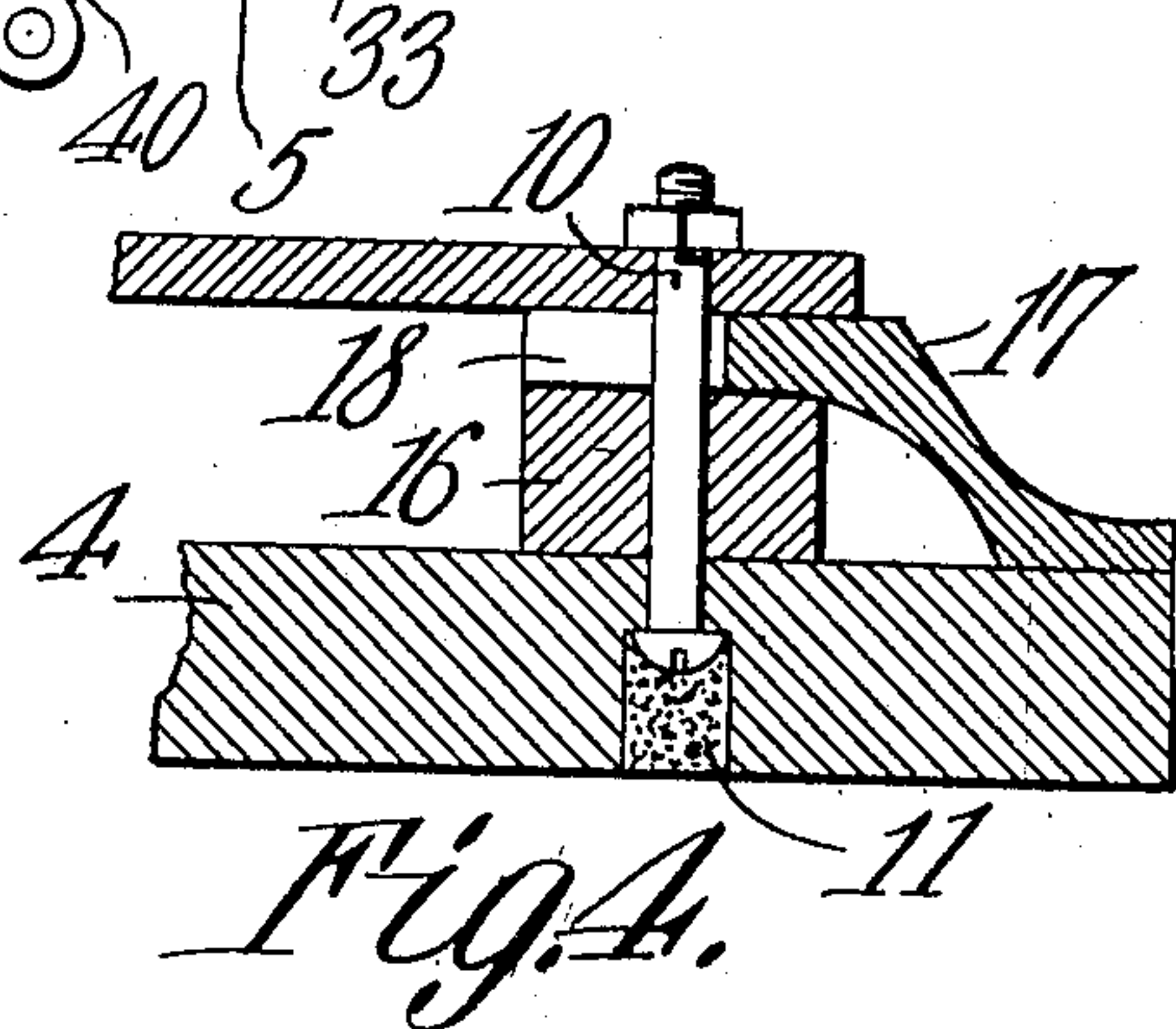
