

No. 682,592.

Patented Sept. 10, 1901.

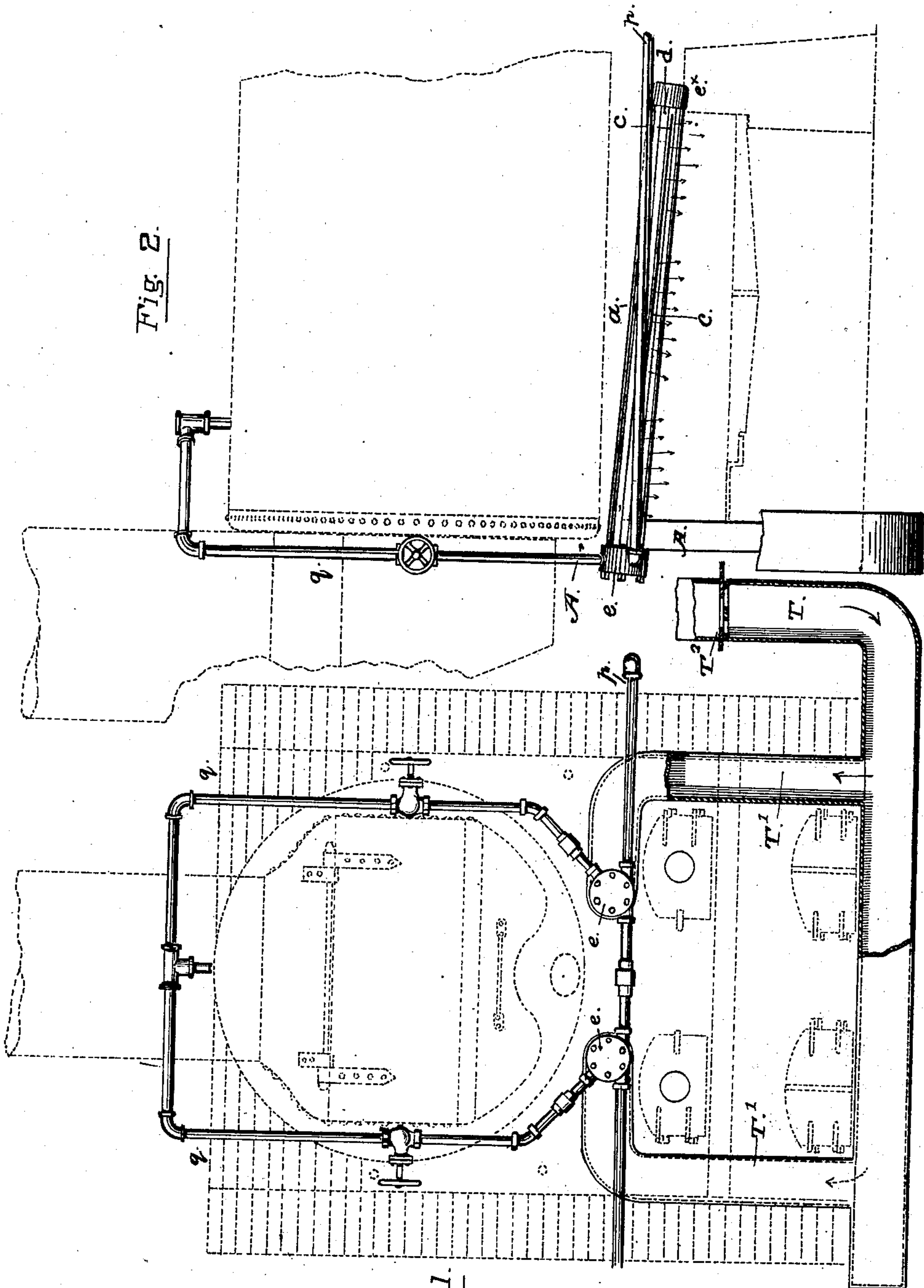
A. HEBERER.

DEVICE FOR INTRODUCING AND DISTRIBUTING AIR TO FURNACES.

(Application filed Apr. 16, 1900.)

(No Model.)

3 Sheets—Sheet 1.



Witnesses:

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Fig. 1.

