

No. 712,251.

Patented Oct. 28, 1902.

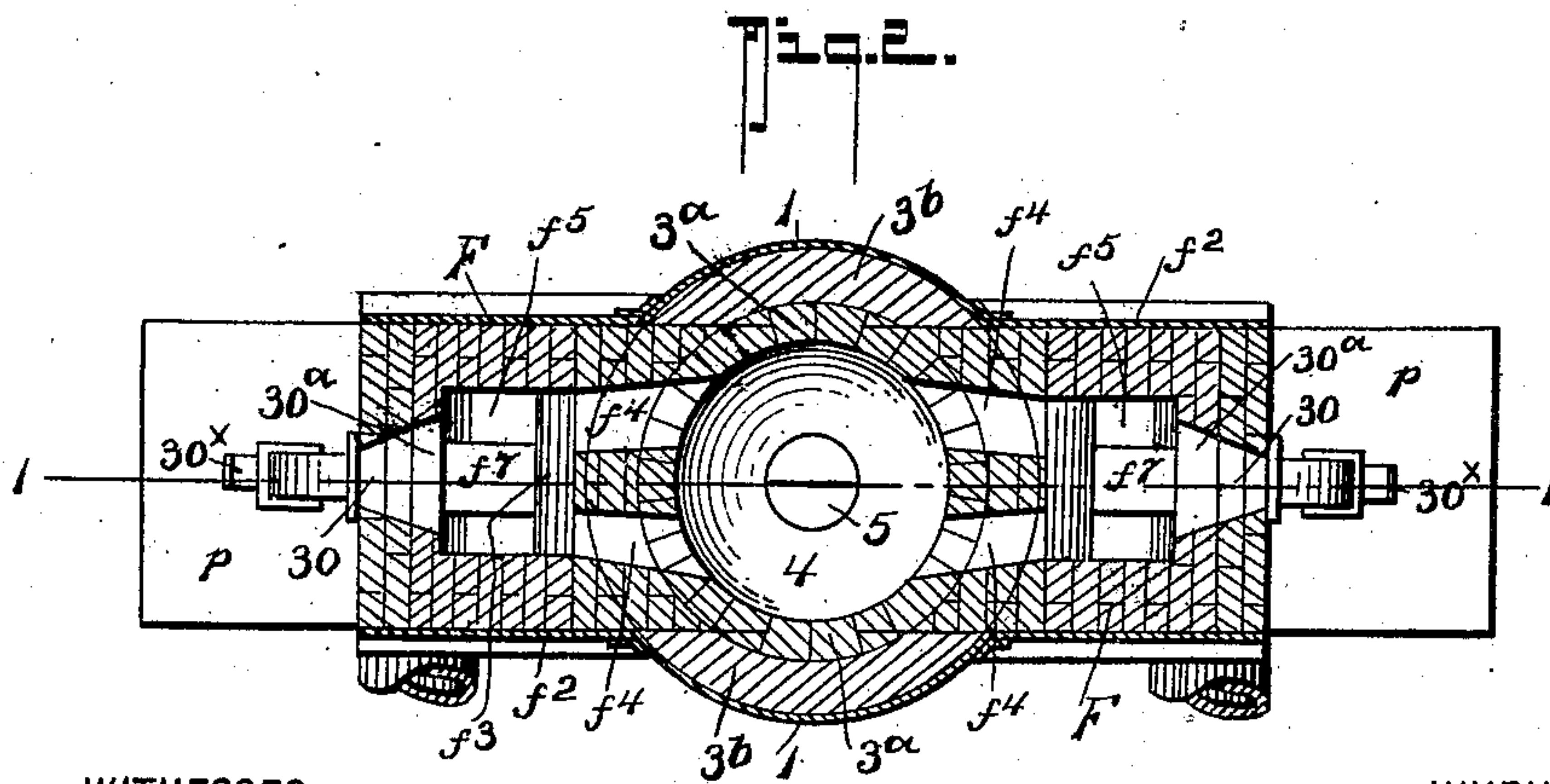
