

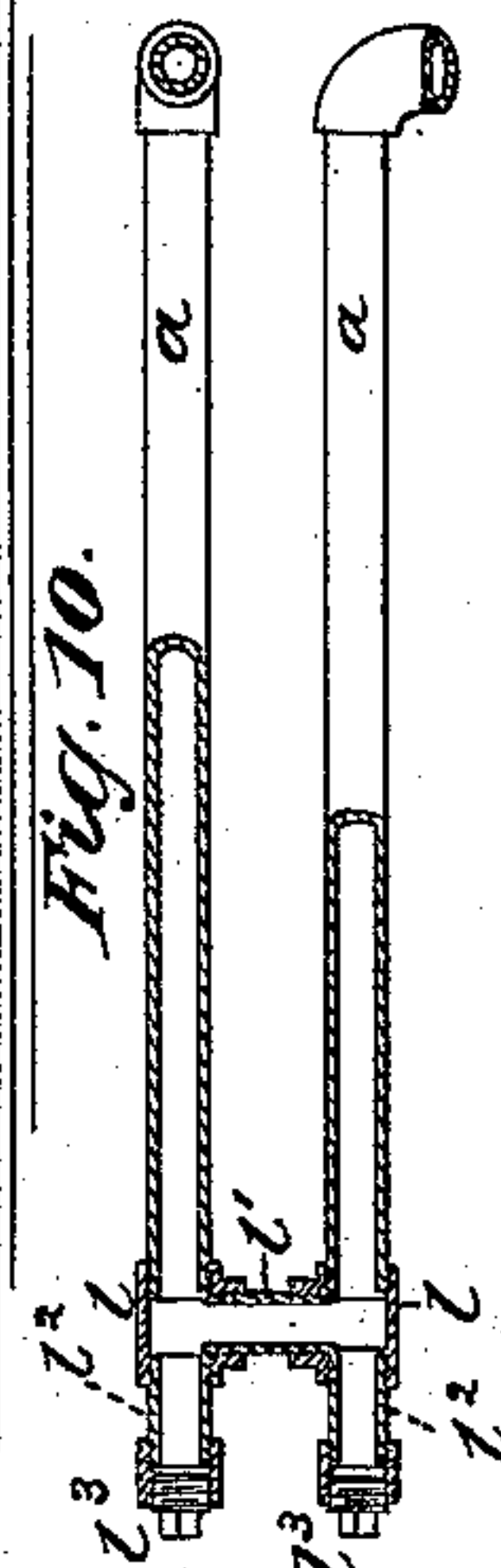
