(No Model.)

T. FITZGERALD & E. T. WHITE.

LOCOMOTIVE OR OTHER BOILER.

No. 509,800. Patented Nov. 28, 1893.

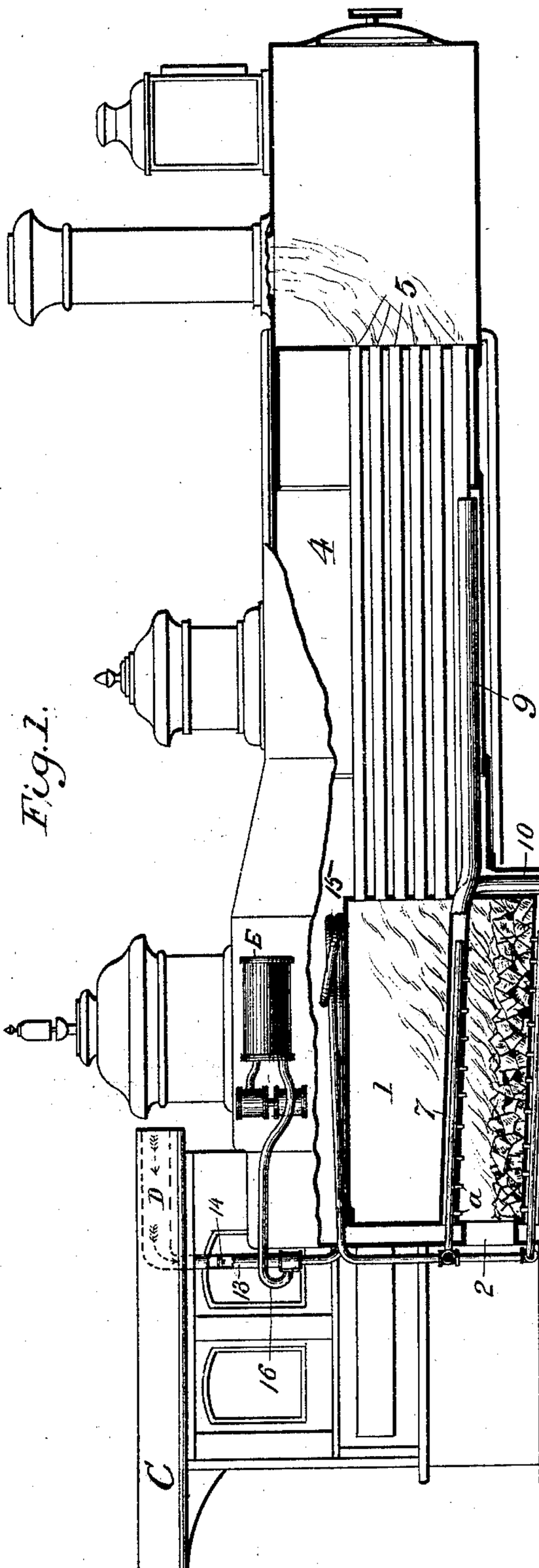

Fig. 1.