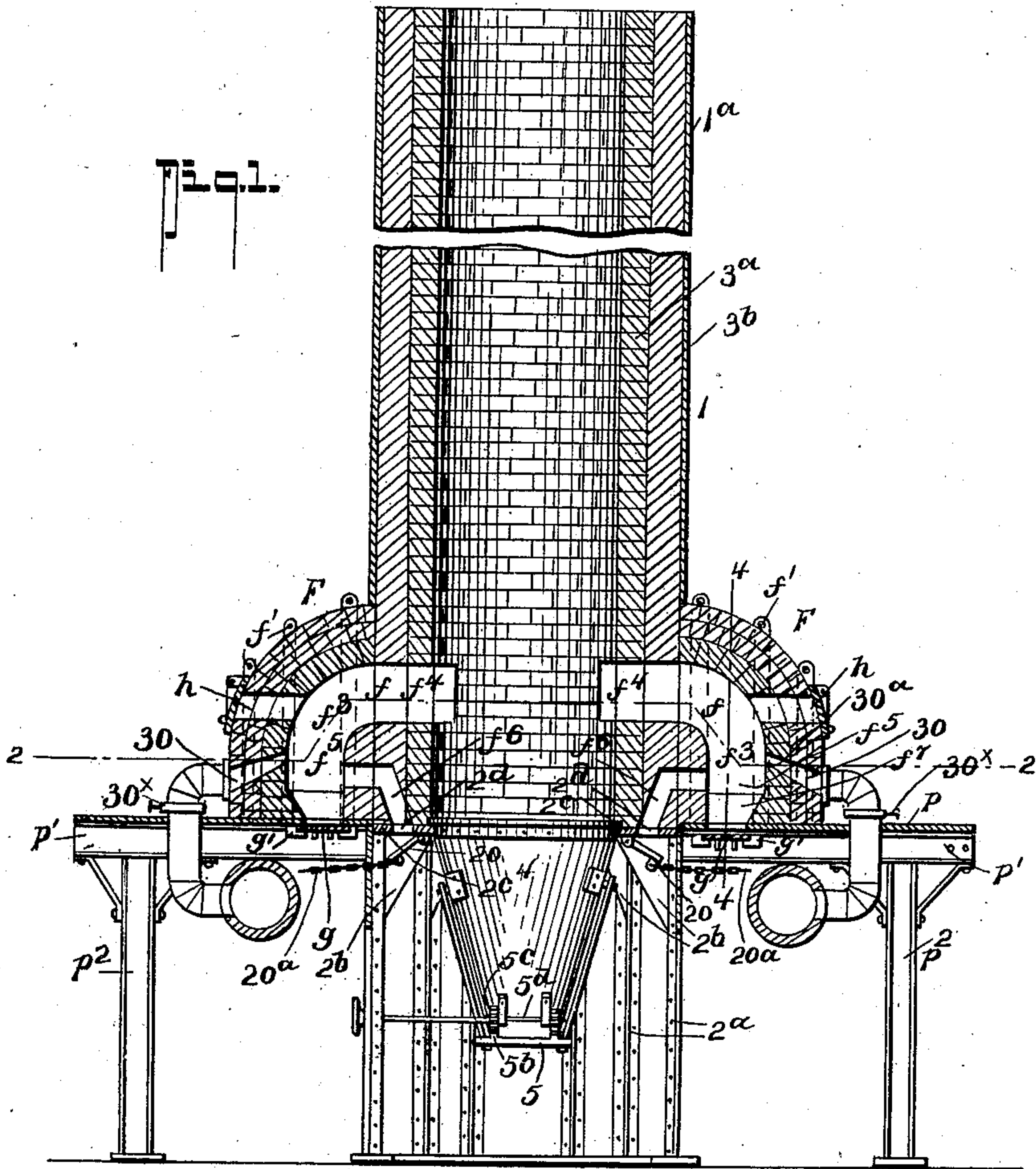
A. P. BROOMELL.

