(No Model.) 2 Sheets—Sheet 1.

H. A. HOUSE.

VAPOR BURNING APPARATUS.

No. 559,894. Patented May 12, 1896.

Fig. 1.

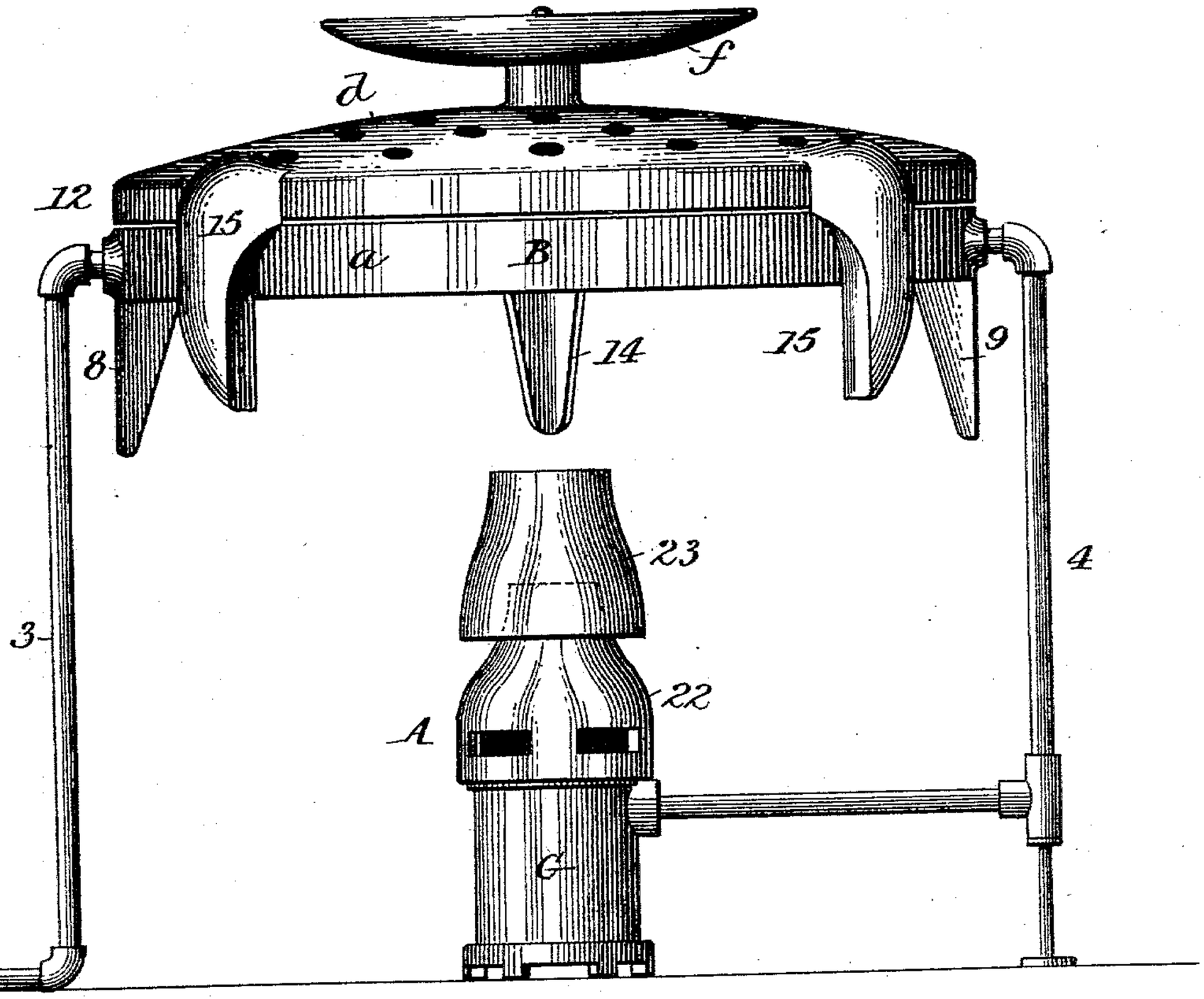
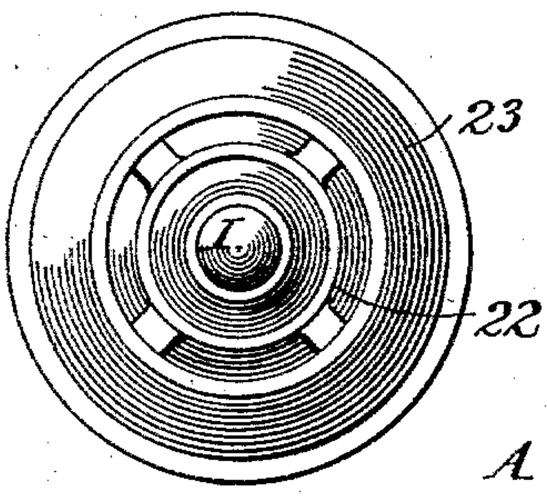