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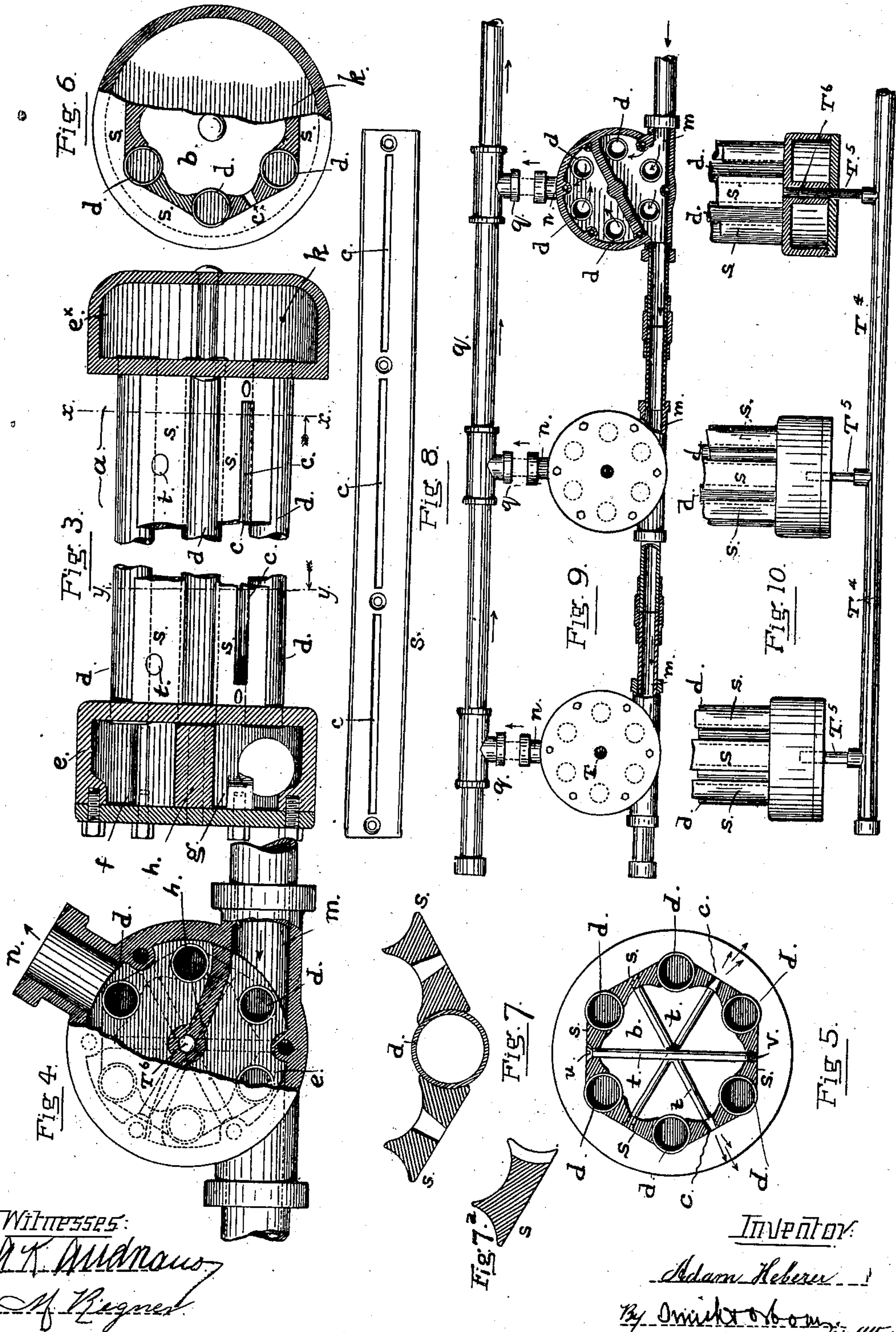
