No. 621,459. Patented Mar. 21, 1899.

L. M. MOYES.

FURNACE CONSTRUCTION FOR STEAM BOILERS.

(Application filed Oct. 25, 1897.)

(No Model.) 4 Sheets—Sheet 1.

FIG. 2.

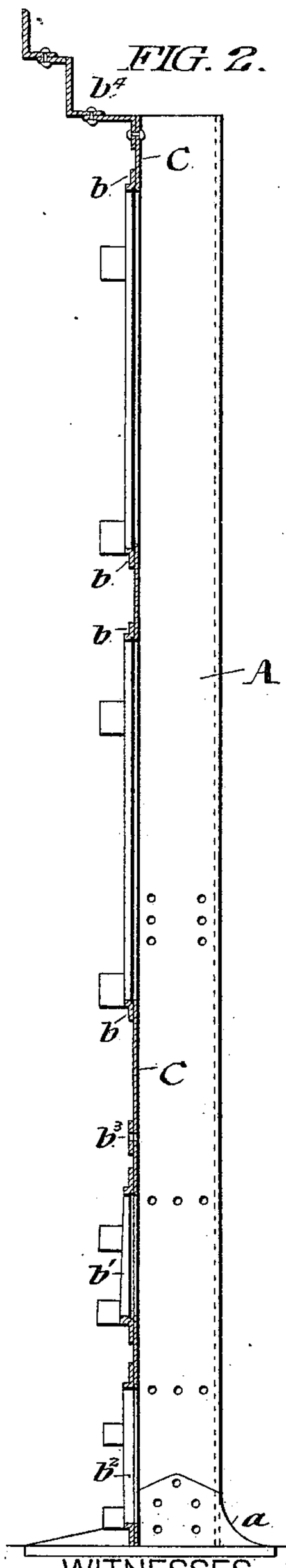

FIG. 1.