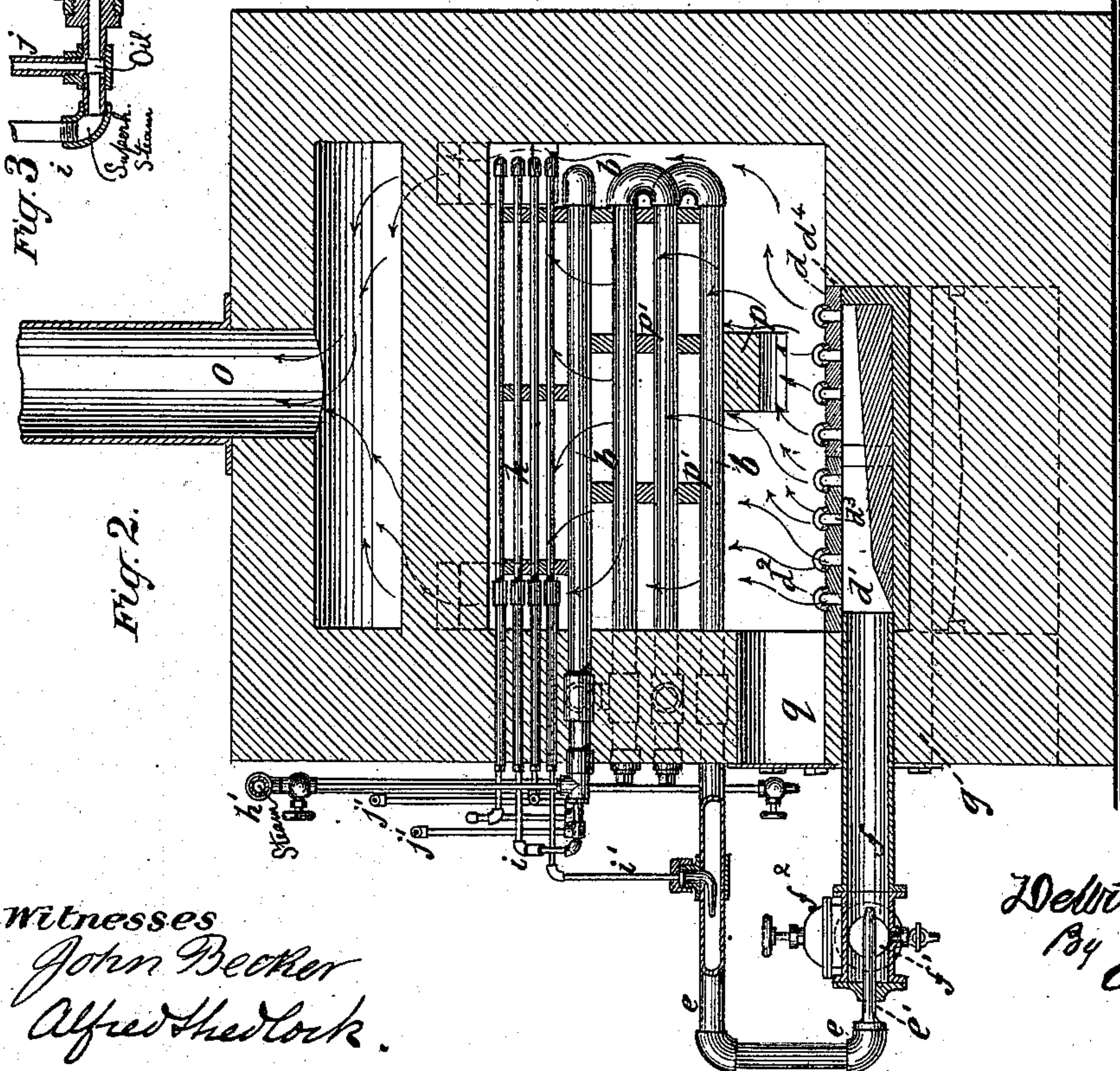
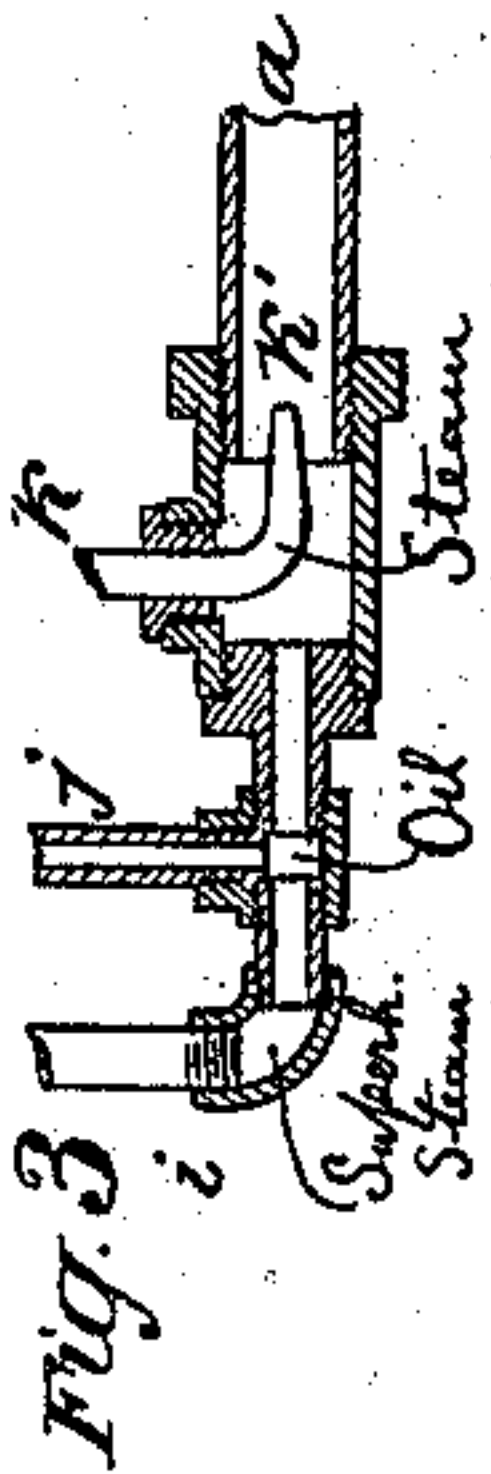
