

April 25, 1939.

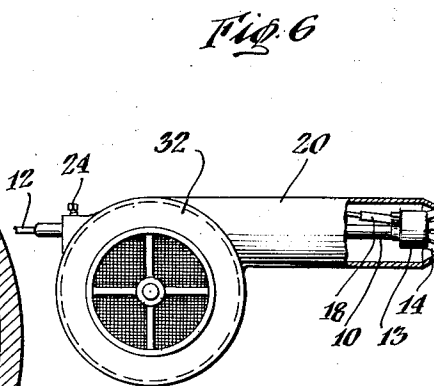
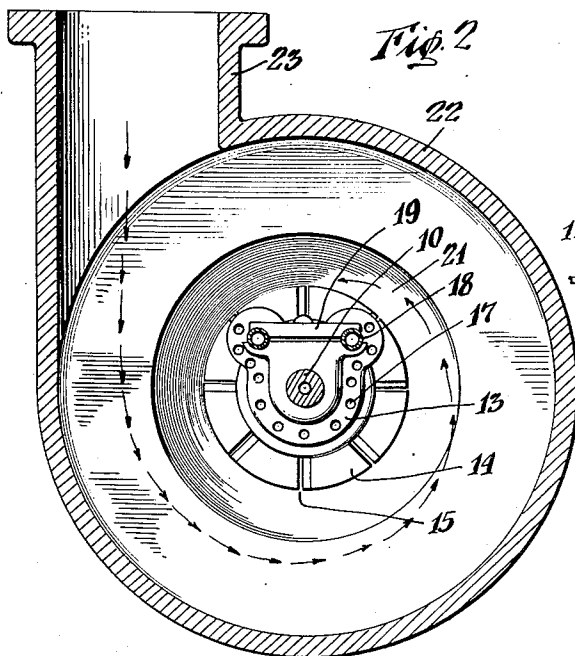
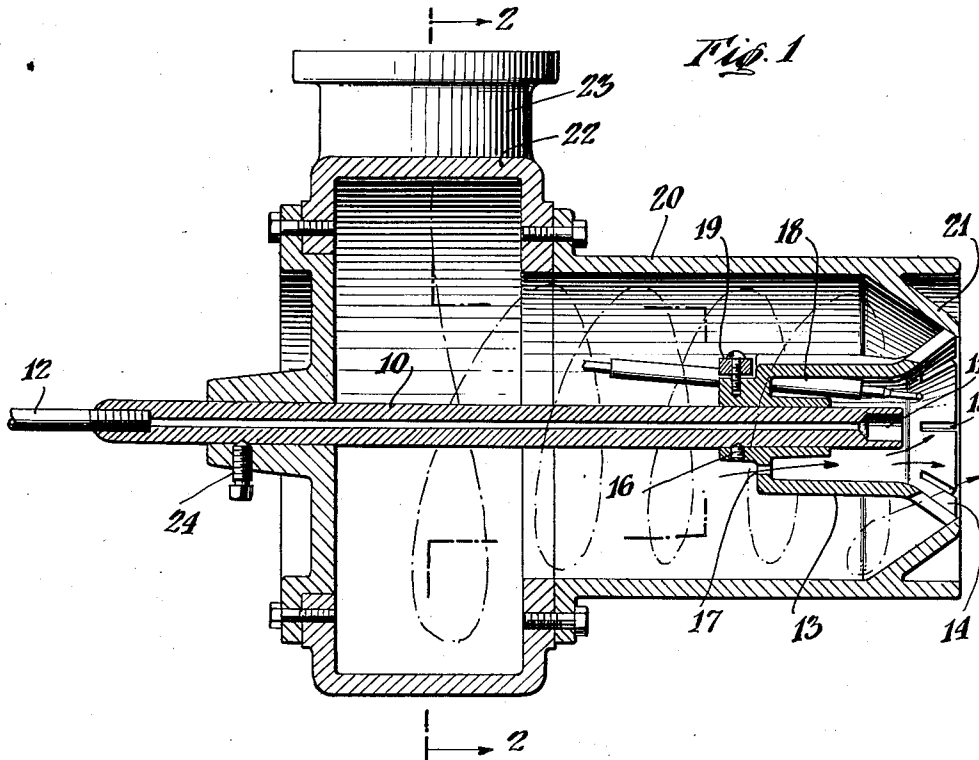
J. N. MACRAE

2,156,121

BURNER

Filed April 7, 1937

2 Sheets-Sheet 1



INVENTOR
James N. Macrae
BY
Duell, Kane + Smoot
ATTORNEYS

April 25, 1939.

