No. 767,079. PATENTED AUG. 9, 1904.

J. McL. McMURTRIE.

LIQUID HYDROCARBON BURNER.

APPLICATION FILED OCT. 13, 1903.

NO MODEL. 2 SHEETS—SHEET 1.

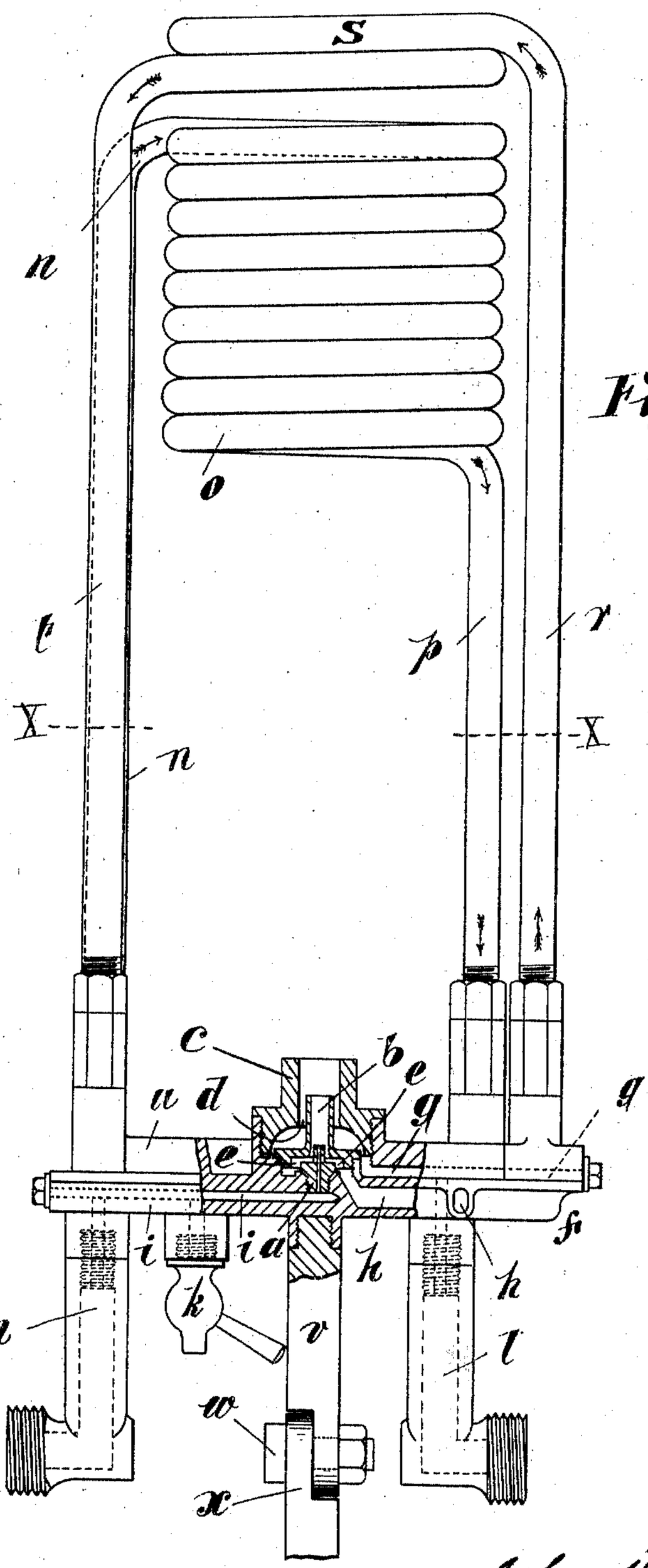

Fig. 1.

Witnesses=
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NO MODEL. 2 SHEETS—SHEET 2.

Fig. 2.