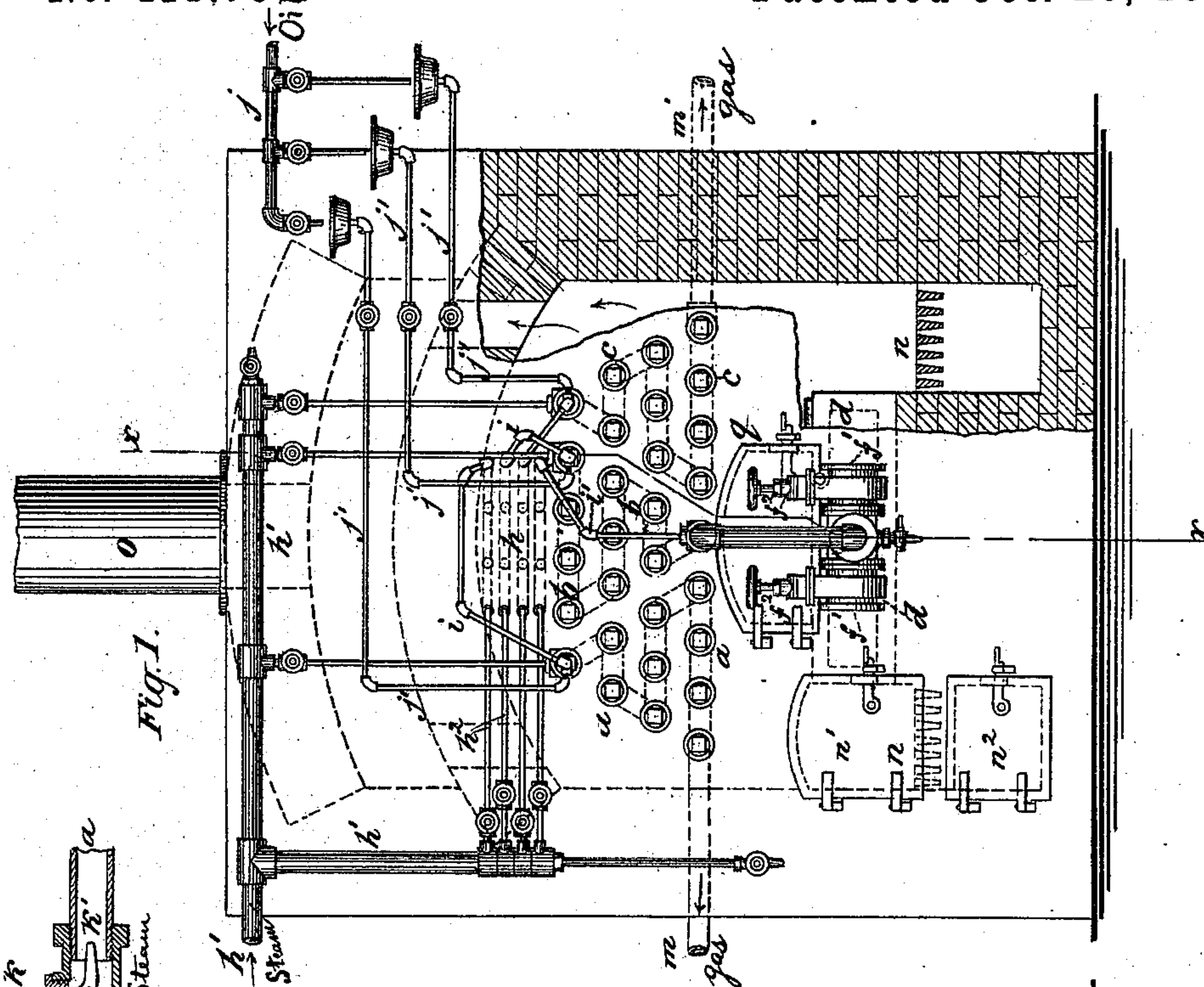
(No Model.)