LIMEKILN.

(Application filed May 28, 1902.)

(No Model.)

2 Sheets—Sheet 1.



WITNESSES:

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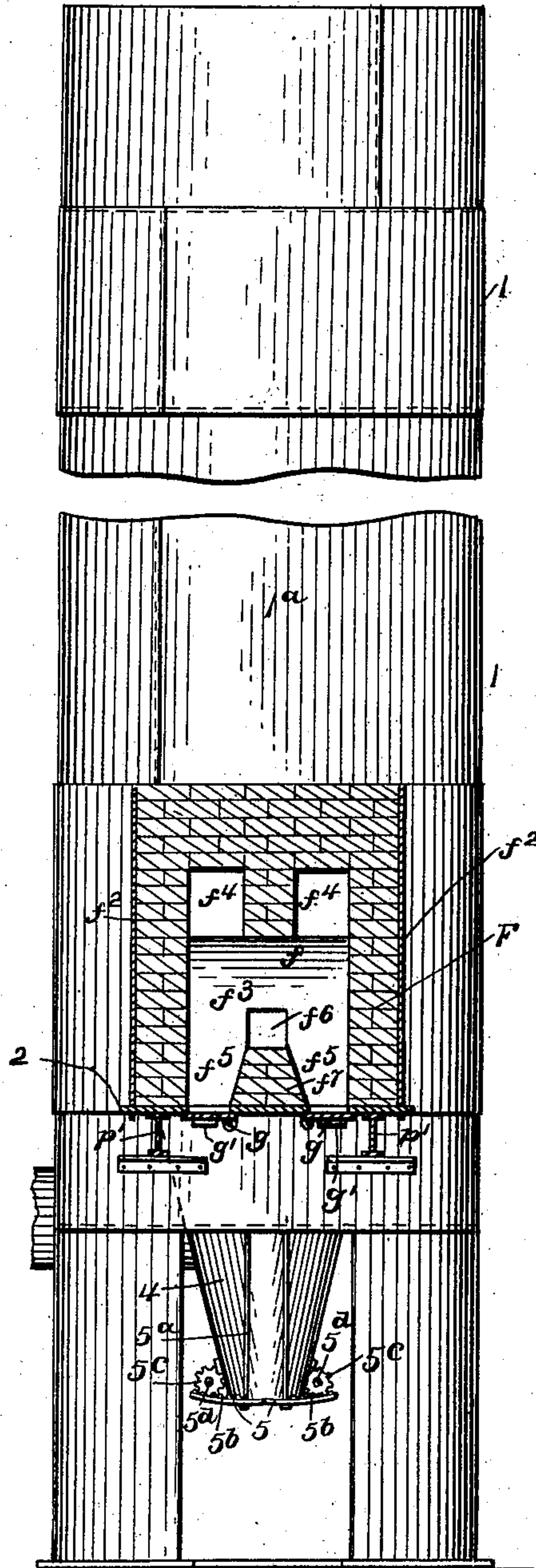
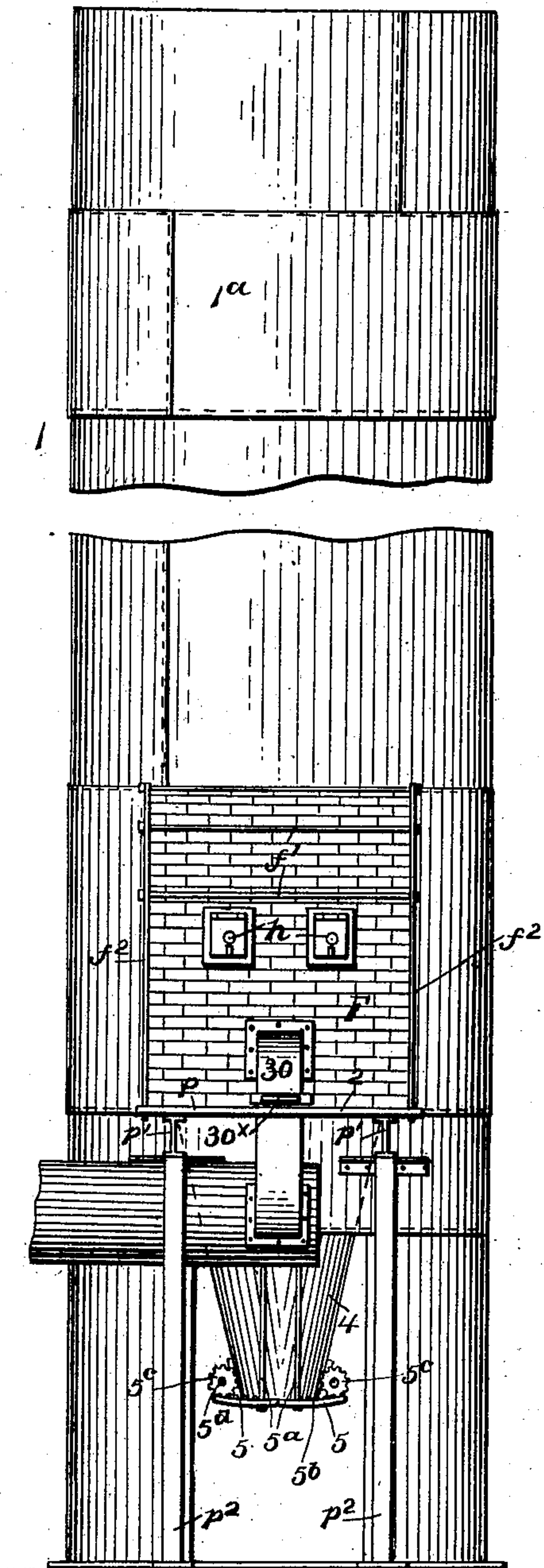
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2 Sheets—Sheet 2.