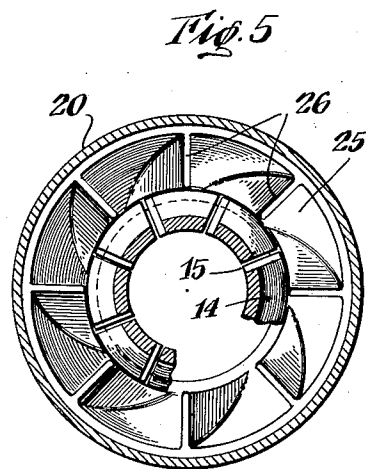
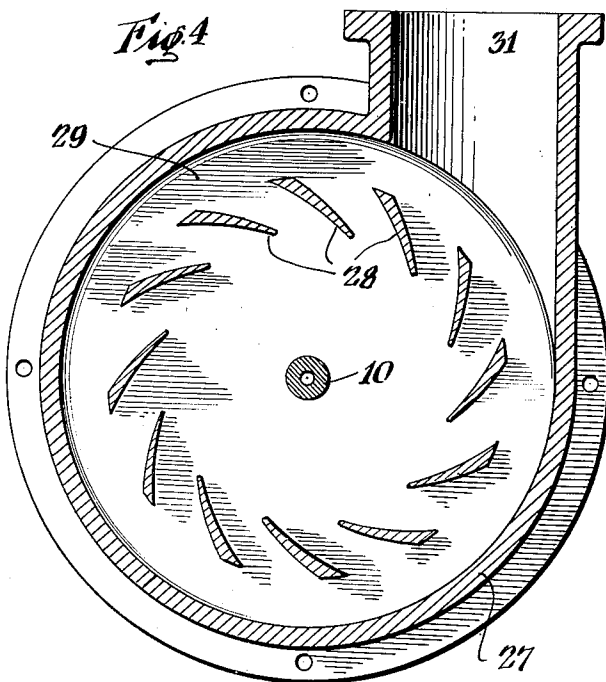
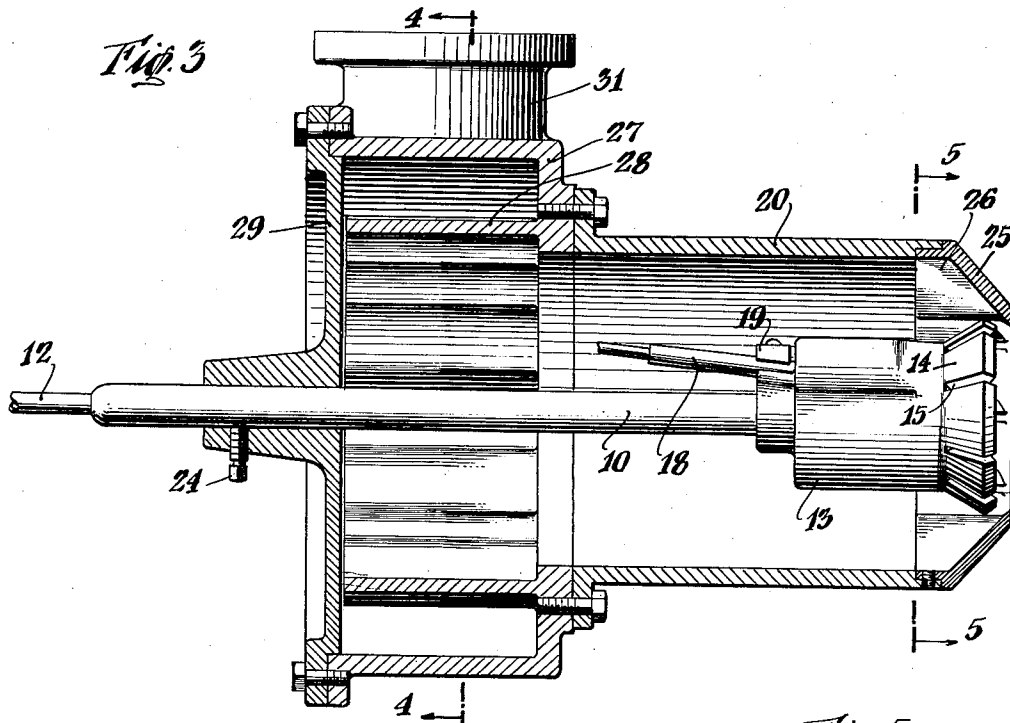
J. N. MACRAE

