

(No Model.)

2 Sheets—Sheet 1.

P. TARBUTT.

APPARATUS FOR THE COMBUSTION OF LIQUID HYDROCARBONS.

No. 350,783.

Patented Oct. 12, 1886.

Fig. 2.

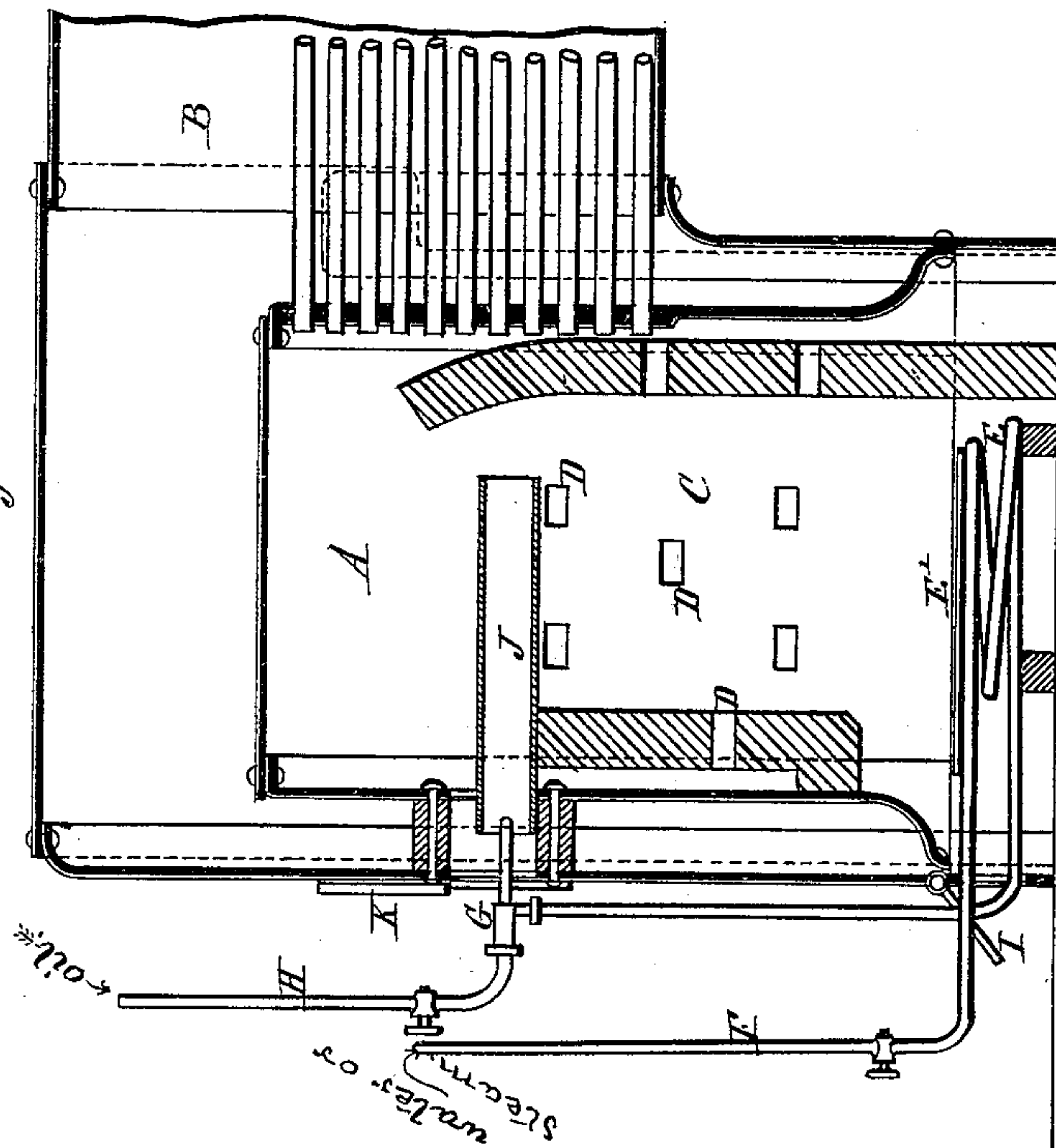
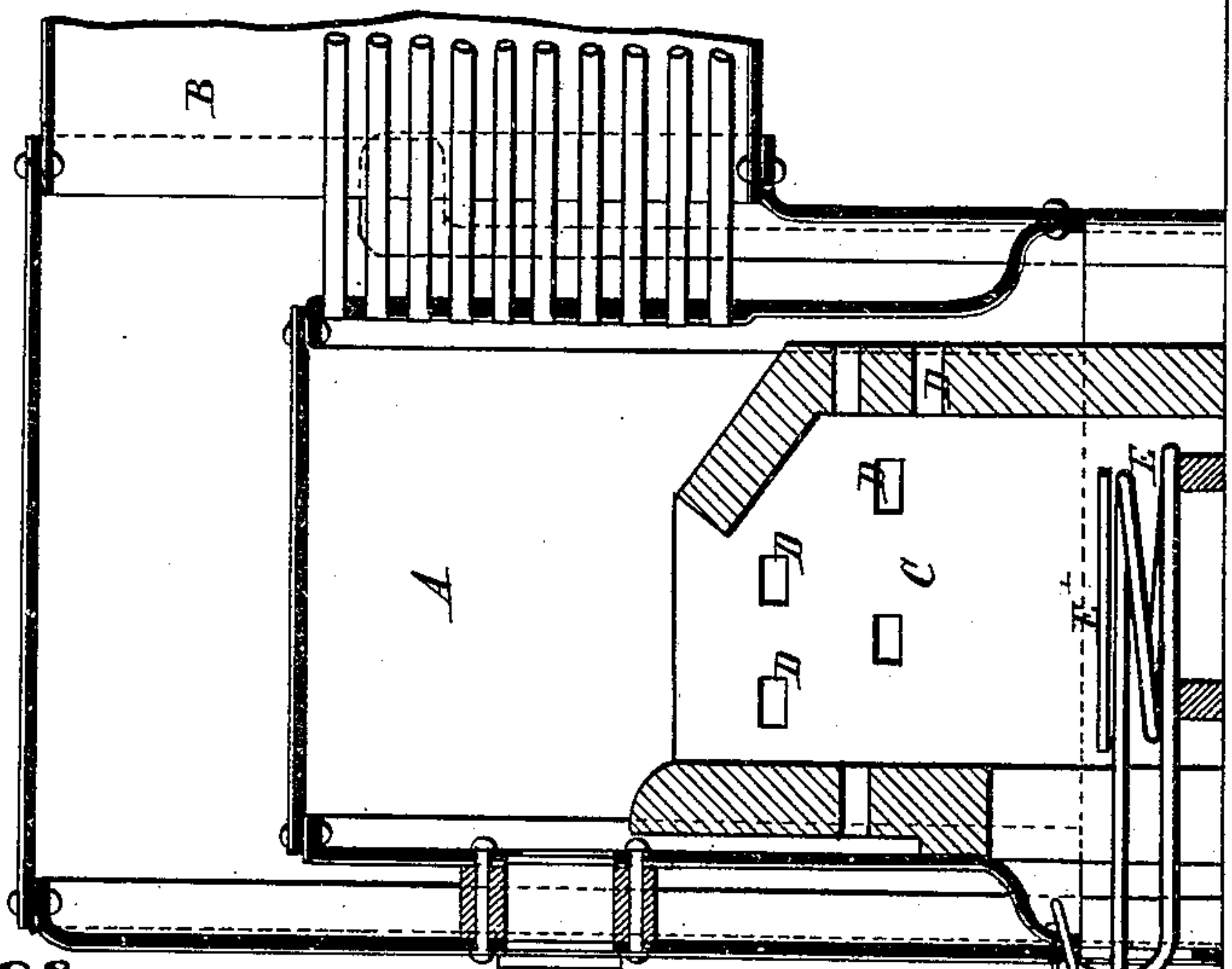


Fig. 1



Witnesses.

Geo W. Rea
Robert G. Pratt.

oil.
WATER OR
steam.

Inventor.
Percy Tarbutt.

