

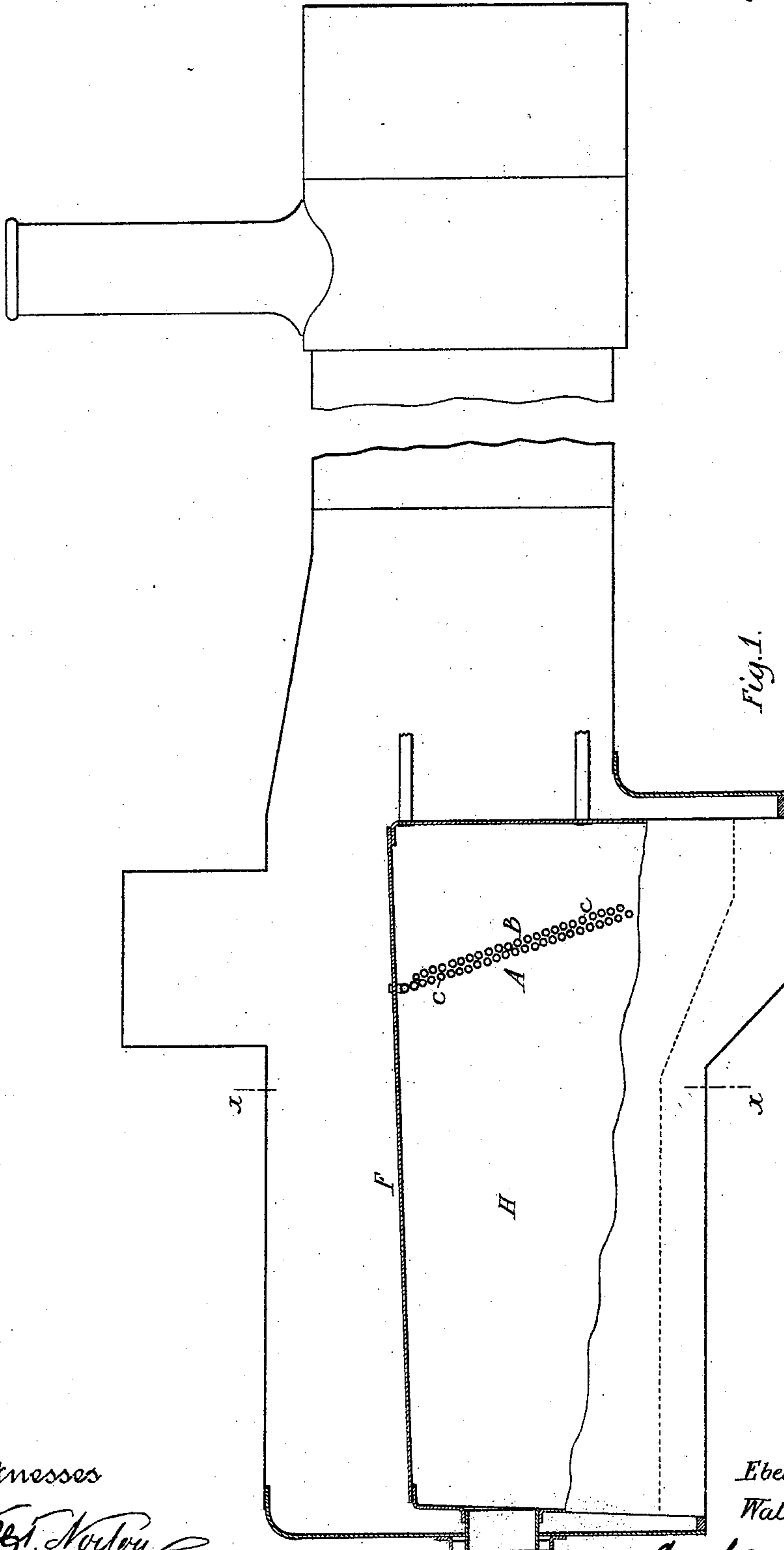
(No Model.)

2 Sheets—Sheet 1.

E. T. WHITE & W. S. FORESTELL.
STEAM BOILER FURNACE.

No. 523,756.

Patented July 31, 1894.



Witnesses

Wm. J. Norton
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Inventors;

Eben T. White

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By *Wm. J. Norton* & *C. A. Wood* their Attorneys.

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2 Sheets—Sheet-2.