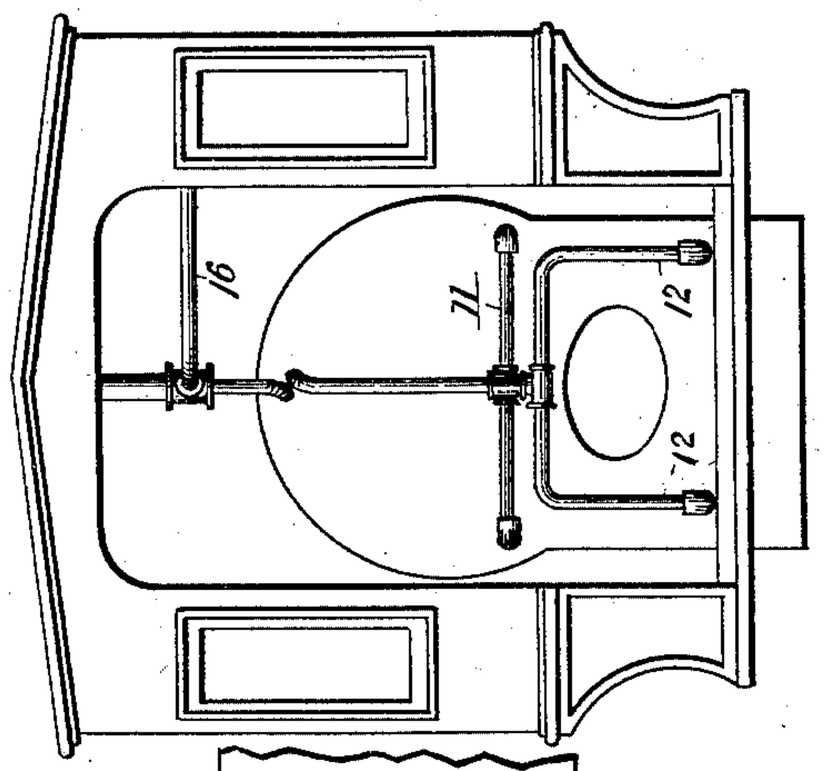

Fig. 3.

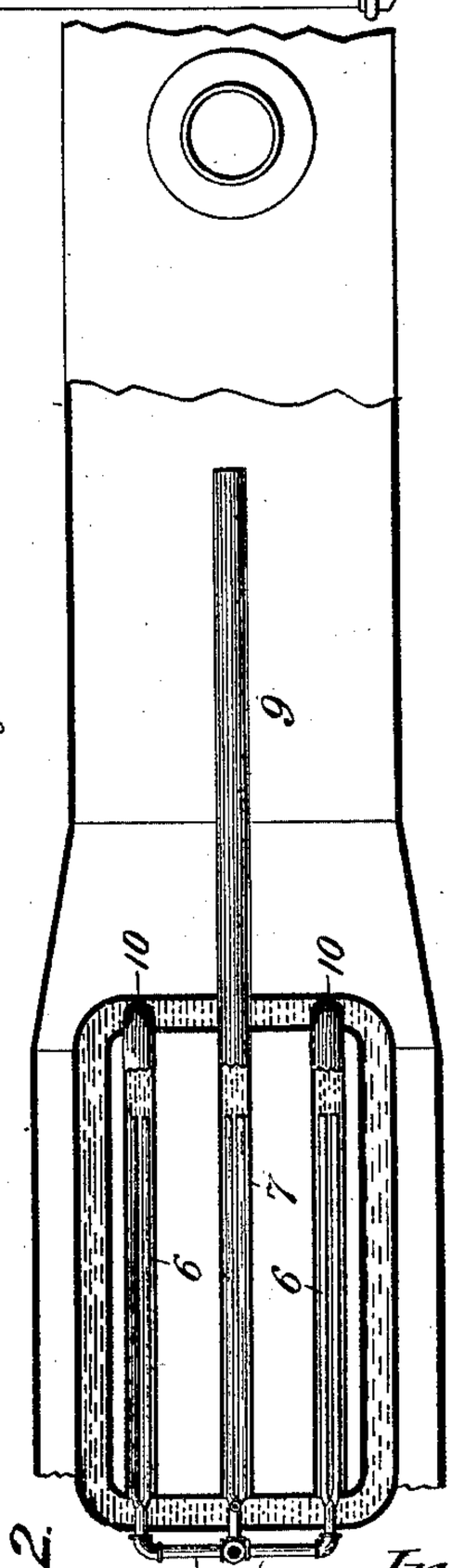

Fig. 2.

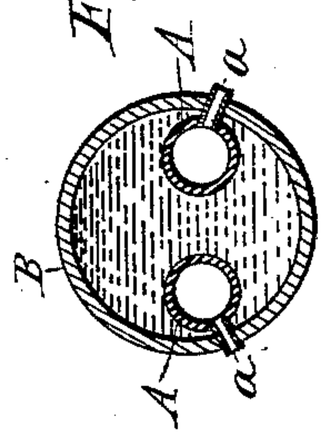

Fig. 4.

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THOMAS FITZGERALD AND EBEN. T. WHITE, OF BALTIMORE, MARYLAND.

LOCOMOTIVE OR OTHER BOILER.

SPECIFICATION forming part of Letters Patent No. 509,800, dated November 28, 1893.

Application filed August 31, 1893. Serial No. 484,420. (No model.)

To all whom it may concern:

Be it known that we, THOMAS FITZGERALD and EBEN. T. WHITE, of the city of Baltimore, in the State of Maryland, have invented a new and useful Improvement in Locomotive or other Boilers; and we do hereby declare the following to be a full, clear, and exact description thereof.

