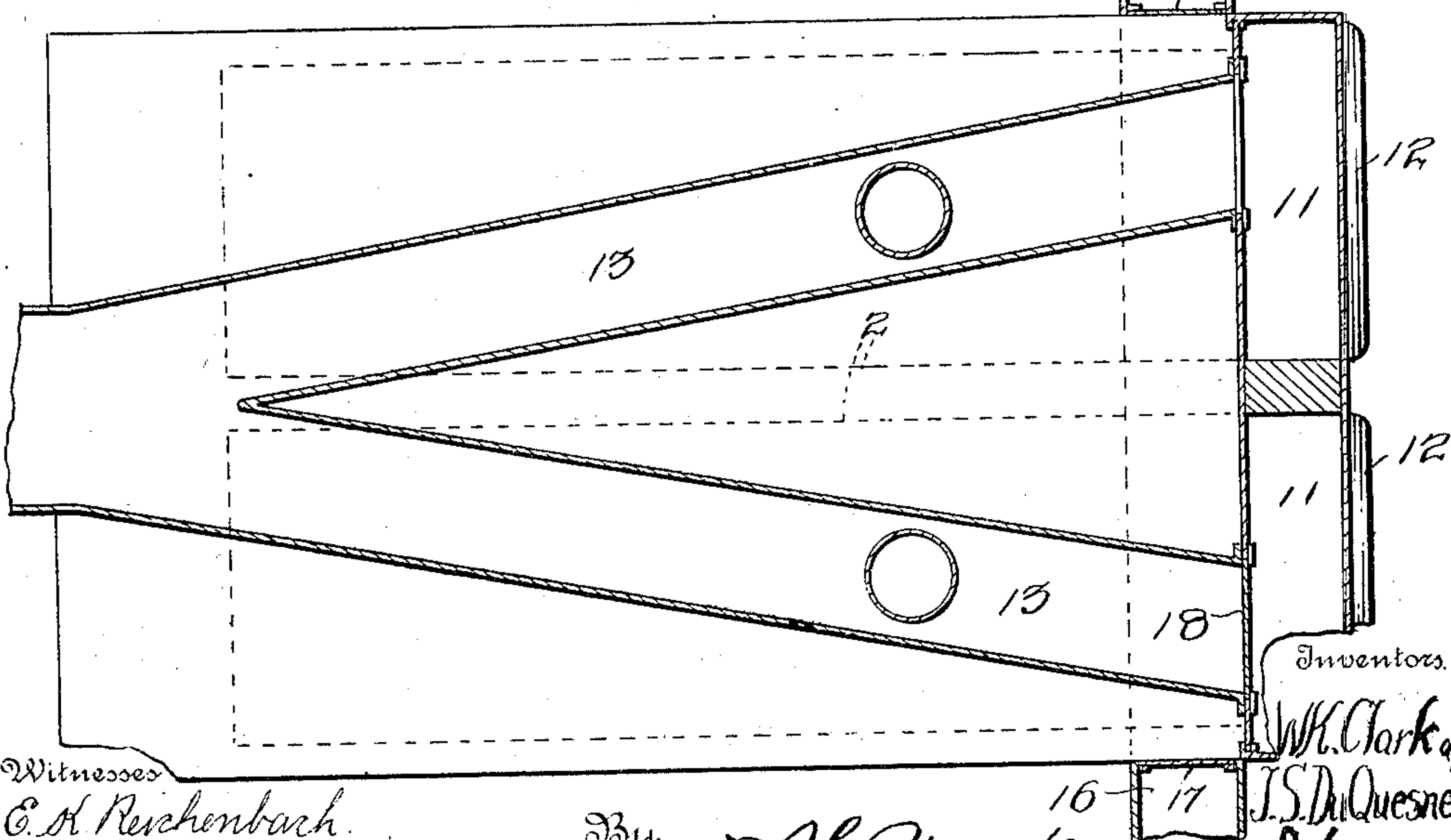


Fig. 3.



