(No Model.)

C. M. COLLINS.

HYDROCARBON BURNER.

No. 426,713. Patented Apr. 29, 1890.

Fig. 1.

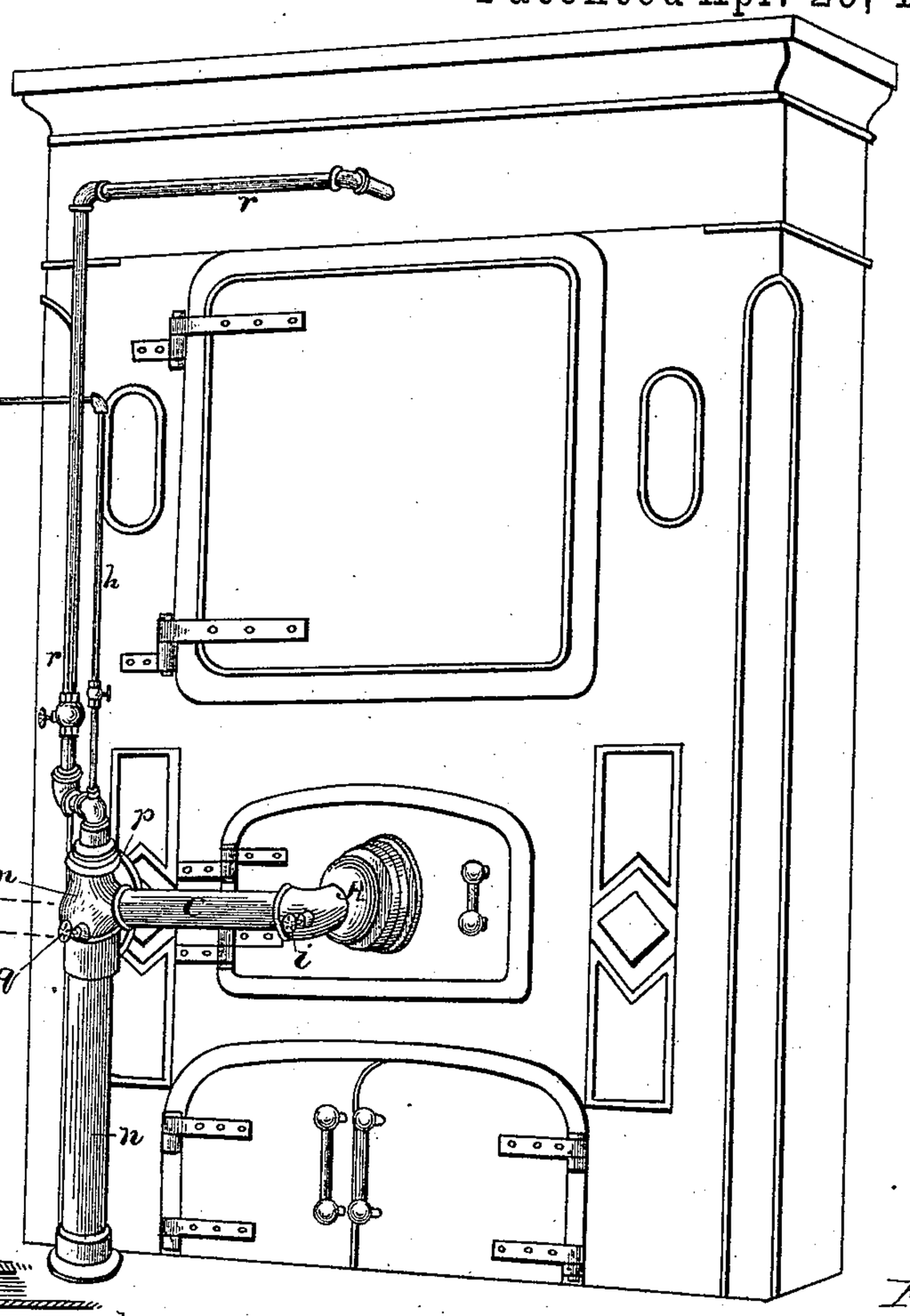


Fig. 4.

