No. 676,605. Patented June 18, 1901.

W. M. GREEN & J. R. GENT.

FIRE GATE FOR FURNACES.

(Application filed Apr. 4, 1900.)

(No Model.) 2 Sheets—Sheet 1.

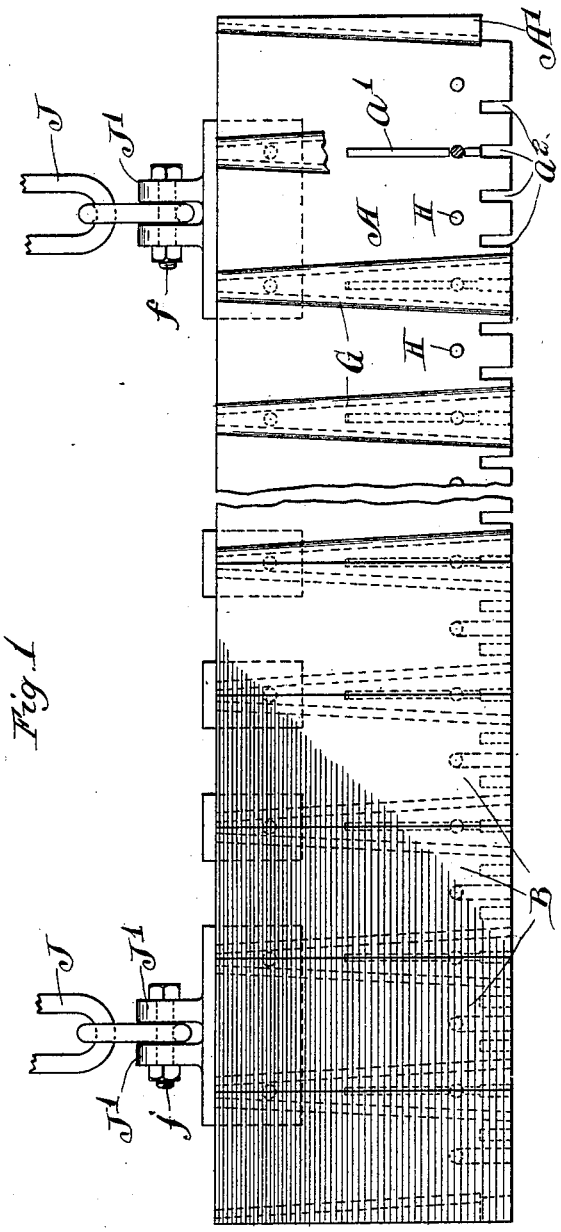

Fig. 1.

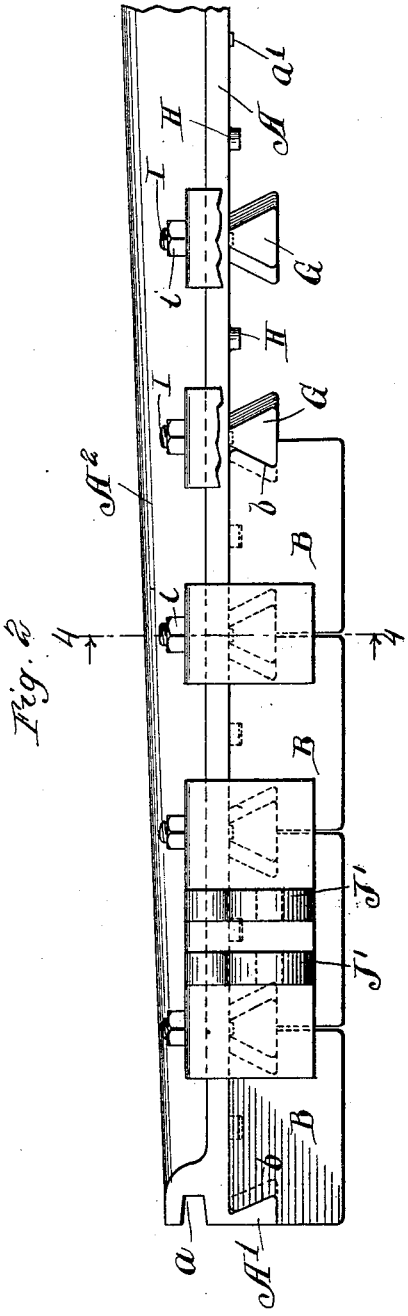

Fig. 2.