Witnesses

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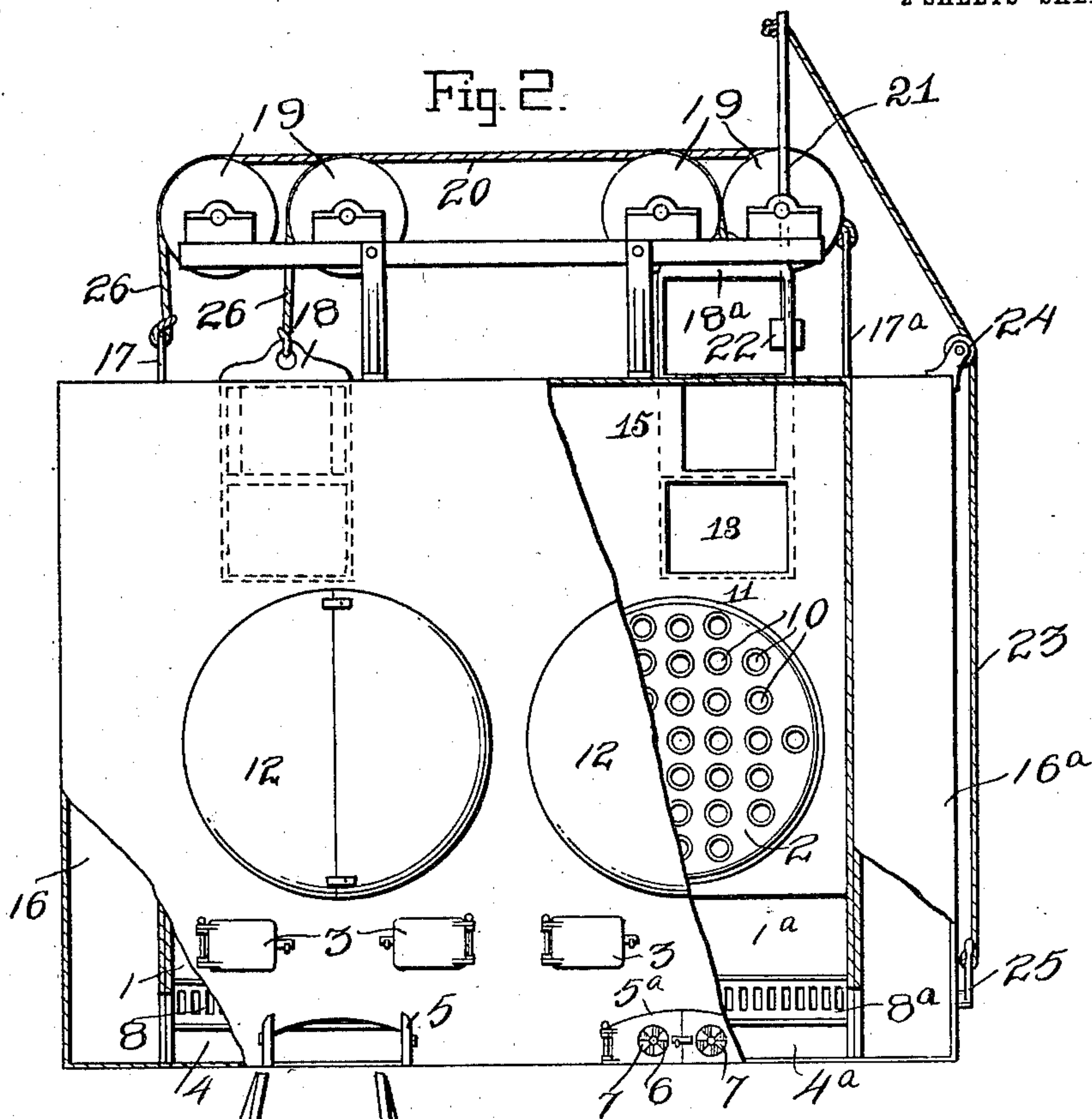
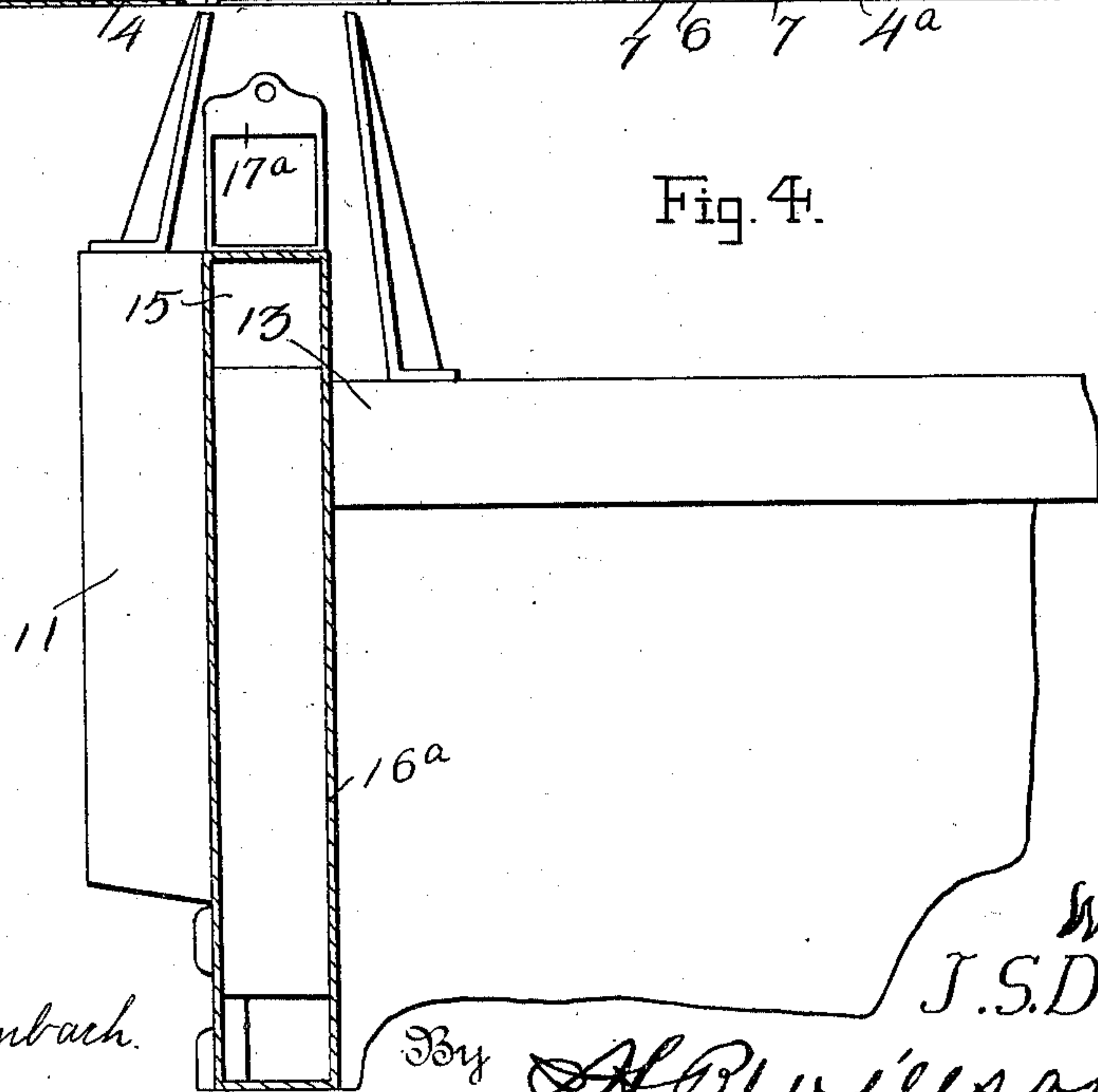


