

(No Model.)

2 Sheets—Sheet 1.

E. SHYDECKER.
STEAM BOILER FURNACE.

No. 538,885.

Patented May 7, 1895.

Fig. 1

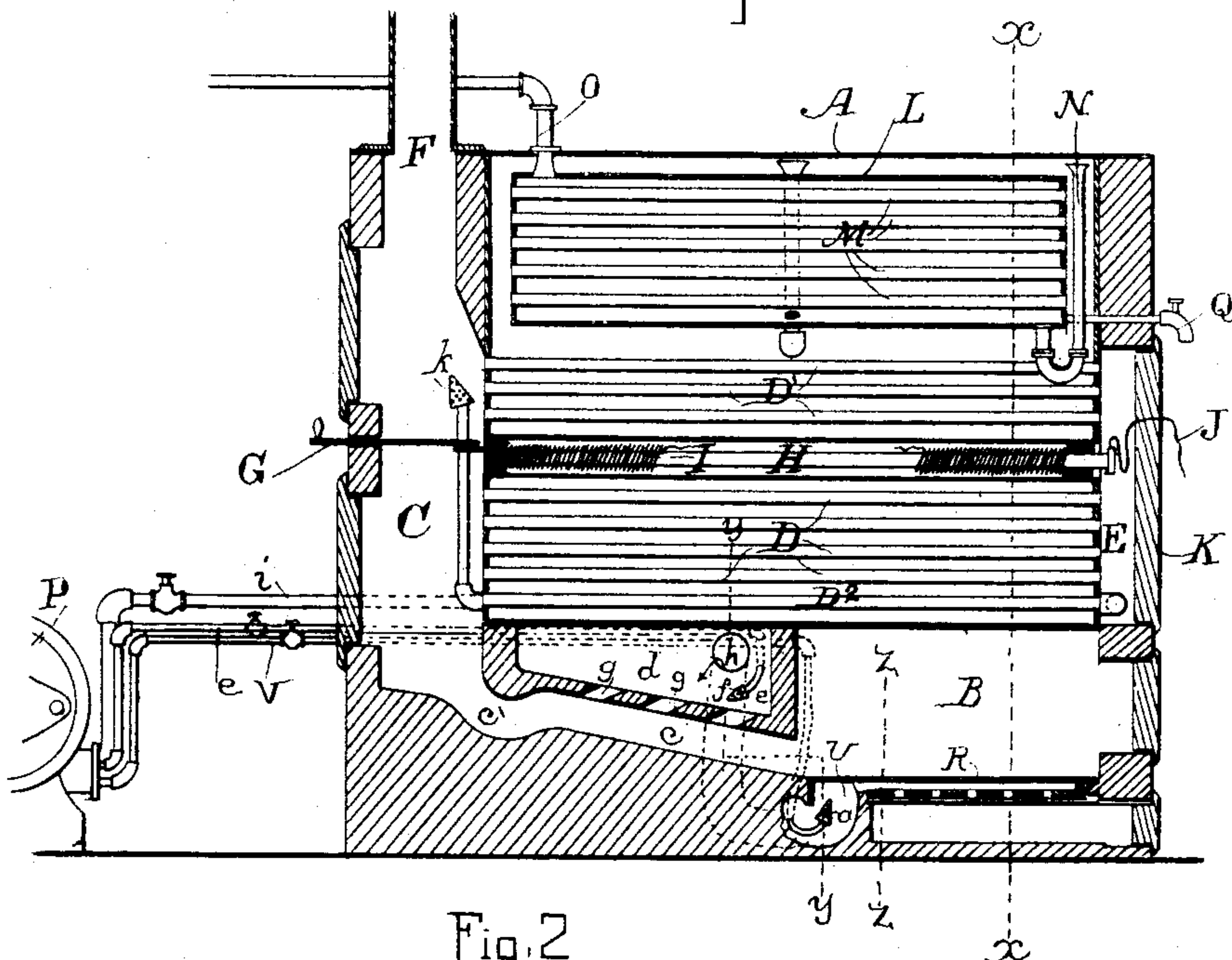
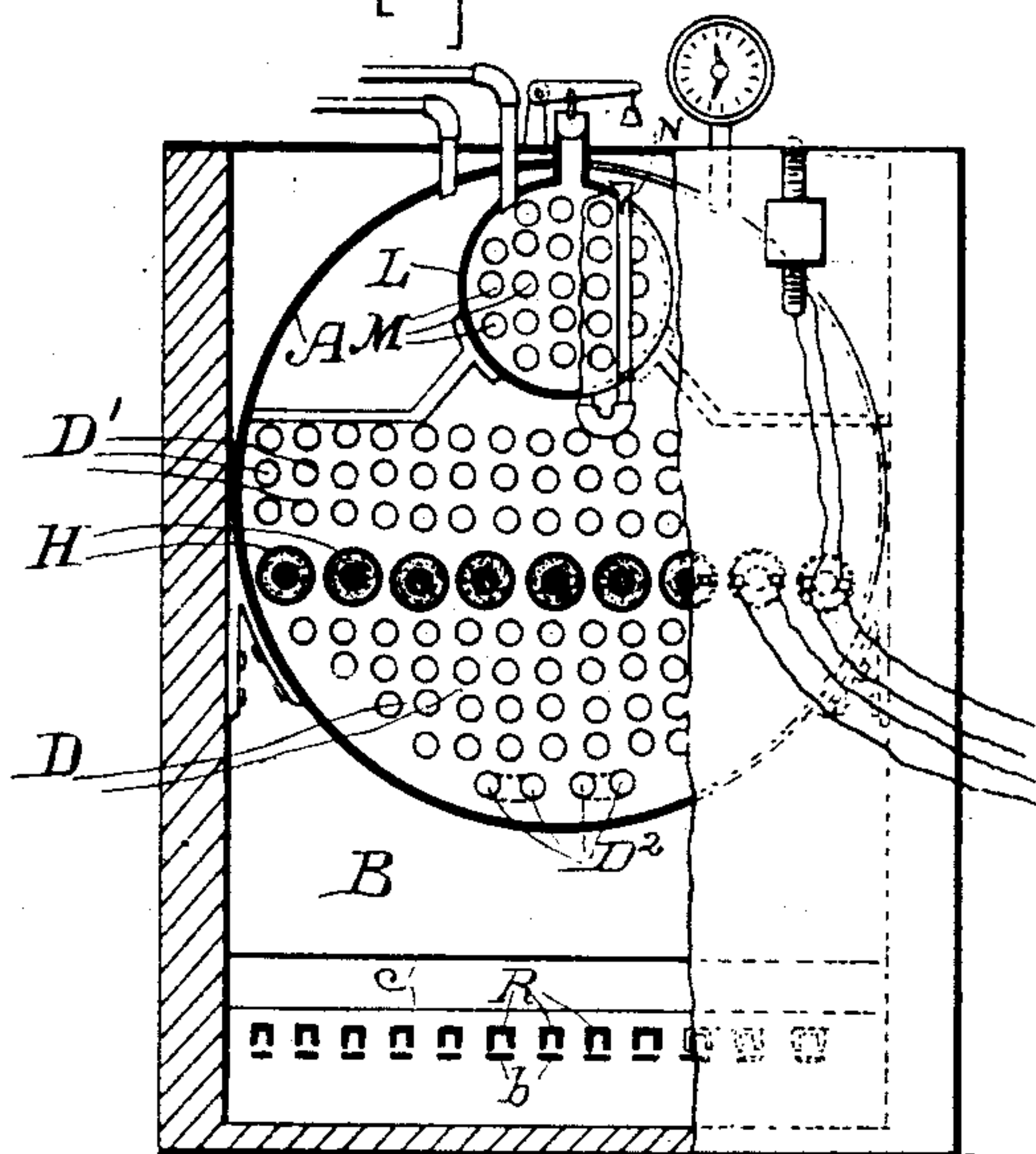