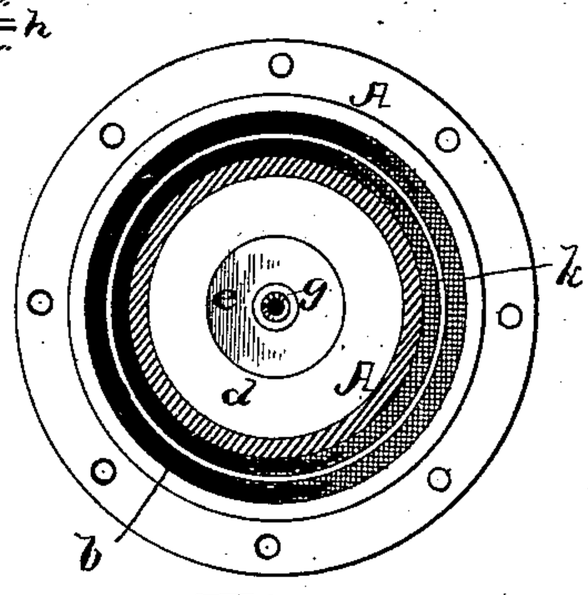
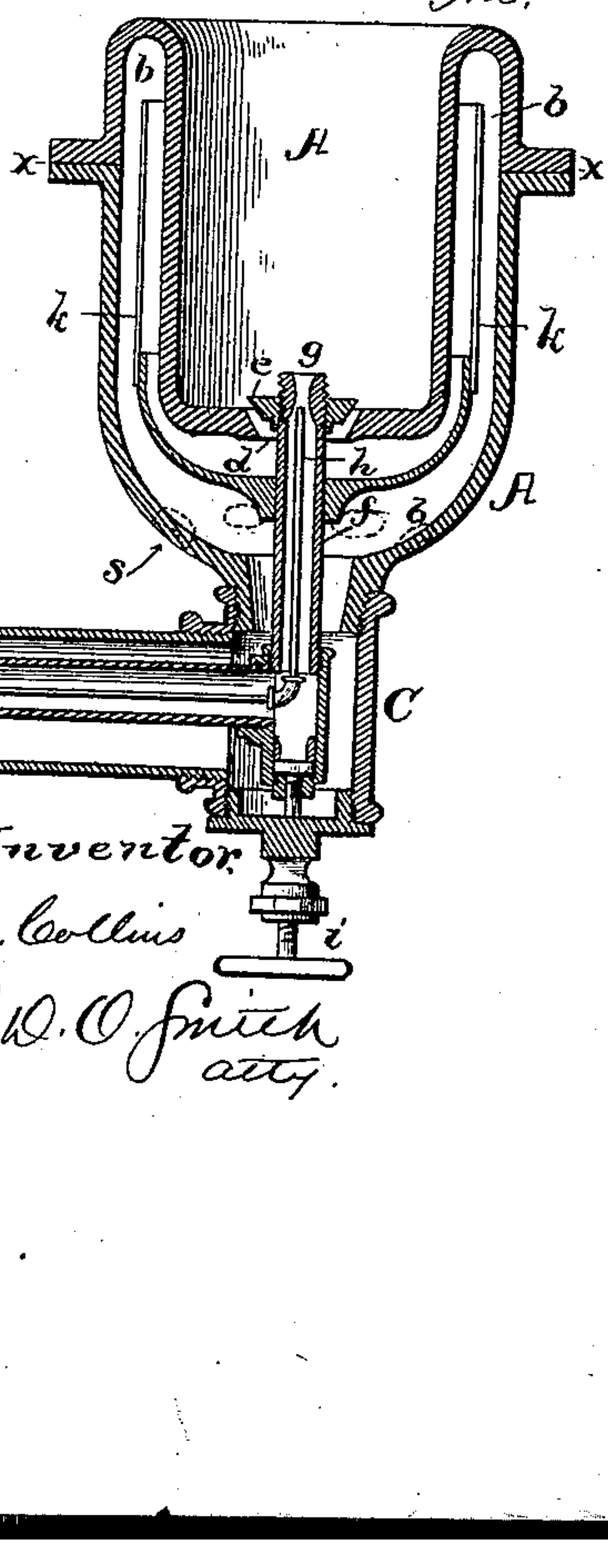


Fig. 3.

Fig. 2.



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UNITED STATES PATENT OFFICE.

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HYDROCARBON-BURNER.

SPECIFICATION forming part of Letters Patent No. 426,713, dated April 29, 1890.

Application filed June 5, 1889. Serial No. 313,255. (No model.)

To all whom it may concern:

Be it known that I, CHARLES M. COLLINS, of South Bend, in the county of St. Joseph and State of Indiana, have invented new and useful Improvements in Hydrocarbon-Burners; and I do hereby declare that the following is a full and accurate description of the same.

This improvement relates to that class of hydrocarbon-burners designed for burning crude or other petroleum in connection with a blast of hot air or steam, whereby the oil is both atomized and vaporized.

I am aware that liquid hydrocarbon has been atomized and blown into the combustion-chamber by a jet of steam, and also that it has been atomized and blown into the combustion-chamber by a jet of air, and also that steam has been employed to atomize and inject both hydrocarbon and air into the combustion-chamber; but these all differ from my invention, first, in the form of the burner; second, in the supplemental blast of hot air; third, in the means of regulating said blast; fourth, in the swivel-mounting which permits the burner to be swung laterally out of operative position.