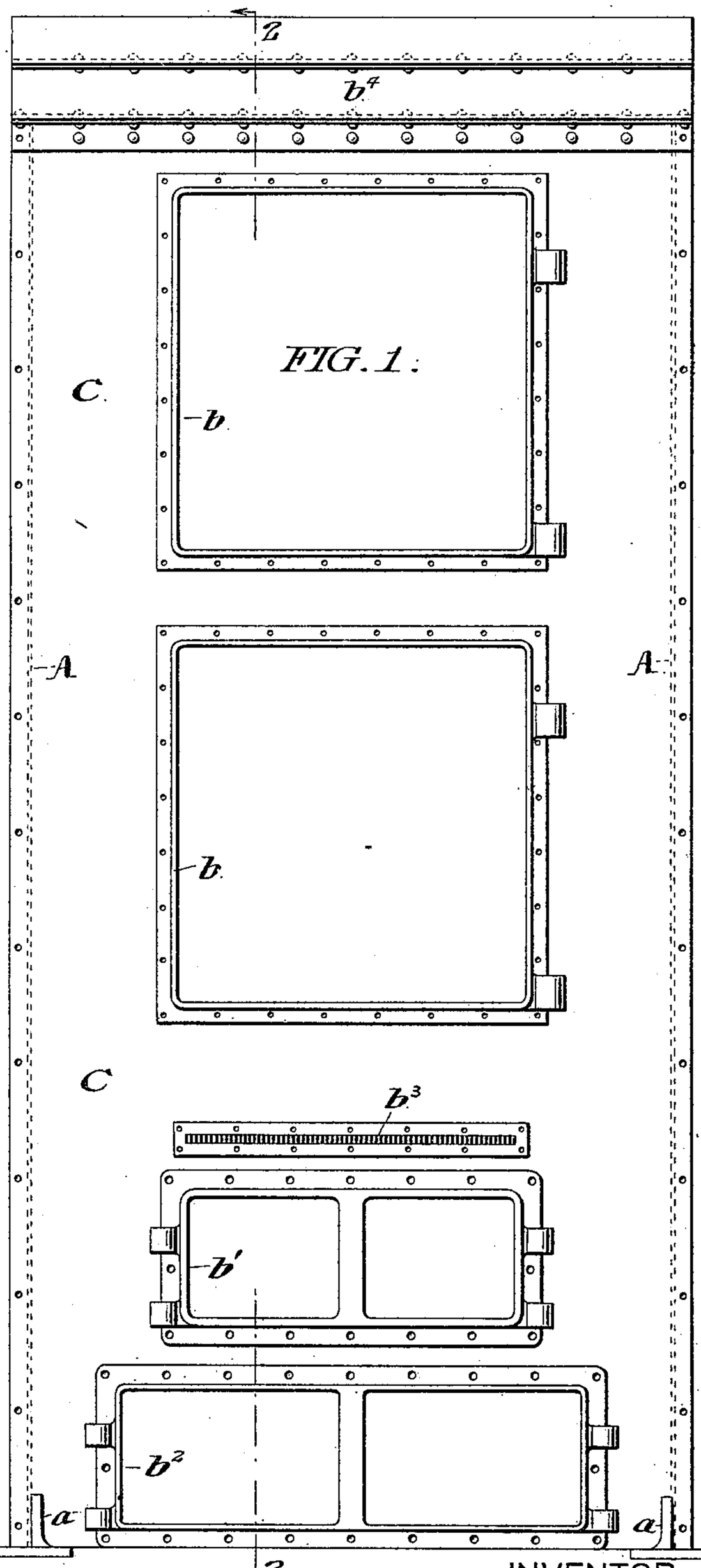

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FIG. 3.

