

(No Model.)

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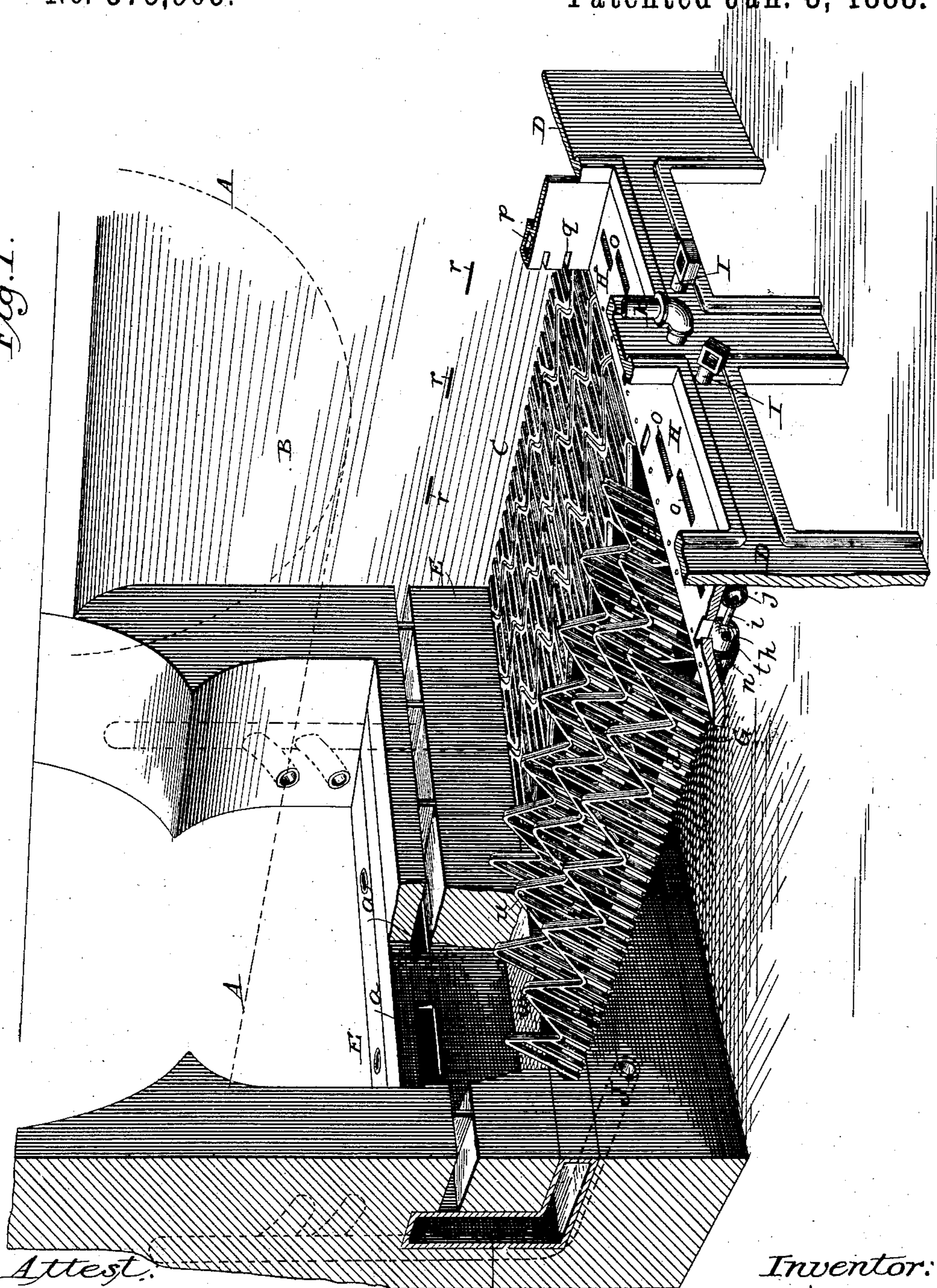
R. WHELAN.

STEAM BOILER FURNACE.

No. 375,905.

Patented Jan. 3, 1888.

Fig. 7.



Attest.

Sidney P. Hogginsworth
Master J. Dodge.

Inventor:

Robert Whelan,
by Dodget Son,
his Attys.

