

**No. 631,528.**

**Patented Aug. 22, 1899.**

**J. MILTON.**  
**STEAM BOILER FURNACE.**

(Application filed Apr. 14, 1899.)

(No Model.)

**3 Sheets—Sheet 1.**

*Fig. 1.*

Witnesses  
C. H. W. Green  
at the Signing

Inventor  
John Milton  
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3 Sheets—Sheet 2.

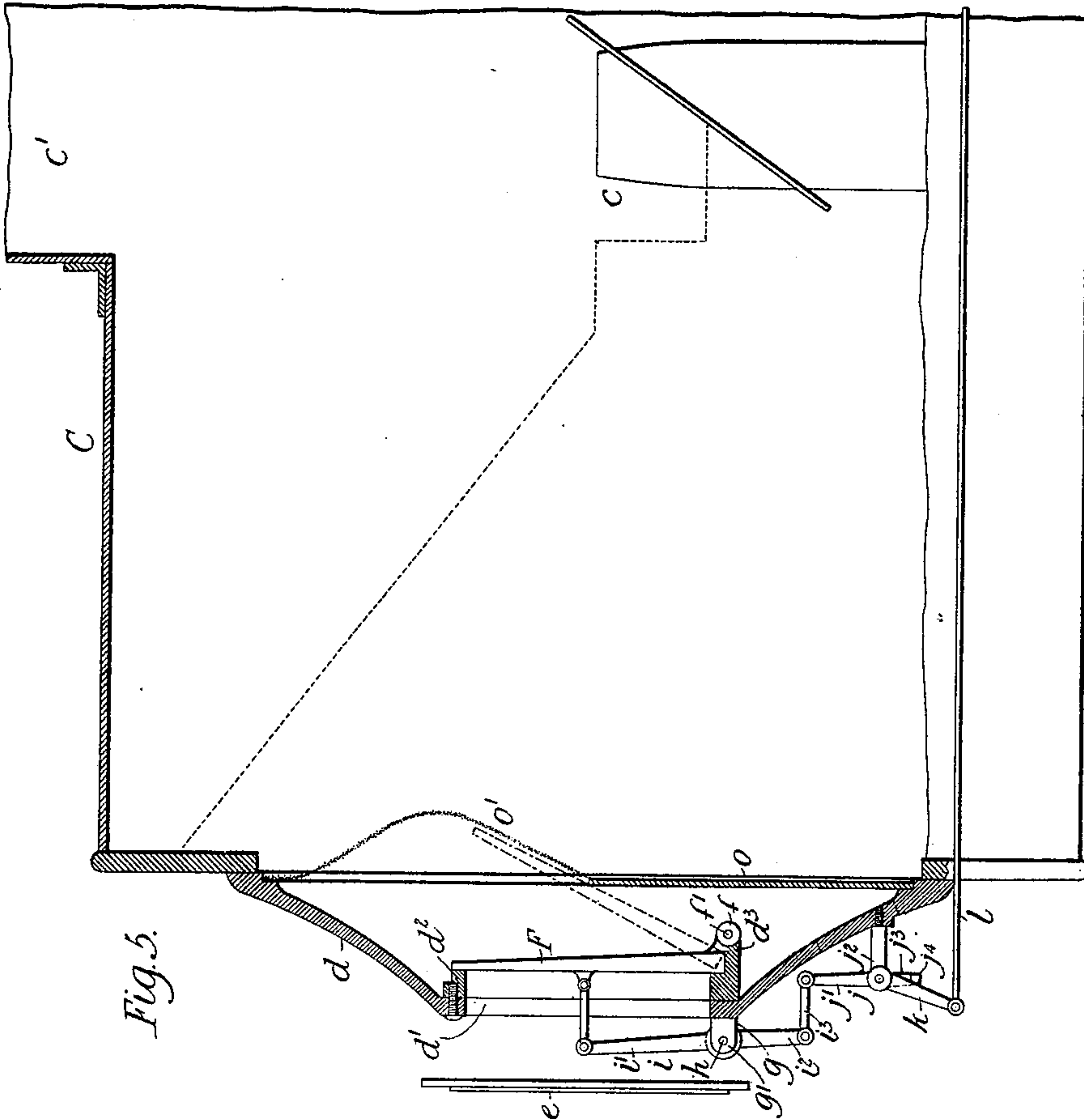


Fig. 5.

