(No Model.)

E. BETZ.

HYDROCARBON BURNER.

No. 519,375. Patented May 8, 1894.

Fig. 1

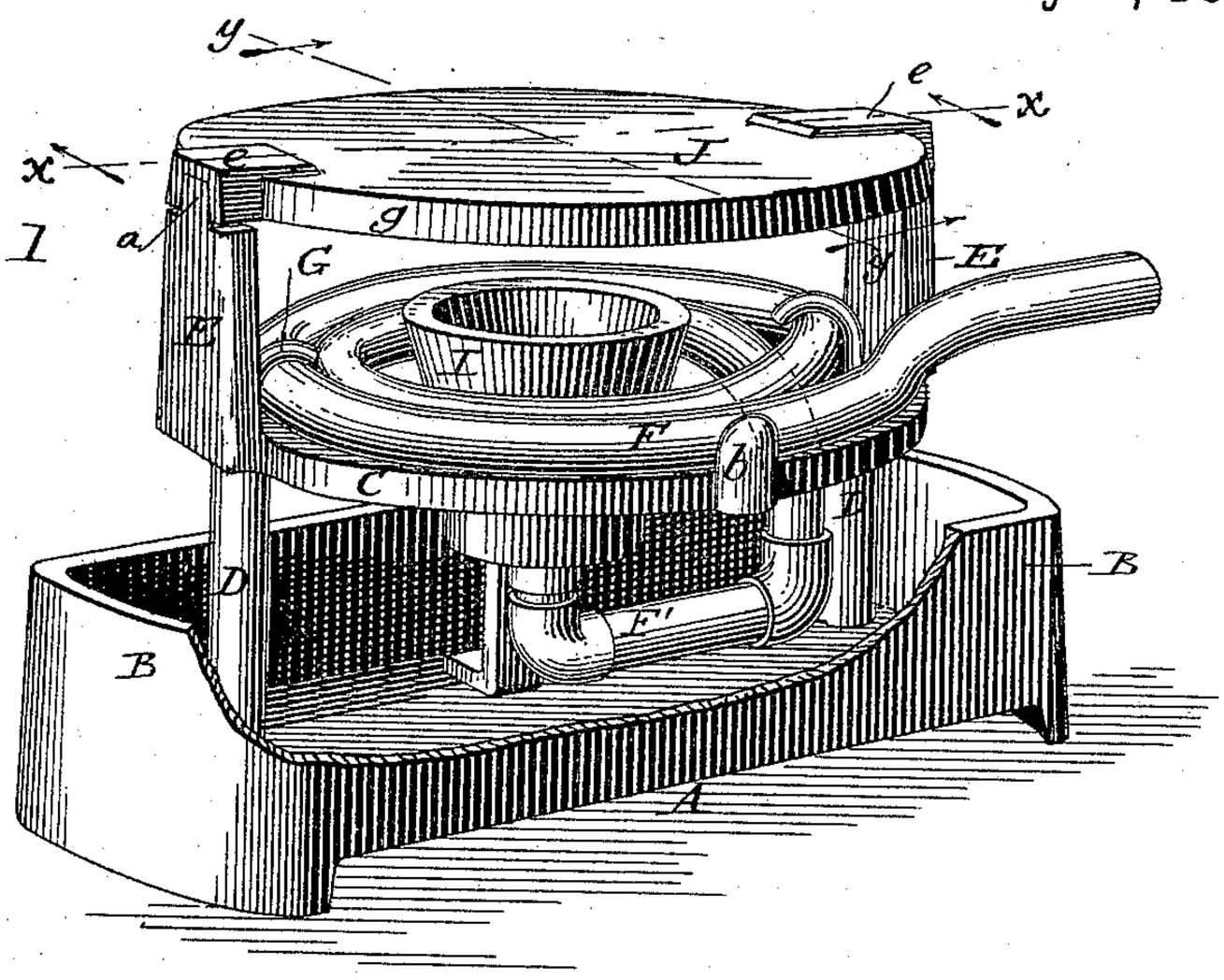


Fig. 2.
on x – x

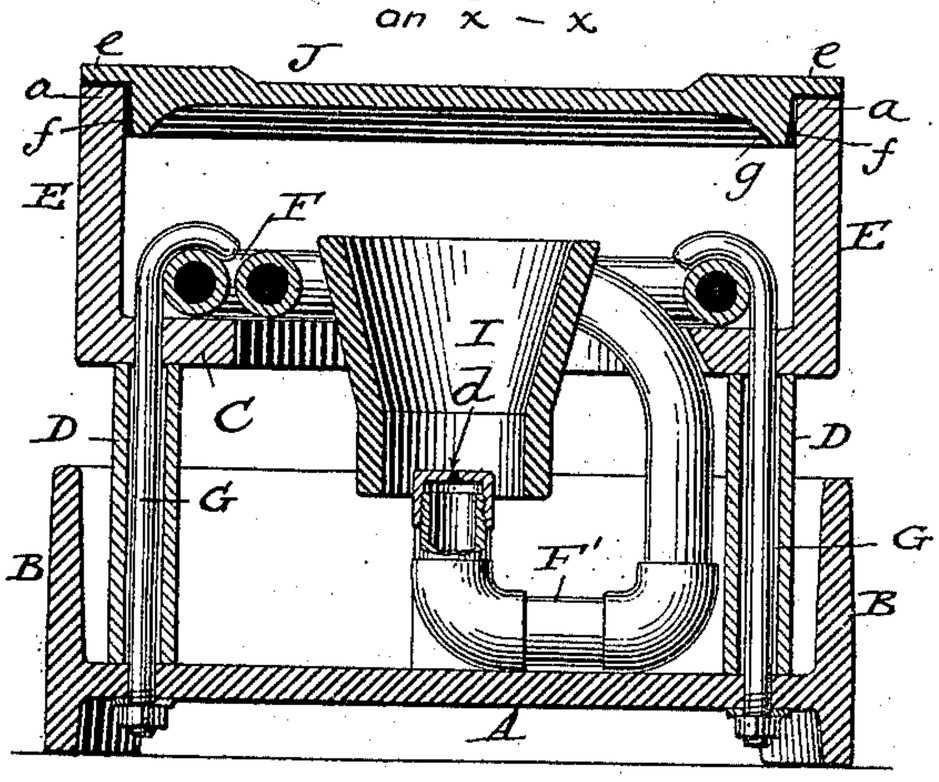


Fig. 3.
on y – y

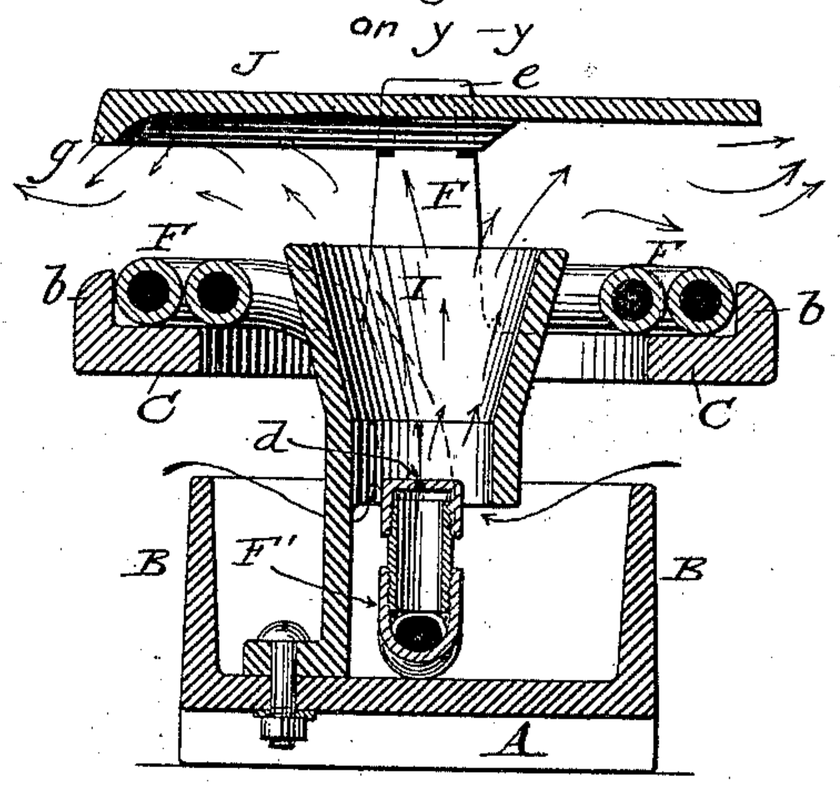
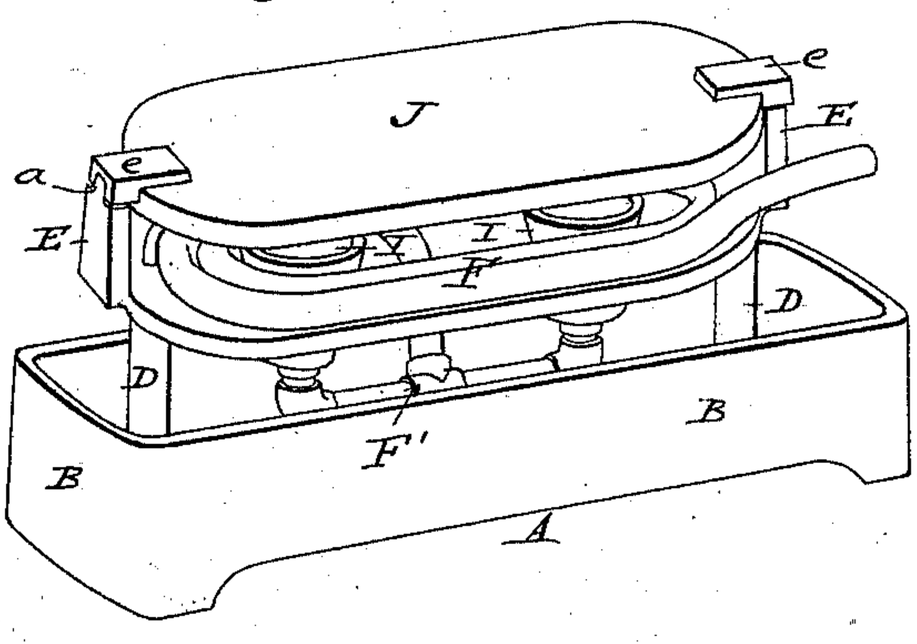


Fig. 4.



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HYDROCARBON-BURNER.

SPECIFICATION forming part of Letters Patent No. 519,375, dated May 8, 1894.

Application filed October 2, 1893. Serial No. 487,007. (No model.)

To all whom it may concern:

Be it known that I, ERNEST BETZ, a citizen of the United States, residing at Washington, District of Columbia, have invented certain new and useful Improvements in Hydrocarbon-Burners, of which the following is a specification.

My invention relates to hydro-carbon burners, and particularly to such as are designed for vaporizing and burning kerosene and similar oils which do not readily vaporize at ordinary temperatures.

The objects of my invention are first, to lessen or suppress the noise commonly attending the operation of such burners; and second, to render combustion more perfect.

In the accompanying drawings, Figure 1 is a perspective view of a single-jet burner embodying my invention; Fig. 2, a vertical central section through the same on the line *x—x* of Fig. 1; Fig. 3, a similar section on the line *y—y* of Fig. 1; and Fig. 4, a perspective view showing the general appearance of a two-jet burner.

At this time numerous oil burners are being brought forward and introduced with more or less success for heating and cooking purposes, but in every instance, so far as I have observed, their use has been attended with a loud hissing or roaring sound, which is exceedingly unpleasant, and interferes greatly with the general adoption of such apparatus. After careful investigation of the subject, and numerous practical experiments and tests, I have succeeded in reducing the sound very greatly, and in practically suppressing it under most working conditions. At the same time I have greatly improved the combustion, so that smoke and soot are not produced, odors are not given off, and the clear blue flame produced possesses great heating power.

