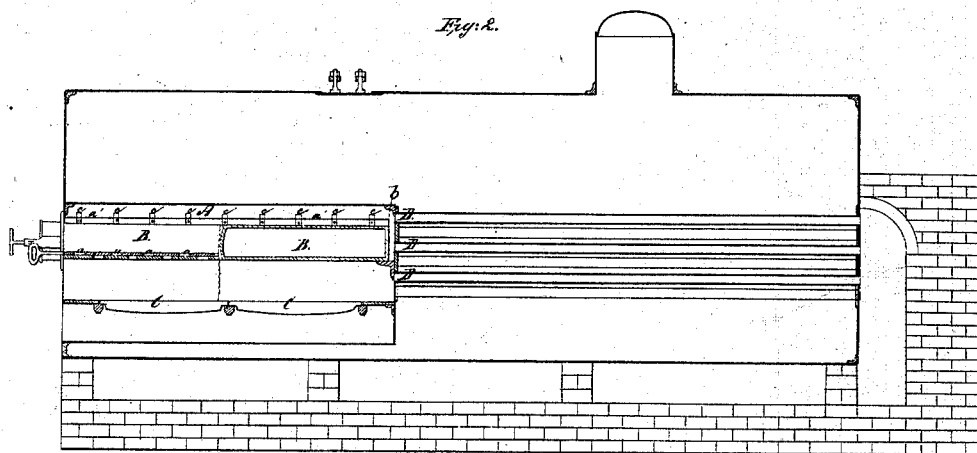
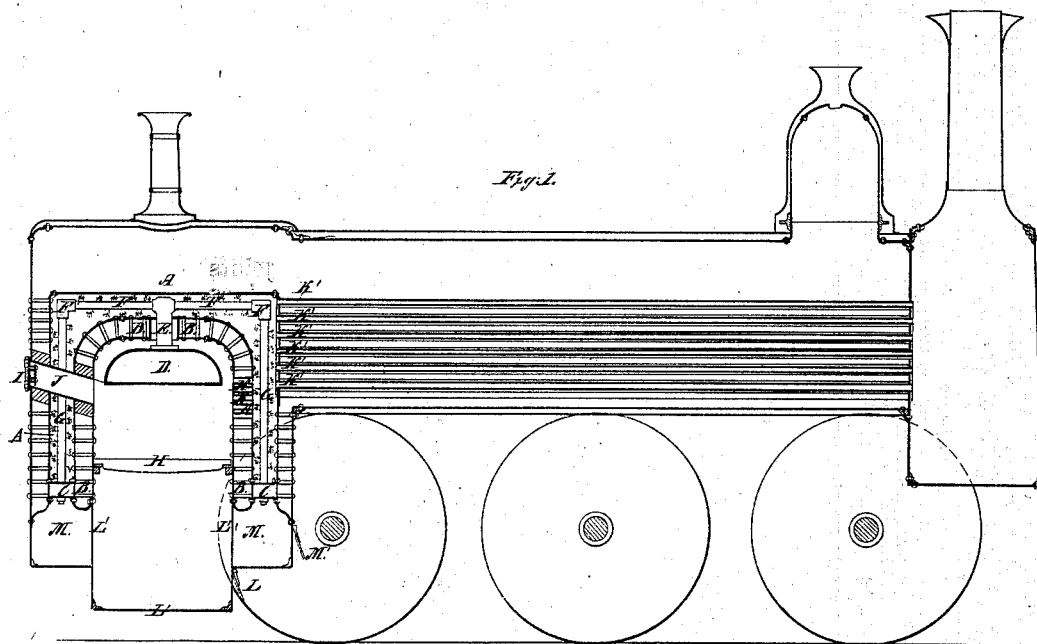


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 APPARATUS FOR BURNING HYDROCARBONS.

No. 49,357.

Patented Aug. 8, 1865.



Witnesses:

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UNITED STATES PATENT OFFICE.

WILLIAM SIM AND ARTHUR BARFF, OF GLASGOW, NORTH BRITAIN.

IMPROVED APPARATUS FOR BURNING HYDROCARBONS.

Specification forming part of Letters Patent No. 49,357, dated August 8, 1865.

To all whom it may concern:

Be it known that we, WILLIAM SIM and ARTHUR BARFF, of Glasgow, in the county of Lanark, North Britain, have invented certain new and useful Improvements in Method of Employing Mineral and Vegetable Oils, &c., for heat-producing purposes; and we hereby declare that the following is a full, clear, and exact description of the same, reference being had to the accompanying drawings.