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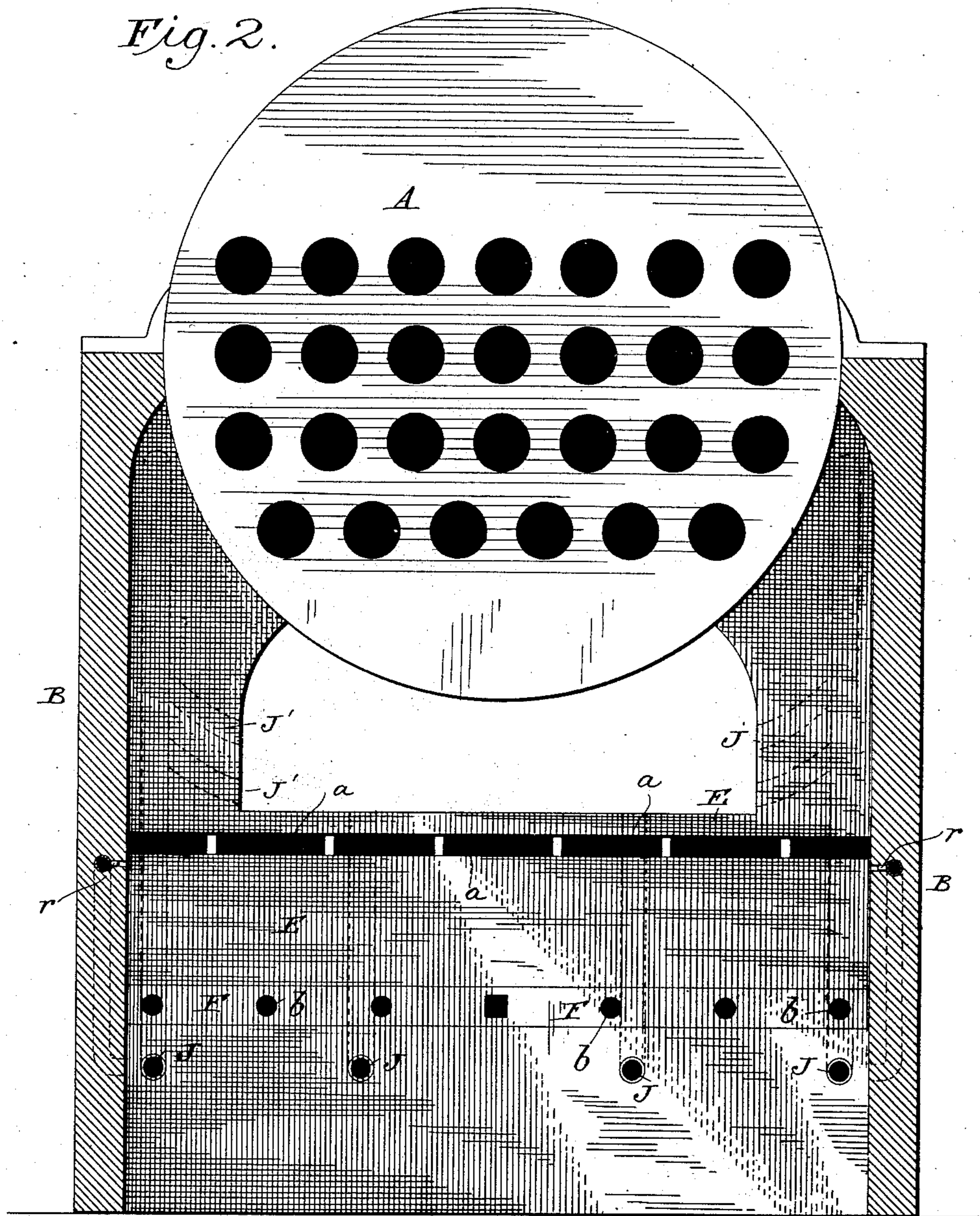
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R. WHELAN.
STEAM BOILER FURNACE.

No. 375,905.

Patented Jan. 3, 1888.

Fig. 2.