2,156,121

BURNER

Filed April 7, 1937

2 Sheets-Sheet 2



INVENTOR
James N. Macrae
BY
Duell, Kane & Smoot
ATTORNEYS

UNITED STATES PATENT OFFICE

2,156,121

BURNER

James N. Macrae, Rutherford, N. J.

Application April 7, 1937, Serial No. 135,426

3 Claims. (Cl. 158-76)

This invention relates to an improved burner or combustion apparatus and in its more specific aspects aims to provide a functionally and structurally improved oil burner, capable of use in association with virtually any type of heat exchange apparatus.

It is well appreciated by those skilled in the industry that considerable difficulty has been experienced in providing a burner which might be utilized to efficiently burn different quantities of oil and in which such difference is over a wide range. In other words, it has been perfectly feasible to produce a more or less satisfactory apparatus which would operate to burn from, for example, one and one-half to three gallons of oil per hour, or from three and one-half to five gallons per hour. However, when one has attempted, in a single apparatus, to burn, for example, one and one-half gallons per hour, or five or six gallons per hour, it has been found necessary, in effect, to reconstruct the unit, or else to be penalized by improper combustion with all the difficulties which naturally ensue therefrom.

It is an object of the present invention to furnish a burner with which there may be associated, for example, a one and one-half or six gallon per hour nozzle, and which will efficiently burn oil over this entire range, or in fact beyond the same. Thus, a more or less universal type of apparatus is furnished which will cover virtually any condition arising in varying types and sizes of installation.

A further object of the invention is that of constructing a burner in which the air and fuel may be more efficiently mixed than has heretofore been possible, and in which moreover the control and adjustment of this mixture will present no particular problem.

A further object is that of furnishing a unit of this type which will embody relatively few parts, each individually simple and rugged in construction and capable of operating over long periods of time with freedom from all difficulties.

Another object is that of constructing an assembly capable of ready association with burners as heretofore furnished, so that the operation of such burners may be improved. It is to be understood, however, that preferably in accordance with the teachings of the present invention a unit should embody an entire assembly of parts.

With these and other objects in mind, reference is had to the attached sheets of drawings, illustrating practical embodiments of the invention, and in which

Fig. 2 is a transverse sectional view taken along the broken line 2-2 and in the direction of the arrows of Fig. 1;

Fig. 3 is a view similar to Fig. 1, but showing a slightly different form of construction;

Figs. 4 and 5 are transverse sectional views taken along the lines 4-4 and 5-5 respectively, and in the direction of the arrows indicated in Fig. 3, and

Fig. 6 is a somewhat schematic partly sectional view showing a modified form of burner constructed in accordance with the teachings of the present invention.

In these views, reference numeral 10 indicates a tube formed of any desired material such as brass, and which has adjacent its forward end a socket 11 to receive a nozzle (not shown). The rear end of the tube may have its bore connected to a pipe 12 through which fuel is fed toward the nozzle. Moreover, there is mounted upon the tube and adjacent the nozzle end of the same a cup element 13 having an outstanding portion 14 in the form of a truncated cone adjacent its edge and which is formed with slots 15 preferably extending at a tangent to the edge of tube 10.

The method of attaching the cup 13 to the tube is relatively immaterial. For example, a set screw 16 may be used to lock the parts against movement, it being understood that the cup member is normally not subject to adjustment lengthwise of the tube. The base of the cup may be formed with a series of openings 17 as well as two larger openings through which electrodes 18 may extend the latter being maintained against movement by a bracket 19.

Tube 10 and cup 13 are positioned within a sleeve 20, the latter preferably having its forward edge inclined as at 21 to provide a reduced end portion against the inner face of which the edge of member 13 may be abutted. Sleeve 20 may be supported adjacent its rear or inner end by the housing 22 which includes a duct 23 connected to a suitable blower or air compressor (not shown). It is also to be understood that while duct 23 in these views as well as in subsequent views, extends to one side of the center of sleeve 20, this duct or its functional equivalent might be positioned as desired, it being the primary purpose of this unit to supply air at high velocity to the interior of sleeve 20.

