

(No Model.)

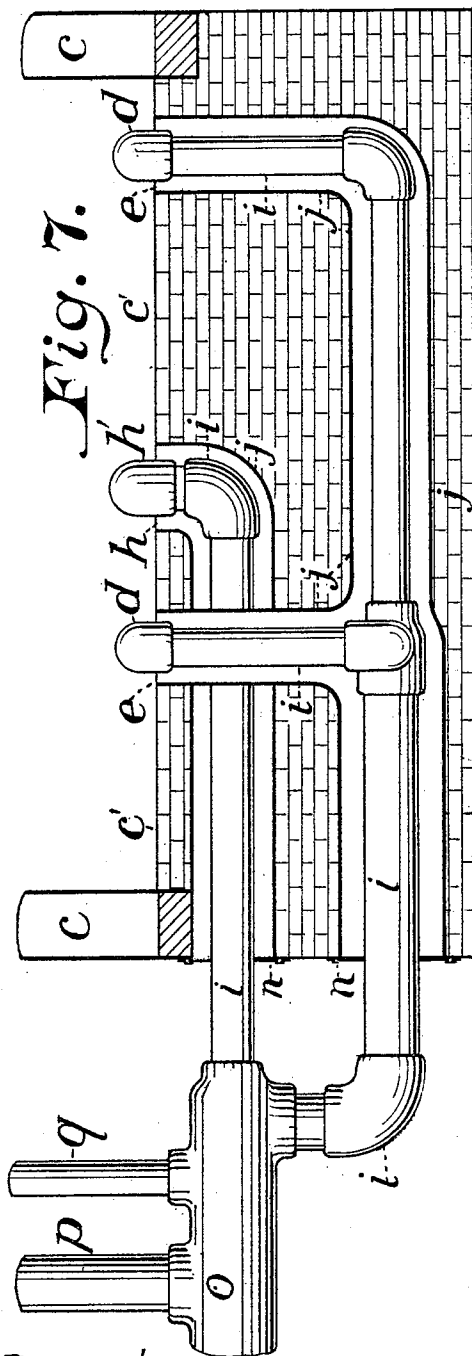
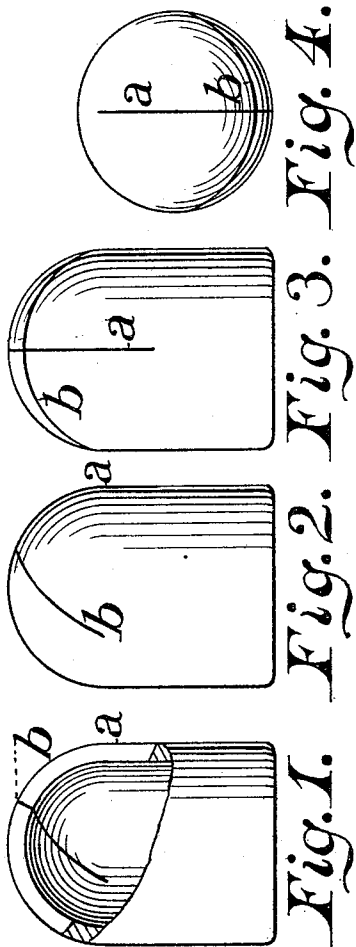
3 Sheets—Sheet 1.

J. FAHNESTOCK.

APPARATUS FOR BURNING LIQUID FUEL IN FURNACES.

No. 459,701.

Patented Sept. 15, 1891.



Witnesses
Louis W. Hunt,
John R. Fritz.