Referring again to the drawings, A indicates a base plate adapted to rest upon the grate of a common stove, range or furnace, and provided with raised walls B, the height of which depends upon the location of other parts, as will be explained.

C indicates an elevated platform of annular form, supported upon standards D and formed or furnished with upright arms E, which terminate at their upper extremities in tapering or beveled tenons *a*. The platform C is designed to support a coil F of pipe, which may be connected with or form a continuation of the oil supply pipe, and which constitutes a retort wherein to vaporize the oil or hydro-carbon. To secure the coil F permanently in position, I provide hook bolts G, which, passing down through the tubular standards D and being each furnished with a nut below the base A, serve to bind the parts together. The coil F has its inner end bent or carried downward, and carried thence horizontally over the base plate A, the end or extension F′ of said pipe or coil being extended vertically and provided with a perforated cap. To prevent the coil and its extension from being displaced or shifted, I provide the platform C with ears or lugs *b* at the sides, and with the bolts G before referred to, to hold the coil.

I indicates a mixing tube or funnel, provided with a supporting leg or standard by which it is raised above the base plate A and above the extension F′ of the pipe coil or retort F. It will be observed that this funnel is arranged with its larger end uppermost, contrary to the usual practice, and this arrangement is of great importance in suppressing sound and in promoting combustion. It is likewise important that the funnel or mixing tube, which is arranged over and concentric with a jet orifice *d* of pipe or extension F′, be arranged to permit a full and free entrance of air into said funnel with the jet of vapor issuing from the orifice. Finally, the side wall or guard B, arising from the base plate A, should extend to a horizontal plane approximately the same as that of the lower end of the funnel or mixing tube. In practice I have found it advantageous to extend said wall slightly above the level of the lower end of the funnel or mixing tube.

J is a top plate or cover, provided with ears *e*, having flaring mortises *f*, of a shape to receive the tapering tenons *a* of the uprights E. By reason of the bevel or taper of the tenons and the corresponding form of the mortises, the parts are caused to fit and bind snugly one upon the other, and thus the top is prevented from rocking or tipping.

As shown in Figs. 2 and 3, the cover or top plate J is formed with a downwardly-turned rim or flange *g*, which serves to deflect the

flame downward upon and around the coil or retort F, thus more effectively heating it, and consequently better insuring complete vaporization of the oil which passes.

The burner being constructed as above set forth, is supplied with oil under head, or under air pressure, which oil flows into the coil or retort, descends into and fills the horizontal pipe F′, and escaping at the orifice *d*, flows over the base plate A to greater or less extent. Being lighted, the oil upon the base plate produces a large flame, which, acting upon the pipe F′ and coil F, heats them sufficiently to vaporize the oil within them, the vapor escaping under considerable pressure at the orifice *d*. As soon as the vaporization begins, the regulating valve is set to reduce the admission of oil, and that which has escaped to the base plate being speedily consumed, only vapor is thereafter burned, mingled however with oxygen from the atmosphere. The vapor escaping from orifice *d* is directed centrally into the lower end of the funnel or mixing tube I. The vapor jet mingling with the surrounding air, carries a considerable volume of air along with it into said funnel, and becomes intimately commingled therewith in passing through the funnel. Being suddenly freed in leaving the orifice *d*, the vapor quickly expands, but its pressure is sufficient to convey it into the mixing tube or funnel, together with a large body of air, before it begins to burn, or at least before there is material consumption, if any. The funnel being of increasing diameter toward the top, affords room for adequate expansion, and permits the free passage of the mingled air and vapor, whereas if the arrangement be reversed, as commonly, the vapor and air are forced into a constantly diminishing space, where they cannot properly commingle, and they issue with great force, resulting in a loud roaring or hissing sound.

Practical use of both constructions demonstrates a vast superiority of the arrangement shown, with the larger end of the funnel uppermost, both as regards quietness of operation and thoroughness of combustion. The downwardly-directed flange or ring also contributes to these results. The reason of this I believe to be the more perfect heating of the coil or retort, and the consequent perfect vaporization of the oil and heating of the vapor, by reason of the flame being directed downward upon the coil or retort.

