

(No Model.)

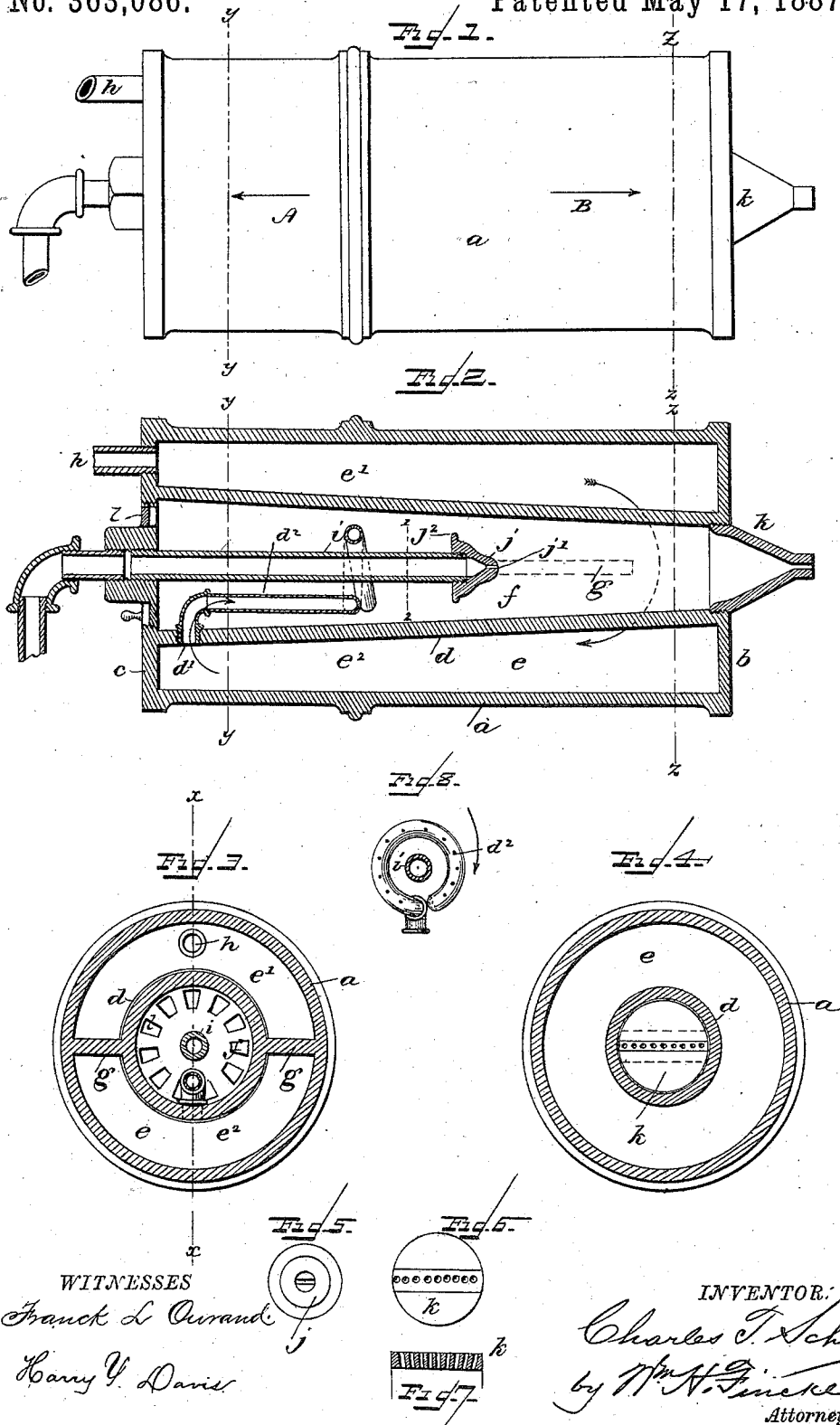
2 Sheets—Sheet 1.

C. T. SCHOEN.

COMBINED SUPERHEATER AND HYDROCARBON BURNER.

No. 363,086.

Patented May 17, 1887.