Fig. 5.

Fig. 6.



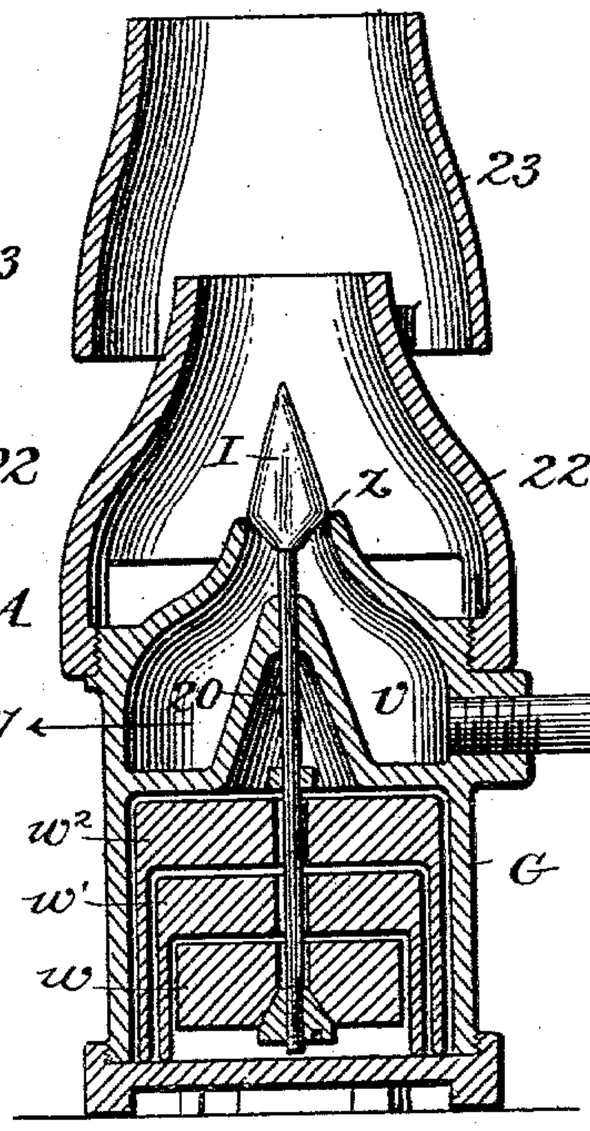
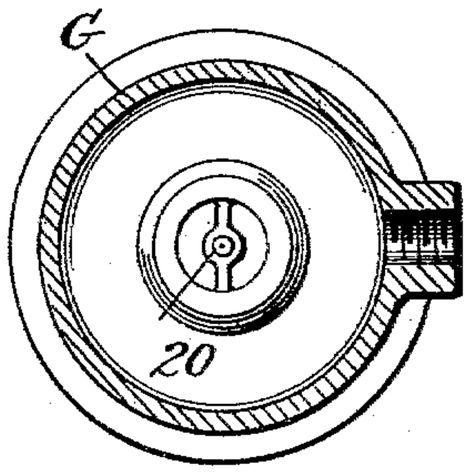


Fig. 7.



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(No Model.) 2 Sheets—Sheet 2

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VAPOR BURNING APPARATUS.

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Fig. 3.