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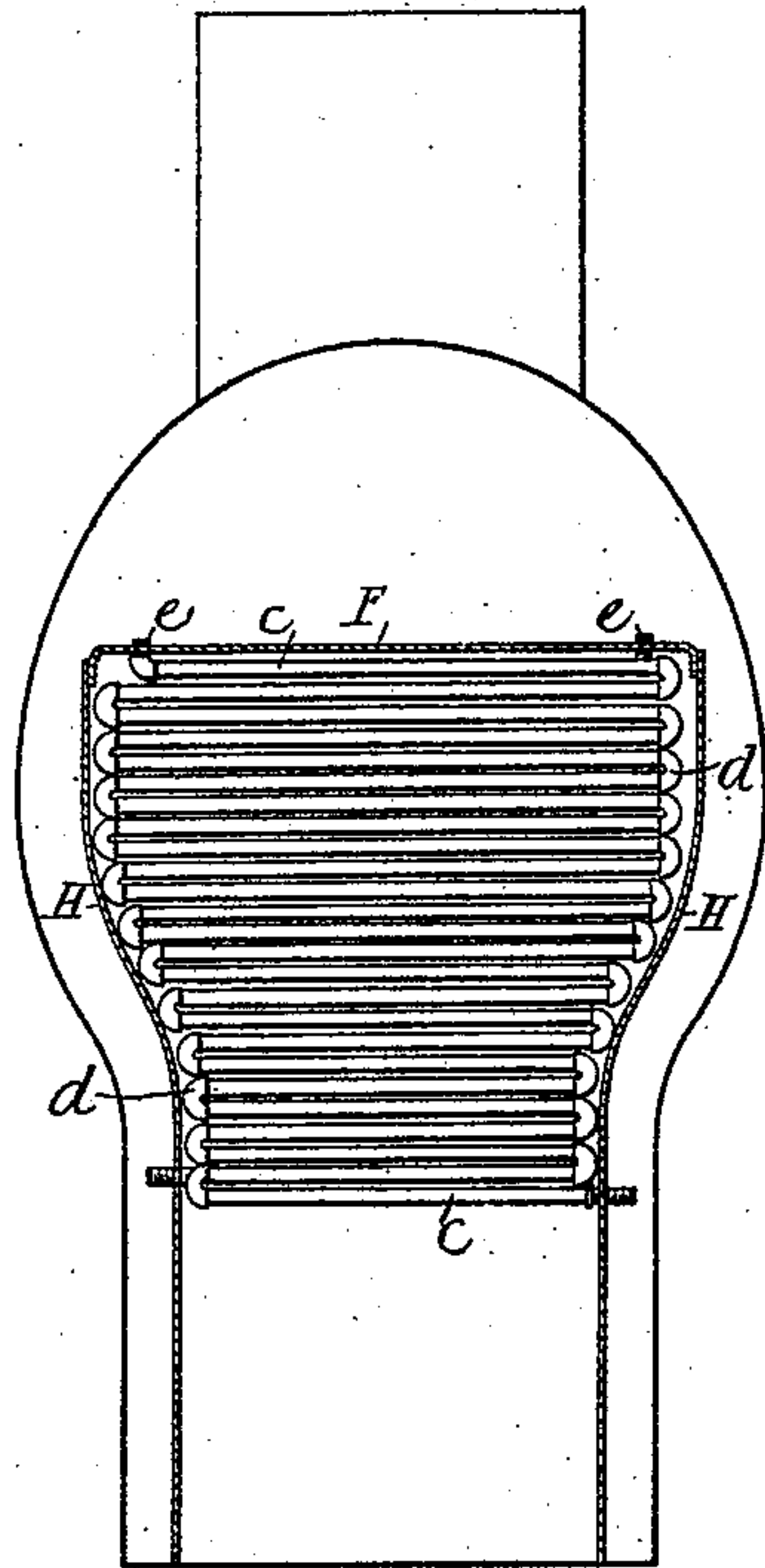


Fig. 2.

