(No Model.)

M. B. DODGE.

FUEL SAVING DEVICE.

No. 444,976. Patented Jan. 20, 1891.

Fig. 1.

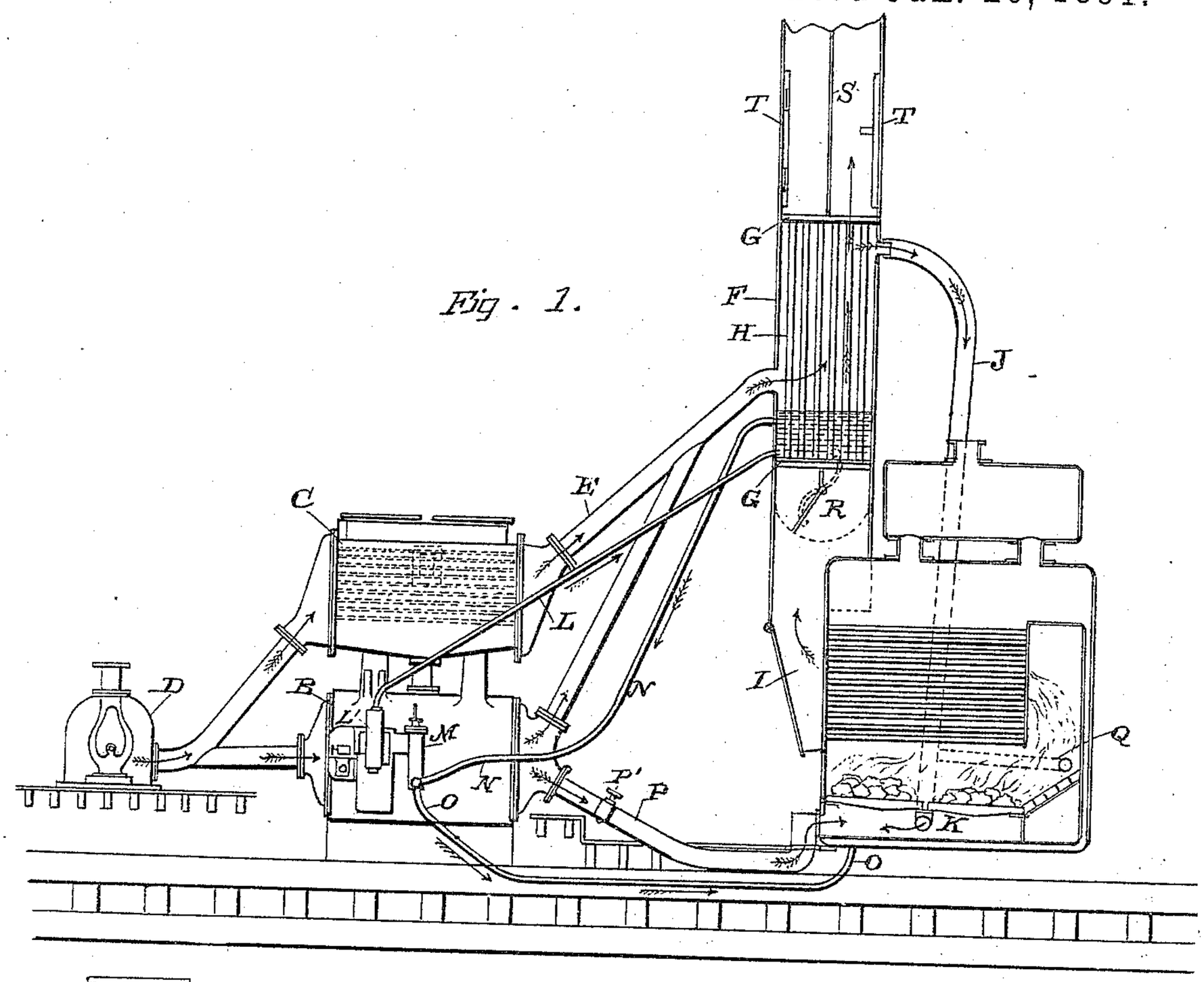


Fig. 2.