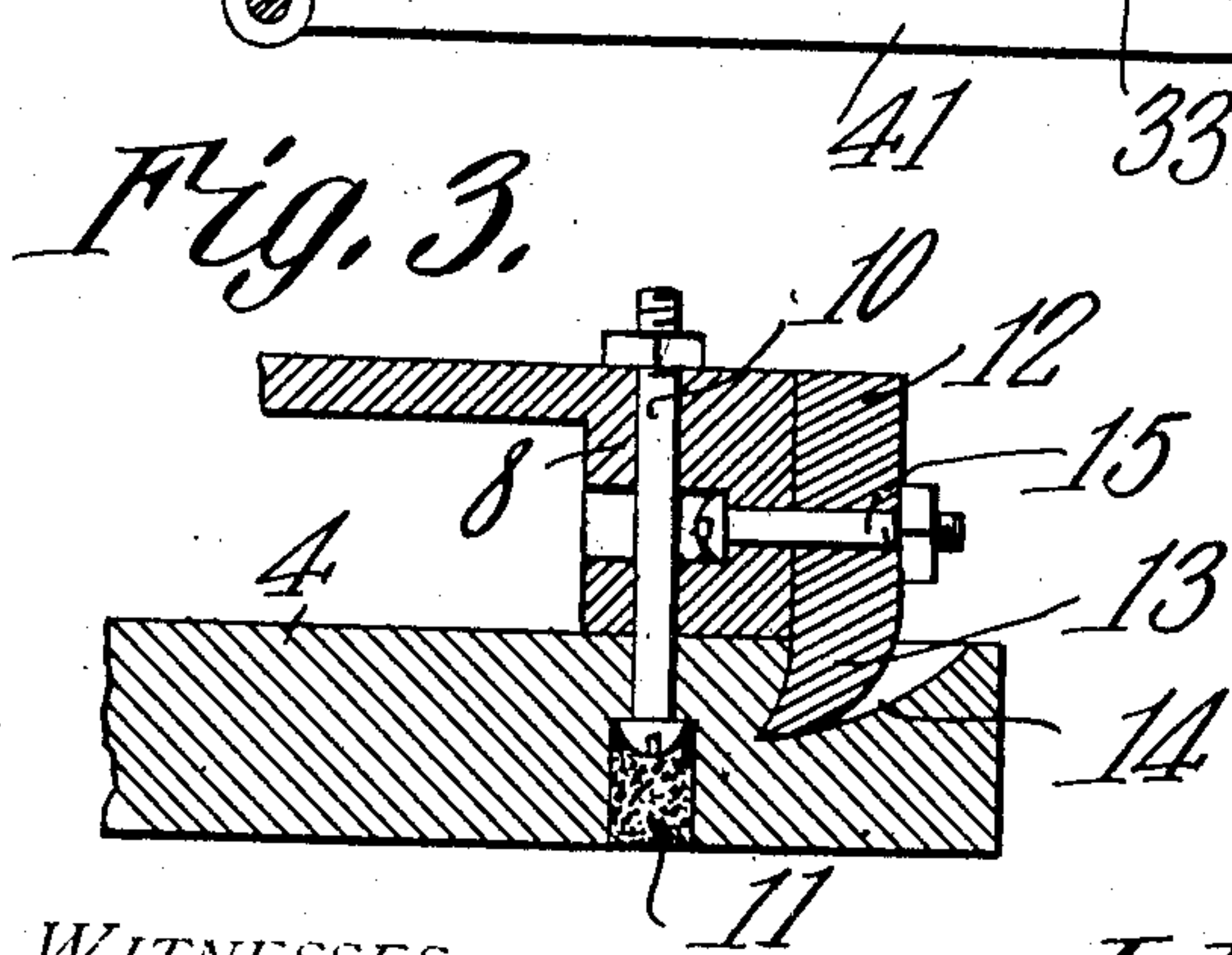
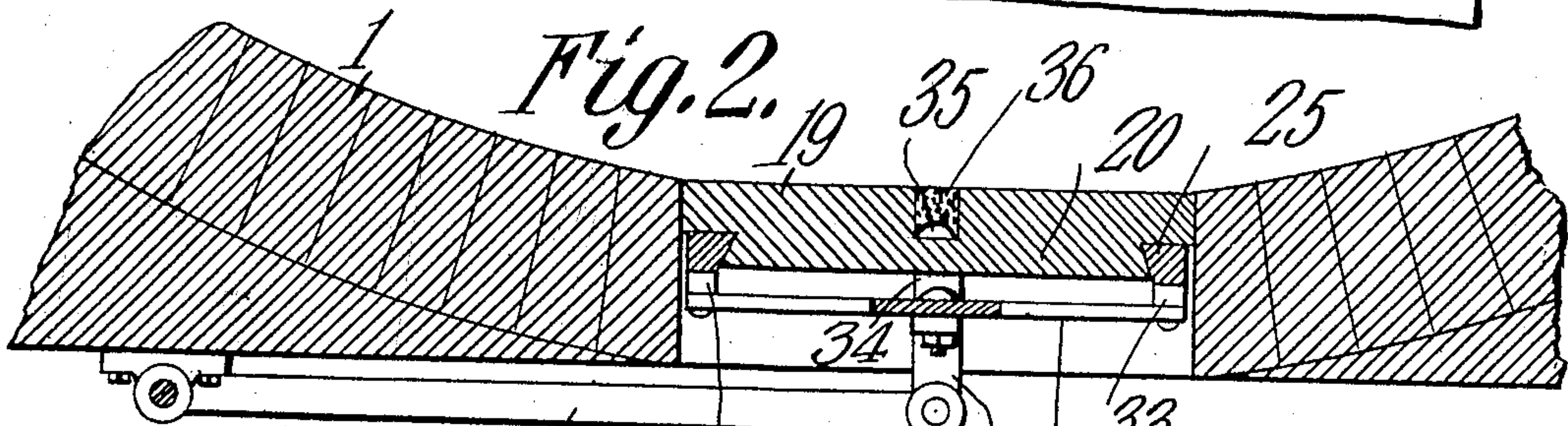