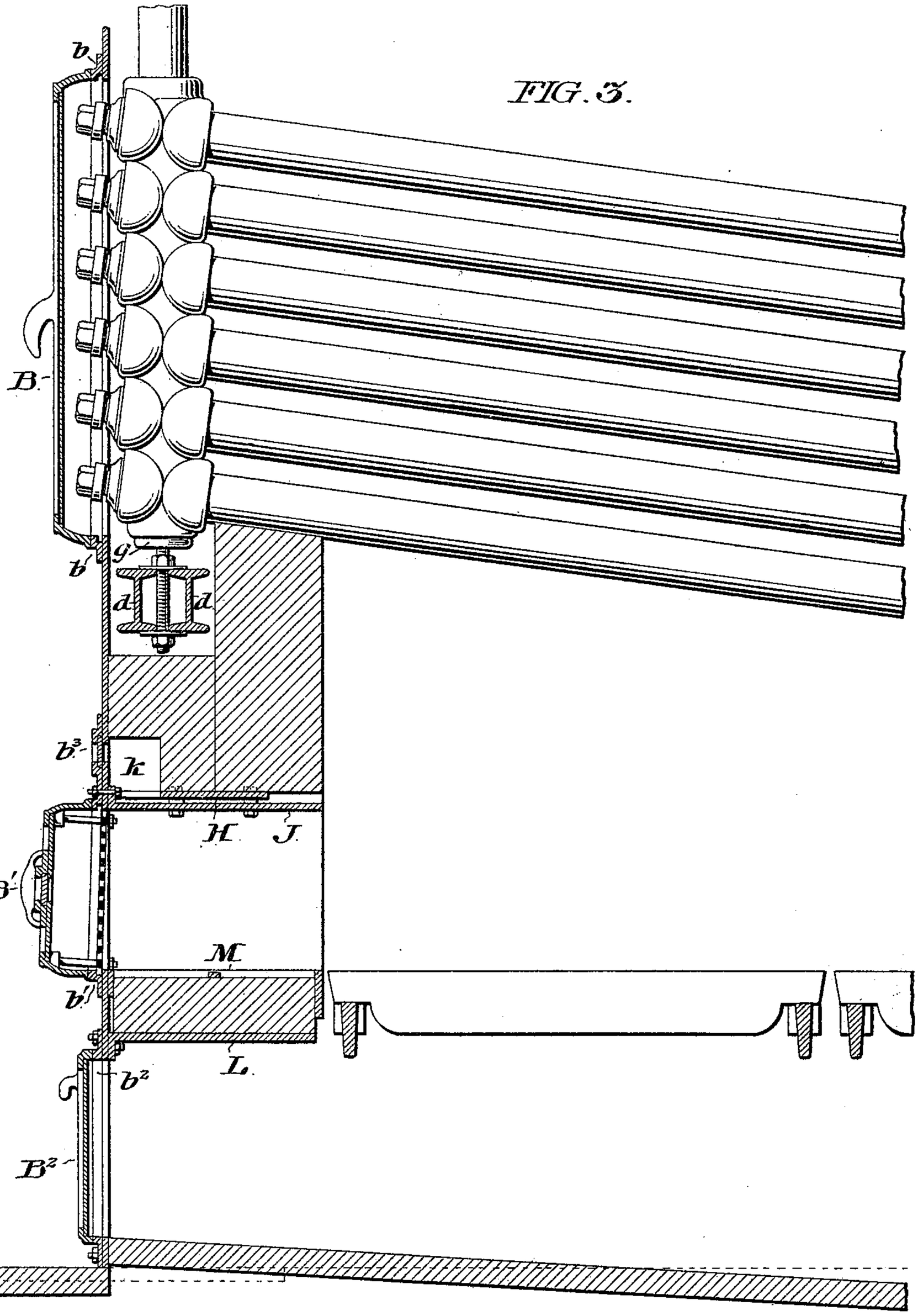

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FIG. 4.