2 Sheets—Sheet 1.

DE WITTE STEARNS.
BURNER FOR GAS GENERATORS.

No. 413,766

Patented Oct. 29, 1889.



Witnesses
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2 Sheets—Sheet 2.

No. 413,766.

Patented Oct. 29, 1889.



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UNITED STATES PATENT OFFICE.

DE WITTE STEARNS, OF DES MOINES, IOWA.

BURNER FOR GAS-GENERATORS.

SPECIFICATION forming part of Letters Patent No. 413,766, dated October 29, 1889.

Application filed June 12, 1888. Serial No. 276,836. (No model.)

To all whom it may concern:

Be it known that I, DE WITTE STEARNS, a citizen of the United States, and a resident of Des Moines, Polk county, Iowa, have invented certain new and useful Improvements in Burners for Gas-Generators, of which the following is a specification.

This invention relates to improvements in gas-burners, and particularly to that class of burners designed for use with gas produced from liquid hydrocarbons; and it embodies novel features of construction whereby a uniform heat can be maintained over the entire area of the burner.

My improved burner is shown in the accompanying drawings, and is here described in conjunction with a gas-producing apparatus from which it obtains its supply of combustible vapor, the heat from which is in part utilized in the conversion of the liquid hydrocarbons.

Parts of the invention herein shown have been made the subject-matter of another application, which was filed on the 2d day of November, 1888, and is known as Serial No. 289,809, and entitled "Improvement in gas-burners."

Figure 1 is a front elevation, partly in section, of my improved apparatus for the production of gas from liquid hydrocarbon, embodying the burner forming the subject-matter of this application. Fig. 2 is a longitudinal vertical section of the same on the line $x x$. Fig. 3 is a sectional view of the inlet of one of the retorts. Fig. 4 is a plan of a rectangular burner with one of the upper tiles removed. Fig. 5 is a perspective view of one of the burner-tiles in section. Fig. 6 is a plan view of a burner-tile, showing a modification in the gas-orifices. Fig. 7 is a vertical section of the same. Fig. 8 is an elevation, partly in section, of a modification in the arrangement of the retorts. Fig. 9 shows the application of my improved gas producing and burning apparatus to a steam-boiler. Fig. 10 is a view showing the manner of connecting the front ends of the adjacent pipes of the retorts.

The retorts $a b c$, in which the gas is produced, consist of rows of pipes arranged in pyramidal form, each alternate retort thereby

formed being inverted, as shown in Figs. 1 and 2, or reversed, as shown in the modification Fig. 8. The purpose of this arrangement is to economize space and to better utilize the heat from the furnace above the burner-tiles $d d$. The outlet of the central retort b is connected to the burner d by the pipe e , the end of which is provided with the nozzle e' , which projects into the closed end of the mixing-chamber f to or past the air-inlets f' , the areas of the orifices of which are controlled by the valves f^2 , and this mixing-chamber passes through the front wall g and enters the forward end of the burner-chamber d' . The upper wall of this burner-chamber d' is formed by the perforated burner-tiles $d d$, and the floor is composed of some refractory material formed into two planes the one nearest the combustion-chamber beginning on the level of the lower wall of the combustion-chamber f and extending rearward at an angle of about thirty degrees from the horizontal for about one-eighth of the length of the burner-chamber, and the other extending from such point to the rear wall of that chamber at a considerably less angle, so that the space between the floor and the under side of the burner-tiles decreases as the rear wall of the burner-chamber is approached to about one-third of its depth at the front end.

It will be understood that ordinarily the burner-chamber would be rectangular in plan and conform to the burner-tiles d , as shown. These burner-tiles $d d$ (shown in Figs. 4 and 5) consist of flat plates of some refractory material—such as fire-clay—provided with parallel slots, the upper edges of which are beveled for the purpose of forming a seat for the burner-tips d^2 . These burner-tips are composed also of some refractory material, are nearly semi-cylindrical in form, provided with transverse slots, and have their lower edges tapered to correspond with the beveled upper edges of the slots d^3 in the tiles d , into which they are seated and cemented. A single tile may be used in place of the group shown in Fig. 4. In that figure one tile is removed to show the burner-wall d^4 and part of the floor of the burner-chamber d' .

The modification of the burner-tile (shown at Figs. 6 and 7) consists in providing such

tiles with a series of small openings, preferably circular in form, enlarging from the upper to the lower surface of the tile.

The steam-superheaters *h*, placed above the
5 retorts *a b c*, are supplied with steam from the pipe *h'* through the horizontal pipes *h²*. The superheated steam passes from the superheaters into the entrance ends of the retorts *a b c* through the connecting-pipes *i*, at which
10 points it comes in contact and mixes with the liquid hydrocarbon and carries the same into the retorts. The liquid hydrocarbon supplied by the pipes *j* enters the entrance ends of the retorts through the pipes *j'*. To facilitate the
15 entrance of the hydrocarbon into the retorts, pipes *k* extend from the steam-supply pipe *h'* to the retorts, each being provided with an injector-nozzle *k'*, arranged within the entrance end of the retorts, as shown at Fig. 3.
20 To facilitate the cleaning of the pipes composing the retorts *a b c*, these pipes are connected together in pairs at their front ends by T's, and with nipples joining the side branches of the T's. These pipes are extend-
25 ed in a straight line through the front wall *g* by short pieces of pipe, the ends of which are closed by means of plugs. One of these connections is shown at Fig. 10, wherein *ll* represent the T-pieces, *l'* the connecting-nipple,
30 *l²* the front extension-pipes, and *l³* the plug. The removal of these plugs *l³* permits of any suitable scraper or cleaning implement being passed into the retort-pipes for the extraction of any deposit that may occur therein
35 without disturbing any of the connecting-joints.