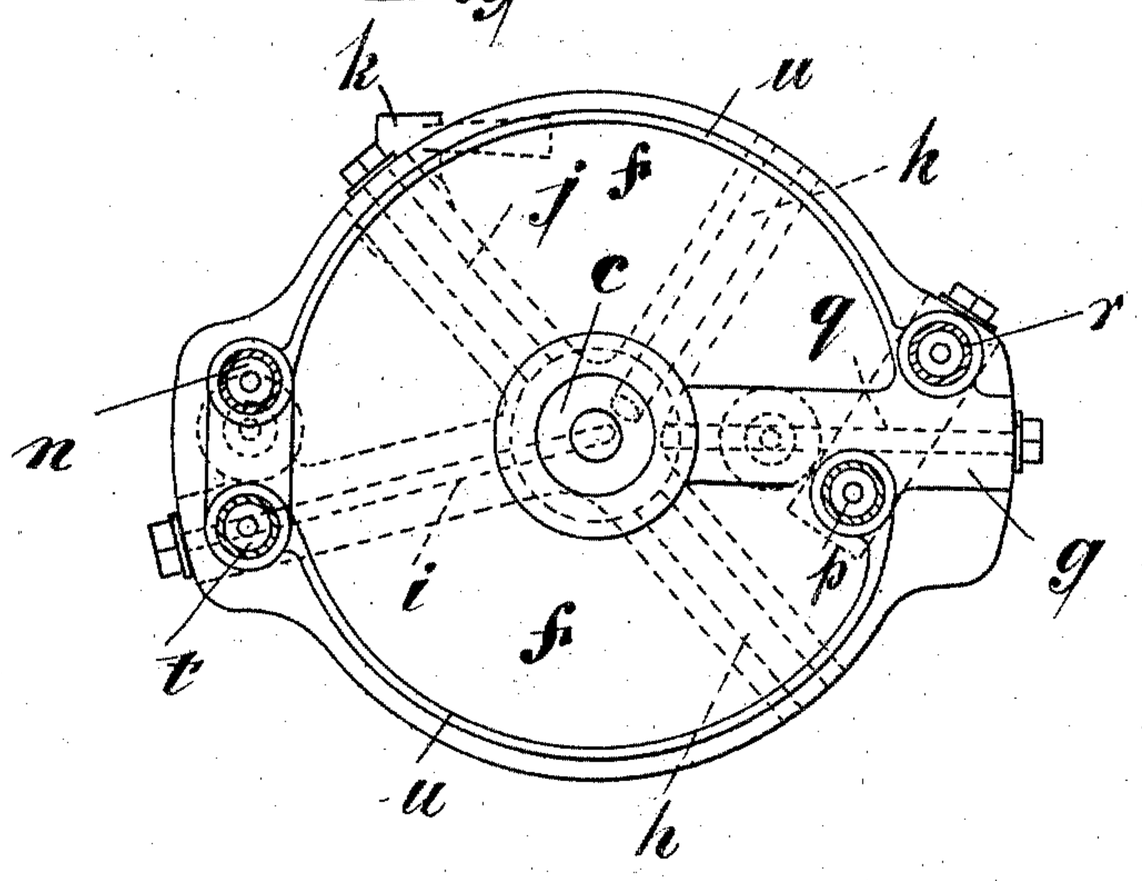
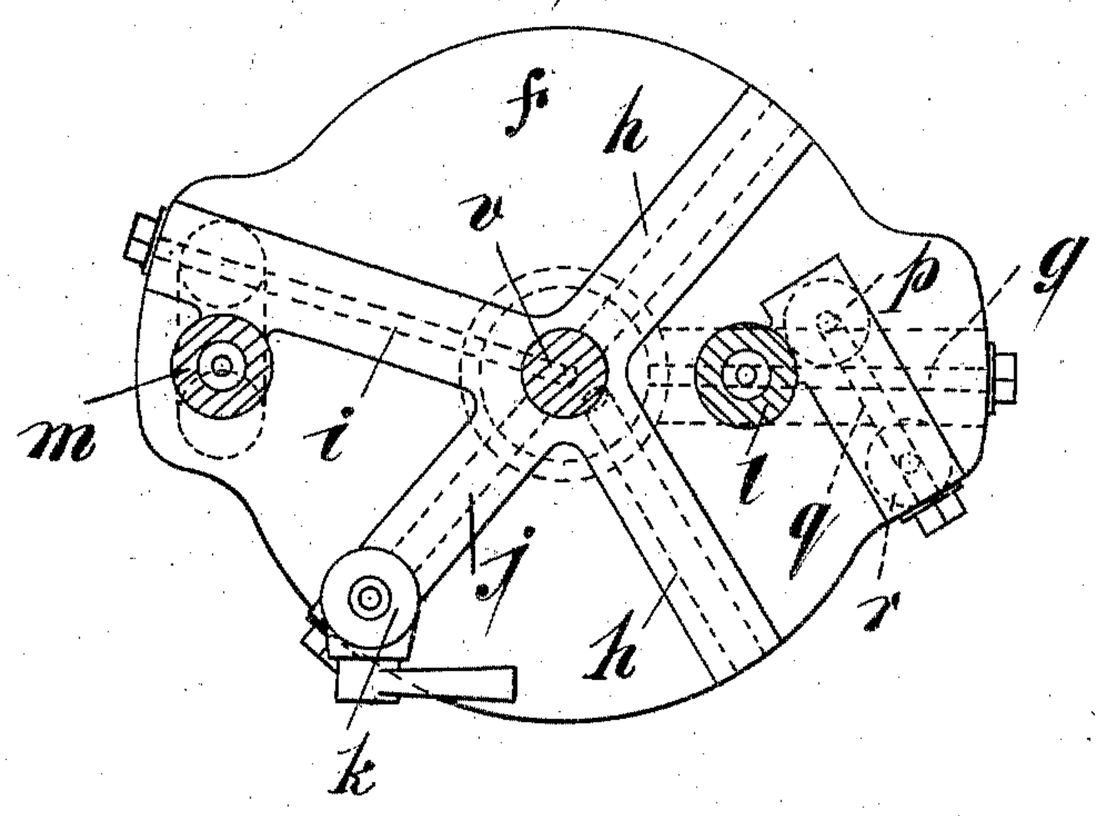