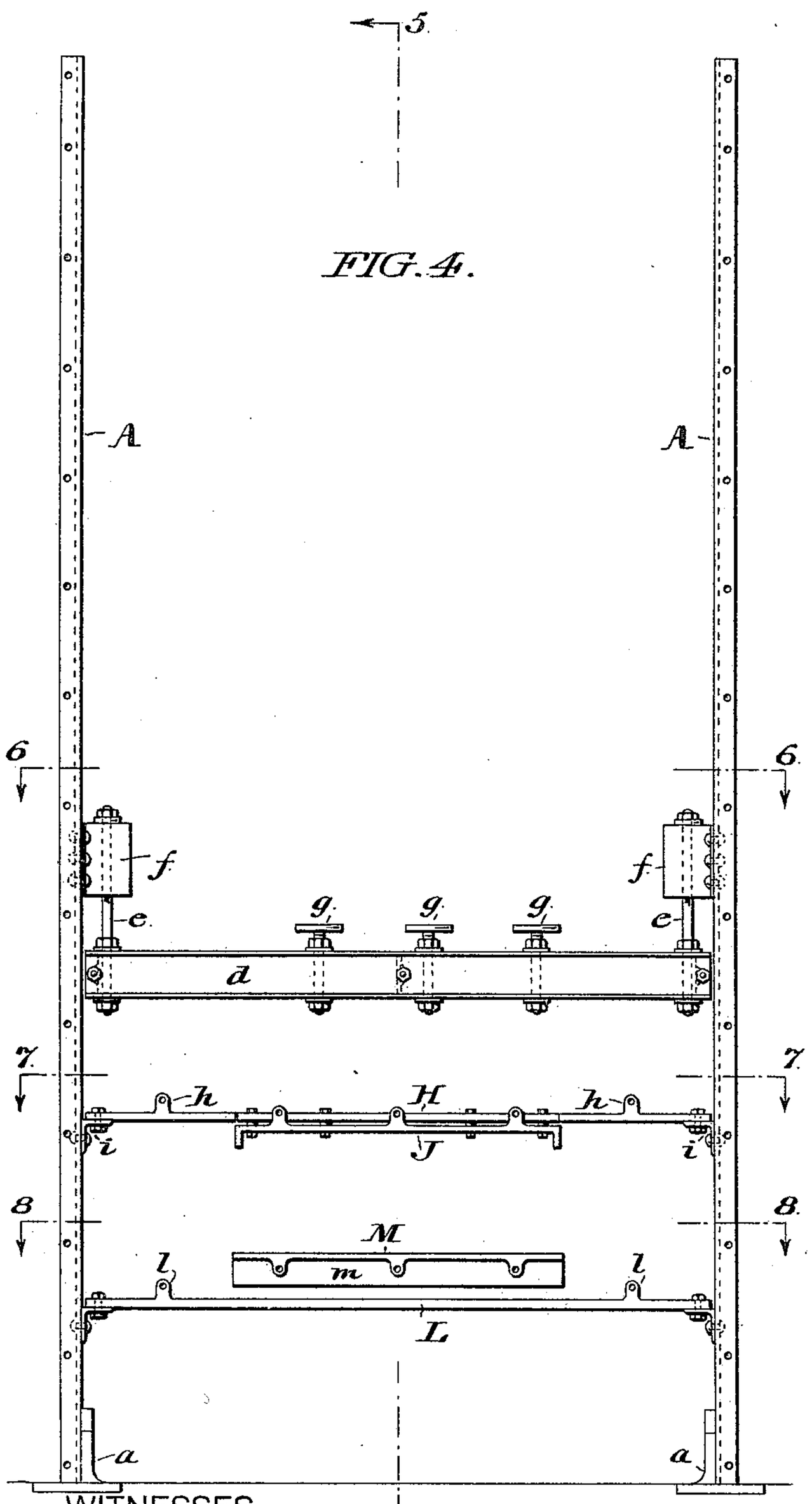
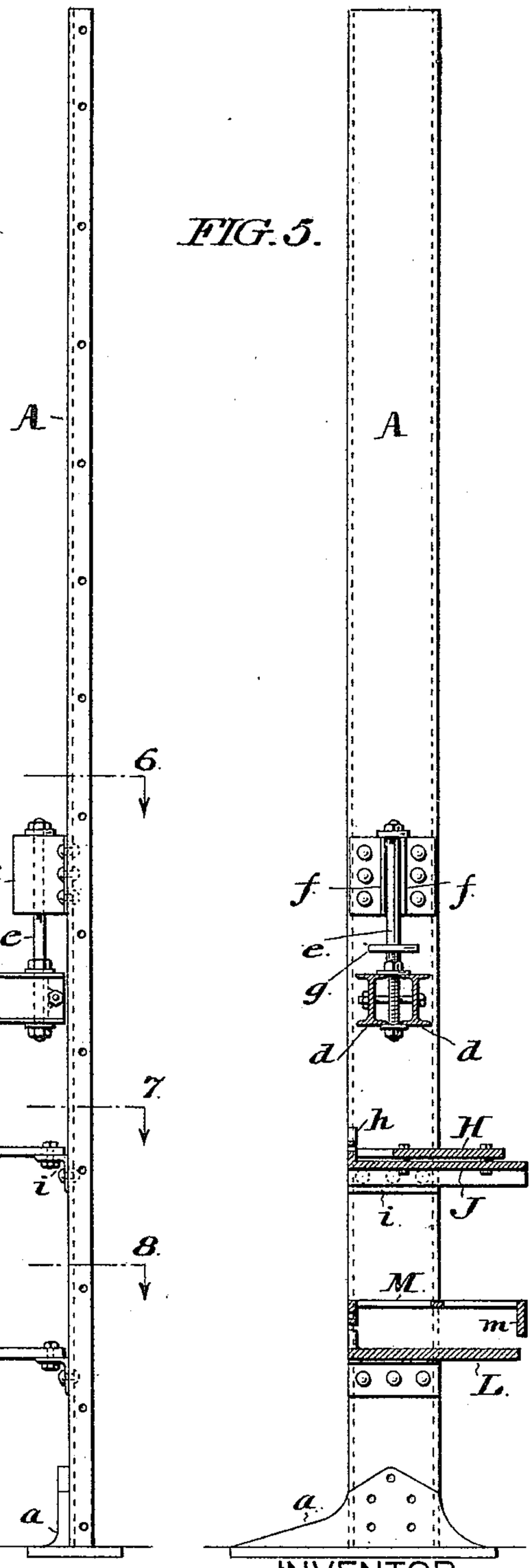


FIG. 5.