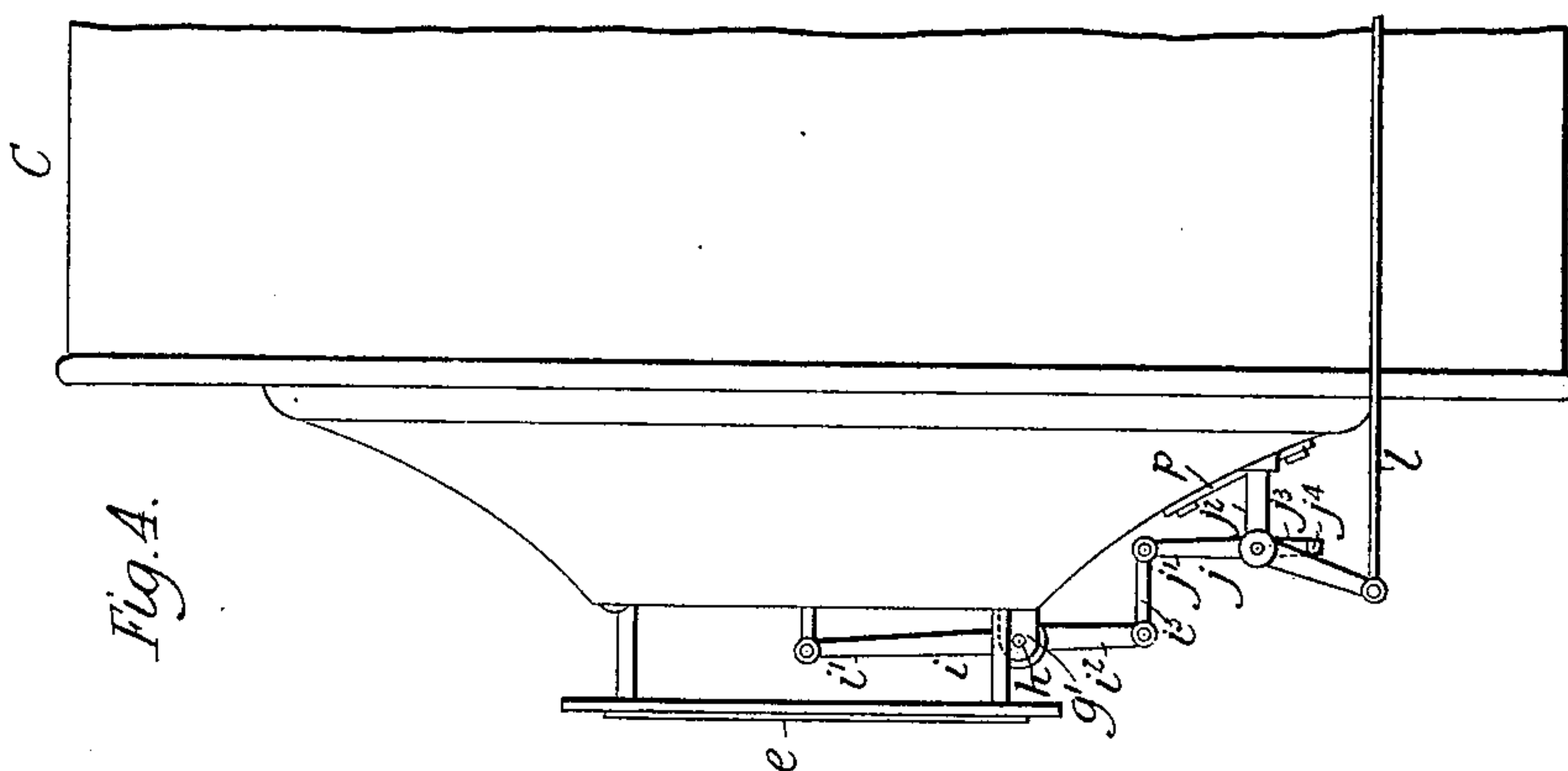


Fig. 4.