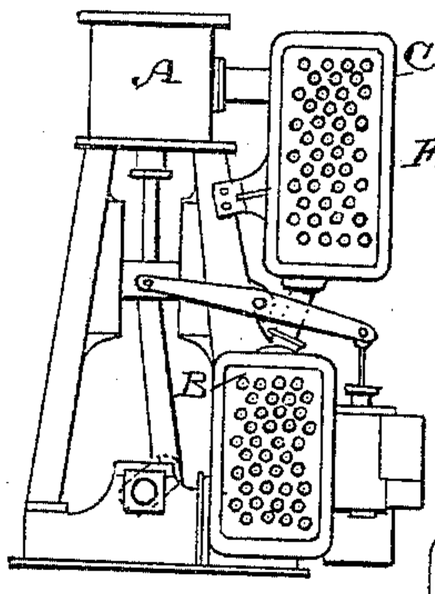
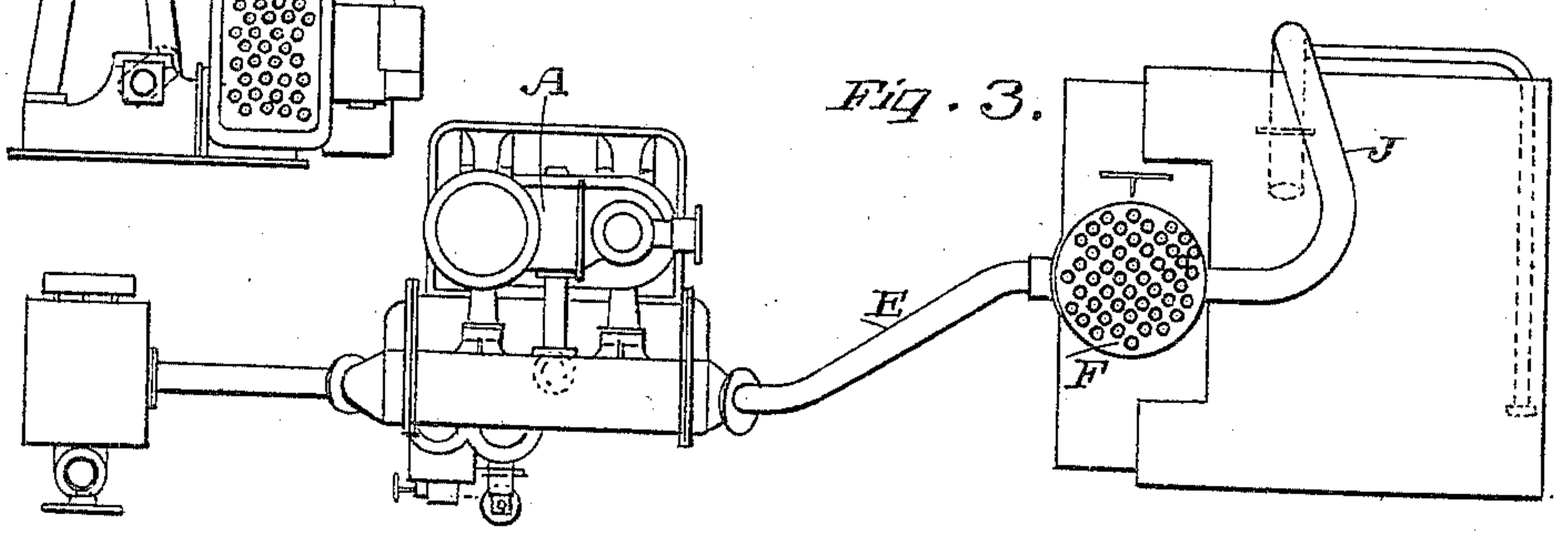


Fig. 3.



Witnesses,
Geo. H. Strong.
J. B. Howard

Inventor,
Miles B. Dodge,
By Dewey & Co.
Attys

UNITED STATES PATENT OFFICE.

MILES B. DODGE, OF SAN FRANCISCO, CALIFORNIA.

FUEL-SAVING DEVICE.

SPECIFICATION forming part of Letters Patent No. 444,976, dated January 20, 1891.

Application filed January 27, 1890. Serial No. 338,275. (No model.)

To all whom it may concern:

Be it known that I, MILES B. DODGE, a citizen of the United States, residing in the city and county of San Francisco, State of California, have invented an Improvement in Fuel-Saving Devices for Boiler-Furnaces; and I hereby declare the following to be a full, clear, and exact description of the same.

My invention relates to an improved apparatus to be used in connection with steam-engines and boiler-furnaces for the purpose of economizing the fuel used under the boiler.

It consists in certain details which will be more fully explained by reference to the accompanying drawings.

Figure 1 is an elevation in section showing a marine boiler and the engine-condensers with connecting-pipes. Fig. 2 is a side elevation showing the engine in outline and section of the condensers. Fig. 3 is a plan view of the engine and condensers, showing section of the smoke-stack of the boiler-furnace.

The object of my invention is to introduce air into the furnace for the purpose of combustion at a high temperature and to utilize the exhaust-steam of the engine and the waste heat from the boiler-furnace successfully for the purpose of raising the temperature of the air, at the same time employing the air-blast which is thus being heated as a means for condensing the steam which exhausts from the engine.

In the present case I have shown my invention as applied to an ordinary compound marine engine A, provided with the usual air, water, and other pumps.

In the present case I have shown two condensers B and C, the latter situated above the former; but, if desired, one of these may be dispensed with. The blast of air, which is supplied from a blower or other air forcing or suction mechanism D, is driven through the tubes of the condenser, the strong blast serving to condense the steam which arrives from the exhaust-passages of the engine-cylinders. If these be not sufficient to entirely condense the steam, the upper condenser C is connected with the lower one B by pipes, and by the employment of water in the lower condenser any measure of condensation that is desirable may be obtained.