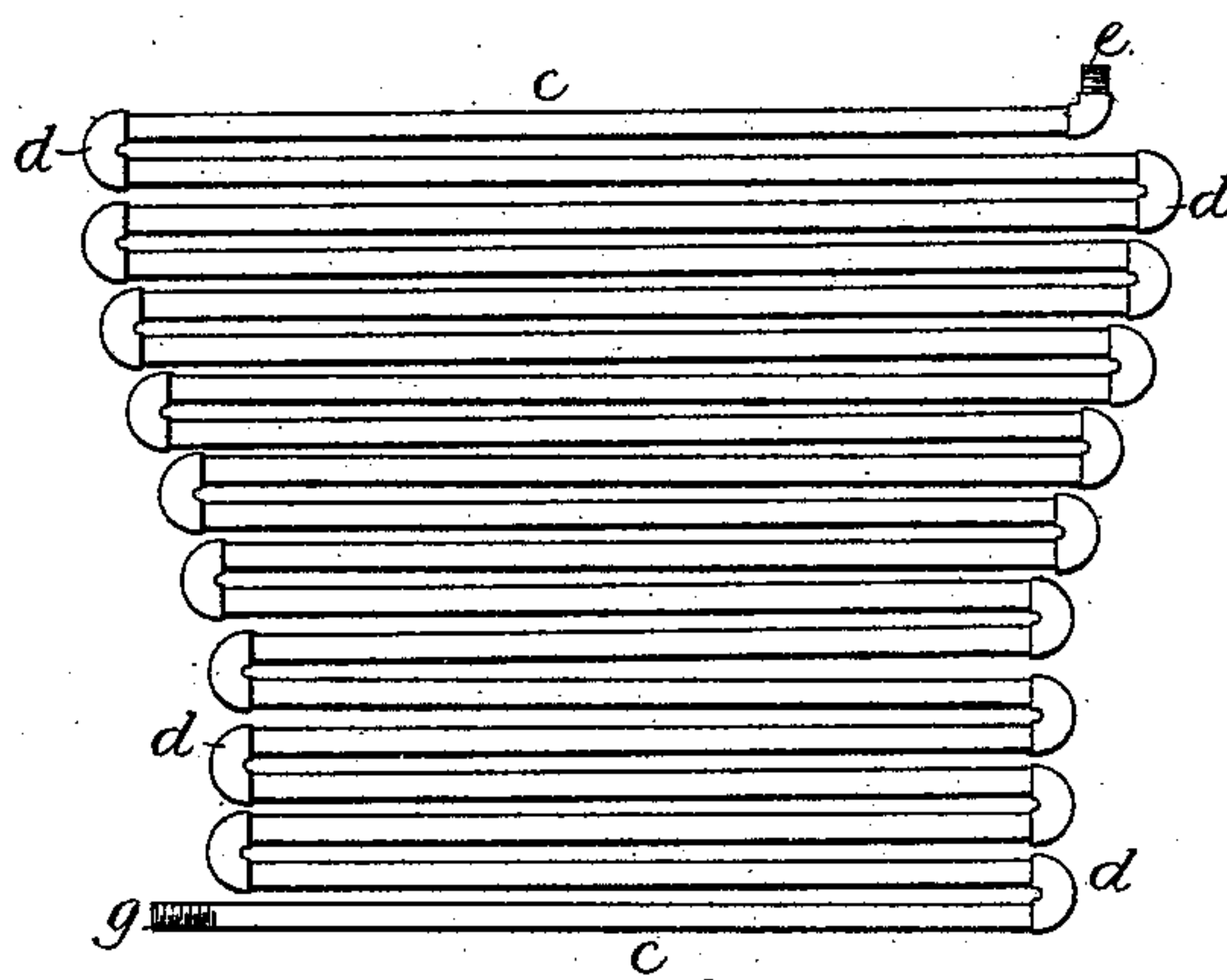


Fig. 3.

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UNITED STATES PATENT OFFICE.

EBEN T. WHITE AND WALTER S. FORESTELL, OF BALTIMORE, MARYLAND,
ASSIGNORS OF ONE-FOURTH TO GEORGE W. CROMWELL, OF SAME PLACE.

STEAM-BOILER FURNACE.

SPECIFICATION forming part of Letters Patent No. 523,756, dated July 31, 1894.

Application filed December 9, 1893. Serial No. 493,252. (No model.)

To all whom it may concern:

Be it known that we, EBEN T. WHITE and WALTER S. FORESTELL, citizens of the United States, residing at Baltimore, in the State of Maryland, have invented certain new and useful Improvements in Steam-Boiler Furnaces; and we do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

Our invention has reference to improvements in steam boiler furnaces, and especially to that type or pattern employed in locomotives wherein the smoke and other products of combustion pass from the bed of fuel directly to and through the flues and thence to the stack.

The object of our invention is the retention in the furnace, of such of the products of combustion as, escaping into the outer atmosphere in the form of smoke, sparks and cinders, occasion considerable dirt, labor and inconvenience, and danger from liability of fire; and this retention of such products of combustion in addition to overcoming these disadvantages has the resultant effect of reducing the consumption of fuel to such an extent as to permit the running of the furnace on a comparatively economic basis.

In all existing types of arresters, so far as we are aware, all of the sparks, fine coal, and coke are permitted to pass through the flues into the extension front or smoke box, where they are caught by a wire netting or by perforated sheet iron plates, and are thus retained in the smoke box. The disadvantages of such an arrangement are that no saving of fuel is attained, and the accumulation in the smoke box is so rapid as to necessitate the cleaning out of the box after each trip, and frequently on long runs in heavy freight service, it is necessary to stop on the line of road and remove such accumulations; which occur in the flues as well as in the extension fronts.

