

(No Model.)

2 Sheets—Sheet 1.

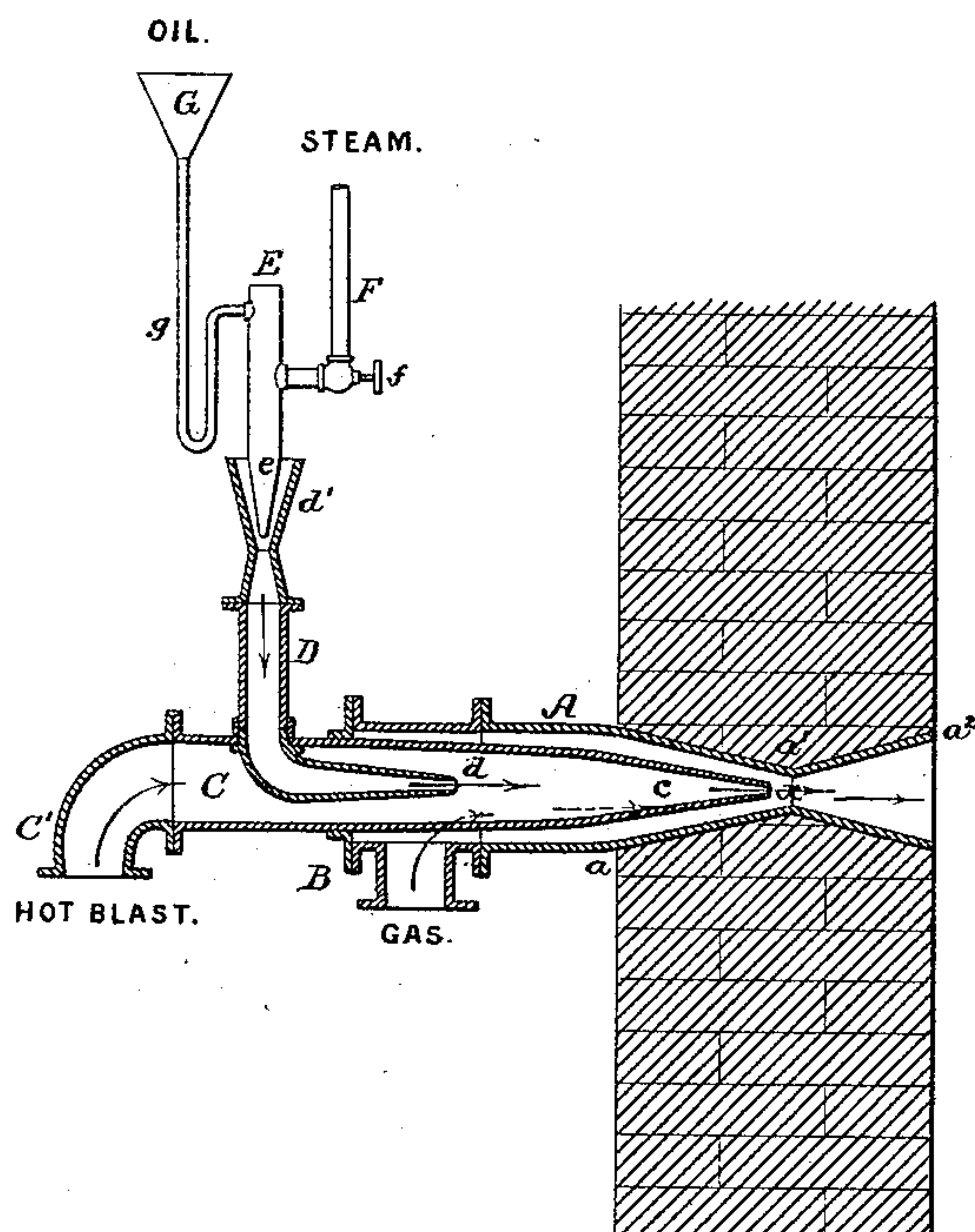
W. FIELD.