Witnesses  
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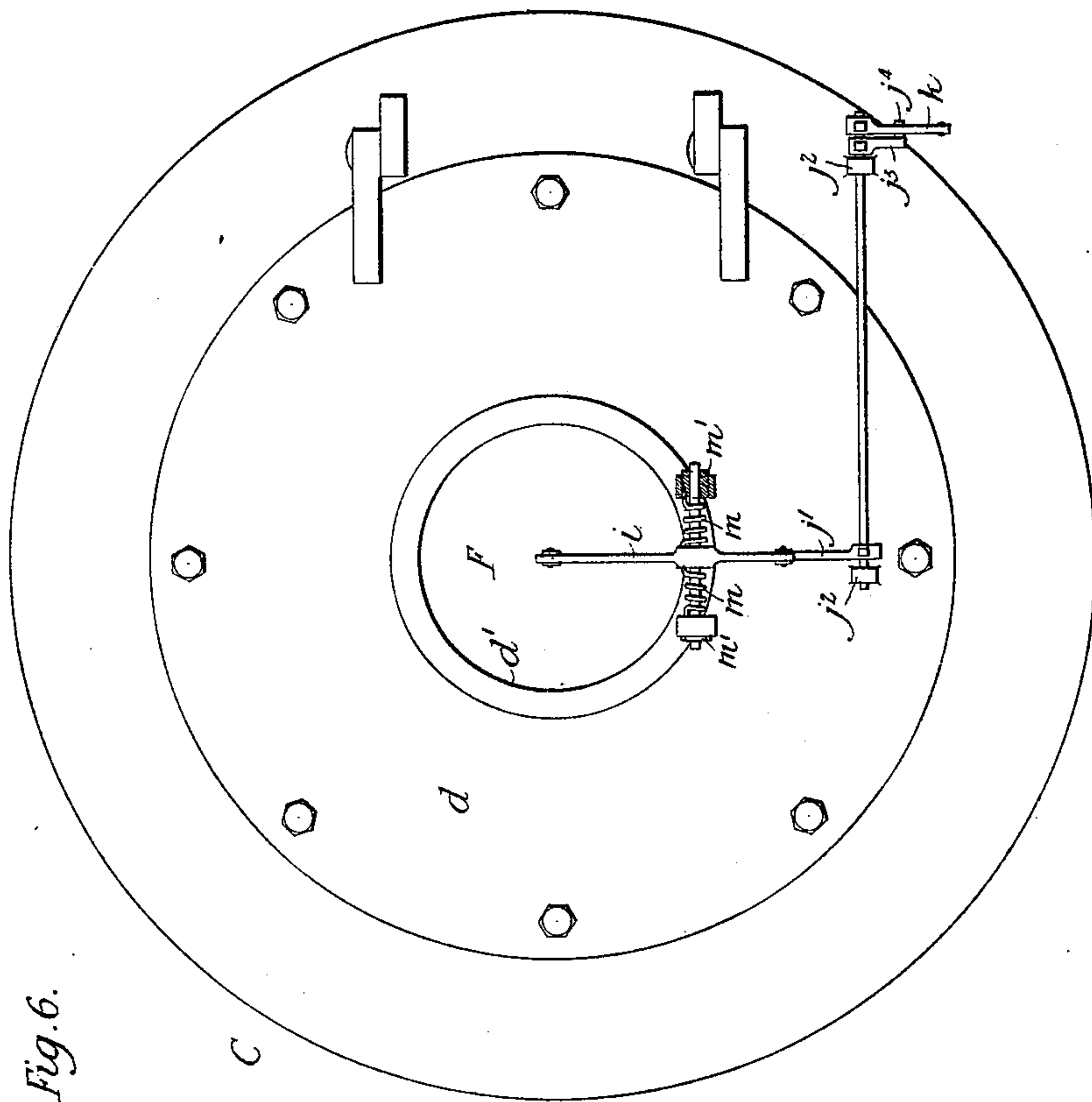


Fig. 6.

Witnesses  
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Inventor  
*John Milton*  
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his Attorneys.



# UNITED STATES PATENT OFFICE.

JOHN MILTON, OF WASHINGTON, DISTRICT OF COLUMBIA, ASSIGNOR TO  
THE AMERICAN LOCOMOTIVE APPLIANCE COMPANY, OF VIRGINIA.

