

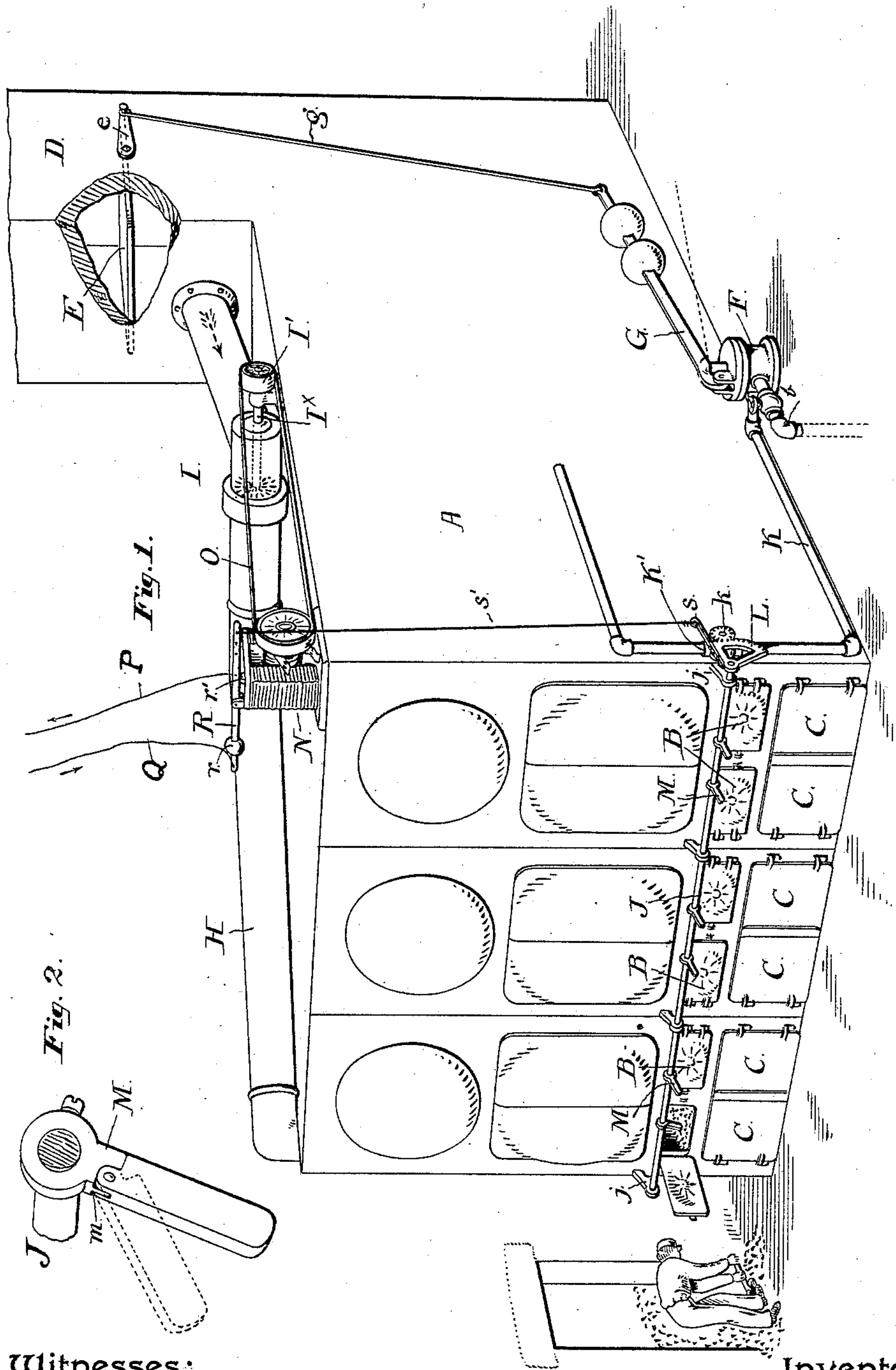
(No Model.)

2 Sheets—Sheet 1.

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FURNACE.

No. 422,189.

Patented Feb. 25, 1890.



