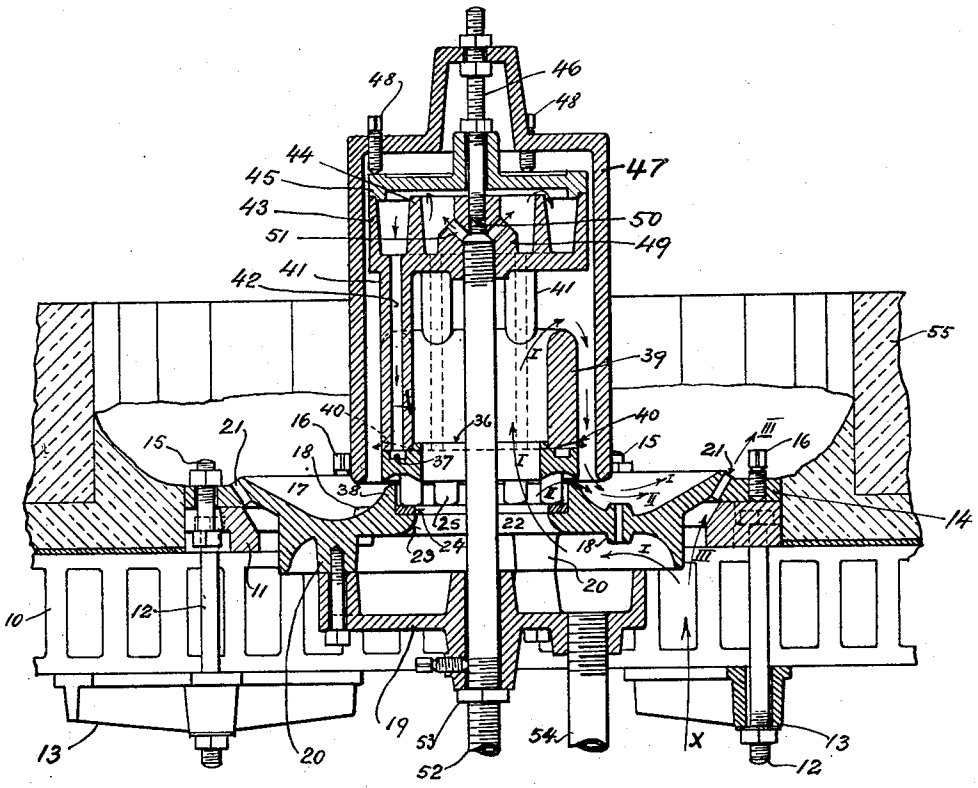
July 21, 1931. P. M. KLEIN 1,815,317

HEAT GENERATOR

Filed Nov. 5, 1928




INVENTOR

Paul M. Klein

Patented July 21, 1931 1,815,317

# UNITED STATES PATENT OFFICE

PAUL M. KLEIN, OF CEDARHURST, NEW YORK

## HEAT GENERATOR

Application filed November 5, 1928. Serial No. 317,459.

This invention relates to heat generators in general, and particularly to the kind designed for burning oil, such as covered in my United States Patent #1,647,409, dated November 1st, 1927, and as disclosed in my pending applications: Serial #20,053, filed April 2nd 1925; Serial #105,871, filed April 30th 1926; Serial #125,845, filed July 30th 1926; Serial #163,925, January 27th 1927.

The prime object of this invention is to provide a device of the class described with certain improvements for converting liquid into gaseous fuel in the absence of air prior to its combustion and to create successive stages of air carburations prior and during the process of burning the fuel.

The foregoing and further objects will be more fully apparent from the accompanying description and the drawing, forming part thereof, but by no means intended to limit my invention to the structure shown, and be it understood therefore that variations, changes, additions and modifications may be made without departing from the principle involved.

Before going into details, it may be well to recapitulate what has been disclosed by me in the course of many years of experience with the problem of burning liquid fuel.

Oil cannot be burned in its liquid state efficiently. For this reason it was found advantageous to atomize the oil into a mist so that a fair mixture between the combustible and air may be accomplished. A far greater efficiency however will be obtained when the liquid is converted into gas prior to mixing it with air for the purpose of combustion.

It is well known that the affinity between gases is quite strong, and decidedly stronger than between atomized oil particles and air, no matter how fine an atomization may be accomplished. This invention is primarily designed to solve this problem in a novel way in that the oil is conveyed to and retained in a substantially closed chamber, in which it is subjected to the influence of, what might be termed, indirect or radiant heat instead of exposing it to an open flame directly.

This feature is of rather paramount importance, for the reason that if the oil or the generator in which the oil is retained would be exposed to a direct flame, the result will be a complete cracking of the fuel, which will in a considerably short time result in the inoperativeness of the device. This is due to the rigid formation of solids left within the chamber after the volatiles of the substances of the oil have been discharged.

By preventing the generator from being exposed to direct heat, the temperature at which the gasification of the oil takes place, is automatically regulated by the air coming in contact with the generator. Thereby an excessive heating of the latter is prevented and thus the disadvantages of cracking eliminated to such an extent that the devices may operate for an unusually long time without the necessity of cleaning it.