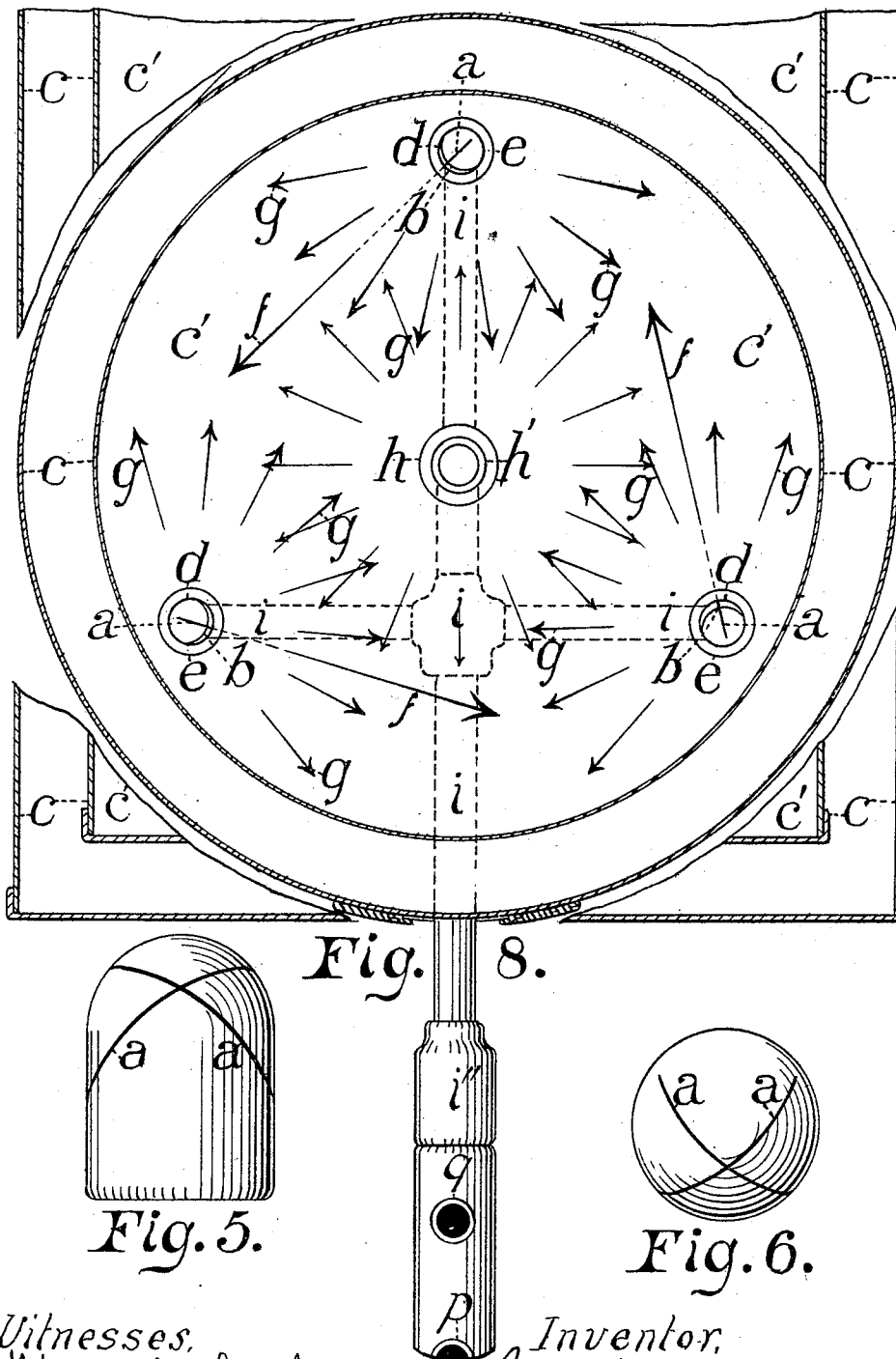
Inventor
J. Fahnestock

J. FAHNESTOCK.

APPARATUS FOR BURNING LIQUID FUEL IN FURNACES.

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Patented Sept. 15, 1891.



Witnesses.
R. M. Roscher
R. C. Swan

Inventor,
J. Fahnestock

(No Model.)

3 Sheets—Sheet 3.

J. FAHNESTOCK.

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Patented Sept. 15, 1891.