Attest:
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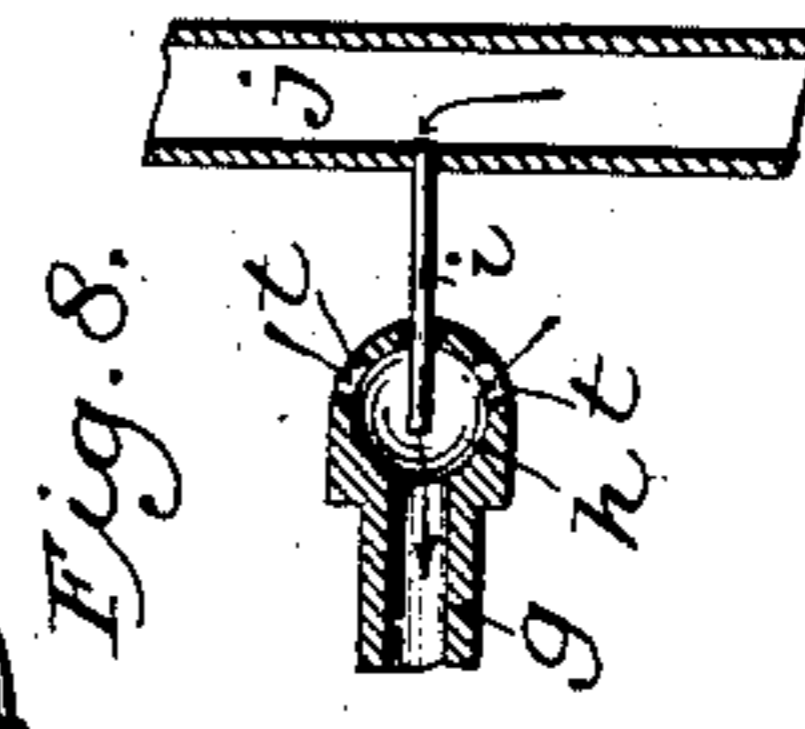
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3 Sheets—Sheet 3.

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STEAM BOILER FURNACE.

No. 375,905.

Patented Jan. 3, 1888.



UNITED STATES PATENT OFFICE.

ROBERT WHELAN, OF CHICAGO, ILLINOIS, ASSIGNOR OF ONE-HALF TO
ROBERT A. WHELAN, OF SAME PLACE.

STEAM-BOILER FURNACE.

SPECIFICATION forming part of Letters Patent No. 375,905, dated January 3, 1888.

Application filed May 3, 1887. Serial No. 236,981. (No model.)

To all whom it may concern:

Be it known that I, ROBERT WHELAN, of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful
5 Improvements in Steam-Boiler Furnaces, of which the following is a specification.

My invention relates to gas-consuming furnaces, and is designed as an improvement upon that for which Letters Patent No. 341,196 were
10 issued to me May 4, 1886.

The invention is designed particularly to be applied to furnaces which have shaking-grates; but I wish it understood that I do not limit myself to a furnace having such a grate, as it
15 is apparent that various features of the invention can be applied whether the grate be a stationary or shaking one.

Briefly stated, the invention consists in a novel means of feeding air and steam to the
20 furnace, whereby the gases are consumed and the draft increased.

In the accompanying drawings, Figure 1 is a perspective view of a portion of my improved furnace with parts broken away to show the interior. Fig. 2 is a front end view, with the grate and furnace-front removed. Fig. 3 is a
25 perspective view of a portion of the grate. Fig. 4 is a longitudinal central sectional view through the grate and bridge-wall. Fig. 5 is a vertical transverse sectional view of one of the grate-bars; and Figs. 6, 7, and 8, views illustrating certain details, hereinafter referred to.

In the drawings, A indicates a boiler; B, the
35 masonry or wall of the furnace supporting the same; C, the grate proper; D, the furnace-front, and E the bridge-wall, said parts being arranged in substantially the same manner as in my former patent hereinbefore referred to.

40 Within the bridge-wall I place a metallic L-shaped box or chamber, F, (shown in Figs. 1 and 4,) said box being provided on its front face with elongated openings *a* in the upright portion, and with cylindrical holes or openings *b* in the front face of the horizontal portion.
45

As shown in Figs. 1 and 4, the openings *a* are continued outward through the bridge-wall, so as to deliver the air or steam outward
50 toward the front of the furnace directly over

and upon the mass of fuel upon the grate, while the circular openings *b* are adapted to receive the cylindrical ends *c* of the grate-bars G. These grate-bars are of the form shown in Figs. 1, 3, 4, and 5, and it will be noticed that
55 they are hollow from end to end, so as to form a channel or passage for the steam or air to the chamber in the bridge-wall.