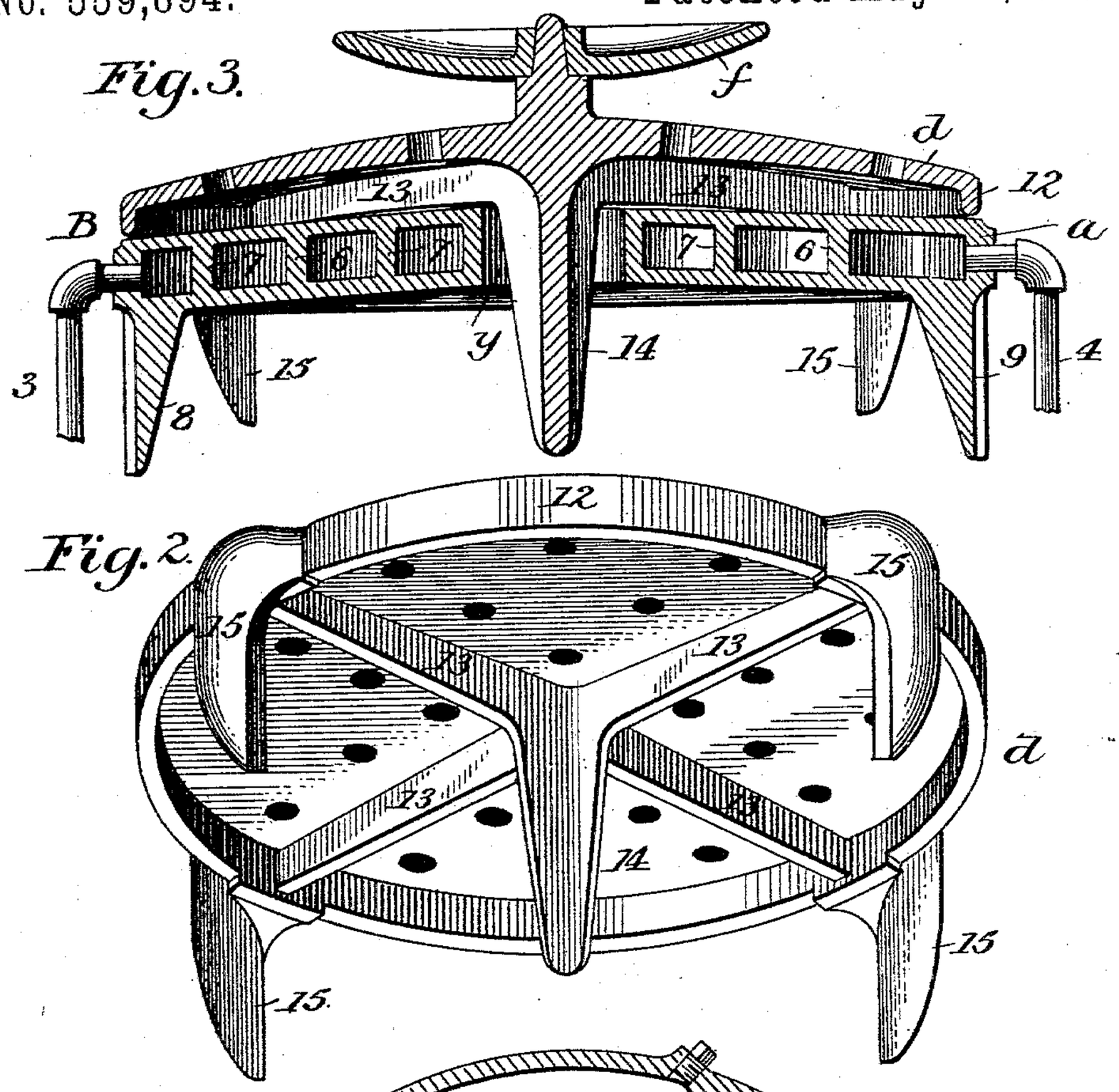