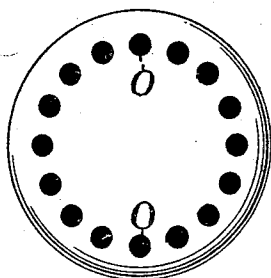


Fig. 11.

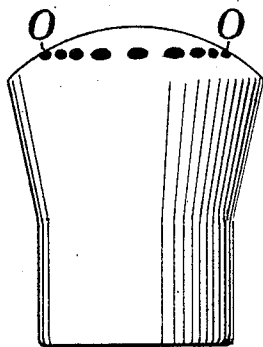


Fig. 9.

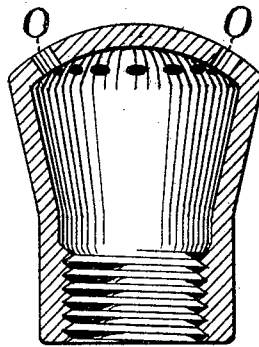


Fig. 10.

Witnesses

Ralph C. Swan

John A. Anderson

Inventor

John Fahnestock

UNITED STATES PATENT OFFICE.

JOHN FAHNESTOCK, OF BROOKLYN, NEW YORK.

APPARATUS FOR BURNING LIQUID FUEL IN FURNACES.

SPECIFICATION forming part of Letters Patent No. 459,701, dated September 15, 1891.

Application filed June 25, 1888. Serial No. 278,194. (No model.)

To all whom it may concern:

Be it known that I, JOHN FAHNESTOCK, a citizen of the United States, residing in the city of Brooklyn, in the county of Kings and State of New York, have invented a new and useful Improvement in Apparatus for Burning Liquid Fuel in Furnaces, which is fully described in the following specification.

The object of my invention is to induce a cyclonal movement of the burning products in the fire-box of the furnace with three or more oblique cross-slitted caps, through which the cross-sheeted flames are projected to every part of the heating-furnace, causing a complete and smokeless combustion of the fuel.

My invention relates to improvements in apparatus for burning crude petroleum and steam; and it consists of oblique cross-slitted caps, through which cross-sheeted flames are directed, where they are desired, and not aimlessly, as in other devices, for burning crude petroleum.

My invention also consists of fixing three or more of these oblique cross-slitted caps in a triangular or other geometric position in the floor of the fire-box of a furnace.

My invention further consists in connecting three or more of these oblique cross-slitted caps with suitable pipe and fittings, all of which are located in the ash-pit and connecting them with an injector, which is located in front of the furnace.

My invention still further consists in fixing air-ducts around the pipe and fittings which are in the ash-pit space, to utilize the heat that is absorbed by the refractory matter with which the intervening space is filled.

I do not make any claim in this specification for an injector, because any injector that will thoroughly atomize the oil can be used with my apparatus.

Referring to the accompanying drawings, forming part of this specification, similar letters of reference refer to corresponding parts.

Figures 1, 2, 3, and 4 on Sheet 1 are four views of my oblique cross-slitted caps. Figs. 5 and 6 on Sheet 2 represent a modification of the manner of cutting the cross-slits. Figs. 7 and 8 on Sheets 1 and 2 are representations of the complete apparatus applied to the fire-box of a round and square furnace. Figs. 9,

10, and 11 are views of the cap with annular series of openings.

Detailed description.—Figs. 1, 2, 3, and 4 show one conformation or manner of cutting the cross-slits. Fig. 1 is a side view, with the upper part of the front side broken away to show the cross-slit in section. Fig. 2 is also a side view. Fig. 3 is a front view, and Fig. 4 is a top view. In the four drawings the cut *a* is made longitudinally on one side of the cap, cut deeper on one side of the hemispherical top, with a cross-cut *b* at a right angle thereto. Figs. 5 and 6 show a modification of cutting the cross-slits, in which both cuts *a a* intersect at a right angle, but are inclined at an angle of forty-five degrees to a horizontal line drawn on the surface of the cap and intersecting the cuts at its base.

The construction of the caps is clearly shown in all of the drawings. Each cap is a short tube, closed hemispherically on one end and the other is threaded to screw on the pipe.

