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M. FRIEDMANN & R. KNOLLER.

VAPOR BURNER.

APPLICATION FILED JULY 29, 1903.

NO MODEL.

Fig. 2.

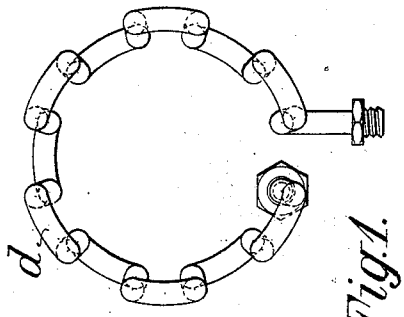


Fig. 1.

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UNITED STATES PATENT OFFICE.

MAX FRIEDMANN AND RICHARD KNOLLER, OF VIENNA, AUSTRIA-HUNGARY.

VAPOR-BURNER.

SPECIFICATION forming part of Letters Patent No. 773,383, dated October 25, 1904.

Application filed July 29, 1903. Serial No. 167,506. (No model.)

To all whom it may concern:

Be it known that we, MAX FRIEDMANN and RICHARD KNOLLER, both subjects of the Emperor of Austria-Hungary, and residing at Vienna, in the Empire of Austria-Hungary, have invented certain new and useful Improvements in Vapor-Burners for Heating, of which the following is a specification.

This invention relates to new and useful improvements in vapor-burners, and has for its object the construction of a burner which will work in a closed combustion-chamber and in which the vapor-jet will itself draw in all of the air necessary to complete combustion, thereby dispensing with the use of a chimney, blower, ventilator, or the like for introducing the air, as has heretofore been necessary.

The invention has for its further object the construction of a burner in which the vaporizer will thoroughly and uniformly vaporize the combustible at different performances of the burner.

The invention further aims to construct a vapor-burner which shall be simple in construction, strong, durable, efficient in its use, and comparatively inexpensive to set up.

To this end the invention consists of the novel combination and arrangement of parts hereinafter more specifically described, illustrated in the accompanying drawings, and particularly pointed out in the claims hereunto appended.

In the accompanying drawings, Figure 1 is a vertical section through a boiler fitted with our improved burner, also shown in section. Fig. 2 is an end view of the vaporizer looking to the right of Fig. 1.

The burner consists of the vapor-jet nozzle *a*, from which the fuel issues, a primary mixing-tube *b* for the incoming air and vapor, a funnel-shaped auxiliary mixing-tube *c* coaxial with the vapor-jet nozzle *a* and provided with jet-openings and a baffle *f*, a vaporizer *d*, surrounding the auxiliary mixing-tube *c*, a shell *e* around the vaporizers, an annular nozzle *i*, surrounding the inner end of the primary mixing-tube and provided with openings *k*, and a perforated cap *g*, connected to the outer end of the primary mixing-tube and adapted to support the vapor-jet nozzle *a*. The vaporizer *d* extends around the auxiliary mixing-tube and is connected at one end to a source of supply and at its other end to the vapor-jet nozzle. The vapor-jet issuing from the nozzle *a* passes through the tube *c*, where owing to the expanding form of the latter the speed of the vapor is so far reduced that combustion begins within the tube *c*. By means of the baffle-piece *f* on the mouth of the tube the burning gas is deflected so that it comes in contact with the air drawn in through holes *g* by the vapor-jet and streaming around the tube *c*. In this manner a complete combustion is instituted. The beginning of the combustion zone in the tube *c* is not limited to an invariable position, but shifts as the performance of the burner diminishes or as the superheating of the vapor by the entrance *h* of the tube *c* increases. Consequently the red-hot zone of the tube *c* is variable in the same sense. The vaporizer *d*, surrounding the tube *c*, is heated by radiation from the red-hot part of the tube *c*. This heating is therefore diminished by a diminished performance of the burner or by an increased superheating of the vapor or is increased in the contrary case, whereby at different performances of the burner a uniform degree of superheating is maintained. The entrance *h* of the nozzle *c* is so far separated from the tube *a* that, on the one hand, the suction of air in the mixing-tube *b* can proceed unhindered, while, on the other hand, when the jet of vapor enters the tube *c* an intermixture of air and vapor has not yet occurred, and thus a jet of vapor poor in air is kindled in the tube *c*. In this manner in spite of an abundant automatic intake of air a cutting off or extinction of the flame is prevented, as easily happens when a current of gas rich in air, in which the speed of propagation of the combustion is small, is directly kindled.