The central retort *b* is connected to and supplies gas to the burner *d d' d²* by means of the pipe *e*, and to insure the flow of gas
40 therefrom the pipe *i'* from one of the steam-superheaters is arranged to enter the pipe *e* and terminate therein with a nozzle, as shown in Fig. 2.

The gas generated in the two outside re-
45 torts *a* and *c*, Fig. 1, is carried off for illuminating or heating purposes or for storage through the pipes *m* and *m'*, connected to the exit ends of such retorts.

At each side of the gas-burner, and ar-
50 ranged near the bottom of the furnace, is a small grate *n*, upon which a wood or other fire may be kindled to initially heat the retorts, the necessary fuel being applied through the doors *n' n'*, and the ashes removed through
55 the doors *n² n²* in the front wall *g*. By this arrangement of grates at the sides of the gas-burner dirt and ashes from the starting fires are prevented from being deposited on the burner and obstructing its gas-orifices.

60 Gas previously produced by the apparatus or otherwise, if conveniently stored, may be supplied to the burner to initially heat the retorts and start the generation of the gas in lieu of using fires in the side grates. When
65 the retort *b* becomes sufficiently heated to convert the steam and liquid hydrocarbon into gases, the gases therein formed pass

through the pipe *e* and the mixing-chamber *f* into the chamber *d'* of the burner, taking
70 with them, through the openings *f'* of the mixing-chamber, the quantity of air necessary to insure perfect combustion. The amount of this air-supply is controlled by the adjustment of the air-valves *f²*. The mix-
75 ture of the gases and air so produced fills the chamber *d'* with a uniform pressure throughout, and issues therefrom through the orifices in the tiles *d*, and a steady and uniform fire over the whole extent of the burner-tiles is thereby
80 secured upon the ignition of the gas, and economical distribution and utilization of the heat therefrom among and by the pipes com-
85 posing the retorts *a b c* results in part therefrom and in part from the relative arrangement of such pipes, and the products of com-
90 bustion not utilized finally escape through the flue *o*. The lower layer of pipes of the retorts are supported on the narrow arch *p*, and the successive layers of these pipes are held out of contact with each other by the
95 spacing-bars *p'*.

The construction of the burner-tips *d²* before described admits of the ready removal of any that become defective and of the sub-
95 stitution of new ones, and this may be done through the front door *q* without disturbing any other part of the apparatus.

The number of the retorts may be varied at pleasure, according to the exigencies of the case. The novel method of inverting or revers-
100 ing the position of the alternate pyramidal retorts, besides more fully utilizing the heat, admits of the arrangement of a group of such retorts vertically, as shown in the modifi-
105 cation, Fig. 8, thereby economizing floor-space when desired.

It is evident that my improved form of burner is adapted to be used for burning nat-
110 ural gas or heating-gas produced by any means or apparatus soever. An application thereof to a steam-boiler is shown at Fig. 9, which view also shows a gas-generator *s* and steam-superheater *t*, arranged in the furnace to produce gas for and act in conjunction with
115 the burner *d*.

I claim as new and desire to secure by Let-
ters Patent—

1. A gas-burner comprising a chamber hav-
ing an inlet at one end thereof and having the floor of its interior inclined upwardly from
120 the inlet side to the rear wall in two planes, the one adjacent to the inlet being at a greater angle to the horizontal plane than the other, and a horizontal top of refractory material provided with outlet-orifices at intervals over
125 its entire surface, substantially as set forth.

2. The combination, with flat tiles of refractory material provided with a series of parallel slots beveled at the upper edges, of
130 semi-cylindrical burner-nipples of refractory material, having their lower edges tapered to correspond with the beveled edges of the slots in the tiles, and having transverse slots formed through their rounded upper parts

connecting with their interior surfaces, substantially as set forth.

3. A gas-burner comprising a chamber having an inlet at one end thereof and having
5 the floor of its interior inclined upwardly from the inlet side to the rear wall in two planes, the one adjacent to the inlet being at a greater angle to the horizontal plane than the other, and a horizontal top of refractory material
10 provided with outlet-orifices over its entire

surface, in combination with a gas and air mixing chamber and adit-pipe.

In testimony that I claim the foregoing as my invention I have signed my name, in presence of two witnesses, this 11th day of June, 15 1888.

DE WITTE STEARNS.

Witnesses:

CHAS. STILLWELL,
JOSEPH S. MICHAEL.