Witnesses:

J. Norman Dixon
Lewis Altmaier.

Inventor:

Geffroy P. Denis
By his attorneys
W. C. Strawbridge
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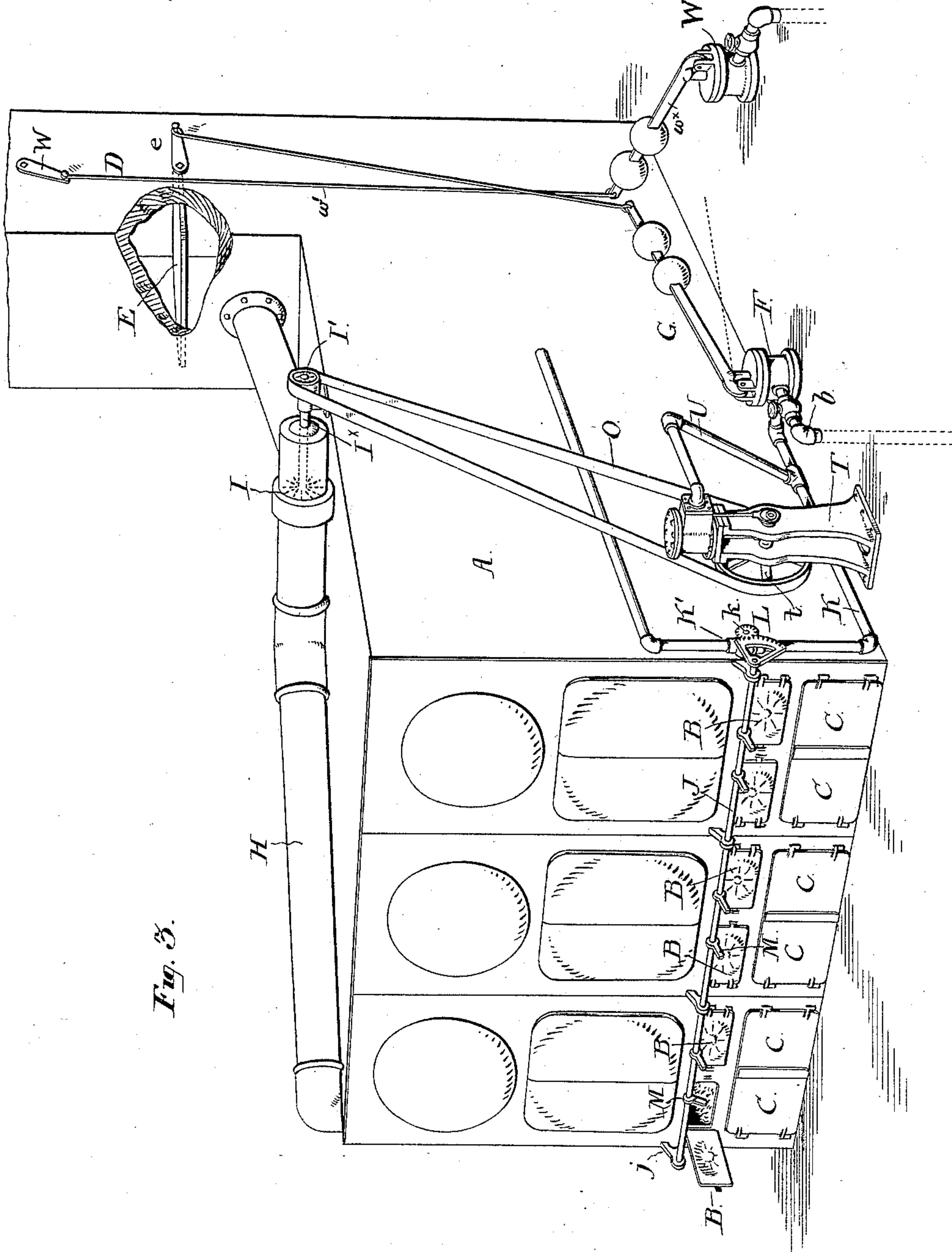


Fig. 3.

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UNITED STATES PATENT OFFICE.

GEFFROY P. DENIS, OF CHESTER, PENNSYLVANIA.

FURNACE.

SPECIFICATION forming part of Letters Patent No. 422,189, dated February 25, 1890.

Application filed July 17, 1889. Serial No. 317,835. (No model.)

To all whom it may concern:

Be it known that I, GEFFROY P. DENIS, a citizen of the United States, residing at Chester, in the county of Delaware, and State of Pennsylvania, have invented certain Improvements in Furnaces, of which the following is a specification.

My invention relates to a class of furnaces in which provision is made for arresting in the chimney the smoke and gases generated by the combustion of the grate, and for leading them back and discharging them into the furnace at such point as may be desired.

In the practical operation of furnaces, it is only when the fires are fed or stirred that the greatest volume of smoke is generated; and it is the object of my invention to provide devices governed by the opening and closing of the furnace doors, which shall both open and close a chimney damper, and operate an exhaust fan situated in a conduit leading from the chimney to the grate bars.