FURNACE AND BURNER FOR BURNING HYDROCARBON OIL.

No. 370,251.

Patented Sept. 20, 1887.

FIG. 1.



Witnesses  
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William Field  
by his Attorneys  
Hewson & Sons

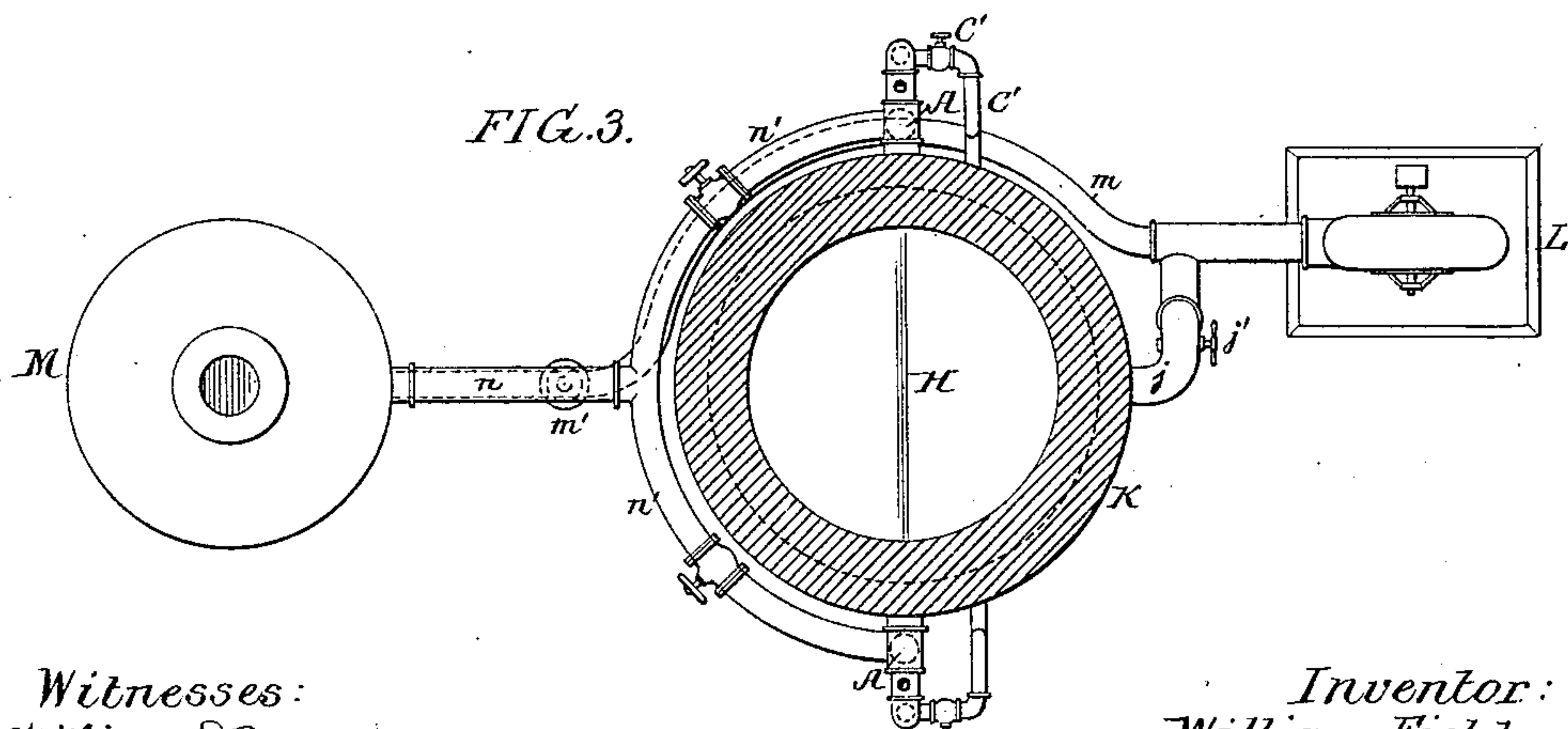
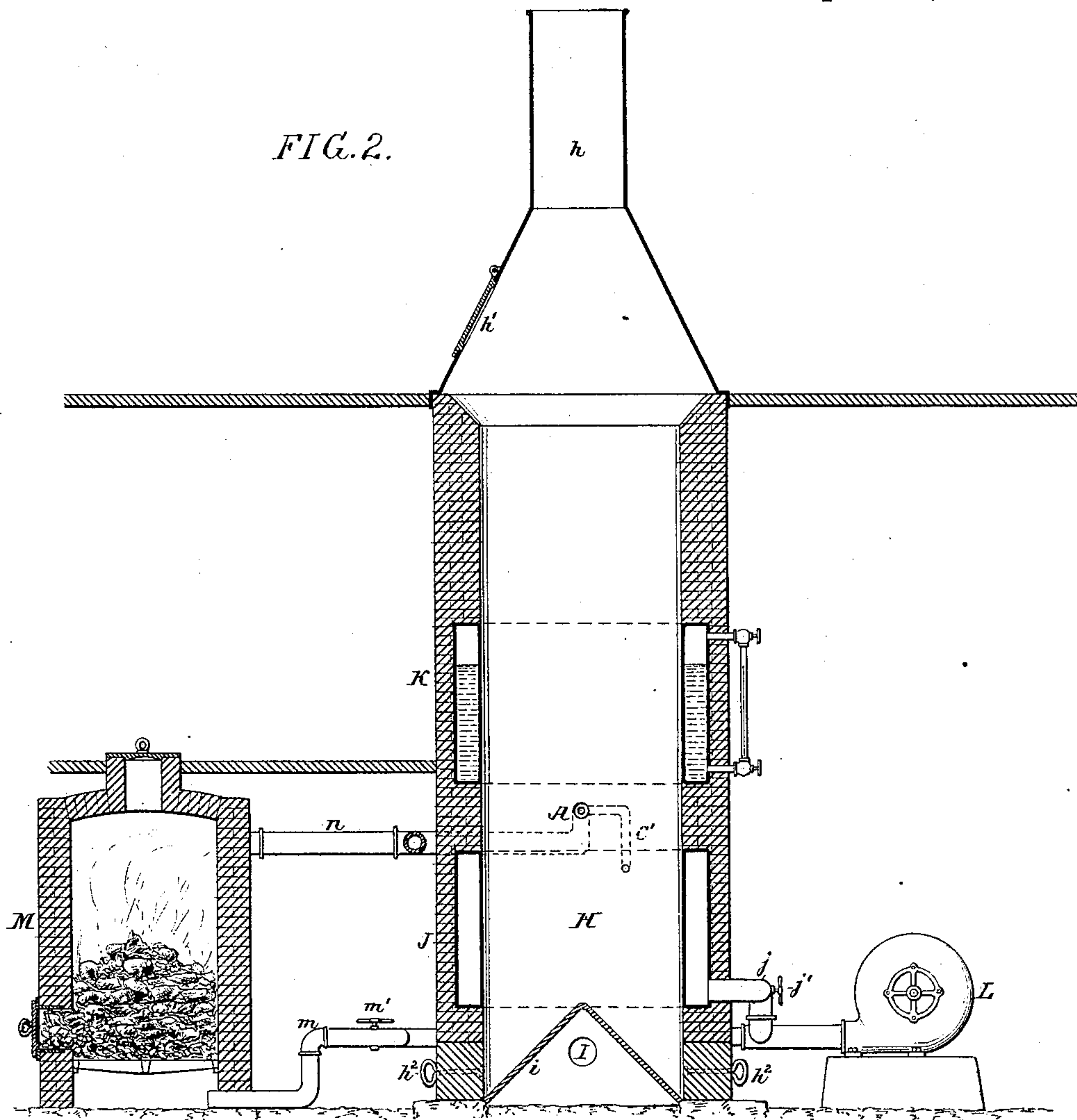
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2 Sheets—Sheet 2.