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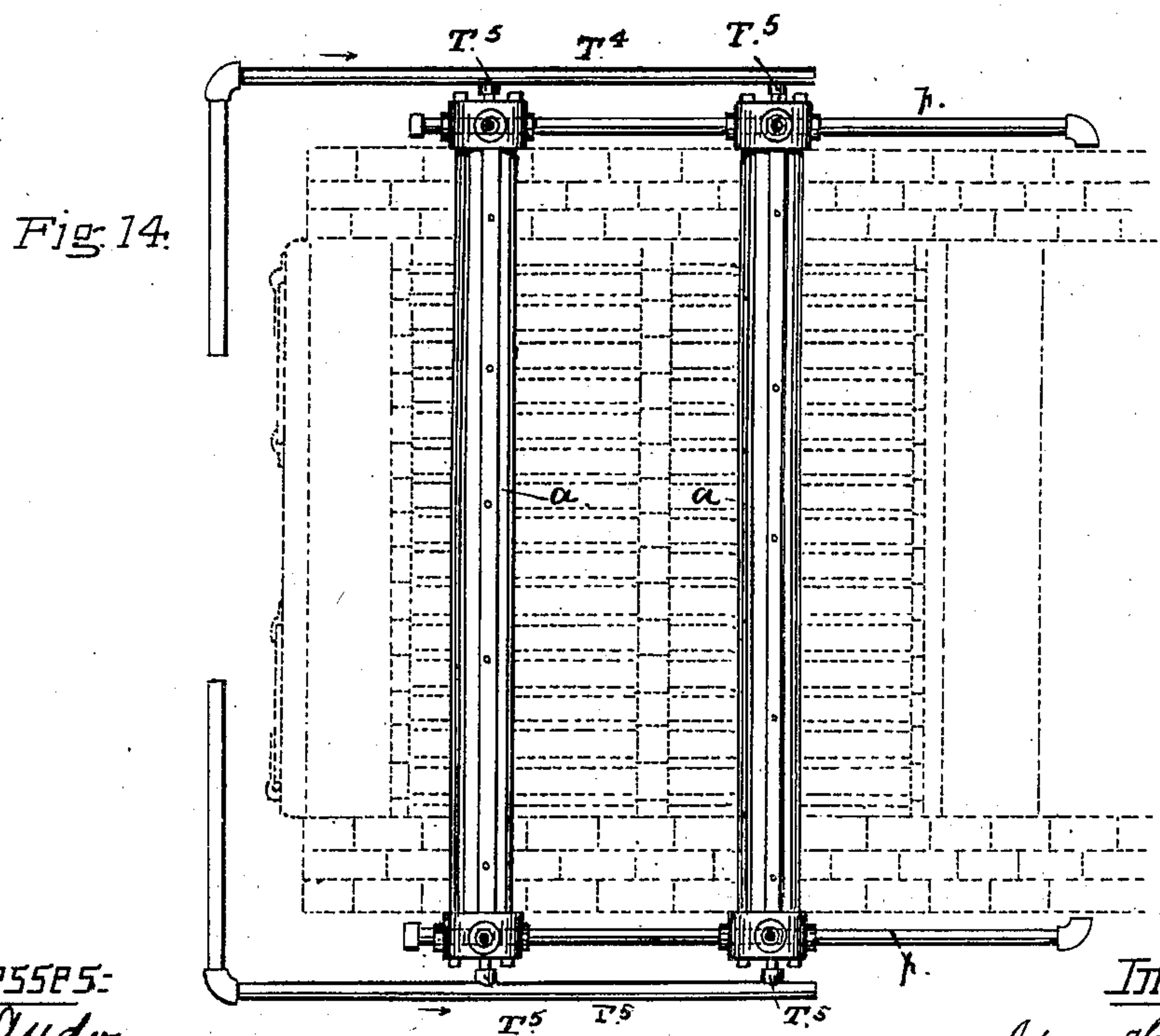