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Fig. 3

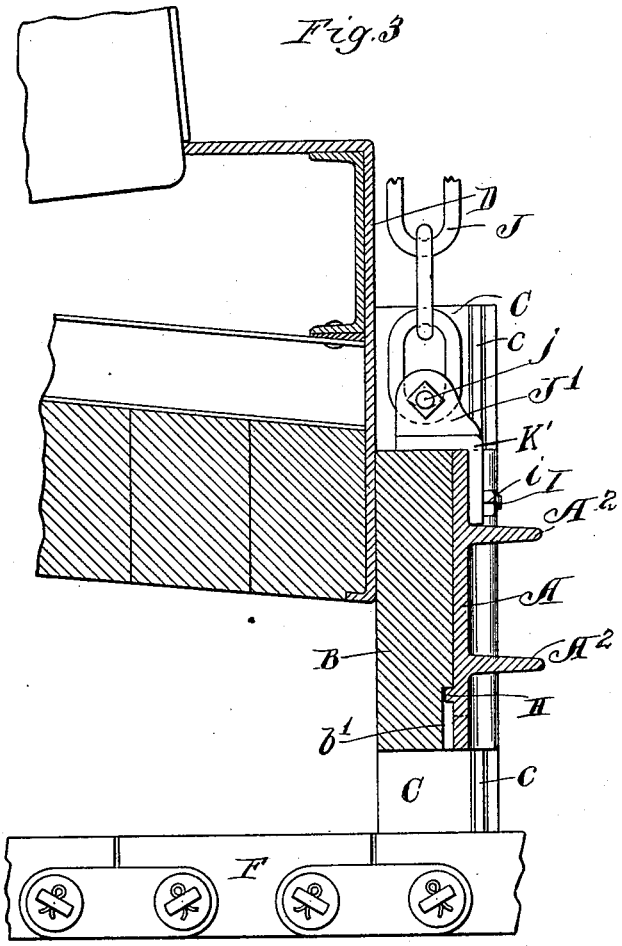


Fig. 4

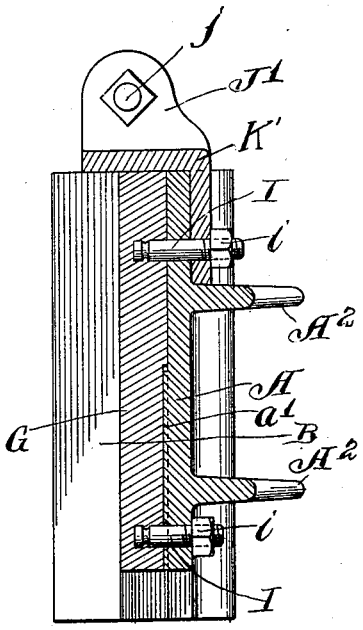
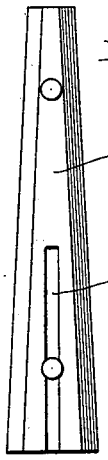


Fig. 5



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FIRE-GATE FOR FURNACES.

SPECIFICATION forming part of Letters Patent No. 676,605, dated June 18, 1901.

Application filed April 4, 1900. Serial No. 11,442. (No model.)

To all whom it may concern:

Be it known that we, WILLIAM M. GREEN, a resident of Evanston, and JOHN R. GENT, a resident of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Fire-Gates for Furnaces; and we do hereby declare that the following is a full, clear, and exact description thereof, 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 improvements in doors or gates for furnaces, and more especially to adjustable gates of that class used in connection with furnace-feeding devices to control the supply of fuel and which are exposed on their inner faces to the heat from the interior of the furnace and are provided with an inner lining of fire-brick or like refractory substance to prevent injury by such heat to the metal part of the gate.

The invention consists in the matters hereinafter set forth, and pointed out in the appended claims.

Our invention is herein shown in connection with a furnace provided with a fire-arch extending to the front wall thereof and with a traveling grate on which the fuel is delivered and on which it rests while being carried into the furnace beneath the fuel-controlling gate. The features constituting our invention may, however, be applied to furnaces of other kinds and to those provided with other kinds of fuel-feeding devices than those illustrated.

In the accompanying drawings, illustrating our invention, Figure 1 is a rear elevation of a gate constructed in accordance with our invention with portions of the fire-brick lining removed to show the construction of the parts. Fig. 2 is a plan view thereof with parts removed to show more clearly the details of construction. Fig. 3 is a vertical section through a gate embodying our invention in connection with adjacent parts of a furnace embracing a fire-arch and chain grate. Fig. 4 is a detail section of the gate taken on line 4 4 of Fig. 2. Fig. 5 is a detail view from the inner side thereof of one of the vertical ribs which serve to hold the section of the refractory lining in position or place upon the metal back plate of the gate.