With air so supplied, it is obvious that it will be caused to flow toward the outer end of sleeve 20 adjacent which it will be compressed by the inturned end portion 21. If cup member 13 is in contact with such portion—as shown in Fig.

Fig. 1 is a sectional side view of a burner;

1—then the air to escape must flow through slots 15. In such flow it will, of course, be given a circular twist and will move to a position adjacent the nozzle in the form of a rapidly whirling column extending beyond tube 10 and in line with the axis of the same.

Of course, a certain amount of air will flow through openings 17, and will assist in the primary combustion of the fuel. However, the amount of air flowing in this manner should preferably be relatively insignificant and serve primarily merely for the purpose of maintaining the nozzle, electrodes and associated parts at a comparatively low temperature. A setting of the parts such as noted may be ideal for a given installation, but we may now assume that another installation is in contemplation and that such new installation requires a larger nozzle or has a combustion chamber presenting conditions such that a proper mixture would not, under the given circumstances, be presented.

It is to be observed that casing 22 is formed with an opening through which tube 10 extends and that while the latter is normally secured against movement with respect to the same, as for example by a set screw 24, adjustment is possible and intended. Of course, any desired mechanism normally maintaining a locked condition of the parts, but allowing for adjustment of the same, could be utilized. Under the conditions just described, the operator would simply release bolt 24 and retract the tube 10, cup 13, and associated parts within the bore of sleeve 20. Immediately upon the edge of the cone or cup 13 being spaced from the inner surface of flange 21, it is obvious that air, in addition to flowing through openings 17 and slots 15, will begin to flow between the edge of portion 14 of the cup and the inner surface of the intumed portion 21. It is, of course, to be understood that an adjustment such as the foregoing is resorted to if the character of the mix is undesirable, or if it becomes necessary to replace the nozzle in socket 11 by a larger nozzle. Usually where a smaller nozzle is substituted, a reverse adjustment of the parts is resorted to. In any event, however, the fan or blower (not shown) under all circumstances continues to operate for example at a substantially constant speed and without change of its impeller; the entire air adjustment occurring adjacent the nozzle.

Substantially the same construction as that aforescribed occurs in Figs. 3, 4 and 5, in which the same reference numerals have been used to identify the heretofore referred to parts. However, two factors are additionally present in these views, either one or both of which may be employed if the construction shown in Figs. 1 and 2 would—for some reason—not suffice. Thus, it is primarily to be observed that the outer end of sleeve 20 may be inwardly extended or tapered as at 25 to functionally correspond to flange 21. In addition, however, this inwardly extending portion is formed with a plurality of spirally curved or tapered ribs or vanes 26. Preferably, the inner portion of these vanes define in aggregate an annular space of constant radius and corresponding substantially to the maximum diameter of cup member 13. The latter has sliding contact with these edges so that it may ride along toward and away from the outer end of sleeve 20. It is apparent by this construction that the air adjustment desired is again achieved adjacent the nozzle and not, for example, at the outlet or intake end of the blower or fan, or by

changing the size of the impeller associated with the latter. However, as the cone or cup member 13 is shifted to provide a greater or lesser space between the inner surface of member 25 and the cup or cone, a greater or lesser volume of air passes through this space. All such air in flowing in contact with the vanes, will be given a twisting or spiral motion which will complement the flow of air passing through slots or openings 15, resulting in an axial twist being imparted to the column of air flowing from sleeve 20. It is preferred that, as shown, the twisting action imparted to the columns of air flowing through the slots of the cup member or between the edge of the latter and the adjacent tube surface coincide. This need not necessarily be the case and, of course, if desired, the parts might be modified to such an extent that the two layers of air would be given reverse rotations resulting in a condition of extreme turbulence. While this might, in certain installations, be desirable, I have found that under ordinary circumstances such a construction is not conducive to a proper combustion and desirable flame.

The second factor present in this latter group of figures is embraced within the casing connected to the rear end of sleeve 20. This may include a forward section 27 and a cover plate 29. This forward section carries a series of spirally extending vanes 28. The inlet 31 to this casing assembly may be off center as illustrated or otherwise disposed. In any event, air will flow around the casing and be distributed between vanes 28 so that as it enters sleeve 20 it will move in a spiral path. This path may again coincide to that imparted to it by slots 15 or vanes 26. As heretofore brought out, however, any desired path of travel may be imparted to the air, according to the curvature and disposition of the vanes.