Fig. 4.



Witnesses

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UNITED STATES PATENT OFFICE.

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SMOKE-CONSUMING FURNACE.

SPECIFICATION forming part of Letters Patent No. 731,546, dated June 23, 1903.

Application filed January 15, 1903. Serial No. 139,187. (No model.)

To all whom it may concern:

Be it known that we, WILLIAM K. CLARK and JOSEPH S. DU QUESNE, citizens of the United States, residing at Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Smoke-Consuming Furnaces; and we do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

Our invention relates to improvements in smoke-consuming furnaces in which the smoke is caused to be passed through a brightly-burning fire, and thereby consumed before it reaches the chimney or draft-exit; and it consists in the peculiar construction and combination of devices hereinafter fully described and claimed.

In the accompanying drawings, Figure 1 is a vertical longitudinal sectional view of a steam-boiler furnace embodying our improvements. Fig. 2 is partly a front elevation and partly a sectional view of the same on a plane intersecting the front vertically-disposed flue-head. Fig. 3 is a horizontal sectional view of the same, taken on the plane indicated by the line *a a* of Fig. 1. Fig. 4 is a vertical sectional view of the same, taken on a plane intersecting one of the vertically-disposed side flues.

In the embodiment of our invention we provide a furnace which has two separate fire-boxes 1 1^a, which are preferably disposed side by side, and each of which may be employed, as in the form of our invention shown in Figs. 1, 2, 3, and 4, to heat a boiler 2. Each fire-box is provided with one or more fuel-doors 3, and below the respective fire-boxes are ash-pits 4 4^a, each of which has one or more draft-doors 5 5^a. As here shown, the draft-doors are hinged, and each is provided with a draft-opening 6 and a pivotally-mounted cut-off plate 7 to regulate the effective area thereof. The grates 8 8^a of the respective fire-boxes are inclined longitudinally, their rear sides being lowermost, and hence the grates in stoking become covered with a bed of fuel which is deepest at its rear side.

The tendency of stokers or firemen is usually to heap the fuel in the front of the fire-boxes and to have it in a shallow bed at the rear side thereof; but by thus inclining the grates this difficulty is obviated. A wall 9, which may be of any suitable construction, separates the fire-boxes. In the practical embodiment of our invention it is necessary to provide return-flues for each fire-box. Where the furnace is employed for heating steam-boilers, as in the present instance, these return-flues are formed by the boiler-tubes 10, and it will be understood that the draft from the fire-boxes is rearward under the boilers and then forward through the boiler-tubes 10, constituting the return-flues, to the front side of the furnace. The latter is provided on its front side with uptake-flues 11, which may be of any suitable construction and here shown as formed by heads 12, secured on the front wall of the furnace and which also cover the front ends or heads of the boilers. Each uptake-flue 11 leads to a discharge-flue 13, the latter being here shown as disposed horizontally above the boilers and converging at their rear ends, where they discharge into the stack or chimney 14, which constitutes the draft-exit. Each uptake-flue 11 also communicates with a cross-flue 15, which is here shown as disposed above the discharge-flues 13 and near the front side of the furnace. At opposite ends of the cross-flue are flues 16 16^a, which are here shown as vertically disposed and on the outer sides of the furnace. The flue 16 communicates at its lower end with the ash-pit 4. The flue 16^a communicates at its lower end with the ash-pit 4^a.

In the ends of the cross-flue 15 are dampers 17 17^a, which are here shown as slide-valves adapted to move vertically to open and close the respective ends of said cross-flues and as projecting above the upper side of the cross-flue.

The valve 18 controls communication between the uptake-flue 11, the cross-flue 15, and one of the discharge-flues 13. A valve or damper 18^a controls communication between the other uptake-flue 11^a, the cross-flue 15, and the other discharge-flue 13. Each of

the said valves 18 18^a has an opening in its upper portion and its lower portion solid, so that when it is lowered it closes the front end of the discharge-flue 13 with which it coöperates and establishes communication between one of the uptake-flues and the cross-flue 15.