A good form of a convenient embodiment of my invention is represented in the accompanying drawings and herein described, the particular subject matter claimed as novel being hereinafter definitely specified.

In the drawings, Figure 1 is a perspective view of a furnace embodying my invention, showing the exhaust fan operated by an electric motor. Fig. 2 is a detailed view of one of the valve rod trip fingers. Fig. 3 is a view similar to Fig. 1, showing, however, the exhaust fan operated by a small auxiliary steam engine.

Similar letters of reference indicate corresponding parts.

In the drawings, A is a battery of, for instance, three furnaces of any usual construction.

B are the fire doors, and C the ash pit doors.

D is the chimney, E a special retarding damper therein, and F a steam regulator, provided with the usual weighted arm G, which is connected with the lever arm *e* of the retarding damper E by a rod *g*. *b* is a bleeding or outlet pipe from said steam regulator.

H is a pipe, duct, or conduit, the upper end of which opens into the chimney D, and the lower part of which leads to and dis-

charges at any suitable point into, the fire chamber. An exhaust fan I, mounted for rotation upon an axial rod *I*^x is situated in the pipe H, preferably within an enlargement thereof. One end of said axial rod extends outward through an adjacent elbow of the pipe, and its outer extremity is equipped with a band wheel *I'* by means of which said exhaust fan is driven, as explained hereinafter.

Referring now to Fig. 1, K is the steam pipe which leads into and supplies steam to the regulator F, said pipe being as to its other end in communication with the steam supply from which it is desired that the regulator F should be operated. A bend of the pipe K extends to the front of the furnace, where it is provided with a stop-cock *K'* of any convenient construction, the stem of which, however, is formed with a head *k* embodying a circumscribing series of teeth, constituting it a spur wheel.

J is what I term the valve rod, the same being supported in a horizontal position along the front of the furnaces just above the upper edges of the series of fire doors by means of brackets *j*. The outer end of the valve rod is equipped with a toothed segment L. This segment is of such size or so situated that its teeth engage the teeth of the head *k* of the valve stem.

M are a series of fingers mounted upon the valve rod J, at such intervals apart as to cause one finger to lie in front of each of the furnace doors. Each finger is divided into two parts and so connected by a ruler joint *m* that the lower member of the finger may swing in one direction only. Each of said fingers is as to its head provided with a set screw, whereby its angular set with respect to the valve rod may be adjusted at will.

N is an electric motor of any preferred construction, conveniently mounted on top of the furnace, and provided with a driving wheel which is connected by a band O with the band wheel of the exhaust fan, so that when said motor is in action its power will occasion the driving of the fan.

P Q are line wires leading from any suitable source of supply to said motor, the wire P leading directly thereinto, but the wire Q being connected to a balance arm R, the outer end of which is provided with a weight *r*, and

the inner end of which when held down against the stress of the weight makes contact with the contact point r' , and completes the circuit, while when raised by the stress of said weight it breaks said contact.

S is an arm or extension attached to or forming a part of the segment L, and the outer end of which is connected by means of a wire or rod s' to the inner end of said weighted arm, R, so that the raising and lowering of the weighted arm will be controlled by the movement of the segment arm S.

Having thus described the construction of a convenient embodiment of my invention, its operation will be readily understood:—Assume all the doors of the furnace closed, all the fingers of the valve rod except the one in front of the last door hanging straight downward, all the fingers, except said last finger arranged so that their lower members hang free to swing inward on their joints and said last finger hanging free to swing on its joint outward,—assume also the valve K' closed, the arm R dropped so as to break its contact with the contact point r' , the fan stationary, and the retarding damper E open:—When, then, the fire door nearest the eye is, for the purpose of charging the furnace, thrown open, it will encounter the finger in front of it, and will swing said finger outward thereby rotating the valve rod to which the finger is rigidly connected. The rotation of the valve rod will cause the throw of the segment and consequently the turning and opening of the valve K' , with the result that steam will flow through the pipe K, fill the regulator, and close the damper. The throw of the segment will at the same time through its arm S and the wire or rod s' occasion the pulling down of the balance arm R to make its contact, energize the motor, and rotate the exhaust fan. The smoke and gases will, therefore, be stopped by the damper, drawn downward into the pipe H by the fan, and discharged into the furnace. When then the first door is closed, it will encounter the lower end of the finger in line in front of it, and simply swing the end of said finger inward on its joint, the valve rod not being thereby rotated. The opening and closing of the intermediate doors is without effect upon the valve rod. The finger located in front of the last door of the battery is set at an angle upon the valve rod differing from that at which the others are set, and such that when said door is opened it will encounter said finger, and simply lift and pass under it, but when said door is being closed, it will encounter the other side of said finger, straighten it, and swing it inward, with the result that the valve rod will be rotated with it in a direction opposite to that in which the opening of the first door rotated it. The closing of the last door and said opposite rotation of the valve rod occasions by the reverse throw of the segment the closing of the valve K' and the consequent dropping of the