As shown in said drawings, the gate illustrated consists in its main features of a cast-metal back plate A and a refractory lining consisting of a plurality of fire-brick B B. The gate serves to close the front or fuel opening of the furnace and is adapted to slide vertically on the front plate of the furnace, being for this purpose herein shown as provided in the ends of the back plate A with guide-grooves *a*, which engage guide-flanges *c* on standards C C, located at either side of the fuel-opening of the furnace. The rear or inner face of the gate is located adjacent to and slides in contact with the vertical front plate D of the furnace. The gate is located over or above the supporting-surface on which the fuel rests as it is fed into the furnace, said furnace, as herein shown, being formed by means of a traveling chain grate F.

Now referring to the details of construction in the back plate A, the fire-brick lining, and means for attaching to the back plate the fire-brick B B, constituting said lining, the same are constructed as follows: At each end of the back plate A on the inner face thereof is formed a vertical flange or integral rib A′, the inner lateral surface of which is inclined inwardly and downwardly from its upper to its lower end and is also undercut to overhang the face of the back plate. In the particular construction illustrated the undercut side faces of said ribs are inclined inwardly, so as to give to the said ribs the form of one-half of a dovetailed tenon. At equal intervals across the face of the back plate between the side ribs A′ A′ are located a plurality of vertical ribs G G, which are tapered on both their side faces and are made larger at their lower ends than at their upper and have their side faces thereof undercut, so that the outer faces of said ribs are wider than the inner faces thereof. The lateral faces of these ribs also are shown as inclined, giving to each rib the shape of a dovetailed tenon. Said ribs G G coact with each other and with the ribs A′ A′ to support the fire-brick B on the gate. From the shape of the ribs G described it follows that between each pair of ribs is formed a recess wider at its inner than

its outer part, while similar-shaped recesses or spaces are formed between the ribs G nearest the ends of the plate A and the ribs A′ on the ends of said plates. The several fire-brick B are made of a thickness considerably greater than the distance which the ribs G and the ribs A′ project from the inner face of the plate A, and said fire-bricks are each provided in the side edges thereof adjacent to their inner faces with two grooves *b b*, the said grooves being inclined or tapered vertically and so shaped laterally as to conform to the shape of the inclined and undercut side faces of the said ribs A′ and G. The said fire-brick extend at their lower edges to the bottom of the back plate and are made wide enough on their outer faces or those exposed to the heat of the furnace to completely cover the back plate, so that their side edges meet and cover the several ribs G G. The brick at the ends of the plate similarly project over and cover the ribs A′ A′. By reason of the tapered and undercut form of the several ribs G G and A′ A′ the fire-brick B B are adapted to be interlocked at their side edges therewith and when so interlocked are held in contact with the plate A and also held from downward movement by being wedged between the said ribs. In order, however, that the lower edges of said fire-brick may be exactly flush with the lower edge of the back plate A when they do not exactly and closely fit the side faces of the said ribs A′ and G, the plate A is provided between each of the ribs G G with inwardly-projecting lugs or studs H, and in the rear faces of the fire-brick are formed vertical grooves *b′*, which extend upwardly from the lower edges of the fire-brick and terminate at the level of the said studs, the upper ends of said grooves forming shoulders which rest against the studs, and thereby positively limit the downward movement of the fire-brick, as clearly seen in Fig. 3. Said studs H are shown as cast integral with the plate A; but they may be, if desired, made separate and inserted therein.

To facilitate and cheapen the construction of the gate, the said ribs G G are made separate from and are attached to the back plate A. As a means of attaching the several ribs G G to the plate A said ribs are provided each with two or more studs I I, which are fixed in said ribs and project outward through apertures in the said plate, said studs being screw-threaded to receive nuts *i i*, by which the ribs are clamped against the plate. Said studs I I are herein shown as cast in the ribs G G, being for the purpose of holding them firmly in the ribs provided with grooves near their inner ends or otherwise irregularly shaped, so as to prevent their withdrawal from engagement with the ribs. As a means for securing the ribs G upon the plate A, so as to hold the same securely from lateral movement, said plate has cast upon its front face a plurality of vertical ribs *a′*, which ribs are adapted to fit within longitudinal grooves *g*, formed in the rear or inner faces of the ribs G, as clearly seen in Figs. 4 and 5. Said ribs *a′* need not extend the full length of the ribs G G and are herein shown as terminating at a considerable distance from the top of the back plate.

The plate A is provided in its lower edge with a plurality of vertical slots a^2 a^2, which open through and extend upwardly from the lower edge thereof. Said slots are arranged at short distances apart throughout the entire length of the lower edge of the plate, thereby forming on the said plate a plurality of depending fingers. By so slotting the plate as to form a series of fingers the said lower edge of the plate, which becomes highly heated by its contact with the fuel, is prevented from being warped and twisted through being so heated.