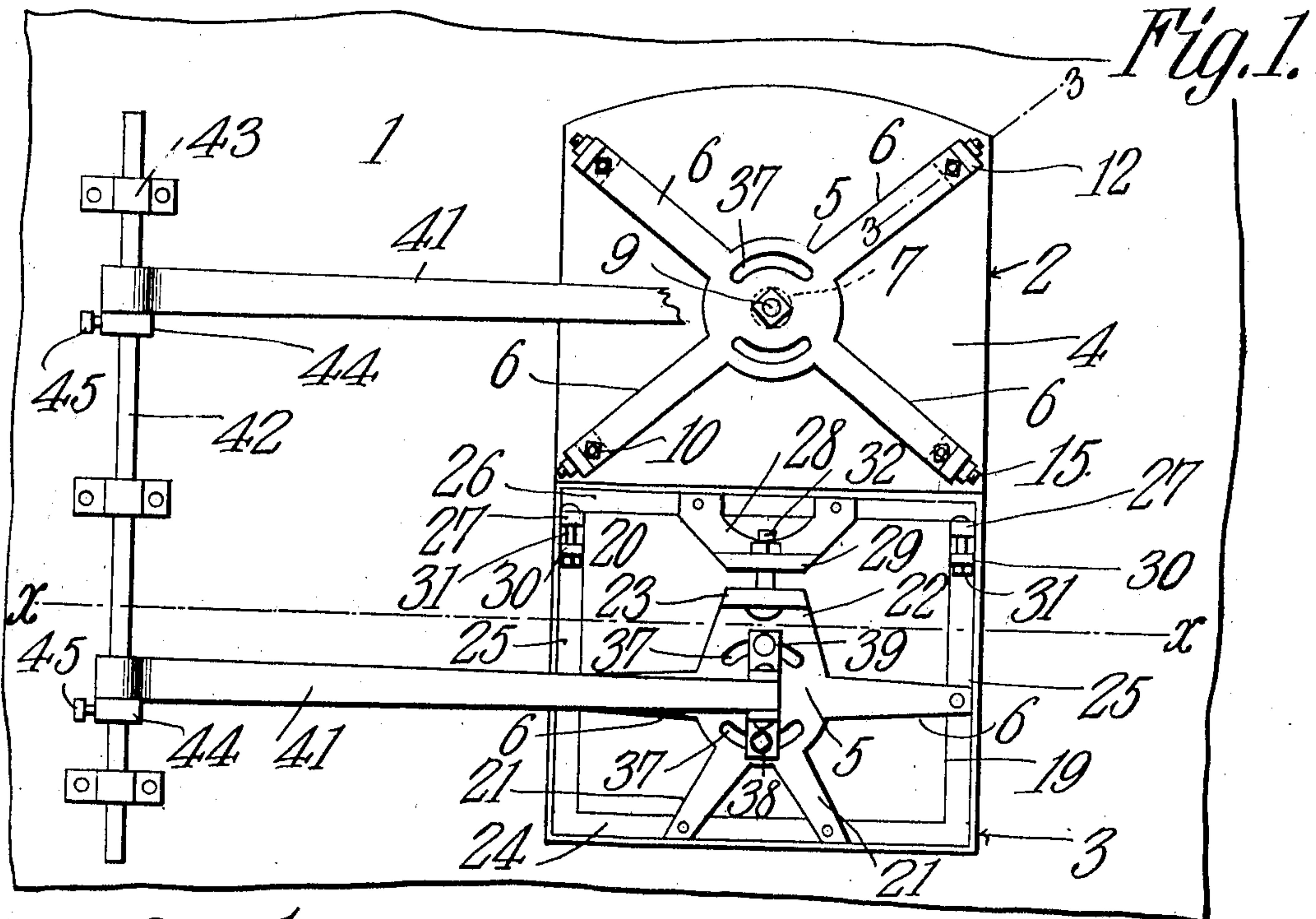