steam regulator and opening of the damper, and also occasions the breaking of the contact of the arm R with its contact point, and the consequent stoppage of the exhaust fan. It is, of course, obvious that doors of boilers out of service can be passed by, and that if there be no fire in the last furnace of the battery, the finger of the battery next to the last may be adjusted to the position described with reference to that of the door of the last battery. After the steam has been thus shut off from the pipe K the bleeding pipe b allows the steam in the regulator to escape. The valve of the bleeding pipe may be opened very slightly, and the slow escape of the steam will cause the gradual opening of damper E.

In Fig. 3 of the drawings illustrated the employment of a small independent steam engine for the rotation of the fan, from inspection of which it will be apparent that the same arrangement of fire doors, valve rod, and rod fingers, steam regulators, dampers, conduit leading from the chimney to the fire box, fan in said conduit, and steam pipes leading to the steam regulators, is employed. In this modified arrangement T is an independent or auxiliary steam engine the driving wheel, t , of which is connected by a band O with the band wheel of the exhaust fan, so that when the engine is thrown into operation the fan will be rotated. The engine T is a simple type of upright engine which I deem it unnecessary to describe in this connection, as an engine of any character may be employed. The engine is by the connecting pipe U, connected with the steam pipe K, at a point between the valve K' and the steam regulator F, and will receive steam and be thrown into operation for the rotation of the fan at such time as the valve K' may be opened and steam let into the pipe K. The valve of the pipe K will be opened by the throw of the segment L, and by the opening of said valve the steam will of course operate the engine T and consequently the fan I, and will also cause the lift of the arm of the steam regulator and the closing of the damper E.

Other devices than the electric motor or the independent steam engine for driving the said exhaust fan, and other devices than those shown and described for throwing such motor devices into and out of operation, may, without departure from my invention, be resorted to.

In Fig. 3 is shown a second damper, being the usual damper, mounted in a chimney above the retarding damper, the lever arm W of which is connected by a rod w' with the weighted arm w^x of a second steam regulator W^x . This second damper and damper regulator operate in the manner usual in furnaces, and independently of the damper and damper regulator first described, to control the fire.

Having thus described my invention, I claim:

1. In combination, in a furnace battery,

furnace doors, a pipe leading from the chimney and discharging into the furnace, a fan mounted in said pipe, and means controlled by the movement of the furnace doors for operating said fan, substantially as set forth.

2. In combination, in a furnace battery, furnace doors, a pipe leading from the chimney and discharging into the furnace, a fan mounted in said pipe, means controlled by trip devices for operating said fan, and trip devices adapted to be thrown by the movement of the furnace doors, substantially as set forth.

3. In combination, in a furnace battery, furnace doors, a furnace chimney, a damper mounted therein, means controlled by trip devices for opening and closing said damper, and trip devices adapted to be thrown by the movement of the furnace doors, substantially as set forth.

4. In a furnace, in combination with a series of doors, a rotatable rod, the rotation of which controls the operation of devices for opening and closing a damper, and jointed trip fingers mounted upon said rod and adapted to be encountered in the movement of said doors, substantially as set forth.

5. In combination, in a furnace battery, furnace doors, a furnace chimney, a damper mounted therein, a steam regulator connected with said damper, a steam pipe leading to said regulator, a cock in said steam pipe, a cock operating device adapted to be operated by a trip, and a trip set to be thrown by the movement of the furnace doors, substantially as set forth.

6. In combination, in a furnace battery, furnace doors, a furnace chimney, a damper mounted therein, a steam regulator connected to said damper, a steam pipe leading to said regulator, a cock in said steam pipe, a rotatable rod provided with fingers adapted to be encountered by the furnace doors, and a cock operating segment upon said rod, substantially as set forth.

7. In combination, in a furnace battery, furnace doors, a furnace chimney, a damper mounted therein, a steam regulator connected with said damper, a steam pipe leading to said regulator, a cock in said steam pipe the head of which is provided with teeth, a rotatable rod, upon which is mounted a toothed quadrant in engagement with said head, and intermediate of its length provided with fingers adapted to be encountered by the furnace doors, substantially as set forth.