Fig. 3.

Fig. 4.



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# UNITED STATES PATENT OFFICE.

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## LIMEKILN.

SPECIFICATION forming part of Letters Patent No. 712,251, dated October 28, 1902.

Application filed May 28, 1902. Serial No. 109,303. (No model.)

*To all whom it may concern:*

Be it known that I, ALBERT P. BROOMELL, residing at York, in the county of York and State of Pennsylvania, have invented certain  
5 new and useful Improvements in Limekilns, of which the following is a specification.

This invention relates to improvements in that class of kilns used for roasting lime-rock in the manufacture of lime, cement, and the  
10 like, and it primarily seeks to provide a kiln of the character described especially designed for burning lime by producer-gas in a convenient, economical, and effective manner; and in its generic nature my invention com-  
15 prehends a novel construction of kiln, including a steel shell, having a base portion for firmly resting on the ground and having a special bottom construction for supporting the upper portions of the kiln, including its  
20 brick and the rock in the course of burning.

My invention also includes a special construction of shears or discharging-doors, which constitute the bottom of the cooler, a means for operating the same, and a novel  
25 construction of gas-feeding and burner devices, including damper-controlled hot-air-feeding means, and mechanism for conveniently removing rock or other accumulations in the burners to prevent the lime or other  
30 material from choking the air-inlets to the burners.

In its more subordinate features my invention consists in certain novel details of construction and peculiar combination of parts,  
35 all of which will hereinafter be fully described, and specifically pointed out in the appended claims, reference being had to the accompanying drawings, in which—

Figure 1 is a vertical longitudinal section  
40 of my improved kiln, taken practically on the line 1 1 of Fig. 2. Fig. 2 is a horizontal section of the same on the line 2 2 of Fig. 1. Fig. 3 is an end elevation of the same. Fig. 4 is a transverse section of the upper end  
45 thereof, taken on the line 4 4 of Fig. 1.

In the practical construction of my invention the main or body portion is built of steel, the platform being also of metal. The body portion includes a shell 1, the outer part 1<sup>a</sup> of  
50 which extends above the platform 2 in a cylindrical or other desired shape in cross-section, and the said shell incases the burning-

stack or rock-holder, having the usual fire-brick lining 3<sup>a</sup> and the surrounding masonry body 3<sup>b</sup>. The entire masonry structure of my  
55 kiln is supported upon the platform-section 2, mounted upon vertical posts or stiffening-ribs 2<sup>a</sup>, bolted on the inside to the bottom part of the shell 1, which, as will be readily seen from the drawings, forms an air-space  
60 surrounding the bottom or cooler end of the kiln portion proper, and the said posts 2<sup>a</sup> 2<sup>a</sup> at their upper ends have steel gussets or angle-braces 2<sup>b</sup>, upon which rests the heavy cast-metal plate 2<sup>c</sup>, that supports the brick  
65 and masonry work and upon which the steel cooler or conical bottom 4 of the kiln-body is fixedly suspended. The cooler 4, which consists of an inverted cone-shaped bottom, riveted or otherwise pendently secured to the  
70 plate 2<sup>c</sup>, has its discharge controlled by a novel construction of shears or discharging-doors, the peculiar arrangement of which forms a feature of my invention. Two op-  
75 posing doors of shear-plates 5 5 are provided, and each door is independently supported upon a pair of hanger-rods 5<sup>a</sup> 5<sup>a</sup> in such manner that the said doors can be swung outward from under the discharge end of the cooler 4, and to provide for a close joint the  
80 said doors are curved in an arc with the fulcrum of the hanger-rods as the center, and the bottom edge of the cooler-cone is suitably shaped to provide for the close-fitting there-  
85 against of the two independently-swingable doors, and for conveniently manipulating the said doors at will to open or close the discharge end of the cooler partially or wholly  
each door has rack portions 5<sup>b</sup> 5<sup>b</sup> for cooperating with the pinions 5<sup>c</sup> 5<sup>c</sup> on the hand-wheel-  
90 equipped actuating-rods 5<sup>d</sup> 5<sup>d</sup>, as clearly shown in the drawings.