By
James L. Norris,
Atty.

(No Model.)

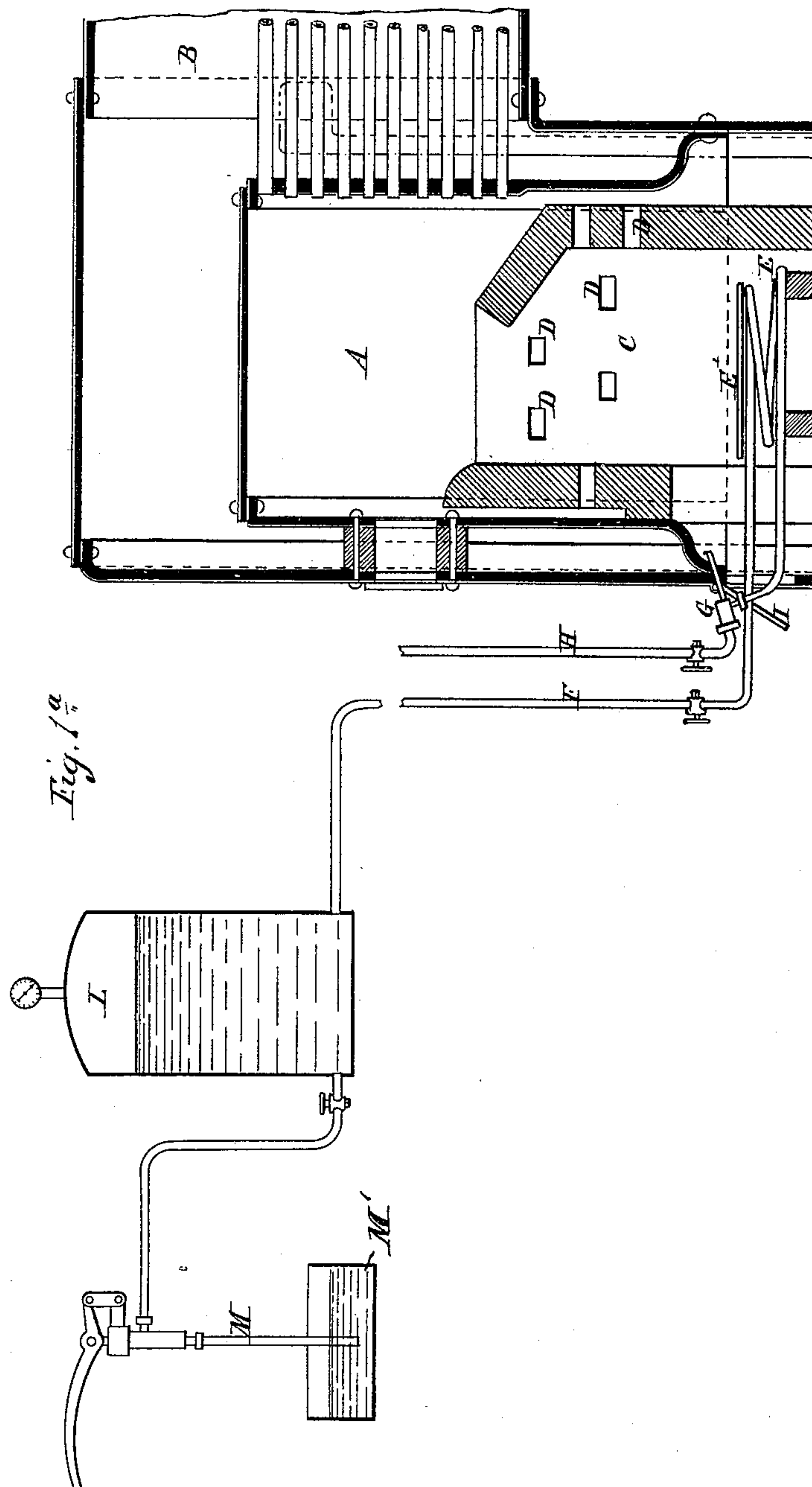
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Witnesses.

Percy B. Hills.
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UNITED STATES PATENT OFFICE.