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FURNACE CONSTRUCTION FOR STEAM BOILERS.

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(No Model.) 4 Sheets—Sheet 4.

FIG. 6.

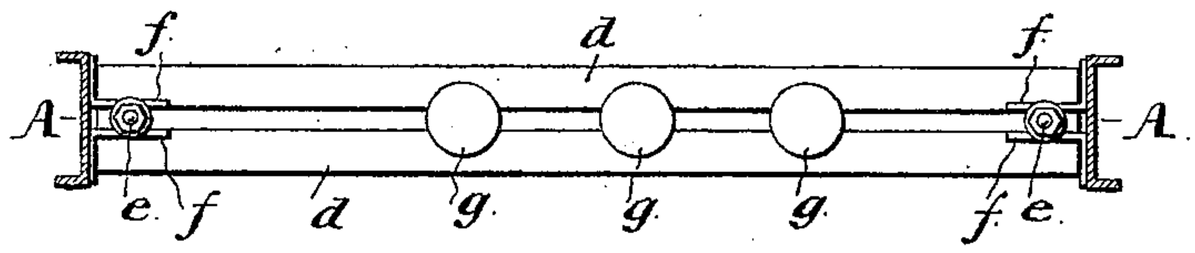


FIG. 7.

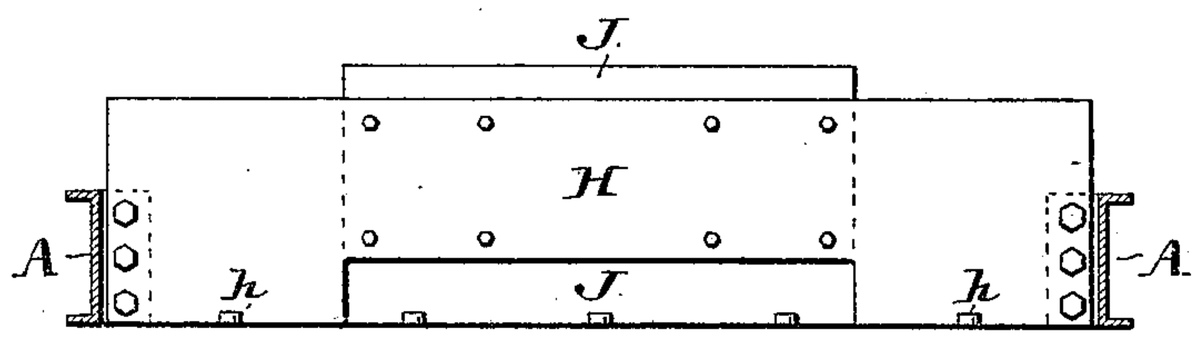
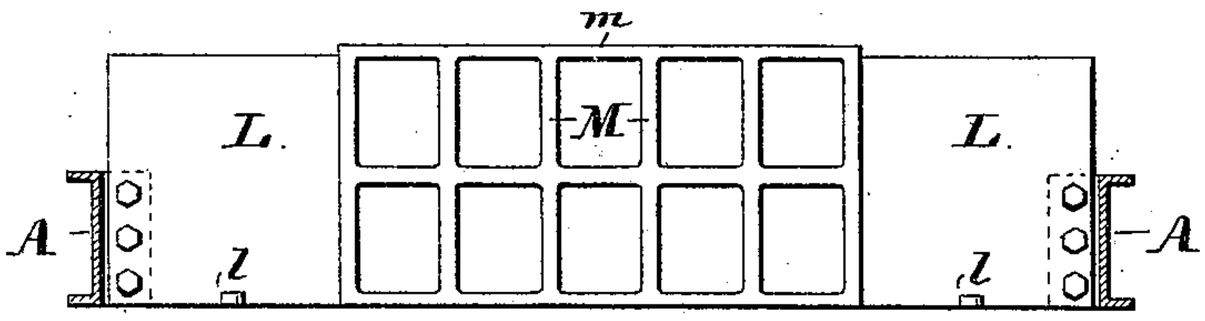


FIG. 8.