Generally speaking, our invention may be said to consist in a spark arrester which is adapted to be placed within the fire box in

the path of the products of combustion, and to operate to retain within the box, where they are consumed, all sparks, fine coal and coke, thereby not only preventing the discharge of same into the outer atmosphere, but the accumulations in the flues and smoke box, and the resultant serious loss of fuel.

Our invention also consists in the construction of the spark arrester, and we will now describe the same fully and clearly in connection with the accompanying drawings which form a part of this specification.

In the said drawings Figure 1, represents in a longitudinal, central sectional view, enough of a locomotive with our improved spark arrester applied, to illustrate our invention. Fig. 2 is a sectional view taken on line $x-x$ of Fig. 1; and Fig. 3 is an elevation enlarged of the arrester detached.

Although we have shown and will describe our improved spark arrester as applied to a locomotive, we do not wish it understood that we confine ourselves to such an application, as the same can be adapted for use in connection with any other type of furnace, and this application is shown merely for the purpose of illustration.

In carrying out our invention we utilize the principle of the rapid conductivity of heat by water with the object of producing an arrester which will withstand the intense heat in the fire box, it being well known by those versed in the art that iron, when placed unprotected, in the fire box, will be rapidly burned and soon rendered unfit for use.

Having these ends in view, we construct a double diaphragm and connect the same with the water space of the boiler in order that a rapid circulation of water may be produced to protect the diaphragm and to increase the heating surface of the boiler. This diaphragm is preferably made up of two series of pipes A, B, each of which consists of a number of straight sections c connected to each other by return bend couplings d whereby is formed a continuous passage for the circulation of the water from the water space of the boiler which is effected by connecting the upper end e of the diaphragm to the crown sheet F, and the lower end g , to the side sheet H, the connections extending through the sheets as

shown. The diaphragms are both constructed in the same manner but have no connection with each other, and the connections of each to the sheets are preferably made on opposite sides as shown in Fig. 2. The diaphragms are parallel with each other and separated but a slight distance, although this separation may be more or less than that shown, and we prefer to arrange one diaphragm above or below the other in order that the open spaces between the pipes in one will be opposite the pipes in the other, the object being to obstruct the open spaces and form a screen which will readily permit the passage through it of air and gases, but will prevent the passage of the particles of coal and coke even when the same are carried upward by the strong draft of the exhaust. This arrangement while effectually preventing the escape of fine coal and coke from the fire box, will not retard the draft inasmuch as the air and gases have ready passage through the arrester by passing over one pipe and under the other as will be understood.

We prefer to locate our arrester at a point near the flue sheet, and at such an inclination as will be at right angles to the current of the products of combustion; but we do not confine ourselves to the particular location shown. The diaphragms are made of such a size and general shape as to conform to the size and shape of the fire box in order that the entire exit will be screened, and all of the heavier particles retained and consumed.

The spark arrester can be cheaply produced and its durability is equal to the furnace as it depends upon the same conditions to protect it, namely the circulation of water through it to counteract the effects of the heat. It can be applied or removed with ease, there being but two connections to make to each section, one to the side sheet of the smoke box and one to the crown sheet of the same.

Although we have shown and described a construction of arrester which will answer all of the purposes for which it is intended we do

not intend to limit ourselves to the same, nor to the precise location shown, inasmuch as the device is susceptible to be modified in many ways without departing from the essence of our invention; and the location may be changed, and the angle or inclination of the diaphragm altered to suit varying conditions.

Having now fully and clearly described our invention, what we claim as new, and desire to secure by Letters Patent, is—

1. A spark arrester for boiler furnaces adapted for location in the fire box, consisting of a screen formed of one or more series of pipes arranged in close and parallel relation, each series having end connections with the water space of the boiler, and being located with the pipes of one series adjacent to the spaces between the pipes of the other series.

2. The combination with the fire box of a boiler furnace, of a series of pipes or tubes put together to conform to the shape and dimensions of the flue sheet, said pipes being arranged in close relation, and connected to each other, forming a passage for the circulation of water from the flue sheet or side sheet at the bottom, to any higher point of said furnace the pipes of one series being located adjacent to the spaces between the pipes of the other series.

3. The combination with the fire box of a boiler furnace of two or more coils or sections of water circulating pipes or tubes placed one above or below the other in such a manner as to cause one pipe or tube to obstruct the space between each alternate pipe or tube, these parts being constructed, fitted together and adapted to operate substantially in the manner and for the purpose hereinbefore set forth as a screen.

In testimony whereof we affix our signatures in presence of two witnesses.

EBEN T. WHITE.

WALTER S. FORESTELL.

Witnesses:

FELIX R. SULLIVAN,

F. R. SULLIVAN, Jr.