The foregoing principles will be more fully understood in connection with a description of the drawing showing a cross sectional view of one of the possible designs in which the aforesaid preparation of the fuel may be accomplished.

In the drawing, numeral 10 denotes the grates of a furnace upon which my device is made to rest and to which it is attached by means of a base ring 11, provided with suitable means for attaching thereto bolts 12. The latter extend downwardly, and under the grates and through, what may be termed, clamping bars 13. These bars are adapted to engage the lower face of the grates while the supporting base ring 11 rests upon the upper face of the latter.

Sitting upon the base ring 11, there will be observed a dished member 14, which is held connected to the base ring by means of bolts 15. Its leveling may be accomplished by adjusting of set screws, indicated at 16. Member 14 is provided with a dished portion, indicated at 17, at the bowed part of which there will be seen bosses 18 provided with vertical apertures. The lower end of bosses 18 are disposed above a drip pan 19, which is attached to bosses 20, provided in the bottom face of member 14. These represent spacers between the drip pan and member 14, the purpose of which will be explained presently.

At the outer periphery of member 14 there

will be observed apertures 21, adapted to convey tertiary air for combustion. The center portion of member 14 is provided with an opening 22, and surrounding the opening is a ledge 23, upon which will be observed a ring 24, which is exchangeable, and upon which rest legs 25 forming supports for an annular member 36, provided with an annular groove 37.

Member 36 is spaced from the inner annular edge, indicated at 38, of the dished member 14, and the lower outer edge of annular member 36 is directed downwardly. The upper face of member 36 is recessed and arranged so as to form a seat for the lower part of the generator body marked 39. The lower seating edge of body 39 is provided with radial apertures 40, the purpose of which will be explained presently.

Spaced from lower body portion 39, by means of columns 41, provided with downwardly directed discharge channels 42, is the upper portion 43 of the generator. This portion constitutes the upper part of a closed chamber divided by an annular partition 44 into two compartments. The inner compartment is adapted to retain a certain amount of oil while the outer compartment is adapted to provide for spreading the oil into a thin film. The outer compartment communicates by ducts or channels 42 with the annular groove 37, provided in the lower member 36.

Detachably associated with the upper portion of the generators is a cover 45, which is held in a convenient fashion, as indicated at 46 in close relation with the body of the generator.

Covering the entire generator and spaced therefrom is a manifold or dome 47, the height or relation of which to the generator may be adjusted by means of set screws 48. If preferred, this manifold or dome may be held in position by nuts engaging member 46.

The center portion of the upper generator part is broadened into a hub 49, provided with a threaded aperture 50, engaged by bolt 46, and side apertures 51, adapted to discharge oil into the inner compartment of the generator and issuing through supply pipe 52. The latter not only serves as supply means for the oil, but also as locking means for the generator proper to the drip pan, which is accomplished by means of a lock nut 53 or its equivalent. The position of supply pipe 52 may be checked by a set screw, shown on the side in the center boss of drip pan. An overflow pipe 54 conveys superfluous oil out of the burner.

Surrounding the burner structure there will be seen a refractory arrangement, indicated at 55, intended to enhance and improve combustion and at the same time act as an accumulator of heat which will radiate towards the burner structure.

*Operation*

Oil supplied through pipe 52 issuing into the generator top is forced to accumulate at the center compartment and to overflow in a thin film into the outer compartment and down through ducts 42. On its way towards openings 40, provided in the bottom face of the generator body, the oil is converted into gas, due to the radiant heat emanating from the manifold or dome 47.

Air is conveyed as indicated by arrow X from under member 14, and is divided to flow in two directions. The arrow marked I shows that the air passes over the oil drip pan into the center opening of member 14 where the major part of the air passes up against the upper portion of the generator, and is deflected around and about the lower portion thereof, and passes out between the lower portion of the generator and the inner wall of the manifold or dome 47.

While passing downwardly it meets with the oil gas issuing from apertures 40 of the generator and forms a premixture which is met by a secondary air supply, indicated by arrow II. This secondary air supply overcomes the deficiency of oxygen of the primary mixture so that a practically complete combustion will take place the moment the now mixed gases will reach the lower edge of the manifold.

The air carries the flame in radial direction outwards and the flame, thus forming, is met by a tertiary air supply, indicated by an arrow III passing through the annularly arranged openings 21 of member 14.

It is evident that the primary air supply I causes a continuous cooling of the generator, while at the same time itself being heated by coming in contact with the wall of the manifold which is hot through the radiant heat emanating from the flame, and from the brick enclosure surrounding the burner. Thus, a steadily moving air layer always surrounds the generator and prevents direct heat from reaching it, thereby precluding cracking of the oil.

The secondary air adds oxygen to the premixed fuel and air combination passing down alongside of the walls between the generator and manifold.

Tertiary air supports the flame after combustion has taken place. It can be readily imagined that the flame issuing from under the dome radiates outwardly towards the brick and this refractory material is heated to incandescency and re-radiates its heat towards the manifold, which again radiates heat of lesser degree towards the generator.