No. 882,365.

PATENTED MAR. 17, 1908.

J. J. ALLEY.
COKE OVEN DOOR.
APPLICATION FILED JUNE 1, 1907.



WITNESSES:

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JOHN J. ALLEY, OF BRISTOL, VIRGINIA.

COKE-OVEN DOOR.

No. 882,365.

Specification of Letters Patent.

Patented March 17, 1908.

Application filed June 1, 1907. Serial No. 376,757.

To all whom it may concern:

Be it known that I, JOHN J. ALLEY, a citizen of the United States, residing at Bristol, in the county of Washington and State of Virginia, have invented a new and useful Coke-Oven Door, of which the following is a specification.

This invention has reference to improvements in coke oven doors, although such doors may also be used for furnaces, kilns, and other places where the heat generated is too great for all-metal doors to give reasonable durability and service.

The object of the present invention is to provide a door structure wherein the parts directly exposed to the action of the fire are made of some refractory material, such as fire brick, either in one piece or in several pieces, while the supporting structure for the fire brick part of the door may be made of metal but so located and constructed as to be protected from the injurious effects of the heat.

The invention is designed more particularly for use with coke ovens of the beehive type. Such ovens are quite large, with a circular flat bottom about twelve to fourteen feet in diameter and extending upward to a height of about seven or eight feet. Through the top opening of such an oven there is introduced the charge of slack, amounting to five or six tons. This piles up in a cone-shape and must be pulled and leveled down to an even depth over the entire bottom, which it covers about fifteen to thirty inches deep. In order to get to this slack to level it the door must be made in two sections, an upper section and a lower section. The lower section, usually covering about one-third to one-half of the opening, must be closed before the charge goes in, but the upper section is left open so that the charge may be leveled, after which the upper section is closed. For this reason the two sections are arranged to be opened and closed independently of each other. When the charge is burned the heat becomes quite intense, coming almost to a white heat, which would quickly destroy a metal door or the parts of the same which are exposed. It is customary in practice to simply close up the opening in the oven by means of fire brick built into place and covered or plastered over the entire outside to make it air-tight. This is done each time the oven is charged

and must be pulled down each time it is desired to draw the coke from the oven. Since this process must be repeated over and over there is great waste of labor and material. This will be more readily seen when it is considered that these doors are from three to four feet wide and high.

The invention consists essentially of a door the fire side of which is made of a single fire brick, or which is made up of several fire bricks, with a metal frame or spider constituting the other side of the door and arranged to engage and hold the fire brick, and in conjunction with the metal frame means are employed whereby the door can be held, handled, and adjusted without exposing any of the metal parts to the fire or to the severe heat from the inside of the oven.

The invention will be fully understood from the following detailed description, taken in connection with the accompanying drawings forming part of this specification, in which,—

Figure 1 is a face view of the two door sections comprising the complete door, with the means for supporting the same; Fig. 2 is a cross section on the line $x-x$ of Fig. 1; and Figs. 3 and 4 are detail sections of the means for holding the fire brick to the supporting frame.

Referring to the drawings, there is shown a small portion of a coke oven 1 which may be considered as of the beehive type but no attempt has been made to show the relative dimensions of this oven with relation to the passageway to the interior thereof or the doors for closing said passageway.