The object of our invention is first to secure the perfect combustion of smoke and gases generated in the use of bituminous coal and similar fuel, particularly in locomotive engine boiler furnaces, and second to increase the steaming capacity of said boiler. As understood by those familiar with boiler furnaces, the flame enters the flues from the fire box in a partially consumed condition and it is found that the water surrounding these flues partially cools the same, thereby extinguishing the flame and causing the gases to pass through the flues in the condition of smoke. In cases where gases arising from the burning fuel come in contact with air of lower temperature, the ignition of such gases is prevented, or if ignited the flame is liable to be retarded or even extinguished. This may be overcome by properly heating the air and then admitting it to the furnace under proper conditions and in proper proportions so that a practically perfect combustion will be obtained. It is also important that such heated air be introduced into the furnace at the proper place. If it be introduced too near the boiler flues it will readily escape therethrough and the result sought thereby is lost. If introduced through suitable means at a point remote from the boiler flues, as for instance from above the furnace door to a point a little beyond the center of the fire box and above the bed of fuel and also in the bed of fuel and among the burning coals almost perfect results are attained and the intensity of the flames is increased. This will give an indirect course to the heated air and a better opportunity for its admixture with the gases. Hence the value of a fuel does not depend alone on the quantity of air supplied thereto, but also upon the condition of the air and its manner of application. With these considerations in mind we have constructed our locomotive engine furnace so that if desired the air may be supplied in three volumes, one of which enters the fire box through the grate bars, generates the gases from the coal, as in a gas producer, and partially consumes them; the other volume of air which has been previously heated enters through an air duct directly into the mass of burning fuel, mingling with the generated gases, and partly consumes them, while the remaining volume of air having also first been heated by passage through a suitable heating chamber, enters the fire box preferably at a point remote from the boiler flues, and mixing with the partially consumed gases, completes their combustion and produces intense heat. We also utilize the means employed in heating and introducing the air into the fire box to greatly increase the steaming capacity, as will be hereinafter fully explained.

To enable others skilled in the art to make and use our invention, we will now describe it with reference to the accompanying drawings in which—

Figure 1— is a sectional view of a locomotive boiler with our invention applied thereto. Fig. 2— is a plan view of the same. Fig. 3— is a view of the rear of boiler and cab. Fig. 4— is a detail view of the end of the pipe we employ to introduce air into the fire box.

Like symbols of reference indicate like parts in each view.

The locomotive boiler is of the usual construction, having the fire box (1), door (2) for feeding the fuel and grate bars (3) at the bottom to support the latter. The boiler (4) has the usual flues or tubes (5) which need not differ in number, arrangement, or position from those in general use.

Within the fire box arranged parallel is an upper series of water protected air tubes (6 and 7) and also a lower series of the same kind of air tubes (8). These tubes extend lengthwise of the fire box, that is, from the flue board to above and below the door. They are of peculiar construction. As shown in Figs. 1, 3 and 4 these tubes are practically three tubes combined into one when viewed externally. They are formed of one pipe B of larger, and two pipes A of smaller diameter; the two smaller pipes are laid within the larger pipe B and extend within the same a distance nearly the length of the locomotive fire box. The pipes A are secured within the

pipe B and on either side of the interior wall thereof by a series of plugs or nipples A arranged about two inches apart. These plugs are driven through previously formed perforations in the walls of pipes A and B and are subsequently drilled or bored throughout their length, thus forming the two fold purpose of securing rigidly together the three pipes, and forming a passage for the escape of air from the pipes A into the fire box.

Numeral (9) represents a pipe forming a continuation of pipe (7), and extends to within a short distance of the flue board separating the boiler from the smoke box, and resting on the bottom shell of the boiler.

Numerals (10) are branch pipes extending from tubes (6), down into the leg of the furnace.

(11) represents the air pipe connecting air pipes in tubes (6 and 7) of upper series, and pipe (12) connecting those of lower series (8).

In the top of the cab (C) is formed a chamber (D) opening at the front end of the cab to the atmosphere; connecting this chamber with the air pipes (11 and 12) is a pipe (13). (14) is an automatic valve employed to shut off communication between air pipes (11 and 12) and chamber (D) when air is being fed from the reservoir.

(15) represents a coil of pipe arranged within boiler and above the fire box for the purpose of heating the air previous to its discharge into the fire box.

Numeral (16) indicates a pipe connecting air ducts or pipe (A) with an air reservoir (E) suitably arranged on the locomotive and supplied by an air pump.

