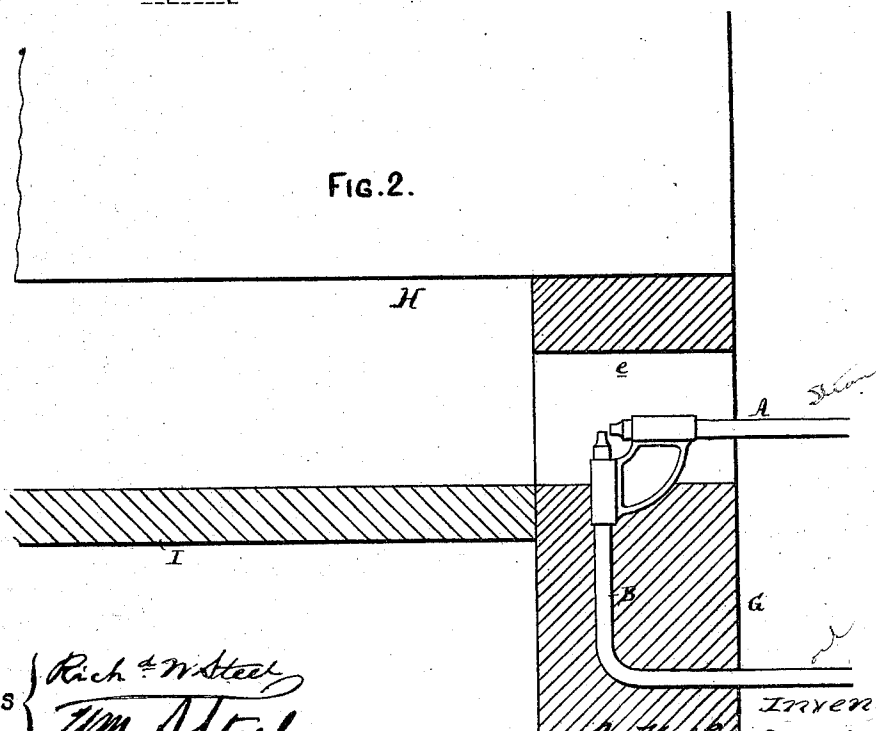
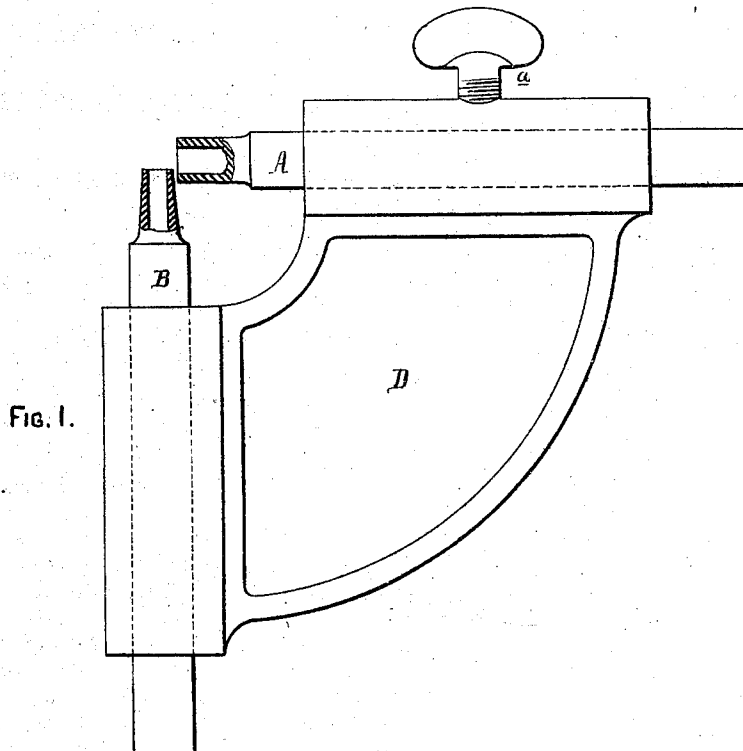


J. K. CALDWELL

Improvement in Heating Furnaces with Hydrocarbon Liquids.

