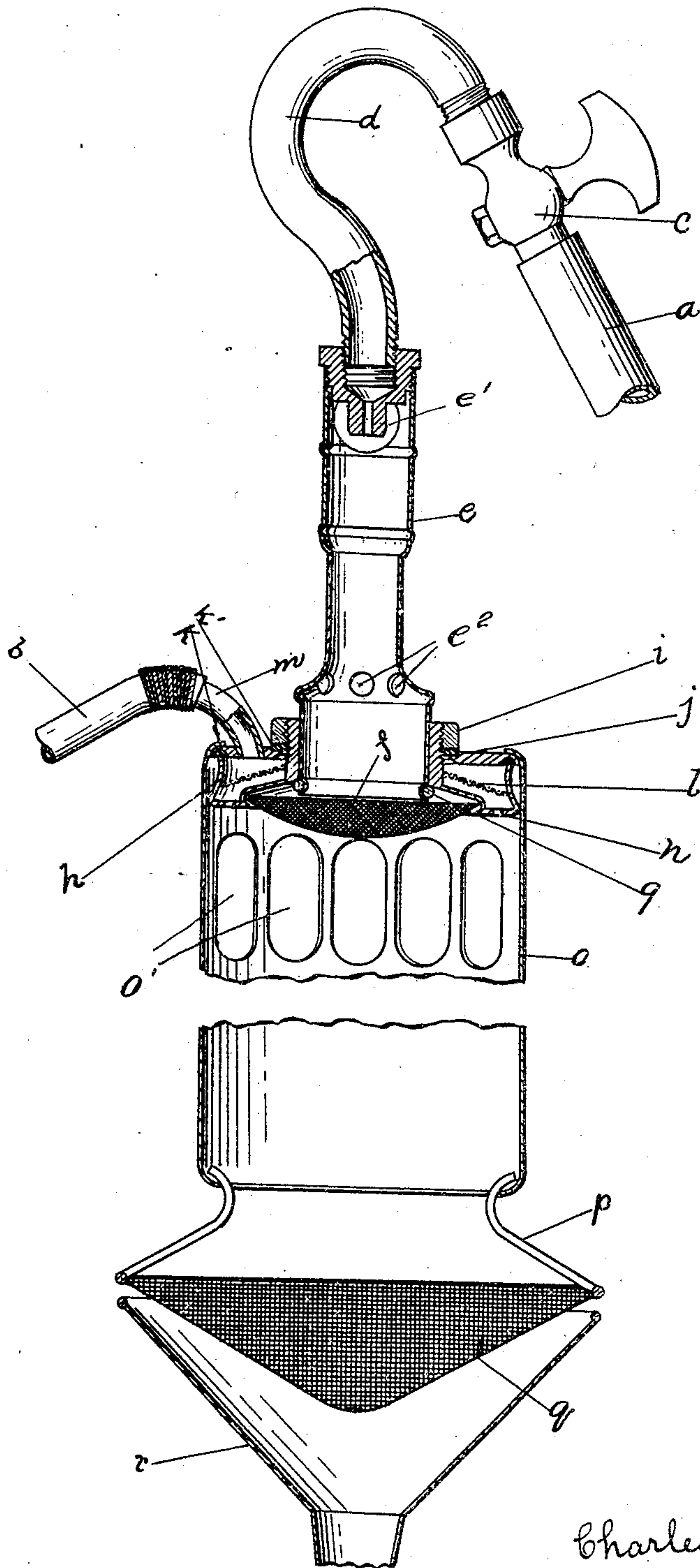


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INSTANTANEOUS WATER HEATER.
APPLICATION FILED FEB. 20, 1907.

940,240.

Patented Nov. 16, 1909.



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INSTANTANEOUS WATER-HEATER.

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Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, CHARLES E. DURYEA, a citizen of the United States, residing at Reading, in the county of Berks and State of Pennsylvania, have invented certain new and useful Improvements in Instantaneous Water-Heaters; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to that class of heaters in which the water to be heated is mingled with the air and flame and the product passes away together.

The objects of my invention are to provide a heater of low cost so that it can be universally used; of light weight, so that it can be portable and thus usable in any portion of the house; and also economical, that the cost of operation may not be prohibitive and that the amount of gas available in the average bath room may be sufficient to operate the device without the necessity of special piping therefor.