By providing a closure means for the cooler operatable in the manner described an easily-working, convenient, and positive actuating  
95 means is produced for controlling the cooler.

In the practical construction my kiln may be equipped with one or more furnaces. In the drawings I have shown two oppositely-disposed furnaces, which communicate with the  
100 stack or kiln body. These furnaces (indicated by F) are of a slim arched shape and constructed of special fire-brick, especially at the sides, center, and top of the flues *f*, and



the brick or masonry work is suitably braced by the truss or cross rods  $f'$ , that connect with the segmental shell-plates  $f^2$ , as best shown in Figs. 3 and 4.

5 The furnaces (see Fig. 1) are supported on the laterally-extended platform-sections, which include the metal plates  $p p$ , mounted on I-beams  $p' p'$ , riveted at their inner ends to the posts  $2^a$  and supported at their outer  
10 ends on the vertical I-beams  $p^2 p^2$ , and the flue  $f$  of each furnace includes a vertical portion  $f^3$ , that extends in a plane below the fuel or feed opening  $f^4$  to form a pocket  $f^5$ , the reason for which will presently appear. Each fur-  
15 nace is also provided with an air-inlet  $f^6$  in the nature of a channel built in the brick-work, that communicates with the flue part  $f^3$  and with an opening  $2^d$  in the cast-metal plate that supports the main or central brick  
20 structure and which opening  $2^d$  communicates with the air-space in the lower end of the shell-pocket that surrounds the cooler. Each air-opening  $2^d$  is controlled by a damper 20 to regulate the amount of air admitted into the  
25 furnace, and to provide for conveniently operating the said dampers each damper has a chain or cable  $20^a$  connected therewith reaching to the platform in front of the furnace.

By having the inlet communicating with  
30 the air-space surrounding the cooler it is manifest that hot air is taken from around the cooling-cone and delivered hot into the combustion-chamber, and hence the chilling action of ordinary atmosphere is avoided, and,  
35 furthermore, by reason of its contact with the hot brick as it passes to the combustion-chamber the air is superheated.

When burning lime there is always more or less rock that falls through the furnace-  
40 flues into the firing-chamber, which can be removed from time to time as it accumulates. In my invention I provide a special means capable of being easily manipulated and adapted to positively provide for the removal  
45 of the accumulations. For this purpose the pockets  $f^5$  are provided. In the bottom of each of said pockets is a brick partition  $f^7$ , having inclined sides, (see Fig. 4,) and these partitions extend directly across the bottom  
50 of the flues. The partitions  $f^7$  also extend up about flush with the bottom of the air-inlets of the said flue. The purpose of the center partitions is to deflect the lime or rock that falls back into the flues to the bottom of the  
55 pocket  $f^7$  onto the doors  $g g$  under said pockets, which are held to slide in the guides  $g' g'$ , secured to the under side of the platform portions that support the furnaces, and are operatable in any well-known manner, whereby  
60 each time the lime is drawn from the cooler-cone the said slides  $g$  can be opened to permit any lime accumulations in the pocket to also drop into the receiving-car or floor below. Each furnace is also provided with two  
65 peep-holes  $h h$ , through which the operation of the fire can be noticed and through which the "lime-burner" can watch the rock as it

passes down in front of the flues. These peep-holes can also be utilized for permitting of the insertion of a bar into the flues and  
70 the limestone or in case the lime becomes bridged or choked.