By making the jet orifice *d* in the cap applied to the end of the pipe or coil, I avoid an accumulation of oil or vapor in the end of the pipe, which would tend to create a back pressure were the orifice in the side and removed from the end.

The wall or guard B is found peculiarly conducive to quietness, and noticeably improves combustion, and although its effect is perceptible when the guard is below the lower end of the funnel, its full effect is realized only when it is on approximately the same level therewith. This fact I have ascertained by thorough test under actual working conditions, and although I am unable to state with certainty the reason for this action, I believe it due to two causes. First, the burner is, in practice, used in a stove or chamber connected with a chimney and having good draft, and cannot be used to good advantage otherwise. In the absence of the guard, the vapor and the air are in greater or less degree deflected from their proper path and carried away from the mixing funnel. Secondly, the guard not only prevents such interference by the draft, but it compels the entering air to drop down somewhat after passing over the guard, before it can enter the funnel or mixing chamber, and by thus changing its course, the rush of air is somewhat retarded, and the commingling of the gas and vapor takes place before the vapor is consumed. The correctness of these views appears to be confirmed by the fact that less oil is consumed under this arrangement than with a contracting mixing chamber and without the guard, while more perfect combustion is secured and greater heat is produced.

Whatever may be the correct theory, the construction above described, and shown in the drawings, results in the material advantages stated, and having thus fully explained the construction and stated the result, I do not insist upon the correctness of the reasoning, but mean to claim the construction.

As mentioned, the peculiar form of the tenons *a* and mortises *f*, cause the plate or cover J to maintain a fixed position, its lower face being parallel with the upper edge of the mixing tube or funnel. This I find important, because if the plate be tipped even slightly, the flame passes off at one side, causing the coil to be less perfectly heated, and moreover producing a cross current which materially interferes with the proper passage of air and vapor through the mixing tube or funnel.

If desired, two or more jets may be used in one burner, in which case there should be a separate mixing funnel or tube for each jet, and the guard should extend around each, either as a continuous wall, or as separate walls. Fig. 4 shows a two-jet burner with a continuous guard wall.

In Fig. 3 I have shown the plate J as having the flange *g* extending downwardly on one side only, the other side being left plain or unflanged. This form of plate is employed when it is desired to use the burner for heating both an oven and a water back, the unflanged side permitting the flame to pass directly and freely over the oven, and the flange *g* directing the flame downwardly onto the water back, as well as upon the coil.

Having thus described my invention, what I claim is—

1. In combination with a base plate A provided with a raised guard or closed wall B, a coil or retort F, having an extension F′ pro-

vided with an orifice *d*, a mixing funnel or tube I above the orifice and of increasing diameter from its lower toward its upper end, and a top plate or cover located above the funnel I.

2. In a burner, the combination of a base plate, a retort or vaporizer above said base plate, a mixing tube or funnel extending upward through the retort or vaporizer, and a closed guard rising from the base plate to a plane approximately coincident with that of the lower end of the mixing tube or funnel.

3. In combination with a base plate and with a retort or vaporizer above said base plate, a mixing tube or funnel extending upward within said retort but separated therefrom, and a top-plate above the retort, having a downwardly-turned rim or flange to direct the flame against the retort.

4. The herein described burner, consisting of the following elements in combination: a base plate A provided with a raised wall or guard B, a platform C raised above the base plate, a coil or retort F resting upon said platform, a delivery pipe F′ extending downward from said retort and provided with a delivery orifice *d*, a mixing tube or funnel I located above the delivery orifice, extending upward within the coil F, and of increasing diameter toward its upper end, and a top plate or cover J, located above the coil and mixing tube and provided with a depending rim, all substantially as set forth.

In witness whereof I hereunto set my hand in the presence of two witnesses.

ERNEST BETZ.

Witnesses:
H. L. SHEPARD,
HORACE A. DODGE.