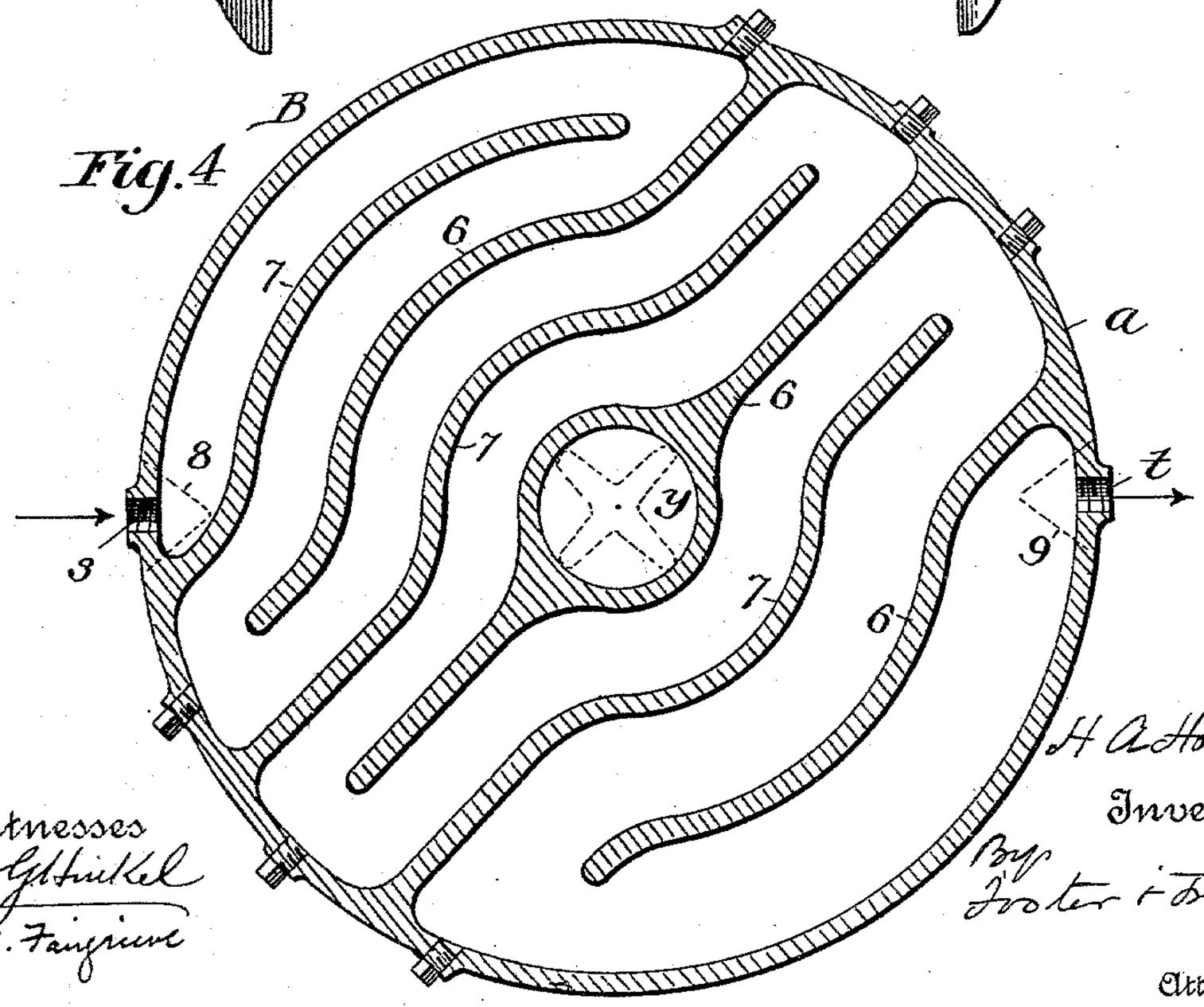