Each furnace has a gas-inlet 30 disposed at the opposite side from the air-inlet, and the said inlets have their discharging-mouth  
75  $30^a$  flared laterally in order that the flame may be distributed all over the combustion-chamber and into the flues. With each inlet is connected a gas-supply pipe which com-  
80 municates with the gas-main, in practice connected with a producer or other means of supply, and while I have not shown it in the drawings it is manifest that one or more  
85 kilns may be operated from a central gas-supply. The amount of gas delivered into each furnace is regulated by a damper  $30^x$  in the gas-pipe, as shown.

From the foregoing, taken in connection with the accompanying drawings, it is thought that the manner in which my kiln operates  
90 and the manner of its construction will be readily understood by those skilled in the art to which it appertains.

Having thus described my invention, what I claim, and desire to secure by Letters Pat-  
95 ent, is—

1. In a kiln of the character stated, a stack, a cooler, pendently joined with the lower end thereof, a metallic shell surrounding the stack and the cooler and extending to the ground,  
100 a furnace connected with the stack by a flue, said flue extending through the shell, substantially as shown and for the purposes described.

2. In a kiln of the character stated, a stack,  
105 a cooler pendently joined with the lower end thereof, a metallic shell surrounding the stack and the cooler and extending to the ground, and forming a supporting member for the stack and furnaces, a furnace connected with  
110 the stack by a flue, and an air-inlet opening into the flue and communicating with the space between the shell and the cooler, as set forth.

3. In a kiln of the character stated, a stack,  
115 a cooler pendently joined with the lower end thereof, a metallic shell surrounding the cooler and extending to the floor or ground, a series of furnaces radiating from the stack, each furnace having a flue communicating with  
120 the stack at a point above the cooler, and an air-inlet which opens into the space between the shell and the upper end of the cooler, and a separate valve for each inlet for controlling that end of the inlet that opens into the shell-  
125 space, as specified.

4. In a kiln of the character described, a metallic supporting-platform, a stack mounted thereon, a cooler pendently supported on the platform, said cooler forming the discharge  
130 end of the stack, a metallic shell surrounding the cooler and forming a central support for the platform, and a series of furnaces mounted upon the platform, said furnaces each in-



cluding a flue discharging into the stack at a point above the cooler, as set forth.

5. In a kiln of the character stated, a supporting-platform, a stack mounted thereon, a furnace projected radially from the stack, and supported upon the platform, said furnace including a flue discharging into the stack, a valve-controlled air-inlet, and a fuel-feed discharging into the furnace-flue, said furnace-flue having a pocket in a plane below the air and the fuel inlets, and a slidable bottom for the said pockets, substantially as shown and described.

6. In a kiln of the character stated, the combination with the stack; of a furnace projected radially from the stack, said furnace including a flue discharging into the stack, said flue having a pendent portion, the lower end of which forms a pocket, a slidable bottom for the pocket, a bridge portion projected centrally upward from the bottom of the pocket, a valved air-inlet, and a fuel-inlet, the said air and fuel inlets having their discharges at a point above the bridge in the pocket, for the purposes described.

7. An improvement for the purposes stated, comprising a metallic supporting-base, including a platform, a stack centrally supported upon the platform, a metallic shell surrounding the stack, said shell including a portion extended below the platform to the ground, a cooler pendently supported from

the central platform, said cooler forming the bottom of the stack and held within the lower metallic shell portion, a series of furnaces radiating from the stack supported upon the platform, each furnace including a flue discharging into the stack, and having a pendent portion discharging through the platform, a gate for controlling the platform discharge to the flue, a valve-controlled air-inlet communicating with the space between the cooler and the metallic shell, and discharging into the flue, a fuel-supply for each furnace including a feed-pipe arranged to discharge into the flue at a point above the air-inlet for the said flue, substantially as shown.

8. In a kiln of the character described, the combination with the conical cooler; of a pair of opposing closure members for the discharge end of the cooler, and forming the bottom thereof, means for supporting the said doors to swing outwardly to and from each other, each of the doors having a rack, said means including a pair of pendent hangers for each door pivotally connected at their upper end to the cooler-body, and an operating-rod for each door having a pinion for engaging the rack, substantially as shown and described.

ALBERT P. BROOMELL.

Witnesses:

BERTHA H. GOODMAN,  
WILLIAM J. KUNTZ.