It is also evident that the greater the flame developed, the greater will be the draft created in the furnace, and that more air at higher velocity will pass through the center opening provided in member 14, against the

generator and against the wall of the manifold, thereby cooling off the generator in proportion as the manifold is bing heated. In other words, the temperature of the generator remains practically uniform at lower or higher flame, and this effect is practically automatic.

Needless to say that the drawing shown represents just one of the possible constructions which will effectively accomplish the result sought. There might be found some more advantageous arrangement for the purpoise of the cheapening or simplifying the manufacture of the burner, but the principle will always remain the same. One of such changeable features is shown in the annular ring 24 resting upon ledge 23 of member 14. This ring, as was stated, constitutes a support for legs 25 for annular member 36.

By inserting a ring of greater height an adjustment of the air space between member 14 and the annular member 36 may be readily achieved, and by changing the thicknesses of similar rings and adjustment for a given draft condition may be readily made.

Furthermore, the adjustment of the manifold may also be changed by raising or lowering it relative to the discharge openings 40 of the generator.

The foregoing changes and suggestions are only a few of the possible improvements in this device, and I therefore shall not be limited by the actual showing, and I reserve for myself the right to make such changes and improvements which may facilitate cheapening the manufacture of the device or/and improve its operation as long as the principle of preparing liquid fuel for and before burning it, is adhered to, and as long as the gasification of liquid fuel is accomplished in a chamber not exposed to the influence of direct heat.

Having thus described my invention, I claim:

1. In an oil burner, a generator or converter for changing liquid into gaseous fuel, comprising a substantially closed chamber having a removable cover and downwardly extending gas discharge means, an air conveying member for delivering primary air to the discharging gas, said member adapted to substantially completely surround and cover said generator while being spaced therefrom, secondary air conveying means disposed below the generator and adapted to convey secondary air to the gas and air mixture, and tertiary air conveying means disposed externally to said generator adapted to deliver tertiary air for completing combustion.

2. An oil burner, comprising a substantially closed, air excluding generator having a removable cover and gas discharge means extending downwardly from within the generator, an air conveying member substantially covering and surrounding, but being spaced from said generator, a dish-shaped member disposed below said generator and spaced therefrom and having means for supplying air from below the generator and having other means for supplying air externally to the generator.

3. An oil burner having a generator for converting liquid fuel into a gas prior to its combustion, said generator comprising an air excluding chamber provided with a removable cover and having downwardly directed discharge means, an air manifold surrounding and spaced from the generator and adapted to convey a constantly moving layer of air about the generator, thereby preventing the latter from being subjected to direct heat, and further adapted to heat the air and mix the latter with gaseous fuel discharging from the generator, a dished member disposed below the generator and having means for supplying additional air to the gas and air mixture emanating from under the manifold, and other means for supplying tertiary air for completing combustion, and means associated with said dished member for receiving and discharging liquid fuel during such periods when gasification does not take place.

4. In an oil burner adapted to be used in a draft furnace, a base having a central air admitting opening therein, an oil conveyor pipe passing through the base, a gas generating receptacle into which the conveyor pipe opens, hollow posts depending from the receptacle, a gas distributor and burner on the base in communication with the hollow ports depending from the generator receptacle, a dome open at the bottom thereof surrounding the generator and burner and in communication with the central opening in the base, and means on the dome in abutment with the generating receptacle, for adjusting the dome in relation to the burner.

5. In a gravity feed oil burner adapted to be set on a draft furnace grate, an annular ring adapted to be secured to the grate, a base having a central air admitting opening therein, means for adjusting the base to a position parallel to a horizontal plane, an annular flange in the air admitting opening in the base, an oil conveying pipe passing through the base, a receptacle in which the gas is adapted to be gasified on the conveyor pipe and in communcation therewith, a cover for the receptacle, hollow posts depending from the receptacle, a gas distributor and burner having gas outlets resting on the flange of the base in communication with the hollow posts, a dome open at the lower end thereof enclosing the receptacle and gas distributor means surrounding the base and ring to permit the entrance of air to the burner through the bottom of the grate only, and means co-operating with the dome for regulating the flame from the burner.

6. In a gravity feed oil burner adapted to be set on a draft furnace grate, a base, means for adjusting the base parallel to a horizontal plane, means on the base for admitting air through the bottom thereof, a gas distributor and burner on the base, a gas generating receptacle on the burner, hollow posts depending from the receptacle in communication with the burner, a cover on the gas generator, a stem in the cover, a dome supported on the stem, means to permit the free passage of air from below the grate into the dome, and means for adjusting the dome on the stem to regulate the flame from the burner.

7. In an oil burner adapted for use in a draft furnace, a base, a fuel oil conveyor, a combined burner and oil distributor adjustably mounted on the base, a gas generating receptacle on the burner, hollow posts depending from the receptacle in communication with the oil conveyor and burner, a stem on the gas generating receptacle, a dome supported on the stem and encircling the generating receptacle and burner, and screws in the dome abutting the cover for raising and lowering the dome to regulate the flame from the burner.

In testimony whereof I affix my signature.

PAUL M. KLEIN.