Thus it will readily be seen by the above arrangement that air can be fed to the fire box directly from the open atmosphere through a chamber over the locomotive cab or by a reservoir fed by an air pump, that the tubes conveying the air can be of iron and are protected from destruction by heat by a jacket of circulating water and thereby are prevented from becoming clogged or stopped up by cinders, &c., as is usual when vitrified clay or brick ducts are employed; that the increased water surface gained in the fire box, namely, the water jackets for the air tubes—greatly increases the steaming capacity of the boiler, and, as will readily be understood by those familiar with hot water circulation, the employment of the tube (9), placed upon the bottom shell of the boiler conveys the cooler water immediately from the front to and through the water jacket of air duct (7) quickly heating the same, thus enabling an engine to readily steam.

The advantages we gain by such an arrangement as our invention discloses are many. If desired the ash-pan may be entirely closed up and air for the furnace draft furnished by our lower series of air pipes (8) which it will be remembered are directly in and at or near the bottom of the bed of fuel, and thereby save a railway corporation many damages caused by fires occurring from red hot coals dropping along the road-way from the locomotive ash-pan.

A serious objection to locomotives equipped with air feeding mechanism is that when the locomotive is at a stand still the supply of air ceases; this objection is obviated by our invention for the reason that the air pump and reservoir can be thrown into action when the locomotive is at a stand still. By this means a complete combustion of the fuel is always maintained, a great saving of fuel is gained and the locomotive renders better service in every way.

We do not wish it understood that we confine our air receiving chambers, connecting with the outside atmosphere, in the top of the cab, although this arrangement is shown as one convenient place.

It should be understood that the chamber may be funnel shaped and placed at any convenient place on the locomotive. Likewise can the air pump and reservoir be conveniently arranged elsewhere than that shown, the main object being to show the two methods of introducing air to the fire box.

Having described our invention, what we desire to claim is—

1. In a locomotive or other boiler, air ducts extending partly through the fire box thereof, above and below the furnace door, the lower air ducts adapted to extend in and among the bed of burning fuel, pipes surrounding said air ducts, and allowing the circulation of water between the outer and inner walls of said ducts and tubes respectively, nipples rigidly connecting said ducts and tubes and allowing escape of air from said ducts, the upper water tubes extending into the boiler some distance from their exit from the fire box thereof, thereby causing circulation of water in said boiler, substantially as described.

2. In a locomotive or other boiler, a series of water protected air ducts extending partly through the upper part of the fire-box, and another series of water protected air ducts extending partly through the lower part thereof, the water tube protecting the upper outer series, extending down within the leg of the boiler, substantially as described.

3. In a locomotive or other boiler, an air collector located upon the same and communicating with the open atmosphere, an air pipe leading from said collector to the fire box of said boiler, an automatic valve arranged in said pipe, an air pump and a reservoir suitably arranged on said boiler, an air pipe leading from said reservoir, to and connecting with said first mentioned air pipe at said automatic valve, and water protected air-ducts arranged within the fire box of said boiler above the furnace door and below said door and in the bed of fuel, whereby air may be fed into the fire box directly from the open atmosphere or from the air reservoir, substantially as described.

4. In a locomotive or other boiler, air-ducts

contained in the fire box thereof, said ducts protected by an outer shell containing therein circulating water, said ducts arranged in series (6 and 7) above, and series (8) below the furnace door; a pipe (9) forming a continuation of pipe (7) of the upper series and extending along and resting on the bottom shell of the boiler to a point adjacent the outer flue-wall, whereby the heated water in the shell or outer tube B surrounding the air-ducts (A—A), is caused to put in circulation the cooler water in the front of said boiler, and cause said cooler water to flow into and through said tube (9) and shell B, and thereby increase the steaming capacity of said boiler, substantially as described.

5. In a locomotive or other boiler, a series (6 and 7) of air-ducts extending into and partly through the fire box thereof, a pipe (9) extending from adjacent the front flue board of said boiler back to and through the fire box and surrounding the middle (7) of the series of air-ducts (6 and 7), pipes 10 forming a continuation of the water protecting tube or shell B of the outer series (6) of air-ducts; said pipes (10) extending down within the leg of the boiler, whereby air may be admitted into the fire box by a water protected duct, and the heated water forming such protection being circulated by heat expansion causes the cooler water in the front of the boiler to pass through pipe (9) to and through shell B of air-duct (7) and circulate rapidly from the front of said boiler, and thereby greatly facilitate the heating of the water in said boiler, substantially as described.

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