In its inception this invention was designed for a specific purpose, of producing cyclonal currents in the fire-box of a furnace, and thereby force the burning products to every part of the heating-surface, retaining them momentarily, and thereby insuring a perfect and smokeless consumption of the fuel, and this object can only be accomplished with my complete apparatus, as shown in Figs. 7 and 8, where it is represented as applied to a round and square furnace.

c c is the water-space between the casings.

c' c' is the floor of the fire-box, which may be fire-brick or other refractory matter. In the floor are four round holes *e e e* and *h*, in which are located the caps *d d d*, which are three of my cross-slitted caps, fixed in a triangular position, with a cap *h'*, having an annular series of jets placed in the center.

i i i i show the pipe and fittings connecting the caps, all of which are located in the ash-pit. It will be observed that the caps *d d d* and *h'* project slightly through the holes *e e e* and *h* which are larger than the caps and correspond in size to the air-ducts *j j j*, which are constructed around the pipes and fittings *i i i i*. All of the intervening space below the refractory floor *c' c'*, formerly the pit, is

filled in with the same refractory matter to absorb the heat and impart it to the air-ducts *j j j*. An injector *O* is placed in front of the furnace, with a steam-pipe *p* and oil-pipe *q*.

5 Figs. 9, 10, and 11 are three views of the annular cap. Fig. 9 is a side view. Fig. 10 is a vertical section, and Fig. 11 is a top view.

O O represents a ring of holes, through which the fuel is discharged. A cross can be
10 made instead of the ring of holes; but any other form of an annular cap may be used.

Referring to Fig. 8, it will be observed that three cross-cut caps *e e e* are fixed in a triangular position and that the oblique cross-slits
15 are on the same angle to the center of the furnace and to each other, the three largest arrows *fff* showing the central line of discharge from the slits *a a a*, and the second size arrows *g g g* showing the discharge from the
20 cross-slits *b b b*, forming cross-sheets of flames, which, by the suction of the discharge, draw a full supply of hot air through the annular holes *e e e* and *h*.

In practical operation the cross-sheeted
25 flames as they issue one behind the other drive the currents in a cyclone around the fire-pot of the furnace and make a perfectly smokeless and complete combustion of the fuel. In a large furnace I place a cap with
30 an annular series of jets in the center of the fire-pot at *h'*, and the smallest arrows pointing outward show the direction of the discharge. The dampers *n n* are placed in front and cover the outer ends of the air-ducts, through
35 which all of the air that is required is admitted and regulated.

What I claim as my invention, and desire to secure by Letters Patent, is—

40 1. In an apparatus for burning crude petroleum and steam, a cross-slitted cap fixed

on a fuel-supply tube cylindrical in form with one end closed hemispherically, on one side of which are cut two slits intersecting at about a right angle, substantially as hereinbefore set forth.

45

2. In an apparatus for burning crude petroleum and steam, a group of three or more oblique cross-slitted caps fixed in a triangular or other geometric position, with a cap having an annular series of jets in the center
50 in the floor of the fire-box of a furnace, with the cross-slits of each cap directed at the same angle to the respective sides of the geometric figure, with pipes and fittings for connecting the caps with an injector for the
55 purpose of producing cyclonal currents, substantially as described.

3. In an apparatus for burning crude petroleum and steam, a group of three or more oblique cross-slitted caps fixed in a triangular or other geometric position in the refractory floor of the fire-box of a furnace, with the cross-slits of each cap directed at the same angle to the respective sides of the
65 geometric figure, whereby the cross-sheeted flames are caused to play through the furnace around a common center and produce cyclonal currents, in combination with pipes and fittings connecting the caps located in the ash-pit and air-ducts inclosing the pipes and fittings, being embedded in the refractory matter
70 which fills up the intervening space, and an injector to atomize the oil and to mix it with the steam, substantially as set forth.

In testimony whereof I have hereunto set my
hand.

JOHN FAHNESTOCK.

In presence of—

LOUIS W. FROST,

R. F. VAN BOSKERCK.