The improved door is composed of two parts 2 and 3, the part 2 constituting the upper section of the door and the part 3 constituting the lower section thereof. Referring first to the part 2, the body of this part is formed of a single fire brick 4, or several fire bricks suitably joined together, and the entire part 2 is shaped in conformity with the opening to be closed thereby. Secured to the side of the section 2 remote from the side exposed to the fire or heat is a spider composed of a central portion or hub 5 and four radial arms 6. This spider is spaced away from the body 4 at isolated points by a central spacing block, indicated in dotted lines at 7, and by end enlargements 8, best shown in Fig. 3. These enlargements may,

of course, be made separate from the arms 6 or they may be cast in one piece therewith as indicated in Fig. 3. Extending centrally through the hub 5 is a bolt 9, and extending through each enlargement 8 and the corresponding end of the arm 6 is another bolt 10, best shown in Fig. 3. The heads of all the bolts are countersunk into the fire side of the fire brick 4 and they may be further protected by a filling 11 of cement or fire clay.

In order that there may be free circulation of air around the metallic spider the arms 6 do not extend quite to the outer corners of the brick 4, and in order to support these corners they may be engaged by dogs 12 each having a tooth 13 entering an undercut recess 14 in the corner of the fire brick. The dogs are held to the enlargements 8 by suitable bolts 15. The dogs 12 are particularly useful for holding the corners of the fire brick should they become broken away from the main body because of the intense heat or through use.

In lieu of the structure just described, the blocks 8 may be omitted from the ends of the arms 6 and shorter blocks 16 may be provided, leaving room for one end of a bracket 17 at each end of an arm 6, and this bracket is so shaped as to bear against the extreme corner of the brick 4 adjacent to each arm 6. The bracket 17 is formed with a slot 18 through which passes the bolt 10 before referred to, whereby the bracket may be easily adjusted to the corner of the brick.

The lower section of the door may be made of a single piece of fire brick 19, or of several pieces of fire brick suitably joined, and on the face remote from the fire side of the brick the latter may be made with a dovetail offset 20, less in area than the outside face of the door section 3. In such structure the supporting frame is somewhat differently shaped than in the structure shown with relation to the upper door section. The hub 5 is provided with arms 6 projecting in diametrically opposite directions therefrom and with shorter arms 21 radial thereto. The hub 5 has also a side offset 22 terminating in a flange 23. The arms 6 and 21 carry a U-shaped frame composed of a bottom bar 24, carried by the arms 21, and side bars 25, carried by the arms 6. If desirable, the spider and bars 24 and 25 may all be cast in one piece. The inner edges of the bars 24 and 25 are suitably shaped to engage under the dovetail offset 20. The top of the offset 20 is engaged by a bar 26, also suitably shaped to engage the dovetail portion of the offset, and this bar is provided with end lugs 27 and a central frame 28 terminating in a flange 29 opposing the flange 23 on the extension 22 of the hub 5. The ends of the bars 25 contiguous to the bar 26 are also provided with flanges 30, and bolts 31 serve to connect the bars 25 and 26 through the flanges 27 and 30, while a bolt 32

connects the extension 22 of the hub 5 and the bracket 28 through the flanges 23 and 29. There is thus provided means whereby the dovetail offset 20 of the fire brick 19 is securely embraced by the metallic frame composed of the parts 24, 25 and 26, and the whole structure is supported by the spider 5—6. The arms 6 are spaced away from the bars 25 by spacing blocks 33, and the hub 5 is spaced away from near the center of the fire brick 19 by a spacing block 34, while a bolt 35, passing through the hub 5 and spacing block 34 and having its head countersunk in the fire brick section 19, serves to hold the supporting spider 5—6 to the center or near the center of the door section 3. A filling or luting of fire clay or cement, indicated at 36, is provided to protect the head of the bolt 35.

Either door section may be provided with either type of supporting means for the fire brick, but I prefer to use the spider shown with relation to the upper door section 2, since the upper edge of the upper door section is largely arch-shaped and the square retaining structure shown with relation to the lower door section 3 would not then apply so readily.

It may be noted that while the supporting structure shown with relation to the lower door section 3 is so close to the edges of the fire brick 19 as to avoid the use of the dogs 12 or bracket 17, there is still a small space left between the outer edges of the frame composed of the parts 24, 25 and 26 and the walls of the opening the door sections are designed to close. This will permit the circulation of air and these metallic parts are therefore kept comparatively cool.