The preferred embodiment of my invention is shown in the accompanying drawing, which is a central longitudinal section of the heater.

In general this device consists of a Bunsen burner and a needle-spray sprinkler. These two are mounted together, so that the flame is produced inside the spray, while a mingling tube surrounds both as they descend to the tub or basin where the hot water is needed.

In the drawings herewith forming part of this specification *a* represents an ordinary gas hose leading to a convenient fixture delivering gas.

b represents a water hose or rubber tube leading to a water spigot as is usually found in bath tubs, wash stands or kitchen sinks. A cock *c* is frequently provided to shut off the gas near the burner because the length of gas hose is frequently such that the regular stop cock usually found on gas fixtures cannot be reached from the position occupied by the person using the heating device. A similar cock could be provided for turning off the water but usually the water is obtained from a spigot mounted in or upon the tub, basin or sink where the device is being used and therefore this spigot serves this purpose. Further, the water pressure

is frequently so great that the rubber tube *b* might burst thereunder if the full pressure of the water was permitted to enter this rubber tube. I prefer, therefore, to attach the tube *b* to the device and wrap it with string or similar fastening so that the tube and heater remain connected while the opposite end of the tube is removable and slipped on to the nozzle of the water spigot. Then if the water pressure is excessive the rubber tube is blown off the nozzle and the escaping water falls in the basin or tub in the usual manner without either damaging the hose or scattering the water.

d is a hook shaped gas pipe which serves both to convey the gas to the burner and to support the heater; a bird-cage bracket or ceiling hook with chain, being commonly used for this purpose. It is evident that the bird-cage bracket can be fastened any where desired upon the wall and swung around closely against the wall when the heater is not in use. It is also evident that the heater can be unhooked from any one point of support and because of the flexibility of the connecting hose, can be removed to any other point desired, as for example, from bath tub to wash stand.

e is an ordinary Bunsen burner, such as is used in Welsbach lamps or similar places. It has at the upper end, a nozzle, frequently made adjustable, for permitting the entrance of the gas, and holes *e'* in the side of the burner tube to permit air to enter and mingle with the gas. Other holes *e''* near the open end of the burner may also be provided for admitting more air and a gauze may be introduced in the open end of the burner to prevent the flame back firing or as I prefer, a larger gauze, offering less resistance may be carried by the sprinkler, as I have shown at *f*. This larger gauze offers more area for the passage of the mixed gas and air and so permits a larger quantity of air to be induced and thus insures more perfect combustion under the effect of the down draft of air produced by the spray of water falling through the tube *o*. The burner *e* has near its open end a groove in which a wire ring *g* is snapped, so that the sprinkler *h* which surrounds the burner cannot slip off but is supported by the burner after the ring *g* is snapped in place. The sprinkler *h* is an annular cup having a bottom more or less flat, perforated with fine holes to form

the needle spray. I have used in practice a circle $1\frac{3}{4}$ " in diameter of holes, these being about $\frac{1}{16}$ " in diameter and about $\frac{1}{8}$ " apart. The inner edge of this annular cup is taller than the outer edge and screw threaded to receive a nut *i*. A plate *j* fits around this central portion and bears against the upper edge of the cup. Gaskets *k* and *k'* are provided at the joints of this plate *j* with the cup so that when the nut *i* is screwed down, the joints are made watertight. A filter or gauze *l* is placed within the cup, while the water is admitted through a pipe *m* and after passing through the filter it escapes through the spray openings shown at *n* and falls downward through the pipe *o*. The extreme upper end of this tube *o* is turned inward at the top so as to rest upon the edge of the plate *j*. Just below the cup *h* holes *o'* are punched through the tube *o* to admit air, the area of these holes being approximately equal to the cross section area of the tube *o*. The lower end of this tube is also slightly turned inward so that any water running down the wall of the tube may be deflected toward a common center rather than scattered. This is a convenience when the water is being caught in a cup as for shaving.

It is, of course, obvious that the tube *o* may be ribbed or otherwise stiffened so that it may be of quite light metal.