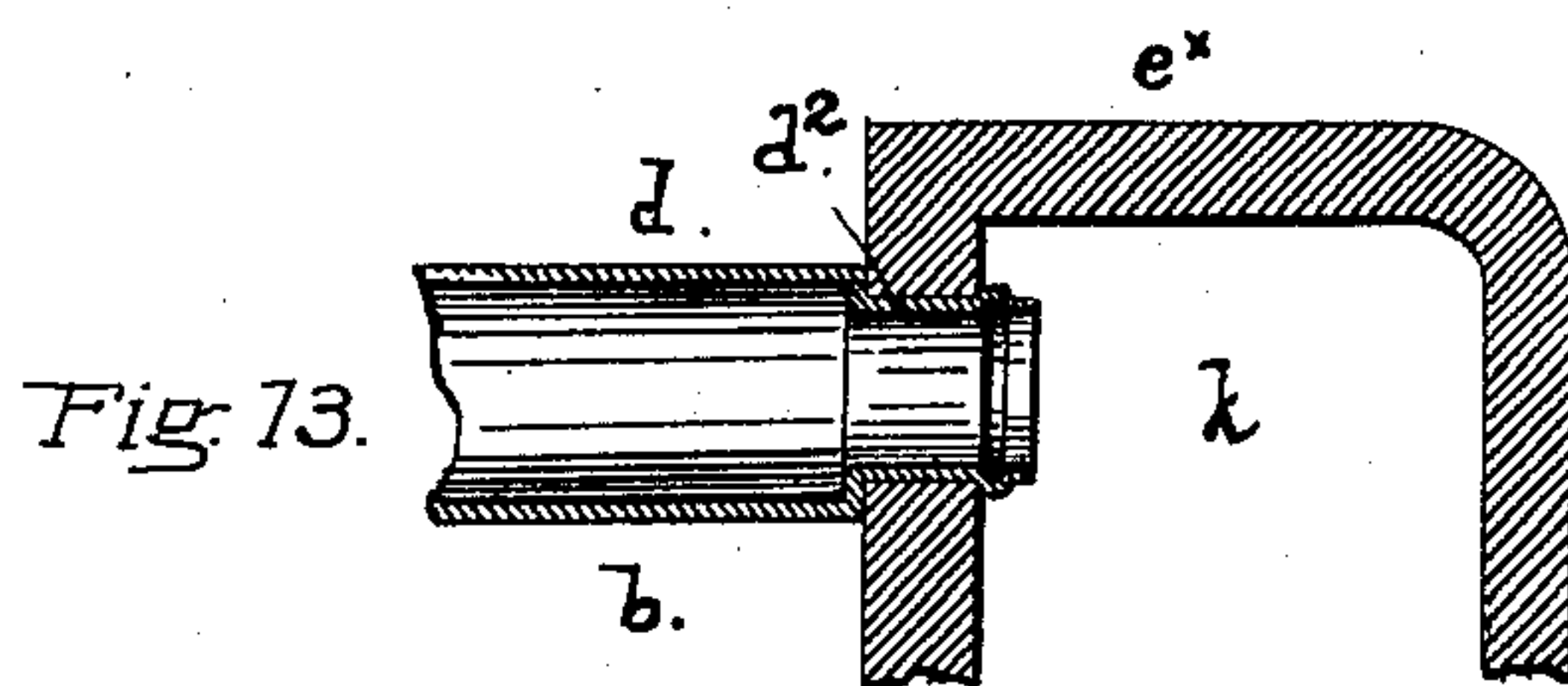
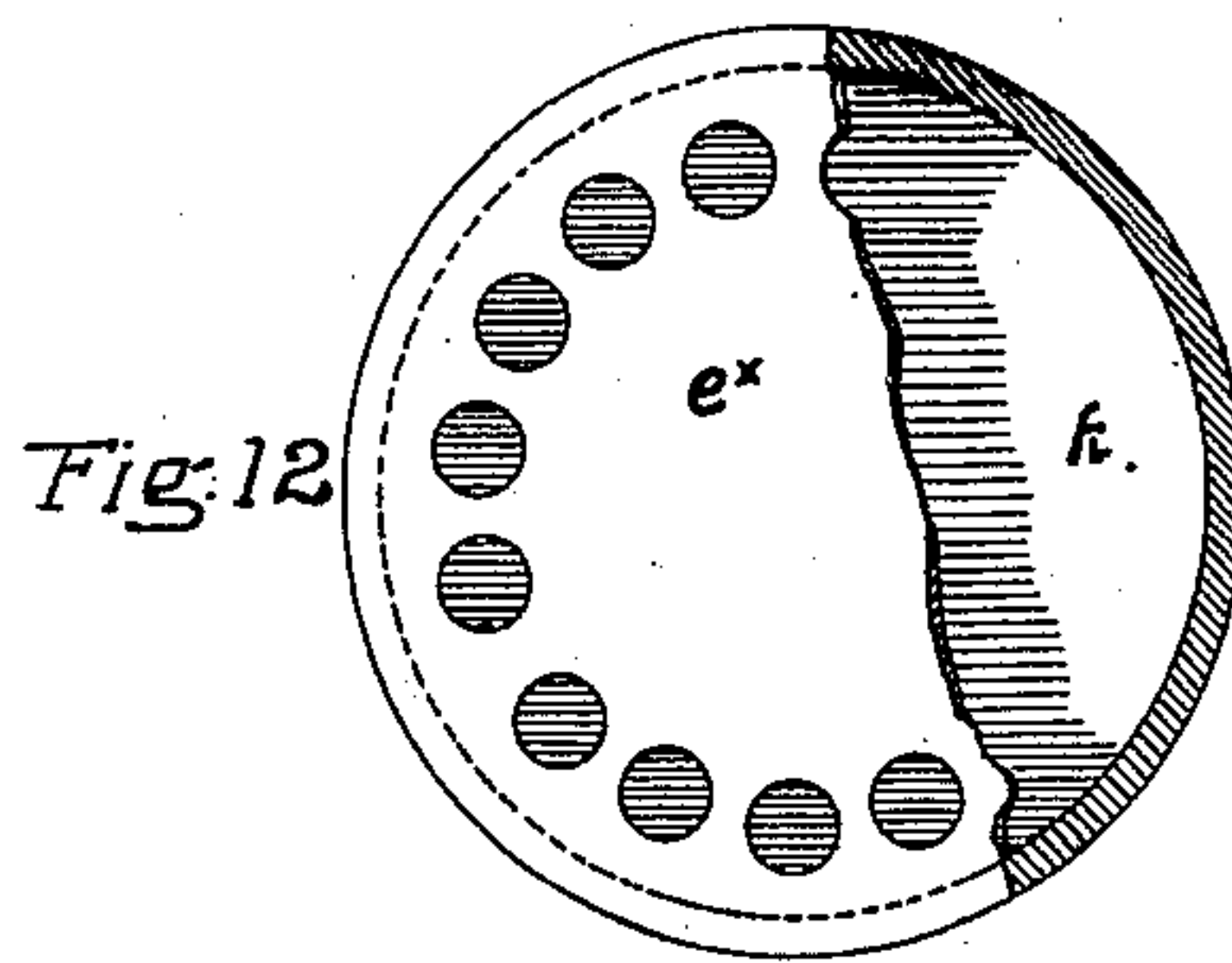