## STEAM-BOILER FURNACE.

SPECIFICATION forming part of Letters Patent No. 631,528, dated August 22, 1899.

Application filed April 14, 1899. Serial No. 712,994. (No model.)

*To all whom it may concern:*

Be it known that I, JOHN MILTON, a citizen of the United States, residing at Washington, in the District of Columbia, have invented  
5 certain new and useful Improvements in Steam-Boiler Furnaces; and I 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  
10 to make and use the same, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

This invention relates to steam-boiler furnaces and is directed to improvements in the exhaust-regulating attachment, for which Letters Patent No. 590,846 were granted to me on or about the 28th day of September, 1897.

My present invention, which is more particularly concerned with furnaces of locomotive-engines, contemplates the provision of an inlet adjacent to the stack, through which air in controllable quantity is admitted for  
25 the counteraction of the influence of the air-blast occasioned by opening the furnace-door, and also for overcoming the effects of excessive exhaust produced while the engine is being started or is moving slowly up a heavy  
30 grade or when the driving-wheels slip in rotation, in all of which cases the exhaust is from a wide-open valve and with practically full boiler-pressure. The effects of the exhaust under the cited conditions are to tear the fire  
35 and disintegrate the fuel to such an extent as to produce by the forcible intermittent draft thus created emissions of sparks and cinders which, aside from the danger and discomfort attending their formation, accomplish by their  
40 exclusion from the furnace a very material loss of heat and consequently power. These enumerated difficulties are practically overcome by the construction set forth in my above-referred-to patent, the invention which  
45 forms the subject-matter thereof consisting, broadly considered, of a valved air-inlet adjacent to the stack, means for automatically controlling the inlet coincidently with the manipulation of the stoking-door, and a valve  
50 carried by and normally closing an opening in the aforesaid valve, adapted to be actuated

by external air-pressure. This valve, which is described as being carried by the inlet-valve, operates more or less successfully to admit air to counteract the injurious effects  
55 of the excessive exhaust produced under the extraordinary conditions named, but owing to certain prerequisites as to the volume of air necessary to be admitted I have found that as an essential to the accomplishment of  
60 the most desirable results this air-opening must be of comparatively large area, and inasmuch as its location in the inlet-valve would necessitate enlargement of the latter to an extent disproportionate to its surroundings  
65 it is my purpose to so modify the construction and arrangement of parts as to enable the inlet-valve to perform the double function of admitting air to counteract the effect of  
70 the exhaust and to overcome the influence of the ingress of air through the open furnace-door. The mechanism by which this highly-desirable result is accomplished is set forth in detail in the following description, which  
75 is to be read in connection with the accompanying drawings.

In the drawings, Figure 1 is a side elevation, partly in section, of a locomotive-engine embodying my invention. Fig. 2 is a rear end elevation. Fig. 3 is a fragmentary top  
80 view. Figs. 4 and 5 are respectively enlarged detail side and central sectional views of the door of the smoke-box, showing the air-inlet, valve, and valve-operating means. Fig. 6  
85 is an enlarged view in elevation of the front of the smoke-box with the number-plate removed.

Referring to the said drawings by letter, A denotes the fire-box of a locomotive-engine. B is the boiler, and C the smoke-box or extension-front, these parts being of the usual  
90 construction and needing no description, except that the fire-box has the usual door *a*, and that in the smoke-box or front are the exhaust-pipe *c* and the smoke-stack *c'*, into  
95 which the exhaust-pipe discharges.

The door *d* of the smoke-box or front is of special construction, being formed with an unusual camber or outward bend, and provided centrally with an opening *d'*, over which  
100 is the usual number-plate *e*. This opening constitutes the inlet for the air, and the plate