WITNESSES

Franck L. Ourand

Harry V. Davis

INVENTOR

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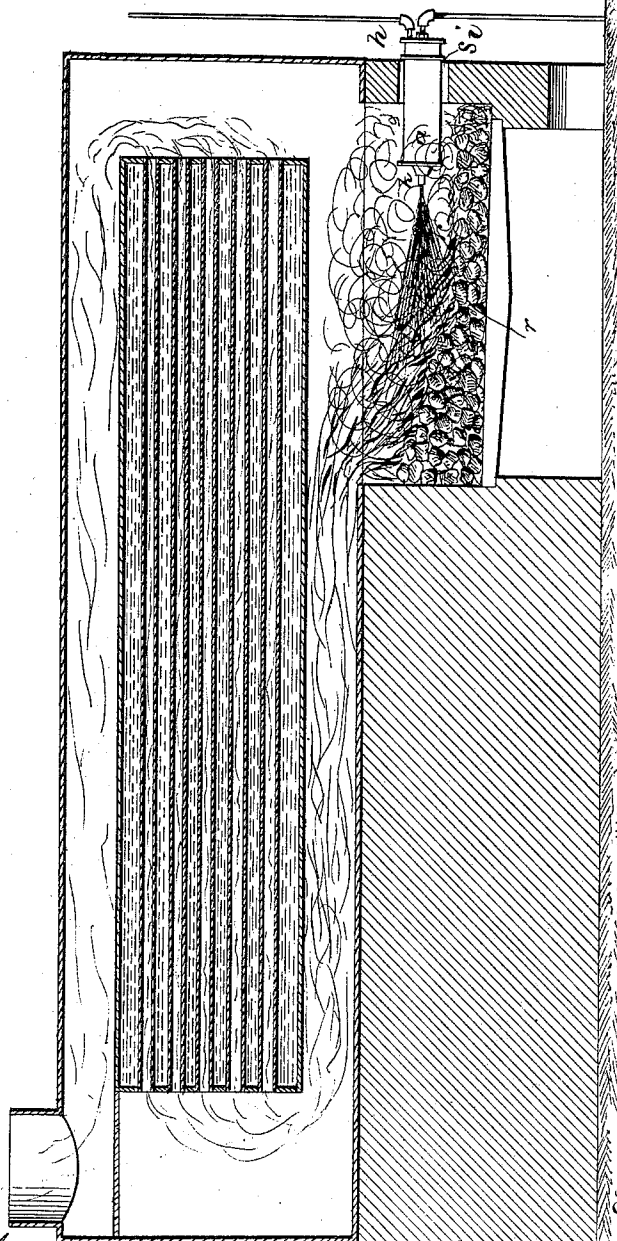
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Inventor:
Charles T. Schoen.
By his Attorney
Wm. H. Finckel.

UNITED STATES PATENT OFFICE.

CHARLES T. SCHOEN, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR TO
JOHN EDWIN CUMMINGS AND GEORGE KING CUMMINGS, BOTH OF
SAME PLACE.

COMBINED SUPERHEATER AND HYDROCARBON-BURNER.

SPECIFICATION forming part of Letters Patent No. 363,086, dated May 17, 1887.

Ap. lication filed February 28, 1887. Serial No. 229,070. (No model.)

To all whom it may concern:

Be it known that I, CHARLES T. SCHOEN, a citizen of the United States, residing at Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Combined Superheaters and Hydrocarbon-Burners, of which the following is a full, clear, and exact description.

10 This invention relates to means for properly introducing liquid fuel for combustion in its most effective condition into furnaces for steam-boilers and for other purposes.

The invention consists in introducing steam 15 into an expansion-chamber, where it is superheated, and then conveying it through a tortuous passage into a separate chamber, where it forcibly commingles with liquid fuel, and whence the resultant mixed vapor is driven 20 through a burner in a thin wide sheet and ignited, substantially in the manner and by the means hereinafter more particularly set forth and claimed.

In the accompanying drawings, in the several figures of which like parts are similarly designated, Figure 1 is a side elevation of my apparatus. Fig. 2 is a central longitudinal section taken in the plane of line *x x*, Fig. 3. 30 Fig. 3 is a cross-section taken in the plane of line *y y*, Figs. 1 and 2, looking in the direction of the arrow A. Fig. 4 is a similar section taken in the plane of line *z z*, Figs. 1 and 2, looking in the direction of arrow B. Fig. 5 is a plan view of the hydrocarbon feed-pipe nozzle. 35 Fig. 6 is a plan view of the flame or burner tip, and Fig. 7 is a longitudinal cross-section of said tip. Fig. 8 is a section in the plane of line 1 2, Fig. 2. Fig. 9 is a sectional elevation showing the device in a steam-boiler 40 furnace.

The letter *a* designates a casing, preferably cylindrical, and having tight heads *b* and *c*, and within this casing and connected tight to its heads is arranged a frusto-conical or tapering shell, *d*, so as to form two main chambers, *e* and *f*, respectively. The chamber *e* is divided into two compartments, *e'* and *e''*, by diaphragms or walls *g g*, extending from the head *c* nearly to the head *b*, and from the cas-

ing *a* to the shell *d*. Communication between 50 chambers *e* and *f* is had through an opening or port *d'*, in the shell *d*, near its base, and most remote from the steam-inlet into chamber *e*.

I prefer to insert in the opening or port *d'* 55 a pipe, *d''*, and extend it parallel with the pipe *i* for some distance, and then provide it with a coil encircling said pipe *i*, and in this coil I provide a series of openings, as shown in Fig. 8.