The grate-bars G are each provided with a series of transverse ribs, *d*, and are further provided with a zigzag or irregular edge, as shown in Figs. 1 and 3. The adjacent edges of the bars G are provided with a strip, *u*, which is cast integral with the bars, and connects the ends of the ribs *d*, thereby serving to strengthen
60 the bars. Of course the grate-bars adjacent to the side walls of the furnace have only one of their sides made in this form, so as to prevent the escape of material along the outer edge of the grate. The central passage or
65 chamber, *e*, extending throughout the length of the grate bars, is provided with lateral passages or openings *f*, as shown in Figs. 4 and 5, which openings extend upwardly to about on line with the base of the ribs *d*, and are
70 adapted to discharge heated air or steam directly and among the burning fuel.

At the front end the grate-bars are formed with a cylindrical neck, *g*, and also with a bulb or enlargement, *h*. (Shown in Figs. 1, 3, 4, and 8.) Upon reference to Figs. 1, 3, 4, and 8,
80 it will be noticed that this bulb or enlargement is perforated to receive in its end a small pipe, *i*, which latter is in turn connected with a larger pipe, *j*, which extends across the furnace-front beneath the dead-plate. In the bulb or enlargement *h* are formed openings or perforations *t*, which, when steam is discharged through the nozzle *i*, permit air to enter said bulb and be discharged with the steam into
85 the grate-bar.

Steam or heated air is supplied to pipe *j* from a pipe, *k*, (shown in Figs. 1 and 4,) said pipe projecting through the furnace-front and conveying steam or air from any suitable
90 source to the pipe *j*, as shown. Of course the pipe *k* will be provided with suitable valves, as in my former patent; but as they form no part of my invention they are not shown herein.
100

Each of the grate-bars is provided with a depending lug, *l*, and one half of the grate-bars have their lugs connected by a bar, *m*, and the other half have their lugs connected by a similar bar, so that each half of the grate may be shaken as desired.

H indicates the dead-plate, which is secured in position in any suitable manner, said plate being provided on its under side with semi-circular collars *n*, which encircle the tubular neck *g* of the grate-bars and form bearings or supports for said bars. Near the middle of the dead-plate there are two of these collars or bearings *n*, in which is journaled a shaker-rod, *I*, as shown in Fig. 3, the inner end of said rod being connected to one end of bar or rod *m*, while its other end projects outward through the furnace-front and is adapted to receive a shaker or wrench, as shown in Figs. 1 and 3. From this construction of the grate it will be seen that either half of the grate may be shaken independently of the other half, and this, too, without in any manner affecting the conveying of steam or air to the bridge-wall. The middle grate-bar will, by preference, be made stationary; but this is not essential. The number of bars in the grate may be varied as desired, and the number of grate-bars to be operated by each shaker-rod *I* is also a matter capable of variation.

The dead-plate H is provided with a series of slots or perforations, *o*, immediately in front of the furnace-doors, as shown in Fig. 1, and to each side of the door are similar perforations, upon and over which the lining shown in Fig. 6 sets. The liner may be made of iron, fire-clay, or hollow tiling, and is formed with a longitudinal chamber or passage, *p*, and with a series of lateral openings, *q*. When in position, the passage or chamber *p* rests directly over one of the openings in the dead-plate, and consequently the air from beneath the grate may pass upward, through the dead-plate and through the liner and be discharged through the lateral openings *q* at the front edge of the grate proper.

Upon reference to Fig. 7, it will be seen that the curved or arched liner is likewise provided with a series of lateral openings, *q*, through which air is discharged the same as from the upright side liners.

Projecting through the side walls of the furnace, as shown in Figs. 1 and 2, are small jets or nozzles, *r*, which are adapted to discharge heated air upon the burning fuel, and projecting through the front of the furnace are three (more or less) similar jets. (Not shown.) If it be desired to discharge steam through these jets or nozzles, they will be connected with the pipe *j*; but if it be desired to discharge heated air upon the burning fuel they will get the air either from the space between the brick-work, on which the boiler is set, or by means of ports opening into the ash-pit below the grate.

In the bridge-wall are a series of upright

pipes, *J*, which, as shown in Figs. 1, 2, and 4, are bent toward the front of the furnace at their lower ends and open into the ash-pit, the upper ends of said pipes being also left open and project up to the top of the bridge-wall.