Fig. 3.



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UNITED STATES PATENT OFFICE.

JOHN McLEOWNAN McMURTRIE, OF GLASGOW, SCOTLAND.

LIQUID-HYDROCARBON BURNER.

SPECIFICATION forming part of Letters Patent No. 767,079, dated August 9, 1904.

Application filed October 13, 1903. Serial No. 176,847. (No model.)

To all whom it may concern:

Be it known that I, JOHN MCLEOWNAN MCMURTRIE, engineer, a subject of the King of Great Britain, and a resident of 21 Princes street, Pollokshields, Glasgow, Scotland, have invented certain new and useful Improvements in Liquid-Hydrocarbon Burners, (for which I have filed an application in Great Britain, No. 28,618, dated December 27, 1902,) of which the following is a specification.

This invention relates to liquid-hydrocarbon burners for lighting and heating purposes; and it has for its object to construct such burners on a novel principle and so that perfect or practically perfect combustion will take place, thereby giving the maximum lighting and heating properties with the minimum supply of oil.

In order to clearly understand the invention, it is necessary to bear in mind the well-known fact that in the case of the ordinary gas or other flame there is what may be termed an "outer" envelop or region wherein actual combustion takes place, while the part of the flame within this region is simply filled with gas, which rushes outward until it reaches the region of combustion, where it comes in contact with the oxygen of the air and bursts into flame, thereby producing the light.

Now many attempts have heretofore been made to produce oil-burners on what has been termed the "spraying" principle—that is, burners in which the oil is sprayed or atomized by means of a jet of steam or air under pressure. In burners of this type the difficulty of imperfect combustion is encountered. This imperfect combustion is, I have found by repeated experiments, largely due to the fact that the oil atoms or particles are too large and the air-supply for the flame is not introduced in the proper manner and in the proper proportion.

I have found by many experiments that in order to obtain complete combustion it is necessary to introduce a certain amount of air to the interior of the flame—that is, to the region of non-combustion—so that the particles of air and gas or oil-vapor may be intimately mixed before reaching the region of combustion, with the result that when they do reach that region they will at once burst into flame without the necessity of absorbing a relatively large quantity of cold air from the outside of the flame. With the present burners cold outer air for producing combustion is drawn into the flame, with the result that the temperature of the flame is much reduced and the combustion consequently retarded and rendered imperfect. The effectiveness of intimately mixing the air and gas before reaching the flame is readily seen from the "Bunsen" burner.

Under my invention the burner is so made that the oil is supplied to the flame in such a finely-atomized condition that it practically forms a vapor or gas, while it is intimately mixed with air and superheated steam, and the whole is supplied at the center of the flame, with the result that immediately it reaches the region of combustion combustion takes place under the most favorable circumstances for giving, as desired, either light or heat.

In order that my said invention may be clearly understood, I have hereunto appended explanatory drawings, whereon—

Figure 1 is an elevation of a lighting or heating burner with the concentric burner-nozzles shown in section. Fig. 2 is a sectional plan of the same, taken on the line X X, Fig. 1. Fig. 3 is an inverted plan view.

On the drawings the same reference-letters wherever repeated indicate the same parts.

The burner consists, essentially, of a central steam-nozzle *a*, an outer concentric air-nozzle *b*, and a third outer concentric oil-nozzle *c*. The three nozzles are so arranged, as shown, that the air-nozzle *b* is larger than and outside of and in advance of the steam-nozzle *a* and the oil-nozzle *c* is larger than and outside of and in advance of the air-nozzle *b*. The three nozzles are or may be screwed into the base-plate of the burner, as shown. With this construction steam from the nozzle *a* first impinges upon the air (drawn into the nozzle *b* by induction) and heats it, as well as mixes with it, and then the combined steam and air current impinges on the oil, which is supplied in the form of a thin annular film through the narrow annular passage *d* of its nozzle