In the accompanying drawings, Figure 1 is a perspective view of an apparatus embodying my invention. Fig. 2 is a horizontal section of the same. Fig. 3 is a vertical section of the same. Fig. 4 is a vertical section of the stand-pipe.

It is well understood that the heat emitted from substances in a state of combustion is in proportion to the rapidity with which the chemical combinations occur, and that the rapidity is increased by heating the combustible elements prior to their contact and union.

In the hydrocarbon-burners heretofore made steam has been employed to atomize the hydrocarbon; but the heat of the steam is not sufficient to disassociate the oxygen and hydrogen of the water, and therefore its effect is to atomize the hydrocarbon without facilitating combustion, and its presence retards rapid union of the combustible elements of the atomized hydrocarbon with the oxygen of the air into which the hydrocarbon is projected. This for some purposes is not objectionable and for other purposes it is objectionable. For instance, for generating steam it is required that the flame shall be of the greatest possible volume, and for the purpose of obtaining a large volume some diminution of heat can be afforded; but for heating iron the greatest possible rapidity of combustion and concentration of heat are desirable. With my burner the use of steam secures a much larger volume of flame than is obtained with air alone; but the latter is hotter than the former.

In those burners heretofore made which atomize the hydrocarbon by means of a jet of air, the air, not being previously heated to or near to the temperature of ignition, requires to be so heated in the process of combustion, and this absorbs a large proportion of the heat generated and retards rapid combustion. In those burners wherein heated air or superheated steam has been employed said air has been heated by forcing it through a heating-pipe laid within the furnace; but this arrangement is a source of resistance, both by reason of friction due to velocity and additional friction and back-pressure due to expansion. These are well-known physical facts. My burner obviates the unfavorable conditions referred to, first, by employing an atomizing jet of air previously heated to a temperature near to the temperature of ignition within the burner; second, by supplying a supplemental blast of similarly-heated air sufficient to provide the oxygen necessary for the combustion of the hydrocarbon ejected by the burner, and, third, by means for the independent regulation of the supplemental blast.

My burner is provided with a hollow-walled bell or part projecting in front of the jet-opening. This bell surrounds the base of the flame, and the air or steam blast passes through the hollow space within the wall of said bell, and thereby becomes heated, taking up the waste heat radiated from the flame to the parts of the burner and utilizing said waste heat by imparting it to the blast. This forms the first part of my invention. Gas or liquid under pressure issuing as a jet from an orifice, after leaving said orifice, expands in accordance with a well-known physical law, and therefore the jet assumes a definite mathe-

matical figure, which will always be the same under similar orifice and pressure. My burner-bell is larger than this issuing jet, so that there is within said bell an annular space around the jet of issuing combustible matter, and this space is open toward the air in front of the burner. By reason of another well-known physical law the action of the jet of combustible matter induces an inflow of atmospheric air along the inner surface of the bell toward the base of jet, where it mingles with and aids in supporting combustion, especially the combustion of the solid particles of paraffine or other unvolatilizable constituents of the liquid hydrocarbon. This effect is made positive and manageable by a supplemental blast around the base of the flame. This constitutes the second part of my invention. This supplemental blast is independently controlled, and this constitutes a third part of my invention.

In applying hydrocarbon-burners to the fire-chamber of a steam-boiler it is highly desirable to be able to remove the burner easily from its operative position and permit solid fuel to be employed in the usual way. This is desirable because it is important not to lose the services of the boiler if some disarrangement of the petroleum apparatus occurs or if the supply of petroleum is exhausted. In many establishments, also, the combustible wastes in the form of shavings, sawdust, &c., are sufficient to supply fuel during a portion of the time. This constitutes a fourth part of my invention.

Having indicated the principles of my invention, I will now particularly describe an apparatus embodying those principles.

As shown in the drawings, the burner consists of the hollow-walled bell A, which for convenience in manufacture is made in two parts, as shown, united in some convenient way to constitute a cup, say, about six inches in depth and the same in internal diameter. These dimensions, however, may be varied to suit the circumstances of any particular case. The annular space between the two walls of the cup A may be about one inch in radial direction. At its base the cup A joins on and forms the terminus of the main air-pipe C.

At the center of the cup there is a conical orifice *d* and a valve *e*, fitted accurately to said orifice. Said valve *e* is the terminus of an auxiliary air-pipe *f*, which for convenience is placed entirely within the main air-pipe C and its inner end is open therein at a little distance from the orifice *d* and valve *e* and takes air from the common blast in said pipe C. If steam is employed, the pipe *f* may be extended to a point convenient and then connected with a pipe taking steam from the boiler. In this way the hydrocarbon may be broken up and vaporized by the steam-jet and air supplied through the port *d* to support combustion, or the pipe C may carry steam wholly, if preferred, for reasons indicated above.