The forward end of the mixing-tube *b*, which is next the tube *c*, is provided with an expanding annular nozzle *i*, in which are openings *k*. By this arrangement in case of

the flame striking back disturbance of the intake of air is prevented and the flame does not extend to the vapor-nozzle *a*, inasmuch as the annular nozzle *i* affords sufficient room for the flame to develop and the openings *k* afford free exit for it. Since in consequence of this widening the main air-intake through the openings *g* is not hindered, the flame is immediately driven out of the mixing-tube *b* again and the normal condition is restored. Moreover, owing to the openings *k* a cutting off of the jet at the place where there is the sudden widening of the nozzle *i* is avoided, which would not be the case if the openings *k* were not there.

The vaporizer is so arranged that it partly or completely surrounds the tube *c*. This vaporizer may advantageously be a pipe curved in S or U form, Fig. 2, in such a manner that the turns are approximately parallel to the direction of the jet. By this arrangement the incoming air-current is little disturbed, as is the case when a spirally-formed worm-pipe is used. Further, owing to the many sudden changes of direction a uniform vaporization of the combustible is obtained. Finally, by a partial heating of the vaporizer, such as by the radiation from the tube *c*, heated, as above described, correspondingly with the performance of the burner, the heat is more uniformly spread over the vaporizer by conduction from the heated to the unheated side of the turns than is the case, for example, in a spirally-wound worm, in which this conveyance from the heated to the unheated side must occur through a much greater length of pipe.

Around the vaporizer *d* in the combustion-chamber is a shell *e*, forming a continuation of the tube *b*, which has for its object to make the vaporizer independent of the reflection from the walls of the combustion-chamber, so that the varying temperature of the latter shall have no influence on the vaporization of the combustible.

Only one auxiliary mixing-tube *c* is shown employed in the structure set forth; but it is evident that several of such tubes can be employed and arranged severally or side by side.

We claim—

1. A vapor-burner, comprising a vapor-jet nozzle, a primary mixing-tube having an air-inlet, a funnel-shaped auxiliary mixing-tube coaxial with and in front of the vapor-jet nozzle and provided with a central baffle-plate and surrounding apertures, said auxiliary mixing-tube having its entrance between said air-inlet and the zone of combustion.

2. A vapor-burner, comprising a vapor-jet nozzle, a primary mixing-tube having an air-inlet, an external annular nozzle surrounding the inner end of the primary mixing-tube and provided with openings communicating with the atmosphere, said annular nozzle adapted to cause the expansion of the flame in case of the flame striking back when the burner is lighted and arrest the passage of the flame to the vapor-jet nozzle, a funnel-shaped auxiliary mixing-tube coaxial with and in front of the vapor-jet nozzle, said annular nozzle forming in combination with the outer surface of the auxiliary mixing-tube a passage to permit the travel of air from the primary mixing-tube around the exterior of the auxiliary mixing-tube to the burner.

3. A vapor-burner, comprising a vapor-jet nozzle, a primary mixing-tube having an air-inlet, an auxiliary funnel-shaped mixing-tube coaxial with and in front of said vapor-jet nozzle having a central baffle-plate and surrounding apertures, an annular nozzle surrounding the inner end of the primary mixing-tube and the outer end of the auxiliary mixing-tube and having openings communicating with the atmosphere, said annular nozzle having its inner surface separated from the outer surface of said auxiliary mixing-tube thereby forming a passage to permit the travel of air from the primary mixing-tube and annular nozzle to said apertures.

4. In a vapor-burner, a vapor-jet nozzle, a primary mixing-tube having an air-inlet, a closed combustion-chamber, an auxiliary funnel-shaped mixing-tube arranged within said combustion-chamber coaxial with and in front of the vapor-jet nozzle and having a central baffle-plate and surrounding openings, said auxiliary mixing-tube having its entrance between the zone of combustion and said air-inlet.

5. In a vapor-burner, a vapor-jet nozzle, a primary mixing-tube having an air-inlet, an auxiliary funnel-shaped mixing-tube coaxial with and in front of the vapor-jet nozzle, said auxiliary mixing-tube having a central baffle-plate and surrounding apertures, and a vaporizer surrounding said auxiliary mixing-tube, said vaporizer consisting of a pipe formed into a series of return-bends extending in the same direction as the axis of the vapor-jet nozzle and arranged in a circular manner so as to present a pair of substantially circular ends, said pipe having one of its ends communicating with a source of supply and its other end communicating with the vapor-jet nozzle.