To the upper margin of the plate A are attached a series of clips K′ K′, which extend over the upper edges of the fire-brick to hold the same from rising on the plate should any one of them strike an obstruction as the gate is lowered. Said clips are shown as arranged one over each of the ribs, so as to overlap two adjacent bricks. The clips are shown as made of inverted-L shape, with their vertical parts bolted to the plate A by the same bolts *i* by which the upper ends of the ribs G are secured to the plate. By the use of a number of separate holding-clips any brick may be removed or replaced by detaching two clips only.

Any suitable provision may be made for raising and lowering a gate made as hereinbefore described. As herein illustrated, two lifting-chains J J are attached to the upper edge of the gate by means of lugs J′ J′, formed on two of the clips K′ K′, to which lugs said chains J are connected by pivoted bolts *j j*. Said clips K′, as clearly shown in Figs. 2 and 4, are wider than the clips K and are conveniently secured to the plate A by engagement with the bolts *i i*, belonging to two adjacent ribs G G.

The plate A may be made either of wrought or cast metal. Preferably, however, and as herein shown, said plate is made of cast metal and provided with horizontal flanges A^2 A^2, extending from end to end thereof, giving longitudinal stiffness to said plate, said flanges being cast integral with the said plate and projecting from the front or outer face thereof.

An important feature of the present invention is embraced in the construction by which the refractory or fire-brick lining is supported on the back plate of the gate entirely by attaching means located on the face of the plate and covered by the refractory slabs or brick forming such lining, with the result that the lower edge of the plate is not relied upon as a means of supporting the fire-brick in place and is without any projecting parts for this purpose. It follows that any injury to said lower edge of the plate due to the extreme heat to which it is exposed, such as the warp-

ing or burning away of said lower edge, will have no effect upon attachment of the fire-brick to the plate.

Another important feature of the invention is embodied in the back plate having slots or notches extending upwardly from its lower edges, this construction enabling the plate to be extended downwardly to the lower edge of the fire-brick, so as to protect the same and prevent them from being broken or injured by the contact of the coal therewith as it passes below the gate, while avoiding any tendency in the lower edge of the said back plate to become warped under the action of the heat with consequent liability of distortion of the entire plate, as might frequently occur if the said lower edges were made continuous.

We claim as our invention—

1. A gate for furnaces comprising a back plate and a refractory lining therefor consisting of fire-brick, said gate being provided with a plurality of vertically-arranged ribs of upwardly-tapered form having lateral interlocking engagement with said fire-brick and provided with oblique, undercut side faces acting to hold the fire-brick in contact with the back plate and also from downward movement, said lining extending downwardly to the lower margin of said back plate.

2. A gate for furnaces comprising a back plate, and a refractory lining therefor consisting of fire-brick, said back plate being provided at its ends and between the same with a plurality of upwardly-tapered vertical ribs constructed for interlocking engagement with the side edges of the fire-brick, those of said ribs which are located between the ends of the plate being detachably secured to the back plate.

3. A gate for furnaces, comprising a back plate, and a plurality of fire-brick having vertical side edges, said back plate being provided with a plurality of upwardly-tapered vertical ribs adapted to interlock with the side edges of the fire-brick, and means for connecting said ribs to the plate embracing integral vertical ribs on the plate engaging grooves in the said ribs and studs on the ribs passing through the plate and provided with securing means by which the ribs are clamped to the plate.

4. A gate for furnaces comprising a back plate and a plurality of fire-brick arranged side by side across the front of the plate, said fire-brick being provided in their inner faces with vertical grooves extending upwardly from their lower edges, said plate being provided with vertical ribs which are tapered from their lower to their upper ends, and constructed to interlock with the side edges of the fire-brick, and also with studs which engage the upper ends of said grooves, in the inner faces of the fire-brick to sustain the same from downward movement.

5. A gate for furnaces comprising a back plate provided at its ends with integral vertical undercut ribs tapered on their inner edges, and between its ends with vertical attached undercut tapered ribs, fire-brick provided on their lateral edges with grooves which engage said ribs, and studs on the plate between the ribs, engaging shoulders on the fire-brick to hold the latter from downward movement.

6. A gate for furnaces, comprising a back plate provided with upwardly-tapered vertically-arranged ribs and fire-brick interlocked at their edges with the same, said back plate being provided with detachable clips which extend over the upper edges of the brick to hold the latter from upward movement on the plate.

In testimony that we claim the foregoing as our invention we affix our signatures, in presence of two witnesses, this 22d day of March, A. D. 1900.

WILLIAM M. GREEN.
JOHN R. GENT.

Witnesses:
C. W. HILLS,
C. CLARENCE POOLE.