A steam-pipe, *h*, enters the compartment *e'*, 60 and a hydrocarbon or liquid-fuel feed-pipe, *i*, enters and extends well up into the chamber *f*, and is provided at its inner end with a nozzle, *j*, having its outlet *j'* in the form of a straight slit (see Fig. 5) and provided with a 65 flange or deflector, *j''*.

The outlet of the chamber *f* is provided with a burner-tip, *k*, contracted to a flat mouth, which is made as a series of holes diverging from the central hole toward each side of the 70 burner-tip. (See Fig. 7.)

The end of the chamber *f* opposite the burner is provided with a valvular device, *l*, of any approved construction—such, for example, as the ordinary draft-regulator used in stove and 75 furnace doors.

The operation is as follows: The apparatus having been placed in position, and connection having been made with a steam supply and also with a liquid-fuel source, the steam 80 is admitted into the compartment *e'*, expands and passes over the walls *g g* into compartment *e''*, and thence through the perforated pipe *d''* in many small jets into the chamber *f*, where, striking the flange *j''* of the nozzle *j*, its course 85 is diverted around said nozzle, and thereby forms what in workshop parlance is termed a "vacuum" in the supply-pipe *i*, and the liquid fuel, being admitted, is drawn forcibly through the nozzle, as by an atomizer, and va- 90 porized by the steam, and the resultant mixed gas or vapor is ejected through the burner-tip in the form of a wide thin sheet, and thus presented in a most effective and economical form for ignition and combustion. The valve *l* 95 is used to admit into the chamber *f* the proper quantity of air, and the incoming steam draws in the air in the form of a powerful blast, sub-

ject, however, to regulation by means of the valve. The arrangement of the apparatus for use as a heater for steam-generators is shown in Fig. 9, and in this arrangement the steam heats the apparatus throughout in the first instance, and, after the vapor is ignited, the heat from the flame in the furnace is also imparted to the apparatus, and thereafter the apparatus, being arranged in the heated atmosphere or atmosphere of flame in the furnace, is kept so hot that the steam is superheated in the chamber *e* before it is admitted to the gas or vapor chamber, and hence it is brought into contact with the liquid fuel when in its most effective form for quickly, economically, and effectually vaporizing such fuel and adding to it the requisite quantity of hydrogen to produce the most intense flame.

When the apparatus is applied to furnaces already in use for burning coal, it is arranged substantially as indicated in Fig. 9. Any heat-absorbing and refractory material may be used in the combustion chamber, as usual, as indicated at *r*.

The tapering shell *d* makes the chamber *e* larger at the fire or educt end than at the inlet end, and so provides for the expansion of the superheated steam, while at the same time it contracts the fuel and gas chamber *f* at its educt end, and so condenses or compresses the gas or vapor for delivery. I esteem this a feature of considerable importance.

It will be noticed that by the described construction the steam is admitted to the hydrocarbon only after completing a tortuous course all around the hydrocarbon-chamber, and hence said chamber is equally heated throughout, the incoming hydrocarbon liquid has a preliminary heating in its feed-pipe, and the steam itself is superheated and its effective quality largely enhanced, and the operation of the apparatus rendered certain and uniform, and a gas or vapor supplied in a most favorable condition for quick and perfect combustion.

The apparatus is arranged in use within the furnace or chamber to be heated, substantially as indicated in Fig. 9, and usually a space, will be left between the apparatus and the portion of the furnace or other structure supporting it for the admission of air to such chamber.

What I claim is—

1. An outer casing and an inner shell inclosed by said casing and terminating in a burner-tip, forming two independent chambers, a steam-inlet into the outer chamber, and a liquid-fuel inlet into the inner chamber terminating in a nozzle, and a communicating passage or port between the steam-chamber and the fuel-chamber opening in the rear of the oil-nozzle, combined substantially as described, for burning the gases as formed.

2. In a combined superheater and hydrocarbon-burner, a steam-chamber whose cross-section is of increasing area from inlet toward the opposite end and of correspondingly decreasing area to the outlet for the steam, and partitions in the steam-chamber separating it into two compartments, combined with a fuel-chamber communicating with the steam-chamber at its most contracted area, and itself contracted toward its outlet end, and a fuel-supply pipe, substantially as described.

3. In a combined superheater and hydrocarbon-burner, a fuel-chamber, an induct-pipe, and a nozzle thereon provided with a flange or deflector at right angles to the pipe, combined with a surrounding steam-chamber in communication with said fuel-chamber in the rear of the flanged nozzle, and adapted to deliver steam against said deflector, substantially as described.

In testimony whereof I have hereunto set my hand this 24th day of February, A. D. 1887.

CHARLES T. SCHOEN.

Witnesses:

WM. H. LEWIS,
GEO. T. BRAMBLE.