6. In a vapor-burner, a primary mixing-tube, a closed combustion-chamber, an auxiliary funnel-shaped mixing-tube arranged within said combustion-chamber and coaxial with and in front of the primary mixing-tube, said auxiliary mixing-tube having a central baffle-plate and surrounding apertures, and a vaporizer arranged within said combustion-chamber and surrounding said auxiliary mixing-tube, said vaporizer consisting of a pipe formed into a series of return-bends extending in the same direction as the axis of the primary mixing-tube and arranged in a circular manner so as to present a pair of substantially circular ends.

7. A vapor-burner, comprising a vapor-jet nozzle, a primary mixing-tube, a cap connected to the outer end of the primary mixing-tube and adapted to support the vapor-jet nozzle, said cap having openings to admit air to the primary mixing-tube, a funnel-shaped auxiliary mixing-tube coaxial with and in front of said vapor-jet nozzle, and an annular nozzle surrounding the inner end of said primary mixing-tube and the outer end of the auxiliary mixing-tube, said nozzle forming in combination with the outer surface of said auxiliary mixing-tube an air-passage from the primary mixing-tube to the burner.

8. A vapor-burner, comprising a vapor-jet nozzle, a primary mixing-tube, a cap connected to the outer end of the primary mixing-tube and adapted to support the vapor-jet nozzle, said cap having openings to admit air to the primary mixing-tube, a funnel-shaped auxiliary mixing-tube in front of and coaxial with said vapor-jet nozzle, an annular nozzle surrounding the inner end of said primary mixing-tube and the outer end of the auxiliary mixing-tube and provided with openings communicating with the atmosphere, said annular nozzle forming in combination with the outer surface of said auxiliary mixing-tube an air-passage from the primary mixing-tube to the burner, and a vaporizer arranged in operative relation with the funnel-shaped mixing-tube.

9. A vapor-burner, comprising a vapor-jet nozzle, a primary mixing-tube, a cap connected to the outer end of the primary mixing-tube and adapted to support the vapor-jet nozzle, said cap having openings to admit air to the primary mixing-tube, an annular nozzle of greater diameter than said primary mixing-tube and secured thereto, said annular nozzle having a portion of its length overlapping the inner end of said primary mixing-tube and provided with openings communicating with the atmosphere, an auxiliary funnel-shaped auxiliary mixing-tube having its smaller end of less diameter than said annular nozzle and extending into the latter, and a vaporizer surrounding said funnel-shaped mixing-tube and connected with the vapor-jet nozzle, said vaporizer communicating with a source of supply.

10. In a vapor-burner, a primary mixing-tube, an annular nozzle attached to and of greater diameter than said primary mixing-tube, said annular nozzle having a portion of its length overlapping one end of said primary mixing-tube, said overlapping part provided with openings communicating with the atmosphere, and an auxiliary funnel-shaped mixing-tube arranged in advance of said primary mixing-tube, said funnel-shaped tube having its smaller end adjacent to the inner end of the primary mixing-tube and its larger end provided with a central baffle-plate and surrounding apertures.

11. In a vapor-burner, a primary mixing-tube, an auxiliary funnel-shaped auxiliary mixing-tube coaxial with and in front of said primary mixing-tube, an annular nozzle having an interior diameter greater than the exterior diameter of said primary and auxiliary mixing-tubes, said annular nozzle surrounding the outer end of the auxiliary mixing-tube and the inner end of the primary mixing-tube and secured to the latter, said annular nozzle provided with openings communicating with the atmosphere, and a vaporizer surrounding said auxiliary mixing-tube, said vaporizer consisting of a pipe having straight portions extending in substantially the same direction as the axis of the auxiliary mixing-tube, said straight portions connected at their ends by bends arranged in a circular manner so as to present a pair of substantially circular ends.

12. In a vapor-burner, a primary mixing-tube, an annular nozzle of greater diameter than said primary mixing-tube and secured thereto, said annular nozzle having a portion of its length overlapping the inner end of the primary mixing-tube, said overlapping portion provided with openings communicating with the atmosphere, an auxiliary funnel-shaped mixing-tube coaxial with and in front of the primary mixing-tube and having its smaller end extending within the annular nozzle, a vaporizer surrounding said funnel-shaped tube, and a shell surrounding said vaporizer.

In testimony whereof we have hereunto set our hands in presence of two subscribing witnesses.

MAX FRIEDMANN.
RICHARD KNOLLER.

Witnesses:
ALVESTO S. HOGUE,
JOSEF RUBUNK.