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Patented Sept. 20, 1887.



Witnesses:  
William D. Brown  
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# UNITED STATES PATENT OFFICE.

WILLIAM FIELD, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR OF ONE-HALF TO EDWARD B. ENGLISH AND HUGH McINNES, BOTH OF SAME PLACE.

## FURNACE AND BURNER FOR BURNING HYDROCARBON OIL.

SPECIFICATION forming part of Letters Patent No. 370,251, dated September 20, 1887.

Application filed July 29, 1886. Serial No. 209,422. (No model.)

*To all whom it may concern:*

Be it known that I, WILLIAM FIELD, a citizen of the United States, residing in Philadelphia, Pennsylvania, have invented certain  
5 Improvements in Furnaces and Burners for Burning Hydrocarbon Oils, of which the following is a specification.

The object of my invention is to so construct a burner for kilns and furnaces that a flame of  
10 intense heat may be produced.

In the accompanying drawings, Figure 1 is a sectional view, partly in elevation, of a burner constructed in accordance with my invention. Fig. 2 is a sectional view of a kiln  
15 or furnace constructed for use with my improved burner; and Fig. 3, a sectional plan on the line 1 2, Fig. 2.

I will first describe the construction of the burner which is shown in Fig. 1.

20 A is a tubular casing having an inward taper from  $a$  to  $a'$  and an outward flare from  $a'$  to  $a''$ , as shown in Fig. 1, this casing being preferably built in the wall of the furnace or kiln, as shown, and being jacketed, if required, to prevent it from burning out. The  
25 casing A projects beyond the wall of the furnace or kiln, and secured to the casing is a branch, B, communicating with a gas-producer, described hereinafter.

30 Within the casing A is the tapering nozzle  $c$  of a tube, C, the nozzle terminating a short distance in the rear of the contracted throat  $x$  of the casing A. This tube C communicates with a hot-air-blast pipe leading either from  
35 tubes in the gas-producer or from a jacket around the furnace, a suitable blower being connected with the jacket or tubes, as will be readily understood. Projecting into the pipe C is another tapering nozzle,  $d$ , which is connected to a vertical pipe, D, having a funnel,  
40  $d'$ , this funnel having a double taper and contracted throat similar to that of the casing A.

Projecting into the funnel  $d'$  is a pipe, E, having a tapering nozzle,  $e$ , and this pipe has  
45 two branches, one communicating through a pipe,  $g$ , with an oil-reservoir, G, and the other communicating through a pipe, F, with a steam-generator, a valve,  $f$ , serving to regulate the supply of steam to the pipe E, so that

the mixture of the steam and oil can be governed as desired. 50

It will be readily seen that the oil and steam are first mixed, the steam forcing the oil through the nozzle of the pipe E and through the contracted throat of the funnel  $d'$ , thus inducing an inflow of air. 55

The mixture of steam, oil-vapor, and air escapes from the nozzle  $d$  into the tube C, where it is mixed with the hot air, and the jet is projected from the nozzle  $c$  through the contracted  
60 throat  $x$  of the casing A, thus inducing an inflow of gas, so that the jet entering the furnace from the flaring mouth of the casing A is composed of steam, oil vapor, hot air, and gas, and when ignited this mixture burns with a  
65 flame of intense heat.

In Figs. 2 and 3 I have shown a kiln or furnace specially constructed for use with my improved burner.

H is the body of the kiln, having the usual  
70 stack,  $h$ , with supply-opening  $h'$ , and the usual outlet-opening,  $h''$ , at the base of the tapered bottom  $i$ , the space beneath which bottom is ventilated by means of openings I in the walls of the kiln, so as to provide means for cooling  
75 the contents of the kiln before they are discharged.