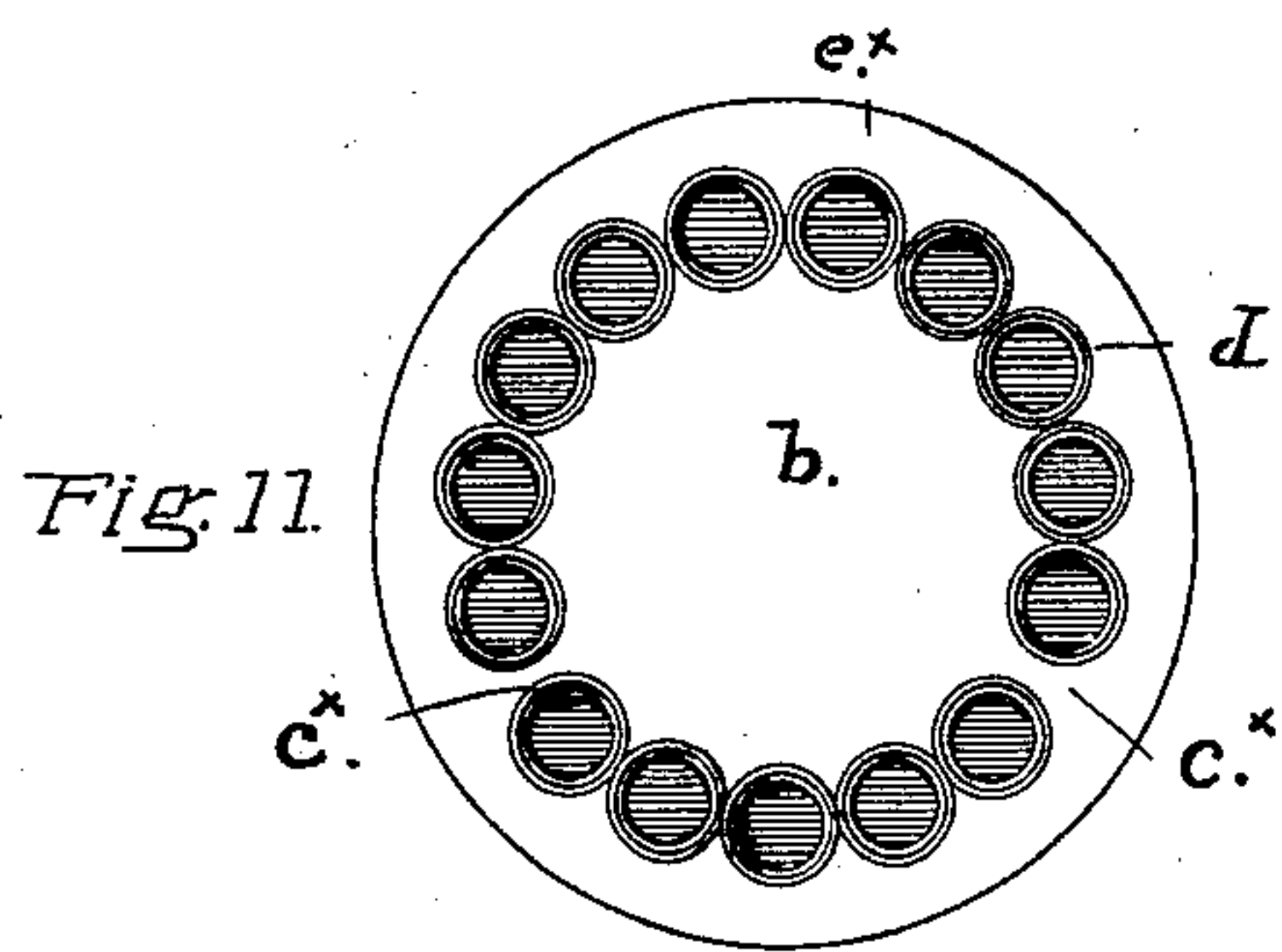
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(No Model.)