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UNITED STATES PATENT OFFICE.

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FURNACE CONSTRUCTION FOR STEAM-BOILERS.

SPECIFICATION forming part of Letters Patent No. 621,459, dated March 21, 1899.

Application filed October 25, 1897. Serial No. 656,267. (No model.)

To all whom it may concern:

Be it known that I, LAURIE M. MOYES, of Philadelphia, in the State of Pennsylvania, have invented certain new and useful Improvements in Furnace Construction for Steam-Boilers, of which the following is a specification, reference being had to the accompanying drawings.

My invention has reference to certain improvements in furnace construction applicable especially to furnaces to be used with boilers of the water-tube type, but also capable of being used in connection with boiler-furnaces generally.

My invention relates to the construction of the front wall of the furnace and certain related parts and includes in its scope improvements by which the front wall may be utilized to support a swinging beam which affords a rest for the boiler capable of yielding to that motion of the boiler which the expansion or contraction of the metal, due to greater or less degree of heat, entails. The method of construction of the front wall further affords a support for an air-register, by which the furnace-arch is kept from overheating. It also affords a support for a dead-plate of novel construction.

In the accompanying drawings, Figure 1 is a front elevation of the metal front of a boiler-furnace constructed according to my invention. Fig. 2 is a vertical sectional view on the line 2 2 of Fig. 1, all of the brick portions of the furnace being omitted. Fig. 3 is a vertical section through the lower portion of the front of a boiler embodying my construction. In this figure the related parts of the furnace and of the boiler are shown in their normal position with reference to the front. Fig. 4 is a front elevation of the metal portions of a furnace-front embodying my invention, the face of the same being removed, so as to reveal the metal portions immediately behind the face. Fig. 5 is a central vertical section of Fig. 4 along the line 5 5. Figs. 6, 7, and 8 are horizontal sections of the parts shown in Fig. 4, taken, respectively, along the lines 6 6, 7 7, 8 8 therein.

My furnace-front is composed mainly of wrought-iron plates and structural iron. In place of the massive castings which are usually employed to form the metal fronts of furnaces of this description I build up a front by riveting plates and angle-irons together. The supporting-structure of my furnace-front consists of two upright iron beams A A, placed one on each side of the front wall of the brickwork of the furnace. These upright beams are supported by suitable foundation-plates *a a*, embedded at the front corners of the furnace. To the front edges of the beams a wrought-iron plate C is bolted or riveted, forming the face of the furnace, as seen in Fig. 1. This plate has suitable apertures in it corresponding to the doors, by means of which access is had to the interior of the furnace. To the edges of these apertures are attached suitable castings to support and form the framework of the door. These doors appear in Fig. 3. In Fig. 1 only the cast-iron frames are shown, *b b* being the frames of the tube-doors B, by which access is had to the upper parts of the boiler-furnace for the purpose of cleaning or removing tubes, *b'* being the frame of the firing-door B', and b^2 being the frame of the doors B^2 of the ash-pit. In addition to these doors there is similarly attached to the wrought-iron face a register or grating b^3, the function of which will be hereinafter explained. At the top of the face a suitable cornice b^4 is formed by riveting angle-irons together, as seen in the sectional view Fig. 2, this cornice serving both to stiffen the front transversely and as a support for certain interior parts of the furnace. In addition to the face the upright beams support three distinct transverse metal structures, which will be described in their order. The first of these is the swinging-support of the boiler-tubes. This consists of a pair of coupled I-beams *d d*, slightly less in length than the distance between the upright beams, between both extremities of which are held the bolts *e e*. These bolts are supported by and depend through a pair of brackets *f f*, riveted to the upright beams. Each bracket consists of two angular pieces, one limb of each projecting out from the channel-iron with their opposing faces parallel but some distance from each other. A washer on the upper end of the bolt *e* bestrides these opposing surfaces, allowing the bolt to depend freely between them, the position of the bolt being such as to allow it to swing or play either