2 *e* is located a sufficient distance therefrom to  
 allow of the admission of air in proper quan-  
 tity. On the inner side of the door, around  
 the opening *d'*, is secured a ring *d*<sup>2</sup>, the inner  
 5 face of which forms a seat for the valve *F*,  
 said valve being pivoted at its lower side to  
 open inwardly. Any suitable pivotal con-  
 nection for the valve may be provided; but  
 I prefer the construction shown, which con-  
 10 sists of ears *d*<sup>3</sup> and *f*, formed, respectively, on  
 the ring and valve, and a pintle *F'*, passed  
 through said ears. The valve is made to rest  
 closely against its seat when in closed posi-  
 15 tion to render the smoke-box at this point  
 approximately air-tight under normal condi-  
 tions. On the outer side of the door, adja-  
 cent to the lower side of the opening, is se-  
 cured a bracket *g*, having ears *g'*, which sup-  
 port a rod *h*. Pivoted on this rod is a lever  
 20 *i*, the upper arm *i'* of which has link con-  
 nection with the valve, while its lower arm *i*<sup>2</sup> is  
 connected by a rod *i*<sup>3</sup> with the upper arm *j'*  
 of a second lever *j*, pivoted to a post *j*<sup>2</sup>, se-  
 cured to and extending outwardly from the  
 25 door *d*. The lower end *j*<sup>3</sup> of the lever *j* is free  
 and is provided with a lateral projection *j*<sup>4</sup>.  
 Pivoted on the post *j*<sup>2</sup>, immediately to one  
 side of the lever *j*, is an arm *k*, which in one  
 direction abuts against the projection *j*<sup>4</sup>. The  
 30 outer end of this arm *k* is connected by a rod  
*l* with the stoking-door *a*, the movement of  
 which controls, through the connections just  
 described, the movement of the valve *F*, as  
 will presently be more fully explained.  
 35 The normal closed position of the valve is  
 effected by the action of right and left coiled  
 springs *m m*, each of which is connected at  
 one end to the lever *i* and at the other end to  
 an adjusting-nut *m'*, by which the tension of  
 40 the springs may be varied. The valve is thus  
 opened against the action of springs, the  
 tension of which may be so delicately adjust-  
 ed as to render the valve exceedingly sensi-  
 45 tive to the action of the exhaust, which oper-  
 ates through the external air pressure or im-  
 pact to move the valve inwardly to uncover  
 the opening and admit the proper quantity  
 of air to neutralize the tendencies of the ex-  
 50 haust when, as before stated, the engine is  
 being started or is moving slowly up a heavy  
 grade or when the driving-wheels slip in ro-  
 tation. The operation of the valve under the  
 action of the exhaust is thus entirely auto-  
 55 matic, and the quantity of air admitted past  
 the valve is governed entirely by the force of  
 the exhaust under the extraordinary condi-  
 tions stated. This excessive exhaust is only  
 temporarily occasioned, and the automatic  
 60 operation of the valve, and consequently the  
 admission of the air to counteract the inju-  
 rious effects which would otherwise be pro-  
 duced, depends entirely upon this increased  
 strength or power of the exhaust. It may be  
 here stated that should there be an improper  
 65 adjustment of the engine-valves, and conse-  
 quently a relative variation in the successive  
 exhausts from the cylinder, the air-valve

may be employed to indicate by its irregular  
 movements such fault in adjustment and to  
 aid in remedying the defect. 70

The automatic operation of the valve under  
 the action of the exhaust is entirely distinct  
 from the operation of the valve to control  
 the inlet coincidently with the manipulation  
 of the stoking-door. In the automatic move- 75  
 ment of the valve to uncover the opening or  
 air-inlet the lever *j* is rocked, and its lower arm  
*j*<sup>3</sup>, which carries the projection, is moved in-  
 dependently of the arm *k*. In operating the  
 valve by the movement of the stoking-door, 80  
 however, the lever *j* is, by the engagement of  
 the arm *k* with the projection *j*<sup>4</sup>, rocked with  
 said arm, and through the described connec-  
 tion with the valve the latter is opened  
 against the action of the springs *m*, admit- 85  
 ting air in proportion to the volume of air  
 entering the stoking-opening. The connec-  
 tion between the rod *l* and the door *a* may  
 be substantially that shown in my patent  
 above referred to, the pintle *a'* of the door- 90  
 hinge carrying an arm *n*, which is connected  
 by a rod *n'* to one of the arms of a bell-crank  
 lever *n*<sup>2</sup>, the other arm having direct connec-  
 tion with rod *l*.