The construction here shown is designed to allow my invention to be applied to condensers of the ordinary pattern which are already in place and use, in which case my air-condenser C is connected directly with the ordinary condenser B; but when the apparatus is built from new designs one of the condensers may be dispensed with and the single one made large enough for the necessary amount of air. The air which is employed for condensing is thus raised to a considerable temperature before it escapes from the condenser, and it passes from the condenser through the pipe E into a suitably-prepared chamber in the smoke-stack F. This chamber is formed by the heads or end plates G, through which the tubes H pass. These tubes serve to convey the products of combustion from the flues of the boiler and from the breeching I, into which these flues open, up through the chamber F, imparting heat to its contents, and the air which is received from the pipe E will thus be superheated to any desirable extent, at the same time utilizing and economizing the waste heat, which would otherwise escape uselessly up the stack.

From the chamber F a pipe J leads to a point where it can discharge into the space below the grate-bars, as shown at K, and the air thus intensely heated, but not depleted of its oxygen, passes immediately into the burning fuel and supplies the necessary amount of oxygen for its combustion. Being introduced at a very high temperature, no appreciable loss will occur from the lowering of the temperature of the fuel, as would be the case if cold air was introduced. The water of condensation which collects within the condensers B and C is delivered through a suitable passage to the air-pump L′ and is delivered through a pipe L into the lower part of the chamber F, where it is also subjected to the waste heat escaping up the chimney, and its temperature is raised, so that by means of the boiler-feed pump, situated at M, the water may be drawn through the pipe N from the chamber F and thence delivered through the pipe O and fed into the boiler in the usual manner.

P is a branch air-pipe leading from the con-

denser B and having a suitable valve or gate, P′ so that, if desired, air may be delivered directly from the condenser into the ash-pit of the boiler-furnace without passing through the superheater F, or both pipes J and P may be used in conjunction if needed to force the draft. I have also shown a branch pipe Q, leading from the pipe J and discharging into the rear of the boiler-furnace, so as to supply additional air at this point, if necessary, for more complete combustion of gases which may escape unconsumed from the boiler-furnace, and which may thus be ignited and entirely consumed at this point, so that the products of combustion in a highly-heated state may not return through the flues of the boiler.

In order to clean the tubes H within the chamber F when desired, I have shown a valve or gate R, which is made semicircular and fitted within the smoke-stack below the chamber F. This valve has a suitable operating lever or handle, and is turned so as to close either one half or the other half of the stack, shutting the products of combustion from the tubes H contained in either half at will.

Above the upper plate G of the chamber F is a vertical diaphragm or partition S, which corresponds with the central line about which the door R turns. It will be manifest that when the door is turned to close one side the products of combustion can pass up freely through the other side and will be cut off by the diaphragm S.

T T are doors, one communicating with each of the spaces above the chamber F, and through these doors the workmen can enter either of the compartments which has been shut off by the damper R for the purpose of cleansing the tubes H upon that side, which can be done in a few moments with the ordinary tools. This being completed, the damper R may be turned so as to close the other side, and that may be cleansed in a like manner. The damper stands at an inclination, so that any soot or dirt which is removed from the tubes H will fall into the breeching immediately on the turning of the damper, so that it allows heat to pass up through both sides of the chamber.

It will be manifest that the air-supply mechanism can be placed, as here shown, so as to force the air through the condenser, or it may be placed between the condenser and the boiler, so as to act by suction, the result being essentially the same; but in practice I prefer the arrangement shown here.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. The combination, with an engine, its condenser, and the boiler-furnace, of an air-forcing mechanism, pipes or passages whereby the air is delivered through the condenser for the purpose of condensing steam from the engine, other pipes by which the air from the condenser is delivered to a superheating-chamber within the smoke-stack, and pipes by which it is led from said chamber and delivered into the furnace, together with a branch pipe leading from the condenser to the boiler-furnace, and a gate through which air may be delivered to the furnace, substantially as herein described.

2. The engine and condenser, the boiler, boiler-furnace, and the superheating-chamber within the smoke-stack, in combination with the pipes and the air-forcing mechanism delivering air under pressure through the condenser and into the superheating-chamber, the water-pipes L and N, and a pump whereby the water of condensation is conveyed from the condenser to the lower part of the heating-chamber and thence to the boiler-feed pump, substantially as herein described.

3. The engine and condenser, the air-forcing mechanism and pipes delivering air therefrom to the condenser, a superheating-chamber formed within the smoke-stack of the boiler-furnace and a pipe delivering the air from the condenser into said chamber, vertical tubes or heat-passages passing through said chamber, a diaphragm fixed vertically and centrally within the smoke-stack above the chamber, and a valve adapted to close either half of the stack, substantially as herein described.

4. A superheating-chamber adapted to receive air and water from the condenser and having the heat-conveying tubes extending vertically through it, a vertical central diaphragm within the smoke-stack above the chamber, and doors T T opening into either side of the stack above the chamber, in combination with the swinging valve or gate R, whereby either half of the stack may be closed or opened at pleasure, substantially as herein described.

In witness whereof I have hereunto set my hand.

MILES B. DODGE.

Witnesses:
S. H. NOURSE,
H. C. LEE.