This invention has for its essential object the employment of the gases produced by the heating of mineral oils for the production of heat and the generation of steam, and when employed for the latter purpose it is preferred to convert the oil into gas for burning in a retort placed in the ordinary fire or fuel chamber of steam-boilers. The gas may, however, be conveyed from a gas-holder or other apparatus suitable for containing it previous to being burned. It is, however, considered advantageous to employ it direct from a retort placed in the furnace of the boiler, as by means of this it is supplied and maintained at a high temperature, which is very desirable for the efficient working of the process and the effecting of an economical use of the oil.

In the accompanying sheet of drawings, Figure 1 represents of longitudinal section of a locomotive-boiler constructed and arranged for the burning of the gas produced by the vaporization of hydrocarbon oils by the combustion of which steam is generated.

The chief difference in the boiler shown in the drawings from the ordinary locomotive-engine boiler consists in the arrangement of the fire-box A, in which there is contained the second water-space, B, connected to the ordinary water-space by means of the ducts or waterways C. Within the second water-space, B, a retort, D, is situated, being fixed therein in any suitable manner, but as in the drawings by means of studs from two of its sides, which, however, in the figure given cannot be seen. From the upper side of this retort D several upright tubular pillars, E, extend, being fixed to the retort by means of studs through the flange on their lower ends. Two of the opposite sides of the upper extremity of these tu-

bular pillars E have a screw-thread cut in them, into which the pipes F are screwed, as shown, the farther ends of the pipes being furnished with miter-pieces F', into which the upright or vertical pipes G are fixed. In the lower part of the box formed by means of this second water-space, B, a set of fire-bars, H, are fixed, on which rests the fuel for generating the gas by the vaporization of the oil in the retort D. The coal is introduced through the fire-door I, through the duct J, which passes through both water-spaces of the fire-box, and thus prevents the coal or other fuel from passing elsewhere than into the fuel-chamber on the fire-box H. The waste gases arising from the combustion of the fuel on the bars H pass through the tubes K, and thence along the ordinary tubes, K', into the funnel. The air for supplying the combustion of the fuel on the bars H is supplied through the ash-pan door L, the sides of the ash-pan itself, L', being continued upward to form a nearly air-tight joint with the lower part of the inner side of the second water-space, B, in the manner shown. A rectangular passage, M, with air-door M', is fixed around the ash-pan, this passage being for supplying the requisite quantity of air for the combustion of the gas as it issues from the pipe situated between the two water-spaces.

The mode of operating with this modification of our said invention is as follows: A small quantity of coal, wood, or other suitable fuel being ignited upon the fire-bars H, the retort D becomes speedily heated, and when having attained a high heat the oil to be converted into gas is admitted therein from a reservoir, preferably in a small continuous stream, so that it may be vaporized as soon as admitted, and, further, that a thick layer of oil may never be present in the retort. Immediately upon the gasification of the oil the gas itself rises through the tubular pillars E, thence into the tubes F between the first and second water-spaces, B, these tubes being perforated or having Bunsen or other burners placed in their sides. The gas issues through these openings and the heat evolved by its combustion is thrown directly upon the absorbent plates of the wa-

ter-spaces, as shown, by the flames *a* issuing from the two opposite sides of the tubes. Such is a description of one method of applying our said invention to the generation of steam in the boilers of locomotive-engines. It is obvious, however, that there are many other ways in which it may be applied. For instance, the retort and pipes might be placed within an ordinary fire-box without the introduction of a second water-space, a small division only being used to separate the fire used for evaporating the oil from that arising from the combustion of the gas.

Instead of using the rectangular air-space *M*, Fig. 1, sliding plates might be placed on the bottom of the fire-box, through which the air necessary for the combustion of the gas would be admitted and its supply regulated; or the space between the two water-spaces might be closed altogether, excepting circular openings for the admission of a tube around the gas-tube for supplying air to the gas on the Bunsen principle.