PERCY TARBUTT, OF LONDON, COUNTY OF MIDDLESEX, ENGLAND.

APPARATUS FOR THE COMBUSTION OF LIQUID HYDROCARBONS.

SPECIFICATION forming part of Letters Patent No. 350,783, dated October 12, 1886.

Application filed January 20, 1886. Serial No. 189,202. (No model.) Patented in England May 6, 1885, No. 5,599; in France January 7, 1886, No. 173,395; in Belgium January 8, 1886, No. 71,539; in Italy June 30, 1886, XXXIX, 347, and in India July 9, 1886 No. 798.

To all whom it may concern:

Be it known that I, PERCY TARBUTT, a citizen of England, residing at Lombard street, in the city of London, county of Middlesex, England, have invented Apparatus for Combustion of Liquid Hydrocarbons, of which the following is a specification.

My invention relates to apparatus for effecting complete combustion of liquid hydrocarbons in furnaces for heating boilers and other purposes.

Within the fire-chamber or fire-box of the furnace or boiler to which my invention is to be applied I construct a combustion-chamber of fire-brick or other refractory material with lateral openings for issue of the flame and hot products of combustion. Into this combustion-chamber I force a spray of the hydrocarbon liquid by means of an injector-jet of superheated steam. At the same time the air required for the combustion is admitted around or near the injector. In some cases I heat the mixture of steam and hydrocarbon either with or without air before it is burned. In order to superheat the steam employed for the jet, I cause it or the water which generates it to pass through a coil of pipe, which is placed in the lower part of the combustion-chamber, and is provided with dampers to regulate the heat to which it is exposed, and I obtain the supply of water to the superheater from a pressure-tank into which the water is forced by a pump. When the apparatus is applied to a boiler, the steam or water for generating it is obtained by putting the superheating-coil in communication with the boiler, in which case the pressure-tank has to be used only at starting.

The accompanying drawings represent apparatus according to my invention suitable for a boiler of the locomotive kind.

Figure 1 is a vertical section through the fire-box; Fig. 1^a, a similar view showing the tank and pump for starting the apparatus where there is not sufficient boiler-pressure for the purpose; and Fig. 2 is a similar section showing a modification suitable for heating the steam and hydrocarbon mixture before combustion.

A is the ordinary fire-box, and B the barrel of the boiler. Within the fire-box I build of refractory material the combustion-chamber

C, which is mostly open at the top, and has also lateral openings D through its sides.

G is the injector, and E is the superheating-pipe coil, which is placed near the bottom of the chamber and has over it a horizontally-slidable shield-plate, E', which may be of any refractory material, or an iron plate covered with sand, that can be withdrawn more or less according as the coil has to be more or less heated.

At starting the apparatus the damper E' is entirely withdrawn. The coil E is supplied by a pipe, F, with water or steam, and it communicates with the injector G, which receives a supply of hydrocarbon liquid by the pipe H. An air valve or damper, I, regulates admission of air to the combustion-chamber.

In addition to the parts mentioned above I sometimes employ, as shown in Fig. 2, a retort-pipe, J, of refractory material, through which the discharge from the injector, either with or without an induced current of air, passes, becoming heated on its way.

The pipe F, for supplying water or steam to the superheater E, communicates with the water or the steam space of the boiler, and also with a closed pressure-tank, which is supplied with water by a force-pump, each of its communications being furnished with a stop-cock or valve. The pipe H, for supplying the hydrocarbon, communicates with a reservoir thereof, and is also furnished with a stop-cock or valve for regulating the supply.

For starting the apparatus into action, all the cocks and valves being closed, a fire of wood or other combustible is kindled on the coil E, and when it is sufficiently heated the water-supply cock is slightly opened to admit to the coil a little water from the pressure-tank. This is converted into steam and superheated, and the superheated steam issues through the injector G. The cock of the pipe H being then opened, the hydrocarbon liquid flows into the injector, and is forcibly driven by the steam-jet into the chamber C, where it is ignited. The flame passes through the openings from the chamber into the furnace or boiler-flues, and also maintains the heat of the coil E. When a sufficient pressure is produced in the boiler, the coil E may be put in communication with the water or the steam space, its

communication with the pressure-tank being closed.