No. 124,791.

Patented March 19, 1872.



WITNESSES { *Rich & W. Steel*
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UNITED STATES PATENT OFFICE.

JOSEPH K. CALDWELL, OF PHILADELPHIA, PENNSYLVANIA.

IMPROVEMENT IN HEATING FURNACES WITH HYDROCARBON LIQUIDS.

Specification forming part of Letters Patent No. 124,791, dated March 19, 1872.

Specification describing an Improvement in Heating Furnaces with Hydrocarbon, invented by JOSEPH KAY CALDWELL, of Philadelphia, Pennsylvania.

My invention consists of the application to furnaces, in the manner fully explained hereafter, of the hydrocarbon burner for which Letters Patent were granted to me on the 12th day of September, 1871; the application of the burners being such that the interior of the furnace is filled with widely-diffused flames, imparting intense heat, and leaving no sooty deposit on the object with which the flames come in contact.

Figure 1 is a full-sized view, partly in section, of the burner; and Fig. 2 illustrates the application of the burner to a furnace.

The burner is similar in its action to that of the device illustrated in my patent of September 12th, 1871. It consists of the tubes A and B, arranged at right angles or thereabout to each other, the tube A communicating with a supply of dry or superheated steam under pressure, and the tube B with a supply of petroleum or other equivalent hydrocarbon. Each tube terminates in a nozzle, that of the tube B extending upward and partly across the orifice of the nozzle of the tube A, as clearly shown in Fig. 1. The tubes are fitted to a casting, D, to which they may be permanently secured; but I prefer to make them adjustable longitudinally in the said casting, to which they may be secured, after adjustment, by set-screws or otherwise. The burner may be applied to different furnaces; one example, however, that of a steam-boiler furnace, will suffice to illustrate the application. G, in Fig. 2, represents a portion of the front wall of the furnace, and H the lower portion of the front end of the boiler. Any desired number of openings *e* are made in the front wall G, and in each opening is placed one or more of the above-described burners in or near the position shown; the burners being in the present instance partly built in the wall. Beneath the boiler, and in the position usually occupied by the gate-bars, is placed a layer, I, of fire-brick; the latter may in fact be arranged on and supported by common grate-bars, the brick-work extending as far toward the rear of the boiler as desirable.

I may state that I have now in use four burners, (one of which is represented in full

size, Fig. 1,) in connection with a boiler which supplies steam to an engine having a cylinder twenty inches, in diameter, a stroke of sixty inches, and making sixty-eight strokes per minute; the steam being maintained at an average pressure of eighty pounds per square inch. The fuel used in connection with the burners is crude petroleum or heavy oil. In the wall of said furnace there are but two openings, *d*, about six inches wide and nine inches high, and in each opening are placed two of the burners; the pipes of the latter being furnished with suitable valves or cocks, on opening which the jets of dry steam from the nozzles of the pipes A, crossing the orifices of the pipes B, cause sufficient of a vacuum in the latter to induce the hydrocarbon to rise. The moment it reaches the orifices the hydrocarbon is forced into spray by and is intimately mixed with the steam, and when ignited forms long widely-diffused flames of intense heat, the flames leaving no sooty deposit in the furnace or on the boiler. The burners, moreover, are entirely free from carbonaceous and tarry deposits, which have been a serious bar to the success of many liquid fuel-burners.

The nozzles, it will be observed, are not confined within any casing, but are freely exposed to the air, and to this may be attributed the invariable cleanliness of the nozzles and the widely-diffused pure flame.

It will be evident that the burners may be applied to different furnaces employed in various branches of the useful arts; slight modifications in the dispositions of the burners being made in accordance with the character of the furnace.

I claim—

The combination, with a furnace substantially as described, of one or more burners, each consisting of two nozzles, exposed to the air, one nozzle for discharging a jet of steam across the orifice of the other nozzle, which communicates with a supply of petroleum or other equivalent hydrocarbon.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

JOSEPH K. CALDWELL.

Witnesses:

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