Fig. 2.

Fig. 4



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UNITED STATES PATENT OFFICE.

HENRY A. HOUSE, OF BRIDGEPORT, CONNECTICUT.

VAPOR-BURNING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 559,894, dated May 12, 1896.

Application filed February 21, 1895. Serial No. 539,557. (No model.)

To all whom it may concern:

Be it known that I, HENRY A. HOUSE, a citizen of the United States, residing at Bridgeport, in the county of Fairfield and State of Connecticut, have invented certain new and useful Improvements in Vapor-Burning Apparatus, of which the following is a specification.

My invention relates to that class of vapor-burner apparatus in which a liquid fuel is vaporized in a generator communicating with the burner of the said apparatus; and my invention consists in certain improvements in the construction of the parts of such apparatus fully set forth hereinafter, and illustrated in the accompanying drawings, in which—

Figure 1 is an elevation of my improved vapor-burning apparatus. Fig. 2 is a perspective view of the refractory cap of the apparatus. Fig. 3 is a longitudinal section of the generator. Fig. 4 is a horizontal section of the generator. Fig. 5 is a vertical section of the burner. Fig. 6 is a plan of Fig. 5. Fig. 7 is a transverse section on the line 7 7, Fig. 5.

The burner A is arranged below the generator B, and oil is supplied to the latter from a suitable reservoir through an inlet-pipe 3, and the vapor passes from the generator through a pipe 4 to a burner. As shown, the generator is a flat casing *a*, having a series of internal partitions 6 7 extending from opposite sides, so as to form a continuous tortuous passage from the inlet-port *s* to the outlet-port *t*, and in the center of the casing is an opening *y*.

As in other apparatus of this class, the burner and generator are relatively so arranged that the flame from the burner passes upward to the generator and is deflected outward and passes up around the edge thereof. As a result, it has been found that when the flame strikes the inlet-pipe 3, which is more or less chilled by the entrance of the cold oil, the gases are chilled by contact with the pipe and carbon is deposited thereon, while the point where the flame strikes the outlet-pipe 4 is apt to be greatly overheated, so as to convert the vapor from the generator into a fixed gas, causing an internal deposit of hard carbon, which clogs the pipe adjacent to the generator. In order to correct these defects, I arrange shields or deflectors 8 9 in position to prevent the gases from directly striking either pipe adjacent to the generator. These deflectors may be formed and supported in any suitable manner. I prefer, however, to form them in one piece with the casing of the generator, each consisting of a downwardly-extending arm triangular in cross-section, as indicated in dotted lines, Fig. 4, whereby the gases are deflected from the pipes without breaking to any material extent the circular character of the flame which passes above the generator.

One difficulty resulting in the use of gas-burners where the gas is generated from oil supplied to a generator heated by a flame from the burner results from the extinguishing of the flame in consequence of water being mixed with the oil, so that at times steam is generated and passes to the burner, cutting off the flame, and before the latter is ignited again the generator becomes more or less cooled, interfering with the continuous rapid generation of gas. In order to overcome this defect, I provide the burner with a self-igniter of any suitable character—as, for instance, with a block of refractory material, which becomes incandescent under the heat of the flame and remains at such a heat during any time that the flame may cease from the presence of steam, and which will immediately upon vapor from oil passing through the burner again ignite the same—and I maintain the heat of the generator by arranging in juxtaposition to the same a section or mass of refractory material, which retains the heat and transmits it by radiation or convection to the casing of the generator. The refractory material may be formed and arranged in different ways to secure these results. As shown, it is in the form of a circular convex cap *d*, having a peripheral flange 12 extending downward and resting on top of the casing *a*, and with radiating ribs 13 and a centrally downwardly-projecting stem 14 passing through the opening *y* and cross-shaped in cross-section, so as not to close said opening, the disk being perforated throughout its entire extent. The downwardly-projecting arm 14 becomes heated to incandescence by exposure to the flame, and therefore if the

gas is cut off at any time and its flow afterward resumed the said arm will serve to again ignite it. Inasmuch, however, as at times the heat is near the periphery of the generator, I provide the cap with additional arms 15 15, which extend downward over the edge of the casing *a* and are exposed to the flame where it passes around said edge and become highly heated and serve to insure the ignition of the gas. These arms also serve to center the cap upon the casing. While the cap may be composed of different kinds of refractory material, I prefer to mold the same from clay and hard-bake the latter. The mass of material of the refractory cap *d* also becomes highly heated during the operation of the burner and will retain this heat for a sufficient length of time after the burner has been cut off by the presence of steam and until it is again lighted to keep the generator in a highly-heated condition, so that it will vaporize the oil that is admitted after the passage of the steam.