The door *d* of the smoke-box carries a par- 95  
 tition *o*, extending from the base to a point  
 about centrally of the valve *F*. This parti-  
 tion is employed to keep the valve free from  
 cinders, and also to deflect the air entering  
 the inlet toward the stack and away from 100  
 the accumulation of cinders in the smoke-  
 box. Above the partition is a screen *o'*,  
 which serves, with the partition, to keep the  
 interior of the door free from cinders. Any  
 fine cinder which finds its way into the door 105  
 may be removed through a hand-hole, shown  
 as closed by a cover *p*.

My invention in its broadest sense consists  
 in the provision of an air-inlet adjacent to  
 the stack of a steam-boiler furnace having an 110  
 exhaust-draft, a valve at said inlet operated  
 automatically under the action of excessive  
 exhaust to admit air for the counteraction of  
 the tendencies of such excessive exhaust, and  
 means independent of the exhaust for oper- 115  
 ating said valve coincidently with the manipu-  
 lation of the stoking-door to admit air through  
 the inlet for the counteraction of the effect of  
 the air-blast in the opening of the door during  
 stoking and manipulation of the fire. This 120  
 air-inlet and the valve therefore may be lo-  
 cated at any desired point which is in suffi-  
 ciently close proximity to the stack and ex-  
 haust to secure the desired results; but for  
 economy of construction and facility of in- 125  
 stallation I prefer that the opening, the valve,  
 and the valve-operating means be applied to  
 the door of the smoke-box, as shown, whereby  
 not only can the invention be readily attached  
 to existing furnaces, but in the case of loco- 130  
 motive-engines, where access to the smoke-  
 box must frequently be had, the device being  
 carried by the door affords no obstruction to  
 such access when the latter is opened.



My invention, while applicable to steam-boiler furnaces of the character above named, is more especially designed for use in connection with locomotive-boiler furnaces, the same, in addition to regulating the draft and relieving the exhaust under the conditions stated, operating to prevent the formation of sparks and cinders, and thereby to avoid the danger of firing adjacent property and insure comfort to the occupants of the train. In addition by the use of my improved appliance not only is there a great saving of fuel, but also in the time and labor incident to the manipulation of the fire, as the bed of fuel is not subjected to the tearing and disintegrating action of sudden strong drafts through the grate induced by the excessive exhausts.

I claim as my invention—

1. In a steam-boiler furnace of the character described, an air-inlet adjacent to the furnace-stack and exhaust-outlet, a self-closing valve at said inlet openable under the action of excessive exhausts, and means independent of the action of the exhaust for opening said valve coincidently with the manipulation of the stoking-door.

2. In a steam-boiler furnace of the character described, an air-inlet adjacent to the furnace-stack and exhaust-outlet, a spring-controlled valve at said inlet openable under the action of excessive exhaust, and means independent of the action of the exhaust for opening said valve coincidently with the manipulation of the stoking-door.

3. In a steam-boiler furnace of the character described, a chamber between the boiler-flues and stack, a door closing said chamber having an opening providing an air-inlet, a spring-controlled valve at said opening carried by the door and openable under the action of excessive exhausts, and means independent of the action of the exhaust for open-

ing said valve coincidently with the manipulation of the stoking-door.

4. In a steam-boiler furnace of the character described, a chamber between the boiler-flues and stack, a door closing said chamber having an opening providing an air-inlet, a spring-controlled valve hinged to the door and controlling said inlet and openable under the action of excessive exhausts, and means located without the chamber operating independently of the action of the exhaust to open the valve coincidently with the manipulation of the stoking-door.

5. In a steam-boiler furnace of the character described, a chamber between the boiler-flues and stack, a door closing said chamber having an opening providing an air-inlet, a valve for said inlet hinged to the door and openable against the action of a spring by excessive exhausts, a lever operatively connected with the door and provided with a projection, and an arm operatively connected with the stoking-door and adapted when moved in one direction coincidently with the movement of the latter to engage the projection on the lever and open the valve.

6. In a steam-boiler furnace of the character described, a chamber between the boiler-flues and stack, a door closing said chamber having an outer wall provided with an opening affording an inlet for air, and an inner wall perforated in its upper portion, a spring-controlled valve hinged to the front wall and normally closing said opening, said valve being openable under the action of excessive exhausts.

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

JOHN MILTON.

Witnesses:

F. L. BROWNE,  
ARTHUR BROWNING.