Each hub 5 is provided with oppositely-arranged arc-shaped slots 37 through which extend bolts 38 passing through ears 39 formed on short arms 40, the outer ends of which are bifurcated to receive the ends of pivoted arms 41, the other ends of which are mounted to turn upon an upright rod 42, which latter is fast in brackets 43 secured to the outer face of the oven. The arms 41 are supported at the proper height on the rod 42 by clamps 44 held in place by set-screws 45.

It will be seen that each door section 2 and 3 is independently movable around the rod 42 as an axis, so that each may be swung into place or swung out of the opening and to one side away from interference with workmen. The slots 37 permit the adjustment of the door sections to a true horizontal position or at any angle within a limited range about a horizontal axis with relation to the horizontal plane of swing of the door, so that the door sections may be easily adjusted to fit the opening to the interior of the coke oven.

By providing spacing lugs at the centers of the door sections as well as at the outer por-

tions thereof these sections are prevented from buckling under the heat to which they are subjected.

It will be seen that the pivoted door sections may be readily swung out of the way when it is desired to remove the coke from the oven, and that when the oven is to be filled with a fresh charge the lower door section may be swung into place, thus leaving ample room above the same for workmen to distribute and level the charge of slack dumped into the oven through the top thereof.

It will also be seen that the frame composed of the parts 24, 25 and 26 is adjustable in size, so that fire bricks 19 of different height may be readily held by the same frame. While the spiders are shown as having four arms, there may be as many arms as desired and as many fastening bolts may be used as may be found necessary, depending on the size and weight of the door section.

The support composed of the arms 40 and 41 permits the door sections to be moved straight into the opening in the coke oven, and this is quite necessary since the door sections should fit reasonably well into the opening and the door is usually set in from fourteen to twenty-four inches from the outside, while the opening is the same width throughout. This form of hinge or support also permits the door to be swung with its hot side away from workmen who are engaged in withdrawing the coke from the oven.

While I have described the door as composed of two separately movable sections, it is, of course, possible to construct the door in the manner herein described in one section, and such a door would be particularly adapted to furnaces or kilns or other such structures where the door is subjected to great heat.

Under some circumstances it is advisable to replace the spiders with metal plates of nearly the full size of the fire brick sections.

Although I have described the door as made of two sections, or, in the case of small doors, of one section only, it is more feasible with large sized coke oven doors to make the upper and lower sections of two sub-sections each and swing the upper and lower right-hand sub-sections to the right-hand side of the opening and the upper and lower left-hand sub-sections to the left-hand side of the opening. This would mean simply a duplication of the structure shown in Fig. 1 to the right of the doors there shown, with the single

exception that the upper door sections would be made to conform to the larger arch opening.

I claim:—

1. A coke oven door comprising a body of refractory material, and a metallic spider support therefor having arms extending from a central point and secured at the ends at isolated points on the cool side of the door and spaced therefrom for the circulation of air between the metallic support and the refractory material.

2. A coke oven door comprising a body of refractory material constituting the fire side of the door, and a metallic spider support therefor on the cool side of the door, said support having arms radiating from a central point and at their ends connected to the refractory material near the outer edges thereof and also connected to the refractory material at the central point, said spider being spaced from the refractory material to permit the circulation of air between the latter and the metallic support.

3. A coke oven door comprising a refractory fire surface, a supporting spider secured at isolated points thereto and spaced therefrom, said spider having oppositely arranged arc-shaped slots at the central portion, and a hinged support for the door connected to said spider through the arc-shaped slots.

4. A coke oven door comprising a refractory fire surface, a supporting spider secured at isolated points thereto and spaced therefrom, and a hinged support for the door to which the latter is connected so as to be adjusted in a plane at right angles to the plane through which the door is swung on its hinge.

5. A coke oven door comprising a face of refractory material for the fire side of the door, a support for said casing attached to the cool side of the door at isolated points near the edges of the door and also at an intermediate point and spaced from said refractory material, a supporting arm secured to approximately the center of the support and adjustable about a central axis with relation to said door, and another arm carrying said supporting arm and hinged to one side of the opening to be closed by the door.

In testimony that I claim the foregoing as my own, I have hereto affixed my signature in the presence of two witnesses.

JOHN J. ALLEY.

Witnesses:

O. A. BUTLER,
H. G. LAVINDER.