The burners are inserted in the present instance in each side of the kiln, as shown at A A; but it will be understood that three or  
80 more burners may be used, and their location may be varied, according to the construction of the kiln.

In the side wall of the kiln are two annular casings, J K, one below the burners A and one  
85 above the same. The chamber in the casing J communicates through a pipe,  $j$ , having a suitable valve,  $j'$ , with a blower, L, and said chamber also communicates with the pipe C' of the burner, said pipe having a regulating-  
90 valve,  $c'$ . The casing K, I use as a steam-generator, this casing surrounding that part of the furnace in which combustion takes place, and being consequently very highly heated. The generator communicates with the burner  
95 through the pipe F.

Situated a short distance from the kiln is a gas-producer, M, having the usual grate-bars



and feed-doors, as will be seen on referring to Fig. 2. A blast-pipe, *m*, communicates with the ash-pit of the gas-producer and with the blower *L*, this pipe having a valve, *m'*, for regulating the supply of air.

The gas-producer communicates with the branches *B* of the burners through a pipe, *n*, which has two branches, *n' n'*, one leading to the burner on one side of the kiln and the other to the burner on the opposite side of the same, as will be seen in Fig. 3.

I have only shown one kiln; but it will be understood that two or more kilns may receive the gas from the same producer and air from the same blower.

The contracted throat *x* of the burner-casing forms the nozzle for the gas-chamber, the nozzle for discharging the mixture of hot air, steam, and oil being in close proximity to this throat—that is to say, at or about the apex of the flaring conical discharge-mouth of the casing. By this means the volume of gas or vapor delivered from the nozzle *c* is caused to follow the flaring walls of the mouth of the burner, and is consequently discharged from said burner in the form of a widely-spreading flame of intense heat.

I am aware that it is common in vapor-burners to mix oil, air, and steam; also, that a mixture of oil, hot air, and steam has been projected into a furnace above the bed of fuel therein; but in my improved burner the gas from the fuel is intimately mixed with the hot air, steam, and oil vapor in the body of the burner itself, so that the mixture is much more thorough and combustion more perfect than where the burner discharges into a volume of gas in the furnace.

I am also aware that a burner has been devised to effect a mixture of steam, oil, and gas, the burner being so constructed that a small quantity of cold air was admitted with the oil-supply; but in my improved burner a large volume of hot air is admitted to the burner-

casing in addition to the limited supply of cold air which is caused to enter the pipe *D* by the action of the injector *E*.

Furnace-stacks have also been provided with steam-generating vessels and air-heating chambers prior to my invention; but I am not aware that a kiln or stack has been combined with such chambers located one above the line of the burners and the other below the same, so that the latter will act to cool the contents as they descend below the burner-line.

I therefore claim as my invention—

1. The combination of a burner-casing having a series of nozzles, located one in advance of another, with steam and gas generators, air-heater, and oil-vessel connected to said casing, as described, whereby the steam and-oil nozzle discharges into the hot-air nozzle, the latter into the gas-nozzle, and the latter into the furnace, all substantially as specified.

2. The combination of the burner-casing forming a gas-nozzle, the hot-air nozzle, the pipe *D*, open at one end to the air and having at the opposite end a nozzle in the burner-casing, an oil-pipe, a steam-pipe, and an injector receiving oil and steam from said pipes, and having a nozzle through which the mixture is discharged into the pipe *D*, so as to induce a flow of air into and through the latter, all substantially as specified.

3. The combination of a kiln or stack having in its walls a steam-generator and an air-heater, one above the other, with a vapor-burner receiving steam and air from said generator and heater and communicating with the stack between said generator and heater, all substantially as specified.

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

WILLIAM FIELD.

Witnesses:

WILLIAM D. CONNER,  
HARRY SMITH.