backward or forward or sidewise. A small washer strung on the bolt-head at the other extremity of the bolt carries the transverse I-beams, which have been spoken of. In the drawings I have further shown a series of seats *g g g*, mounted at intervals between these I-beams, upon which rest the ends of some of the manifolds by which the forward ends of the tubes of a water-tube boiler are united. The alternate manifolds being longer may rest directly upon the I-beams themselves. Upon this swinging beam rests the forward end of the entire boiler, whether it be tubular or of any other description. The rear end, which is usually lower than the front, may rest upon a suitable support at the lower back corner of the furnace. Upon this rear end the boiler may rock as upon a pivot, the swinging nature of the forward support allowing for all the expansion in whatever direction which the heating or cooling of the boiler may occasion.

The second transverse structure supported by the upright beams is the support of the firing-door arch. This consists of a transverse metal plate H, which is bolted at either extremity to angle-irons *i i*, which are in turn bolted to the upright beams A A. The front edge of the plate is also bolted by means of the lugs *h h* to the face-plate C. The shape of this plate as seen from above appears in Fig. 7. It will be noted that its central portion is cut away in front for a length corresponding to the width of the register b^3, which has been spoken of. From the central part of this transverse plate there depends a somewhat wider plate J, the length of which corresponds to the register b^3. This depending plate is hung a short distance below the plate H, so as to leave a flat space between the two. The arch over the door of the fire-box is built over the plate H, as is shown in Fig. 3. This plate is a short distance below the air-register b^3, behind which an opening is left in the brickwork of the arch, corresponding in length both to the register and to the cut-away portion of the plate, to which latter it also corresponds in depth. This opening is seen at *k*, Fig. 3, and forms a heating-chamber. The plate H does not itself form the top of the door of the fire-box, this being formed by the plate J. By this arrangement, owing to the space between the plates H and J, a constant stream of outside air passes through the register b^3 into the heating-chamber *k*, whence it passes, still at a temperature far below the interior heat of the furnace, between the plates H and J, thus preventing these plates from becoming so hot as to soften enough to cause them to yield under the weight of the arch which the plate H supports. The support of the arch of the firing-door has been a problem which has largely engaged the attention of furnace contractors, and which my construction solves with great simplicity. The air-inlet through the register b^3 and between the plates J and H not only serves to cool the arch, but is useful as a smoke-consumer.

The third and lowermost transverse structure which the upright beams support is the support for the dead-plate or lower wall of the firing-door. This consists of a transverse plate L, supported between the upright beams similar to plate H and also bolted through the lugs *l l* to the face of the plate C. This plate forms the roof of the opening to the ash-pit. Upon it is laid a course of brick corresponding to the distance between the door of the ash-pit and the door of the fire-box, over which course is laid a series of iron bars running in both directions and forming a grating M with a turned-down inside edge *m*. This grating is bolted to the face-plate C, the whole forming a dead-plate, the advantage of the construction of which lies in the fact that it will not warp as will a dead-plate formed wholly of iron nor will it disintegrate and crumble away under the constant friction of the firing-irons as will a dead-plate formed wholly of brick or clay. The interval between the grating M and the plate L may, if desired, be filled with fire-clay cement, which under the influence of the heat of the furnace will shortly bake itself, forming a very hard and permanent structure.