In the modification shown in Fig. 2 the jet of steam and hydrocarbon in passing through the hot tube J becomes highly heated before burning when it issues from J. By means of a slide, K, a regulated quantity of air may be admitted through and around the tube J. When there is no boiler-pressure sufficient for starting the apparatus, I provide, as above mentioned, a closed tank, L, into which I force water by a pump, M, from a suitable vessel, M', compressing the air in said tank, so that on opening the cock or valve in the pipe F, leading to the coil E, the water is caused by the pressure of air in the tank to pass through the coil.

In ocean-going steamers, and in localities where fresh water is scarce, instead of employing a jet of steam to inject the hydrocarbon, which would involve expenditure of fresh water, I prefer to use a jet of air compressed and heated. The compression of the air is in such cases effected by a compressing or blowing engine worked by steam taken in the first place from an auxiliary boiler and afterward from the main boilers, and the exhaust-steam from this engine is condensed, either in a separate condenser or in the main condensers, thus maintaining the supply of fresh water. For heating the air it is passed on its way from the blower or reservoir of the compressor to the injector through a coil of pipes or other suitable heating apparatus, which may be situated in the smoke-box. In such a case the superheating-coil E is dispensed with.

I am aware that heretofore the petroleum in a tank has been forced by compressed air in another tank, supplied by a pump, into a mixing device, to which air is also supplied from the compressed-air tank for mixing the oil and air to be consumed. I am also aware that heretofore oil and air have been forced by water and air pressure to a burner in a combustion chamber; but such do not constitute my invention, which differs therefrom in that I provide a coil in a combustion-chamber having one end connected with an injector which is supplied with fluid hydrocarbon, and its other end connected by a pipe with a closed tank supplied with water by a pump having communication with a water-supply, whereby the water pumped into the tank compresses the air therein, and thereby forces the water to the coil, where it is converted into steam, superheated, and delivered to the injector to force the oil therein into the combustion-chamber.

Having thus described the nature of my said invention and the best way I know of performing the same, I claim—

1. The combination, in an apparatus for the

combustion of liquid hydrocarbons, of the fire-box A, the combustion-chamber C, built of refractory material within the fire-box and having its vertical walls provided with a series of lateral openings, D, the heating-coil E in the lower part of the refractory combustion-chamber, the horizontally-slidable refractory shield-plate E', arranged directly over the coil, the injector G, and the supply-pipes F and H, having cocks or valves for the supply of water or steam and hydrocarbon liquid and air, substantially as described.

2. The combination, in an apparatus for the combustion of liquid hydrocarbons, of a fire-box, A, having a combustion-chamber, C, the heating-coil E in the base of the combustion-chamber, the horizontally-slidable refractory shield-plate E', arranged directly over the coil, the injector G, and the supply-pipes F and H, having cocks or valves for the supply of water or steam and hydrocarbon liquid and air, substantially as described.

3. The combination, in an apparatus for the combustion of liquid hydrocarbons, of a combustion-chamber, C, a hydrocarbon-supply pipe, H, an injector, G, connected with the latter, a coil, E, in the lower part of the combustion-chamber and connected at one end with the injector, a closed tank, L, a pipe, F, connecting the latter with the other end of the said coil, and a pump, M, communicating with a water-supply and with the tank, for forcing water into the tank to compress the air therein and by such compression to force the water in the tank to and through the heating-coil into the injector, substantially as and for the purposes described.

4. The combination, in an apparatus for the combustion of liquid hydrocarbons, of the fire-box A, the combustion-chamber C, built of refractory material within the fire-box and having lateral openings D, the heating-coil E in the lower part of the combustion-chamber, the horizontally-sliding shield-plate E', the injector G, the hydrocarbon-supply pipe H, the closed tank L, the pipe F, connecting the tank with the coil, and a pump, M, for forcing water into the tank to compress the air therein and thereby force the water from the tank to the coil, substantially as described.

In testimony whereof I have signed my name to this specification, in the presence of two subscribing witnesses, this 4th day of January, A. D. 1886.

PERCY TARBUTT.

Witnesses:

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