Upon reference to Figs. 1 and 2, it will be seen that the pipes *J* closest to each side wall of the furnace are extended upward through the masonry and provided with lateral branches *J'*, which are adapted to discharge heated air horizontally across the top of the bridge-wall. If desired, all the pipes may be connected either with a steam or air supply; or, as is preferred, part of them will be connected with a steam-supply pipe, and the remainder will be adapted to discharge heated air.

From the above description it will be seen that the drumming noise ordinarily present in smoke and gas consuming furnaces, due to the introduction of cold air or steam into the furnace, is by my construction entirely obviated, the principal reason being that the air that is discharged among the products of combustion is taken from the interior of the furnace, and is consequently warm.

It is obvious that various features of my invention may, with very slight change in their form or arrangement, be adapted for use in locomotives.

Having thus described my invention, what I claim is—

1. The combination, with a fire pot or chamber, of a bridge-wall at the rear end thereof, upright pipes *J*, provided with lateral branches *J'*, adapted to discharge heated air across the top of the bridge-wall, said pipes *J* opening at their lower ends into the ash-pit, all substantially as shown.

2. In a furnace, the combination, with a bridge-wall, of box or chamber *F*, located therein and provided with discharge-openings *a* in its front face, a series of rocking hollow grate-bars journaled at their rear ends in the box or chamber *F*, and a steam-supply pipe adapted to supply steam to said bars at their forward ends.

3. In a furnace, the combination, with front *D*, dead-plate *H*, and a bridge-wall, of a hollow box, *F*, mounted within the bridge-wall and provided with discharge-openings *a* in its front wall, a series of rocking hollow grate-bars, *G*, provided at opposite ends with cylindrical journals, and a steam supply pipe, *j*, adapted and arranged, substantially as shown, to discharge steam into the hollow bars *G*, as and for the purpose set forth.

4. In a furnace, a grate composed of a series of bars, *G*, made zigzag on their adjacent edges and provided on their upper faces with ribs *d*, and a strip, *u*, forming the zigzag edge of each bar and connecting the ribs *d* thereof.

5. In a boiler-furnace, a grate comprising a series of bars, *G*, each ribbed on its upper face and made solid on its lower face, and having a longitudinal passage, *e*, and lateral openings *f*,

communicating with passage *e*, substantially as shown, whereby the bars are adapted to receive and discharge steam or air, or both, into and among the fuel thereon at the base of the ribs.

5 6. In combination with the bridge-wall and the hollow chamber F therein, the hollow grate-bars G, provided with a bulb or enlargement, *h*, and a steam-supply pipe, *j*, provided with a nozzle, *i*, projecting into the bulb or enlargement *h*, substantially as and for the purpose set forth.

7. In combination with the bridge-wall, the hollow box F, dead-plate H, and steam-supply pipe *j*, having a nozzle, *i*, the hollow grate-bar G, provided with bulb or enlargement *h*, and openings *t*, formed in said bulb or enlargement, substantially as shown, and for the purpose set forth.

20 8. In combination with the bridge-wall of a furnace and a box or chamber, F, therein, a dead-plate secured rigidly in position at the front of the furnace, the hollow grate-bars G, provided with cylindrical journals *c* and *g*, the former inserted into the hollow box F, and
25 semicircular collars *n*, encircling the journals *g*, and bolted or otherwise secured to the under side of the dead-plate.

9. In a boiler-furnace, the combination, with
30 a bridge-wall having a hollow chamber, F,

therein, of a series of hollow grate-bars journaled at one end in said hollow box or chamber, and carried at their other ends by the dead-plate and adapted to be rocked or tipped, and a stationary steam-supply pipe connected with
35 and adapted to discharge steam into the interior of the hollow bars, substantially as shown.

10. In a furnace, the combination, with the dead-plate and the rocking grate-bars provided with a depending lug, *l*, of a bar, *m*, connecting the lugs *l* with one another, and a shaker bar or rod, *I*, journaled upon the under face of the dead-plate, connected at its inner end with the bar *m*, and projecting at its front end through the furnace-front, as and for the purpose set forth.

11. In a furnace, a grate comprising a series of bars, G, having on their upper faces a series of ribs, *d*, a longitudinal channel or passage, *e*, extending throughout the length of the grate-bars, and a series of lateral openings or passages, *f*, extending from the chamber or passage *e* upward to the base of the ribs *d*.

In witness whereof I hereunto set my hand in the presence of two witnesses.

ROBERT WHELAN.

Witnesses:

EDWARD DENICOURT,
P. J. SCHREINER.