In practice I have found that the best results are obtained by a long flame of small diameter rather than by a short flame of greater diameter, for the reason that a short flame with its excessive heat overheats the upper end of the tube *o* and does not produce the desired effect, whereas the long slim flame distributes this heat down the tube, permitting it to be absorbed by the water and not radiated from the over hot tube as with the other flame. I have secured satisfactory results from the use of a tube about 30" long and $2\frac{1}{4}$ " diameter with which I have raised water 70 to 80 degrees above the hydrant temperature at the rate of one gallon in two to two and one-half minutes, using about one foot of city gas per gallon. The tube *o* is preferably of light metal and therefore may be sprung out of round without difficulty. This permits the cup *h* to be withdrawn from the upper end of the tube by turning it with one edge in and the other out and slightly springing the tube into an oval cross section.

The light weight and small size of this device not only permits it to be moved readily to the bath room, sick room, kitchen or laundry as desired, but even permits it to be carried in one's trunk. It is particularly valuable during those seasons of the year when fires are not kept going in residences because it provides instantly water for washing one's hands, shampooing, shaving, wash-

ing dishes, or similar needs where water is wanted quickly.

Some of the important features characteristic of my improved heater are the division of the water into fine particles so that it may be fully heated in the short time during which it is exposed to the flame and hot gases; the production of flame in such a manner that it may not be exposed to the water and clogged, cooled or otherwise impeded till it has practically completed combustion; and the mingling of the two in a contracted area so that as little of the heat as possible may be lost with finally a separation of the water from the products of combustion in a simple and yet perfect manner. If the flame is overcooled at an early period in its progress from the burner, the combustion is not perfect with resultant odor and lower economy. A yellow flame indicates the formation of soot which is carried away by the water and is very objectionable. This can be filtered out by suitable means, as, for example, a strainer *q* attached to the lower end of the tube *o* by the spring arms or clips shown at *p*. This should not be needed, however, for a blue flame is not only more economical but makes no odor or soot and is purifying rather than fouling and can be secured by proper adjustment of the water and gas in relation to each other and to the air entering the tube *o*.

Care must be used to turn on the water first for this establishes the down draft of air without which the flame will burn upward around the sprinkler and burner, soot-ing same and needlessly heating them. With the water flowing the gas is carried downward with the induced air and can be readily ignited by a match held so the flame enters any of the holes in the top of *o*. The water filter in the sprinkler may be removed for cleaning in a self evident manner.

If for any reason it is desired to convey the water away from the location of the heater, a funnel *r* may be attached in any self-evident manner under the bottom of the heater and a pipe led to the desired point, it being evident, of course, that this pipe must not be carried higher than the top of the funnel.

If it is desired to make the heater permanent in its location metal pipes may be used instead of the rubber tubing or hose *a*, *b*, and suitable brackets may be provided to support the heater in the desired position.

I claim:—

1. In a water heater, the combination of a blue flame gas burner, an annular water-spraying device arranged to project a tubular spray of water from the burner to entrain the products of combustion issuing from the mouth thereof, and a mingling tube projecting from the burner to surround the mingled spray and products of combustion,

said tube having air inlet openings adjacent the mouth of the burner, substantially as set forth.

2. In a water heater, the combination of a
5 gas burner, an annular water-spraying device arranged to project a tubular spray of water from the burner to entrain the products of combustion issuing from the mouth thereof, a mingling tube projecting from the
10 burner to surround the mingled spray and products of combustion, and a strainer mounted in the discharge end of the mingling tube, substantially as set forth.

3. In a water heater, the combination of a
15 blue flame gas burner having a tubular combustion casing, an annular water-spraying nozzle fitting the outer wall of said tubular casing and adapted to pass over the end of the casing, an annular spring clip engaging
20 the casing to retain said nozzle in position, and a mingling tube projecting from the

nozzle to surround the mingled spray and products of combustion, substantially as set forth.

4. In a water heater, the combination of a 25
blue flame gas burner having a tubular combustion casing, an annular water-spraying nozzle surrounding said casing, and a mingling tube carried by and projecting from the
30 nozzle to surround the mingled spray and products of combustion, said tube having its edge inturned at one end to engage the nozzle and being formed of relatively thin, resilient sheet metal, whereby it may be de-
35 formed and passed over the nozzle, substantially as set forth.

In testimony whereof I affix my signature, in presence of two witnesses.

CHARLES E. DURYEA.

Witnesses:

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