3 Sheets—Sheet 3.



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# UNITED STATES PATENT OFFICE.

ADAM HEBERER, OF BERKELEY, CALIFORNIA.

DEVICE FOR INTRODUCING AND DISTRIBUTING AIR TO FURNACES.

SPECIFICATION forming part of Letters Patent No. 682,592, dated September 10, 1901.

Application filed April 16, 1900. Serial No. 13,014. (No model.)

*To all whom it may concern:*

Be it known that I, ADAM HEBERER, a citizen of the United States, and a resident of Berkeley, county of Alameda, and State of California, have invented new and useful Improvements in Devices for Introducing and Distributing Air to Furnaces, of which the following is a specification.

This invention relates to improvements made in devices or apparatus for introducing and distributing air in the furnaces of steam-boilers for the purpose of promoting combustion and preventing smoke.

The object of the invention is mainly the production of a device or apparatus having several advantages in construction and operation over other means or devices of the kind heretofore produced, especially with regard to cost of construction, facility of application and adjustment to furnaces already in use, effectiveness in operation, and durability under continued exposure to the heat of the furnace.

To such end and object, mainly, this invention consists in certain novel parts and combination of parts producing an improved device for introducing and distributing air in furnaces above the grate-surface and in close relation to the mass of fuel, as herein- after fully described, reference being had to the accompanying drawings, in which—