8. In combination, in a furnace, furnace doors, a furnace chimney, a damper mounted therein, a steam regulator connected with said damper, a steam pipe leading to said regulator, a cock in said steam pipe the head of which is provided with teeth, a rotatable rod, upon which is mounted a toothed quadrant in engagement with said head, and fingers, each formed of parts connected by ruler joints, mounted upon said rod so as to be adapted to

be encountered by the furnace doors, substantially as set forth.

9. In combination, in a furnace battery, furnace doors, a pipe leading from the chimney and discharging into the furnace, a fan mounted in said pipe, a motor for operating said fan so connected with as to be controlled by a trip device, and a trip device consisting of a rotatable rod provided with fingers adapted to be encountered by the furnace doors, substantially as set forth.

10. In combination, in a furnace battery, furnace doors, a pipe leading from the chimney and discharging into the furnace, a fan mounted in said pipe, a motor for causing the rotation of said fan, a rotatable rod the rotation of which causes the throwing of said fan rotating mechanism into and out of operation, a connecting rod between said rotatable rod and said motor, and trip fingers mounted upon said rotatable rod to be encountered by the furnace doors, substantially as set forth.

11. In combination in a furnace battery, furnace doors, a pipe leading from the chimney and discharging into the furnace, a fan mounted in said pipe, an electric motor for operating said fan, a balance arm the lowering of which causes the throwing of said motor into operation, a rotatable rod provided with a projecting arm connected to said balance arm, and trip fingers mounted upon said rotatable rod and adapted to be encountered by the furnace doors, substantially as set forth.

12. In a series of furnaces provided with a chimney, in combination, a damper situated therein, and a steam regulator connected to said damper, a pipe leading from the chimney and discharging into the furnace,—a fan mounted in said pipe,—a motor connected with said fan, a rotatable rod mounted in connection with a series of furnace doors, trip fingers upon said rotatable rod projecting into the path of the furnace doors, a steam cock provided steam pipe leading to said steam regulator, devices upon said rotatable rod to operate said steam cock and to throw the motor into and out of operation, substantially as set forth.

13. In combination, in a furnace battery, furnace doors, a furnace chimney, a damper mounted therein, a pipe leading from the chimney and discharging into the furnace, a fan mounted therein, a motor adapted to operate said fan, means controlled by a trip device, for swinging said damper and operating said fan, and a trip device adapted to be thrown in the movement of the furnace doors, substantially as set forth.

14. In combination, a series of furnaces provided with a chimney, a damper situated in said chimney, a steam regulator connected to said damper, a pipe leading from the chimney and discharging into a furnace,—a fan mounted in said pipe,—a rotatable rod mounted adjacent to the series of furnace

doors, trip fingers upon said rotatable rod projecting into the path of the furnace doors, a steam cock in a steam-pipe leading to said steam regulator, devices upon said rotatable
5 rod in engagement with said steam cock and adapted to control the same, an electric motor adapted to actuate the fan, provided with a contact device, and mechanism upon said rotatable arm controlling said contact device,
10 substantially as set forth.

15 15. In combination, a series of furnaces provided with a chimney, a damper situated in said chimney, a steam regulator connected to said damper, a cock provided steam pipe
15 leading to said regulator, a pipe leading from the chimney and discharging into a furnace, a fan mounted in said pipe, an electric motor adapted to actuate said fan and provided with a movable contact device, a rotatable
20 rod mounted adjacent to the series of furnace doors, engaged with the cock of the steam pipe so that its movement operates said cock, and connected to the contact device of the motor so that its movement opens and closes
25 said contact, and trip fingers mounted upon said rod, and extending in front of the furnace doors, substantially as set forth.

16. In combination, a series of furnaces provided with a chimney, a damper situated in said chimney, a steam regulator connected
30 to said damper, a steam pipe leading to said damper and provided with a cock having a toothed head, a pipe leading from the chimney and discharging into a furnace, a fan mounted in said pipe, an electric motor
35 adapted to actuate said fan and provided with a movable contact device, a rotatable rod mounted adjacent to the series of furnace doors, connected to the contact device so that its movement opens and closes said contact,
40 a toothed segment mounted upon said rod, engaged with the head of the steam cock, and trip fingers mounted upon said rod and extending in front of the furnace doors, substantially as set forth.
45

In testimony that I claim the foregoing as my invention I hereunto sign my name this 18th day of May, 1889.

GEFFROY P. DENIS.

In presence of—

WM. C. STRAWBRIDGE,
F. NORMAN DIXON.