The jet-orifice *g* has the double conical form of greatest discharge, as determined by Venturi, and the oil-pipe *h* is located within the pipe *f* and discharges its oil close to and in line with the center of the orifice *g*, so that the oil is atomized and carried through said orifice *g*, together with the central air or steam blast. The oil-pipe emerges from the air-pipes at some convenient point, and is provided with its own controlling-valve. The pipe *f* is provided with a controlling-screw *i*, whereby the valve *e* may be moved to open or close the port *d* without changing the port *g* in any way, so that the supply of air passing through said port *d* may be exactly adjusted to the amount of oil which is being expended through the port *g*.

The deflecting cup or shield *k* is placed within the hollow space *b*, and may be carried by the pipe *f* or may be attached to the shell of the cup A. Its office is to compel the blast from within pipe C to pass around said shield and in contact with the hot metal of the shell A.

The burner is mounted in front of an orifice in the furnace-wall. In the case of a boiler-furnace said opening may be in the door, which otherwise may be of ordinary construction. In case the furnace is for heating metals and similar purposes, the opening may be at any proper point in the wall. In all cases, and especially in the case of a steam-generating furnace, it is desirable to have the "burner" quickly and easily removable from its working position, so that the fire-chamber may be opened for the purposes of repair or the introduction of solid fuel, as hereinbefore stated.

To make my burner easily removable from its working position without disengaging any of its parts, I extend the pipe C to a swivel-head *m*, which turns freely in the stationary air-pipe *n*. The head *m* is connected with the stationary air-pipe by a joint made air-tight by grinding or otherwise, so that said head may turn thereon without leaking. It is conveniently held in place by a stationary yoke *p*. The oil-pipe *n* passes out of the head *m* in or near to the line of its axis, and may then be connected with the oil-feed pipe *q* by a revoluble union. If desirable, the central pipe *f* may be taken out through the cap of head *m*, also if it is desired to employ steam as the atomizing-blast and air as the combusting-blast.

In case it is preferred to employ steam for the atomizing-blast, it is unnecessary to force the blast of air, and in that case air may be admitted to the pipe C at any convenient point, either by leaving open the regular inlet into stand-pipe *n* or by making one or more openings in the exterior base of the burner-shell—for instance, at the portion indicated by the letter *s*; but it may be desirable to provide means by which air or steam may be employed at will, and for that purpose the pipe *f* may be extended to the head

m, where it may branch, one part turning down into the stand-pipe and provided with a valve *q*, and the other part passing upward and out through the cap of the yoke *p*, where it is provided with suitable swivel-coupling and a valve *r*. This branch of the pipe *f* may be connected with the boiler. The oil-pipe *n*, exterior to the cap of the yoke *p*, is extended to a proper oil-reservoir, and is provided with a controlling-valve.

Having described my invention, I claim as new—

1. A burner for liquid hydrocarbon, provided with a central orifice *g*, and an oil-delivery pipe *h* behind said orifice, disconnected therewith, but stationary and axial as to said orifice, a supplemental annular orifice *d* and valve *e*, and means for controlling the same to regulate the quantity of steam or air supplied to the flame without affecting the quantity of the atomizing-blast through said orifice *g*, and a pipe to connect steam or air under pressure to said orifice, substantially for the purpose set forth.

2. A burner for liquid hydrocarbon, provided with a port *a*, a movable valve-piece *e*, fitted to said port, a central jet-orifice *g* in said valve-piece, an oil-pipe stationary and axial as to said valve-piece and orifice *g*, a device connected with said movable valve-piece accessible to the hand to control said valve, and a pipe to conduct steam or air under pressure to said orifices, substantially as set forth.

3. In a burner for liquid hydrocarbon, the valve *e*, having at its center the jet-orifice *g*, and being attached to the pipe *f*, combined with the hollow-walled burner-shell A, connected with air-pipe C, oil-pipe *h*, and the hand controlling device, whereby said valve *e* may be opened or closed at will.

4. In a burner for liquid hydrocarbon, a hollow-walled shell A, provided with a central port *d*, and a valve *e*, fitted thereto, a jet-orifice *g* in said valve, an oil-pipe *h*, stationary and axial as to said orifice, means for controlling and moving said valve, a deflecting partition cup *k*, and duct to conduct air to said burner, substantially as set forth.

5. In combination, the stand-pipe *n*, the swivel-head *m* and yoke *p*, supported thereon, the blast-pipe C, and the oil-pipe *h*, substantially as shown.

6. In combination with the burner for liquid hydrocarbon, its swinging supporting pipe arm C, swivel-head *m*, and inclosed pipes *f* and *h*, the valves *q* and *r* in said pipe *f*, whereby said pipe *f* may be made to convey either steam or air to the jet-orifice *g*, as described.

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