and mixes with it and breaks it up into such finely-divided particles that the whole issues from the burner in the form of vapor, with the oil particles forming a kind of outer envelop, which is attenuated and expanded by the expansion of the escaping steam and air within it, thereby further subdividing the oil particles and producing the very best conditions for giving perfect combustion. As the finely-divided oil particles reach the region of combustion they burst into flame and are consumed with great fierceness and energy, at the same time giving an intense light and heat. It will be seen that the steam-nozzle *a* is small and projects up into the air-nozzle *b*, leaving a narrow annular space *e* for the air to pass through. Likewise the air-nozzle projects up into the oil-nozzle *c* and leaves a narrow annular space *d*, as aforesaid, for the oil to flow through. This construction is important, as it insures that the air and oil shall only pass in thin films, and therefore be readily broken up and finely atomized by the steam. It will also be seen that the nozzles vary in diameter, the steam one being the smallest, the air-nozzle the next in size, and the oil-nozzle the largest.

Preferably I construct the burner with a base-plate *f*, having ways or passages for the oil, air, and steam. The plate *f* is or may be made of cast metal, and an oil-passage *g* is cast on it at the upper side. (See Fig. 2.) Air-passages *h* are cast on it at the under side, (see Fig. 3,) and a steam-passage *i* is also cast on it at the under side. Further, a blow-off or drain passage *j* is cast on its under side and is provided with a petcock *k*. The oil is supplied to the passage *g* by means of the oil-pipe *l*, while water is supplied by the pipe *m* to the pipe *n* and passes downward through the coil *o* and in so doing is converted into steam by the flame issuing from the burner. From the coil the steam passes down the pipe *p*, along the horizontal passage *q*, cast in the plate *f*, to the pipe *r*, up which it ascends to the superheating-coil *s*. From this coil the steam descends by the pipe *t* and passage *i* to the inner nozzle *a* of the burner. The plate *f* is made with a circumferential wall *u*, so as to form a kind of well in which oil waste or such like can be placed and lighted when starting the burner in the ordinary manner.

It will be seen from Fig. 1 that the oil and water pipes *l* and *m* are kneed at their ends and the knees screw-threaded, so as to enable them to be coupled by screw-couplings to the oil and water supply pipes. Screwed into the bottom of the plate *f* is a support *v*, which is movably jointed by the bolt *w* to the main support *x* for holding the burner in position. By this arrangement of couplings for the oil and water pipes and a jointed support the burner can be moved up and down, so as to deliver the flame at any angle as desired. The burner can be clamped by tightening the nut of the bolt *w*.

The oil may be supplied by gravitation or induction or be forced to the burner, while the air may be supplied by induction through the passages *h* or forced in under pressure, and the superheated steam may be supplied from a steam coil or coils, as at Fig. 1, or chamber or chambers arranged at, near, or over the flame in such manner as to be heated thereby.

If desired, the air and (or) oil may be heated before being supplied to the burner. If preferred, compressed air may be supplied to the nozzle *a* instead of steam.

Having now fully described my invention, what I claim, and desire to secure by Letters Patent, is—

1. In combination, a base-plate, a steam-nozzle in the base-plate, an air-nozzle arranged over the steam-nozzle, an oil-nozzle arranged over the air-nozzle and radial passages in the base-plate for steam, air and oil, substantially as described.

2. In combination, a flat base-plate, a steam-nozzle in the base-plate, a radial passage for steam leading to the nozzle, an air-nozzle fitted in the base-plate over the steam-nozzle, a radial air-passage leading to this nozzle, an outer oil-nozzle arranged above the air-nozzle and having a well or oil-space surrounding the air-nozzle and a radial oil-passage leading to the said oil-well, substantially as described.

3. In combination, a base-plate, a nozzle for superheated steam in the base-plate, a passage in the base-plate for the steam, an air-nozzle fitted in the base-plate over the steam-nozzle and having an upwardly-projecting cylindrical end, an air-passage in the base-plate leading to this nozzle, an outer oil-nozzle arranged over the air-nozzle and made with a cylindrical upper end and an expanded or enlarged lower end which latter is shaped so as to form an oil well or space, the said air-nozzle being so arranged within the said oil-nozzle that only a very small annular oil-passage is left between the cylindrical portions of the nozzles, an oil-supply passage in the base-plate leading to the said oil well or space, a coil-pipe for converting water into steam arranged over the burner, a second coil-pipe for superheating the steam arranged in conjunction with the first coil-pipe, means for supplying water to the said first coil-pipe, a passage in the base-plate connecting the first coil-pipe to the second coil-pipe, and means for supplying oil to the burner, substantially as described.

Signed at Glasgow, Scotland, this 24th day of September, 1903.

JOHN McLEOWNAN McMURTRIE.

Witnesses:

WILLIAM GALL,

HUGH D. FITZPATRICK.