A series of pulleys 19 are journaled in suitable bearings above the furnace and are connected together by an operating-chain 20, whereby they are adapted to be partly turned simultaneously. To one of the said pulleys is connected a lever 21, at the lower end of which and below the said pulley is a weight 22. An operating cord or wire 23 is attached to the upper end of the said lever, is engaged by a direction-sheave 24, and its lower portion is attached to a hand-lever 25. Each of the valves 17 17^a 18 18^a is connected to one of the pulleys by a chain or other suitable flexible connecting element 26, and the same are so disposed that when the valves 17 18 are lowered to close communication between the flue 16 and the flue 15, close communication between the uptake-flue 11 of fire-box 1 and the flue 13 of said fire-box, and open communication between said flue 11 and said flue 15 the valves or dampers 17^a 18^a are raised in position to open communication between the cross-flue 15 and the flue 16^a, close communication between flue 15 and the flue 11 of fire-box 2, and open communication between said flue 11 and the discharge 13^a of fire-box 2.

Assuming the position of the flues or dampers to be as above stated and as shown in Fig. 2 and the draft-doors 5 to be open and the draft-doors 5^a to be closed, the smoke from the fire-box 1 will pass rearwardly therefrom to the rear of the boiler above said fire-box, then forwardly through the return-flues 10 of said boiler to the uptake-flue 11 in front of said fire-box, from thence into the cross-flue 15, through the latter into the flue 16^a, which acts in this instance as a downdraft-flue and is discharged from said flue 16^a into the ash-pit 4^a, from which it is caused to ascend and pass through the mass of burning fuel on the grate of the fire-box 1^a and is thereby consumed.

It will be understood from the foregoing that the smoke arising from the freshly-stoked fuel in one fire-box is consumed by being passed through the mass of glowing fuel in the other fire-box before reaching the draft-exit. Hence by alternately appropriately stoking the fire-boxes and appropriately changing the position of the valves or flues hereinbefore described, which may be done instantly by a single movement of the lever 25, the smoke may be effectually consumed, thereby effect-

ing an economy of fuel and also obviating the smoke nuisance.

From the foregoing description, taken in connection with the accompanying drawings, the construction and operation of the invention will be readily understood without requiring a more extended explanation.

Various changes in the form, proportion, and the minor details of construction may be resorted to without departing from the principle or sacrificing any of the advantages of this invention.

Having thus described our invention, what we claim as new, and desire to secure by Letters Patent, is—

1. A furnace of the class described having separate fire-boxes, return-flues communicating therewith, uptake-flues to which the return-flues lead, discharge-flues, a cross-flue to which the uptake-flues lead, downtake-flues leading respectively from the cross-flue and communicating with the ash-pits of the fire-boxes, and valves to establish or cut off communication between the uptake-flues, cross-flue and discharge-flues at will, substantially as described.

2. A furnace of the class described having separate fire-boxes, return-flues communicating therewith, uptake-flues to which the return-flues lead, discharge-flues, a cross-flue to which the uptake-flues lead, downtake-flues leading respectively from the cross-flue and communicating with the ash-pits of the fire-boxes, valves to establish or cut off communication between the respective uptake-flues, discharge-flues and the cross-flue at will, and means to simultaneously reversely operate said valves, substantially as described.

3. A furnace of the class described having separate fire-boxes, return-flues communicating therewith, uptake-flues to which the return-flues lead, discharge-flues, a cross-flue to which the uptake-flues lead, downtake-flues leading respectively from the cross-flue and communicating with the ash-pits of the fire-boxes, and slide-valves to control communication between the uptake-flues, cross-flue and discharge-flues, each slide-valve being adapted to close a port between two of said flues and having an opening to simultaneously uncover a port between two of them, substantially as described.

In testimony whereof we have hereunto set our hands in presence of two subscribing witnesses.

WILLIAM K. CLARK.
JOSEPH S. DU QUESNE.

Witnesses:

EUGENE S. LINDSAY,
CLARA A. WOOTERS.