Fig. 2 of the drawings shows in longitudinal section one method of applying our invention for the generating of steam in the tubular boiler of a stationary engine, within the fire-box *A* of which there is contained the retort or vaporizer *B*. Below the retort *B* there is arranged the fire-grate *C*, upon which fuel is placed for the vaporizing of the oil. The waste gases from the combustion of the fuel on the grate *C* pass to the chimney through the lower set or sets of tubes, *D*. The upper part of the generator is made circular and of the contour of the interior of the fire-box. This circular or curved portion is perforated or fitted with suitable burners, and the heat arising from the combustion of the gas is thrown directly against the absorbent surface of the fire-box.

The air necessary for the combustion of the gas is admitted through the openings *a*, the sizes of which are regulated by means of the slides *b*.

In place of using a circular retort, one of a horseshoe or other suitable shape may also be employed, and instead of admitting the air necessary for the combustion of the gas through the openings *a* it may be advantageously admitted through perforations or other openings in a plate at the front of the fire-box, and thence drawn directly over the parts of the retort through which the gas issues. This arrangement is rendered intelligible by referring to the red lining in Fig. 2. A plate or shield, *a'*, curved in the form of the retort, is placed along its whole length and closed over at the inner end, *b'*. At the same time the openings *a* in Fig. 2 are dispensed with, the farther end being left open for the admission of air. At suitable distances in the retort short tubes *c* are placed, those portions of these tubes situated between the retort and the shield or plate *a'* being perforated, while within the tubes a gas-burner is fixed, and the air is admitted to the gas so as to burn it through the small perforations

at the lower part of the tubes. The air being admitted only through the openings at the fire-door end of the boiler, can pass only through the space inclosed between the shield *a'* and retort. Consequently the admission of any cold air against the absorbent surfaces of the boiler is thoroughly obviated.

Another modification of this invention is as follows: Within the fire box or furnace of an ordinary locomotive-engine, marine, land, or other boiler there is placed a generator, into which petroleum-oil, shale-oil, paraffine-oil, or other mineral, hydrocarbon, animal, or vegetable oil is admitted. The generator is raised to a high temperature by a fire below or at the sides, and, thoroughly heated, the oil is admitted in a small continuous stream; or it may be dropped in quantities as required. As soon as the oil comes into contact with the hot retort it is converted into gas, in a state fit to be burned through burners at the places where it issues from the generator; but as all the oils contain carbon in excess—that is, the carbon which is left unburned after the hydrogen has united with its combining quantity in burning the surplus carbon—if not united with another body, so as to burn, would be deposited. The chief part of this modification of our invention therefore refers to the addition to the surplus carbon a quantity of hydrogen and oxygen, so that the former may be entirely consumed. One method under which the hydrogen and oxygen are added consists of running or dropping water into the generator when the latter is at a high temperature. The oil and water are thus simultaneously decomposed or converted into gas, the hydrogen and a portion of the carbon of the oils combine in their burning proportion, while the surplus carbon is mixed with the hydrogen and oxygen of the water and is thus consumed, the two gases with the carbon producing burning-mixtures.

Instead of admitting a mixture of hydrogen and oxygen to mix with the surplus carbon, the requisite quantity to take it up may be admitted of either gas singly.

Another modification of this invention consists in placing within a (or the) generator a quantity of carbonaceous mineral, animal, or vegetable substances, and in utilizing the hydrocarbon products of their destructive distillation by conveying the gas thus formed into the decomposing-vessel for the production of heat, by mixing the surplus carbon with hydrogen and oxygen gases, combined or separately, as in the former modification.

Another part of this invention consists in admitting a stream of hydrogen gas into a vessel raised to a very high temperature. The hydrogen may be mixed with a portion of carbonaceous gas sufficient to induce combustion, and in some cases the hydrogen is burned unmixed with carbon. When it is desired to produce a very high heat, and to effect the complete combustion of the surplus or uncombined carbon of the oil, a proportion of hydrogen gas

may be admitted into the retort, so as to be burned along with the hydrocarbon gas.

It is obvious that the aforementioned principle of applying the gases of mineral oils for heat-producing purposes may be applied to marine boilers as well as for the production of heat necessary for the working of metals and heat-producing purposes generally.

We claim—

The general arrangement and construction of apparatus for the utilization of the gases produced by the vaporization of mineral hydro-

carbon oils for the generation of steam and the production of heat generally, as hereinbefore described, or any mere modification thereof.

In testimony whereof, we have signed our names to this specification in the presence of two subscribing witnesses.

WILLIAM SIM.
ARTHUR BARFF.

Witnesses:

ST. JOHN V,
JOHN BROWN.