Figure 1 is a front elevation of my improved device in position as applied to the furnace of a stationary boiler of the horizontal return tubular type. Fig. 2 is a side elevation of the same device. Fig. 3 is a side view, on an enlarged scale, of the cylinder or body of the device, showing the front and rear heads in section and the central portion of the body broken away. Fig. 4 is a front view, partly in section, of the front head. Fig. 5 is a transverse section at *y y*, Fig. 3, looking toward the front head. Fig. 6 is a transverse section at *x x*, Fig. 3, looking toward the rear head. Fig. 7 is a transverse section, on an enlarged scale, of one of the water-circulating tubes and the adjacent blocks that fill the spaces between the tubes around the circumference of the cylinder. Fig. 8 is a front view of one of the filling-blocks seen in Fig. 7. Fig. 7<sup>a</sup> is a transverse section, on an enlarged scale, of a modified form of filling-block. Fig. 9 is a front eleva-

tion of an air-distributing apparatus composed of three cylinders with the water-pipes and connections for carrying the boiler-water or the feed-water through the whole number of cylinders in continuous circulation. Fig. 10 is a top view of the front heads and a portion of the body of each cylinder, showing the pipes for circulation of water and the air-supply pipes connecting the cylinder with a source of air under pressure. Figs. 11 and 12 are views of the front and the rear head of a construction of cylinder in which the body is composed entirely of water-tubes. Fig. 13 is a detail sectional view, on an enlarged scale, of one of the water-tubes where it enters the head. Fig. 14 is a plan or top view in which the cylinders are set transversely over the grate-surface to bring the connections at the side of the furnace.

The device in its simplest form consists of a hollow cylindrical body *a* of proper length to extend through the front *A* of the furnace back to the bridge-wall in a longitudinal direction over the grate-surface and containing a central air space or chamber *b*, at one end of which is an outlet for air outside the furnace, and in the sides of the cylinder-body outlets *c c* for discharging the air in thin sheets in a lateral direction and at varying angles toward or against the mass of fuel. The shell of this cylinder is constructed of a number of water-tubes *d d*, joined together at the front end by a hollow head *e*, containing two separate and unconnected passages or chambers *f g* on opposite sides of a partition *h*, and connected together in like manner at the rear end by a hollow head *e'*, that incloses a single chamber *k*. The ends of the water-tubes are fixed in the two heads at intervals apart in a circle at equal distances from the center, and the partition *h* in the double-chambered head is usually so placed as to divide the number of tubes equally between both chambers. An inlet-aperture *m* in the head opening into one chamber is connected by a pipe *p* with a supply of water, such as the feed-water supply, and by pipes *q* connection is made with the water-space of the boiler for circulation of the boiler-water through the tubes of the shell. An outlet-aperture *n* from the space on the opposite side of the partition *h* is connected with the upper part of the water and steam



space of the boiler, so as to carry and maintain circulation of water through all the tubes that go to form the body of the cylinder.

Figs. 1 and 2 of the drawings illustrate an apparatus of this construction composed of two cylinders connected by a supply-pipe *p* with the lower part of the water-spaces in the boiler and by return-pipes *q* with the upper part of the boiler. These connections produce a continuous circulation of the boiler-water through the two heads and all the water-tubes in each cylinder, the water entering one chamber of the front head and through the set of tubes leading from that chamber to the rear head and returning through the other set of tubes into the space on the opposite side of the partition, and thence through the pipes connected with that space into the upper part of the boiler. In one construction of cylinder which I have employed the water-tubes are spaced at intervals apart around a circle, and the open spaces between the tubes are filled with plates or blocks *s*, shaped to fit and lie closely against the curved sides of the tubes. The blocks are drawn to place and bound together by long bolts *t*, that unite a block on one side of the body with the block diametrically opposite, the bolts being properly spaced at intervals apart in the length of the body to pass one another. The countersunk head *u* of each bolt is let in flush with the outer face of one block, and the screw-threaded end *v*, working in a threaded hole in the oppositely-set block, draws the two blocks toward each other and tightly to place against the tubes, thereby locking the tubes and the blocks together and producing tight joints between the parts. The outlet-apertures for the air are narrow slits or openings formed either through the center of the filling-block, as shown in Figs. 7 and 8, or along one edge between the block and the side of the tube against which the block lies, as represented in Fig. 7<sup>a</sup>. The position of the air-slits is varied in this manner to change the direction of the air-streams, or by shifting the air-slit blocks from one position to another around the circumference the angular direction of the air with relation to the surface of the fuel is varied accordingly.