I am aware that it is not new to swing the forward end of a water-tube boiler upon a transverse support. This has, however, hitherto been accomplished by forming a supporting iron structure reared over the entire boiler, said structure having no other function and not being in any way connected with the face of the boiler, which, as above explained, has been made of suitable castings. Such an arrangement is expensive. It must also be very strong, owing to its height, the weight being supported from the top of the boiler. By my arrangement I am able to get all the advantages of a swinging support without the necessity of so much expenditure for a supporting structure, as the weight of the boiler is not supported from the top of the furnace, but from a height less than half that of the furnace. The upright beams A A do not need to be as massive in comparison with the weight which they support as the standards of such supporting structures as I have just referred to, while at the same time these beams serve the additional function of holding the face-plates of the furnace in position and affording supports for the two other transverse structures which I have described. Furthermore, these two transverse structures themselves serve to stiffen transversely the face-plate C.

By reason of the comparatively low support of the boiler the forward thrust upon the support is minimized, so that the supporting-beams do not need to be embedded in the brickwork, but merely stand alongside of and independent of it.

Having thus described my invention, I claim—

1. In a boiler-furnace, the combination of

two upright beams at the forward end thereof; a cross-beam supported between the upright beams; means for giving to the cross-beam freedom of play between it and its support; and a boiler, the forward end of which rests upon said cross-beam, substantially as described.

2. In a boiler-furnace, the combination of two upright beams; brackets supported by these beams; bolts depending freely from the brackets; a cross-beam supported between the uprights by the bolts; and a boiler, the forward end of which rests upon the cross-beam, substantially as described.

3. In a boiler-furnace, the combination of two upright beams at the front corners thereof; a cross-plate mounted between said upright beams upon which the arch of the firing-door is supported; a second plate a short distance below the supporting-plate, which forms the top wall of the firing-door; and means for allowing constant ingress of air between the two plates, substantially as described.

4. In a boiler-furnace, the combination of two upright beams at the front corners thereof; a cross-plate mounted between said upright beams upon which the arch of the firing-door is supported; a second plate a short distance below the supporting-plate supported thereby, and which forms the top wall of the firing-door; an air-space between the two; an air-chamber formed in the brickwork of the arch immediately in front of said air-space; and a register through which the said chamber opens in front of the furnace, substantially as described.

5. In a boiler-furnace, the combination of two upright beams at the front corners thereof; a cross-plate supported between the same and running over the top of the ash-pit; a course of brickwork or cement supported by said plate; a grating on top of said course of brickwork or cement which forms the dead-plate of the firing-door, substantially as described.

6. In a boiler-furnace, the combination of two upright beams at the forward corners thereof; a transverse support for the forward end of the boiler hung between said uprights; a transverse support for the arch of the firing-door supported between said uprights; and a transverse support for the dead-plate supported between said uprights, substantially as described.

7. In a boiler-furnace, the combination of two upright beams at the forward corners thereof; a transverse support for the forward end of the boiler hung between said uprights; a transverse support for the arch of the firing-door supported between said uprights; a transverse support for the dead-plate supported between said uprights; and a wrought-iron plate forming the face of the furnace supported between said uprights, substantially as described.

8. In a boiler-furnace, a dead-plate formed of a course of brickwork or fire-clay cement covered by an iron grating, substantially as described.

9. In a boiler-furnace, the combination of the coupled **I**-beams *d*, bolts *e*, passing between said coupled **I**-beams, and a swinging support for the upper end of said bolts, substantially as described.

10. In a boiler-furnace, the combination of the coupled **I**-beams *d*, bolts *e*, passing between said coupled **I**-beams; a swinging support for the upper end of said bolts; and a series of seats *g*, supported between said **I**-beams whereby the alternate short manifolds of the forward end of the boiler-tubes are supported, substantially as described.

11. In a boiler-furnace, the combination of two upright beams; brackets supported by these beams; bolts depending freely from the brackets; and means whereby the forward extremity of the boiler is suspended upon these bolts, substantially as described.

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