When the supply of oil to the generator is limited and the flame is not too forcibly expelled from the burner, the gas will meet a sufficient amount of air to preserve the continuity of the flame to a point adjacent to the burner beneath, through, and around the generator. When, however, the gas is very forcibly expelled from the burner and in large volumes, sufficient air will not combine therewith immediately adjacent to the burner to insure thorough combustion, and while the gas will pass as a flame around the burner a certain portion will escape unconsumed under ordinary circumstances. I therefore provide the central passage *y* for a portion of the gas and the channel or passage beneath the cap *d* and the openings in the cap, whereby the gas which passes directly upward from the burner is distributed over a wide-heated surface, escapes through numerous openings in streams which bring it into immediate contact with the air, and insure in most instances thorough combustion. To still further combine the gas and air where the gas issues with great pressure, I make use of a deflector *f* in the shape of a cup-like disk supported above the cap in position to be struck by the gas from the openings nearest the center and deflect the same outward and cause it to mingle more intimately with the air. It will thus be seen that the perforated cap or plate *d* serves as a deflector, as does also the plate or disk *f*, and it will be evident that such deflectors may be differently arranged to cause a more intimate commingling of the gas with the air and a more thorough combustion.

It is important, in order to prevent the overheating of the generator and the clogging of the same with carbon, that the character or energy of the flame shall depend upon the quantity of oil passing through the generator. If, for instance, the generator was heated to as great a degree when a small portion of oil passed through it as when the maximum flow took place, there would be such an overheating, but by reducing the size or energy of the flame when the flow of the oil to the generator is slight and only increasing the size and energy of the flame when the flow of the oil is great enough to cool down and prevent the undue heating of the generator the discharge of carbon may be prevented. I therefore combine with the generator a burner having a gas-opening which is controlled by a valve which may be differently weighted according to the pressure and volume of the gas which passes to the burner. A burner of this character may be constructed in different ways, one of which is illustrated in Figs. 5, 6, and 7. In said figures there is a casing G, to which the vapor passes from the pipe 4, with a port *z* closed by a valve I. The stem 20 of the valve passes downward through a number of weights *w* *w'* w^2, with concentric flanges resting upon the bottom of the casing *g*, and of such a depth that as the valve rises it will first lift the lowest weight, then bring the latter against the next highest, and then the latter against the next, and so on, so that the weights are successively applied to the valve. By this means when the pressure is light the valve will rise to the extent required by such pressure and the flame will be proportioned to the small flow to the generator, but as the flow increases additional weights are added to the valve and the opening for the passage of the gas also increases, but is prevented from becoming unduly great by the greater relative increase of the weight upon the valve. It will be evident that the weights or their equivalent springs may be differently arranged to receive the accumulation of air in the valve as it rises. It frequently happens that at the beginning of operations or when the generator has unduly cooled down oil will flow to the casing of the burner. In order to prevent the oil from passing downward through the opening through which the stem 20 extends, I elevate the bottom of the casing at the point where the opening for the passage of the stem is made. As shown, the valve is surrounded by a hollow cone 22, having an air-inlet near the base and surmounted near another hollow cone 23, open near the bottom to facilitate the mixture of the air with the gas passing from the port. By arranging the weights below the vapor-chamber *v* in the casing G, I prevent bringing the heated gases in contact with the weight, so as to avoid chilling the gases or in any way clogging the weights and interfering with their effective operation.

Without limiting myself to the precise construction and arrangement of parts shown and described, I claim—

1. The combination with a generator and burner, the former having a central opening, of a perforated plate of refractory material having a portion thereof separated from the

generator by spaces and extending through the opening in proximity to the burner, substantially as described.

2. The combination with a vapor-generator having a central opening, and a burner located beneath the opening, of a plate of refractory material having the outer deflecting portions supported above said generator and having the central portion projecting through the opening and separated from the generator by spaces, and a deflector located above said refractory plate, substantially as described.

3. The combination with the generator of a vapor-burner apparatus, of a burner having a port and valve a casing and a number of weights arranged within the casing and connected with the valve, to be successively lifted, substantially as set forth.

4. The combination with the casing and valve of a vapor-burner, of a stem extending downward through the casing and through a number of weights arranged to be successively lifted by the valve, substantially as described.

5. The combination of the casing, valve, downwardly-extending stem and weights arranged to be successively lifted by the valve, the bottom of the casing being elevated where the valve-stem passes through the same, substantially as set forth.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

HENRY A. HOUSE.

Witnesses:
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