Figs. 11 and 12 illustrate a slight modification in which the filling-blocks are dispensed with by increasing the number of water-tubes and setting them in close order around the circle to form the shell of the cylinder, the tubes are formed with bottle-neck ends *d*<sup>2</sup>, reduced in diameter to leave a sufficient quantity of metal for strength between the holes in the front and the rear heads, and the tubes are secured in place by flanging or rolling the ends inside the head, as shown in Fig. 13. In this construction the air-outlets *c* are formed by spacing the tubes around the circle in such manner as to leave a slit or narrow opening *c*<sup>x</sup> between two adjacent tubes, as illustrated in Fig. 12. This modification simplifies the construction by dispensing with

the filling-blocks and the bolts; but on the other hand the increase in the number of water-tubes necessarily adds both to the cost of the parts and the labor involved in putting the parts together. This construction of air-distributing cylinder is well adapted for application and arrangement in various positions in furnaces, and can be set to advantage transversely over the grate-surface, as well as in the longitudinal position shown in Figs. 1 and 2 of the drawings.

In situations where the position of the boiler and its setting will permit the device can be inserted through the sides of the furnace or fire-chamber with the heads standing outside, and provision can be made for introducing the air into the cylinder at both ends. In some cases the apparatus will be found to work better if the air be introduced and supplied to the cylinder at both ends, and particularly where the depth of the furnace calls for a long cylinder.

Air is supplied to the apparatus through a trunk or box pipe *T*, having a branch *T'* to each cylinder and provided with a gate *T*<sup>2</sup> for regulating the supply of air as it comes from the blower to which the trunk is to be connected. The branch *T'* surrounds the front end of the cylinder just behind the head *e*, so that the air will enter the cylinder through the slits *c* at that end of the body. This connection is shown in Figs. 1 and 2 of the drawings. Instead of supplying air in this manner it can be introduced directly into the end of the cylinder through the head, as illustrated in Figs. 9 and 10, by means of an air-pipe *T*<sup>3</sup>, having a branch tube *T*<sup>5</sup>, entering an inlet-aperture *T*<sup>6</sup>, provided for it in the center of the head.

Having thus described my invention, what I claim as new therein, and desire to secure by Letters Patent, is—

1. A device for introducing and distributing air in furnaces of steam-boilers, adapted to be located in the fire-space thereof, and having a shell composed of water-tubes arranged in parallel lines in a circle in close order to inclose a cylindrical air-heating chamber; hollow chambered heads uniting the ends of the tubes, one of said heads having a compartment common to all the tubes at that end, the other head having a partition dividing its internal space into two compartments and separating the water-tubes at that end into separate series for return circulation of water to the opposite head; air-delivery outlets in the shell, formed by spaces left between the series of tubes, as described, extending longitudinally of the shell; an inlet for air through one head leading into the space inclosed by the tubes; means for connecting said inlet with an air-supply; and connections in the partitioned head for introducing water into one compartment and carrying it off from the other compartment.

2. In a device adapted for insertion in the fire-space of a furnace for introducing and



distributing air over and in relation to the fuel as described, the combination of a plurality of water-tubes arranged in a circle in close order to produce a cylindrical shell, said tubes being separated in groups or series at intervals to leave longitudinal apertures in the shell; hollow heads uniting said tubes at the ends, one of said heads having a compartment common to all the tube-terminals at that end, and the other head divided by a partition into two separate compartments and separating the tube-terminals at that end into separate series for return circulation of water; a water-inlet in one compartment and a water-outlet from the other compartment of the same head; means connecting said inlet and outlet with the water-space and steam-space of the boiler; and an air-supply pipe connecting the air-inlet in the head with an air-supply outside.

3. A device for introducing and distributing air in furnaces having a shell or body

formed of a plurality of water-tubes arranged in a circle at intervals apart; hollow heads uniting the ends of said tubes; removable filling-blocks inserted between the tubes; the bolts extending diametrically across the shell and uniting the filling-blocks on one side with those on the opposite side; an air-inlet communicating with the inclosed central space from the outside for introducing air; outlet-apertures at intervals apart in the circumference for distributing air from the interior space through the shell; and water inlet and outlet apertures in one head for maintaining circulation of water through the heads and water-tubes.

In testimony that I claim the foregoing I have hereunto set my hand and seal.

ADAM HEBERER. [L. S.]

Witnesses:

GEO. T. KNOX,  
A. WOLF.