Finally, referring to Fig. 6, it will be observed that substantially the same construction as heretofore illustrated in Figs. 1 to 3 is employed with the exception that a casing has been indicated at 32, which casing may form the housing for the fan, it being understood that the sleeve 20 is directly connected thereto. This follows more commonly accepted practice, it being appreciated that Fig. 6 discloses the unit comprising the outer cup member 13 and its associated parts as a replacement structure. In any event, again in this type of apparatus the volume of air is controlled adjacent the burner tip or nozzle.

It is apparent, from the foregoing, that among others, the several objects of the invention as specifically heretofore noted are achieved. It will be appreciated that numerous changes in construction and re-arrangement of the parts might be resorted to without departing from the spirit of the invention as defined by the claims.

Having described my invention, what I claim as new and desire to secure by Letters Patent is:

1. A burner including a sleeve to be coupled to a source of air supply, an oil discharge tube extending within said sleeve, a cup encircling said tube and adjacent the discharge end of the latter, the base of said cup being formed with openings for the passage of air from said sleeve to the space defined by said cup, said cup having an outwardly flared portion at its open end, said portion being formed with slots extending at a tangent to a circle concentric with the axis of said tube and sleeve, the discharge end of said sleeve being reduced and having an opening substan-

5 tially equal to the greatest diameter of the out-
wardly flared portion, said cup being shiftable
toward the reduced end of said sleeve whereby
to force substantially all the air flowing through
said sleeve to traverse said slots and shiftable
10 away from the sleeve end to permit increasing
amounts of air to flow between the outer edge
of said flared portion and the inner surface of
the reduced end of said sleeve, and a spray nozzle
on said tube adjacent the outwardly flared
15 portion of said cup.

2. A burner including a sleeve to be coupled to
a source of air supply, an oil discharge tube ex-
tending within said sleeve, a cup encircling said
15 tube and adjacent the discharge end of the latter,
the base of said cup being formed with openings
for the passage of air from said sleeve to the
space defined by said cup, said cup having an
outwardly flared portion at its open end, said
20 portion being formed with slots extending at a
tangent to a circle concentric with the axis of
said tube and sleeve, the discharge end of said
sleeve being reduced and having an opening sub-
stantially equal to the greatest diameter of the
25 outwardly flared portion, said cup being shiftable
toward the reduced end of said sleeve whereby
to force substantially all the air flowing through
said sleeve to traverse said slots and shiftable
30 away from the sleeve end to permit increasing
amounts of air to flow between the outer edge of
said flared portion and the inner surface of the
reduced end of said sleeve, a spray nozzle on said
tube adjacent the outwardly flared portion of
35 said cup, a housing connected to the other end of
said sleeve, and a duct coupled to said housing

and extending at a tangent to the same, said
housing having a diameter greater than that of
said sleeve whereby air enters said housing
through said duct and rotates through the hous-
ing and said sleeve in its passage toward said
5 cup.

3. A burner including a sleeve to be coupled to
a source of air supply, an oil discharge tube ex-
tending within said sleeve, a cup encircling said
10 tube and adjacent the discharge end of the lat-
ter, the base of said cup being formed with open-
ings for the passage of air from said sleeve to the
space defined by said cup, said cup having an
outwardly flared portion at its open end, said
15 portion being formed with slots extending at a
tangent to a circle concentric with the axis of
said tube and sleeve, the discharge end of said
sleeve being reduced and having an opening sub-
stantially equal to the greatest diameter of the
20 outwardly flared portion, said cup being shiftable
toward the reduced end of said sleeve whereby to
force substantially all the air flowing through
said sleeve to traverse said slots and shiftable
away from the sleeve end to permit increasing
25 amounts of air to flow between the outer edge
of said flared portion and the inner surface of
the reduced end of said sleeve, a spray nozzle on
said tube adjacent the outwardly flared portion
of said cup, and ribs extending inwardly from
30 the inner face of said sleeve and adjacent the
discharge end of the latter, said ribs being spaced
to receive the outwardly flared portion of said
cup and the edges of such portion having sliding
engagement with the edges of said ribs.

JAMES N. MACRAE