Fig. 2



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Fig. 3

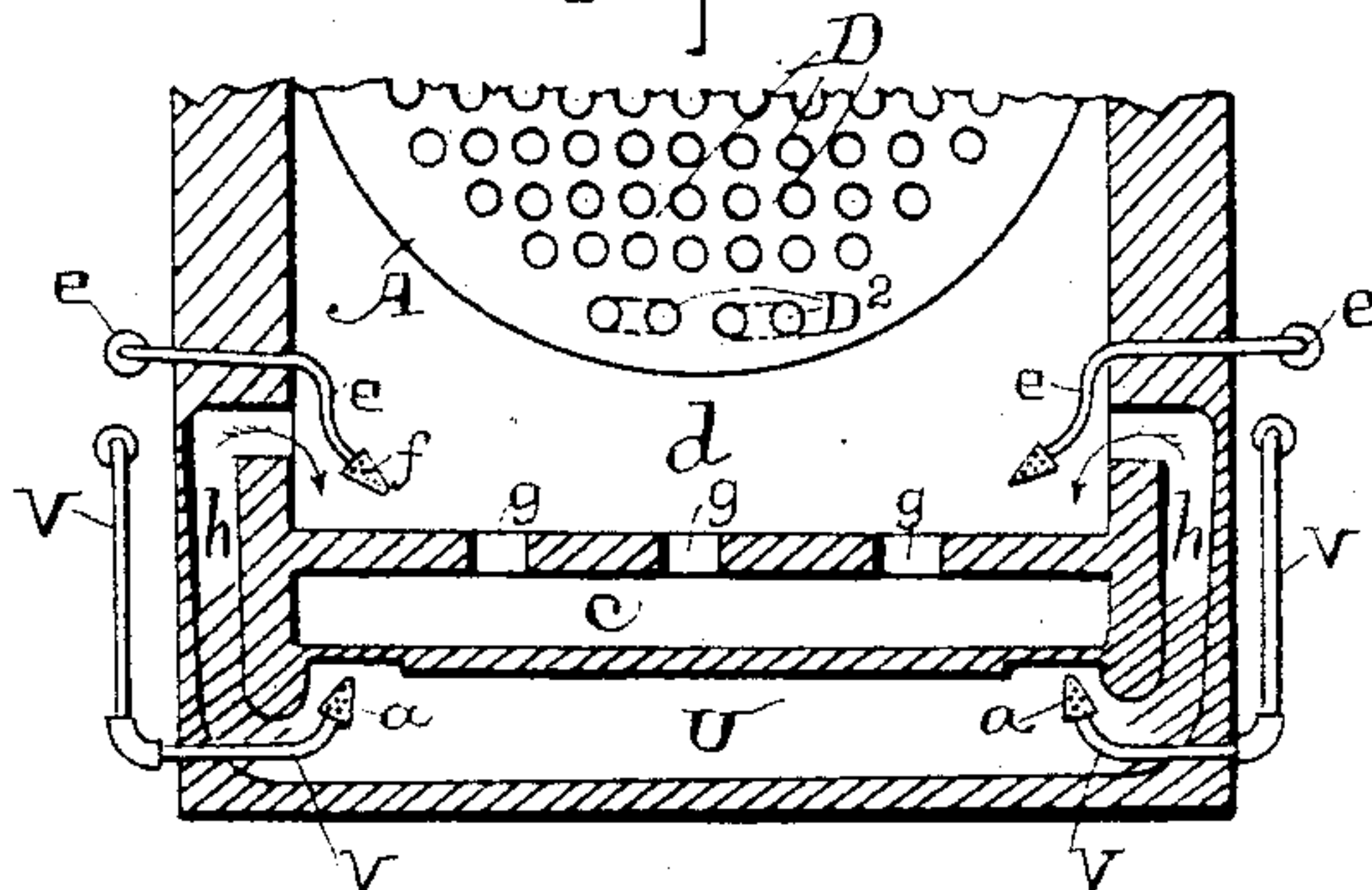


Fig. 4

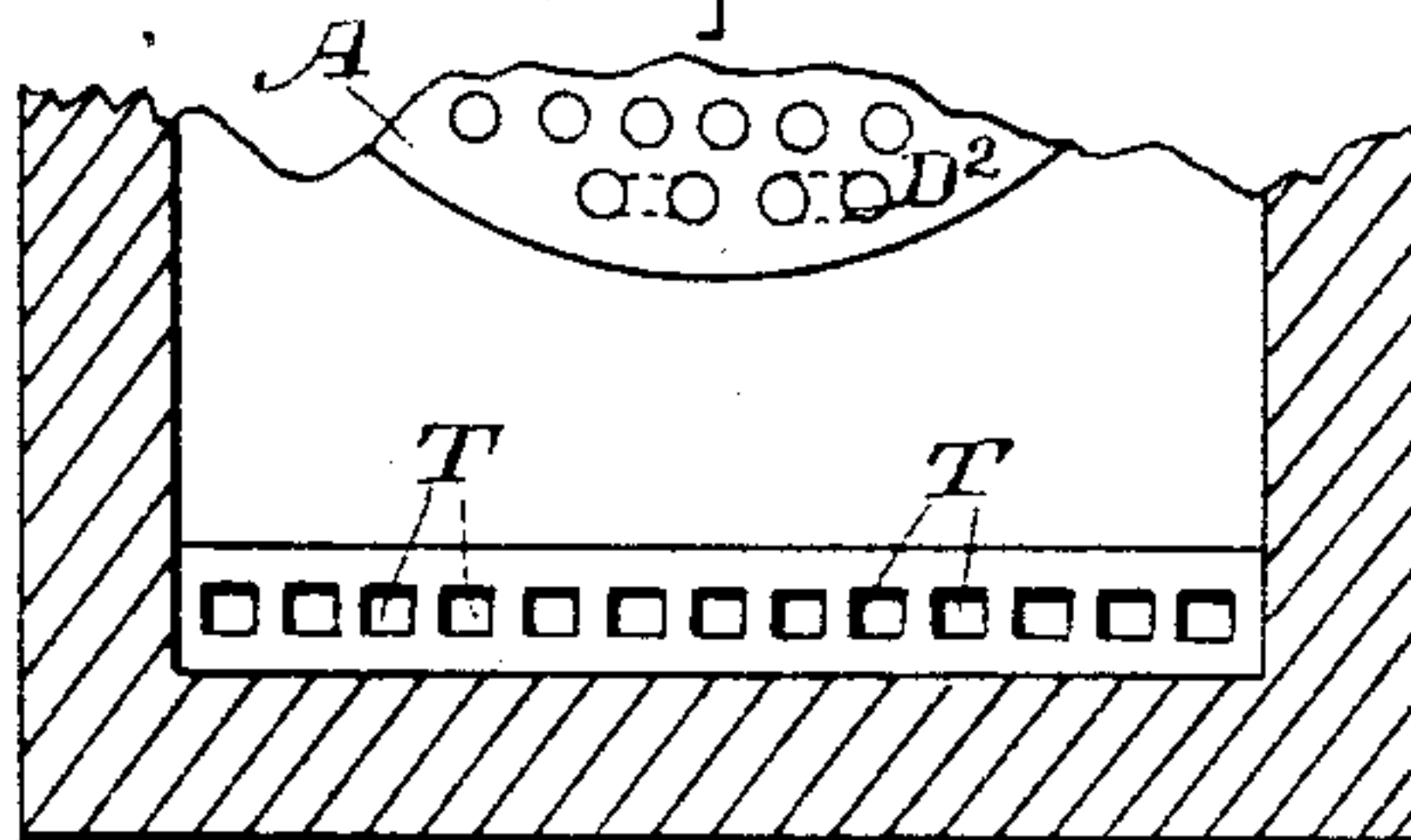


Fig. 5

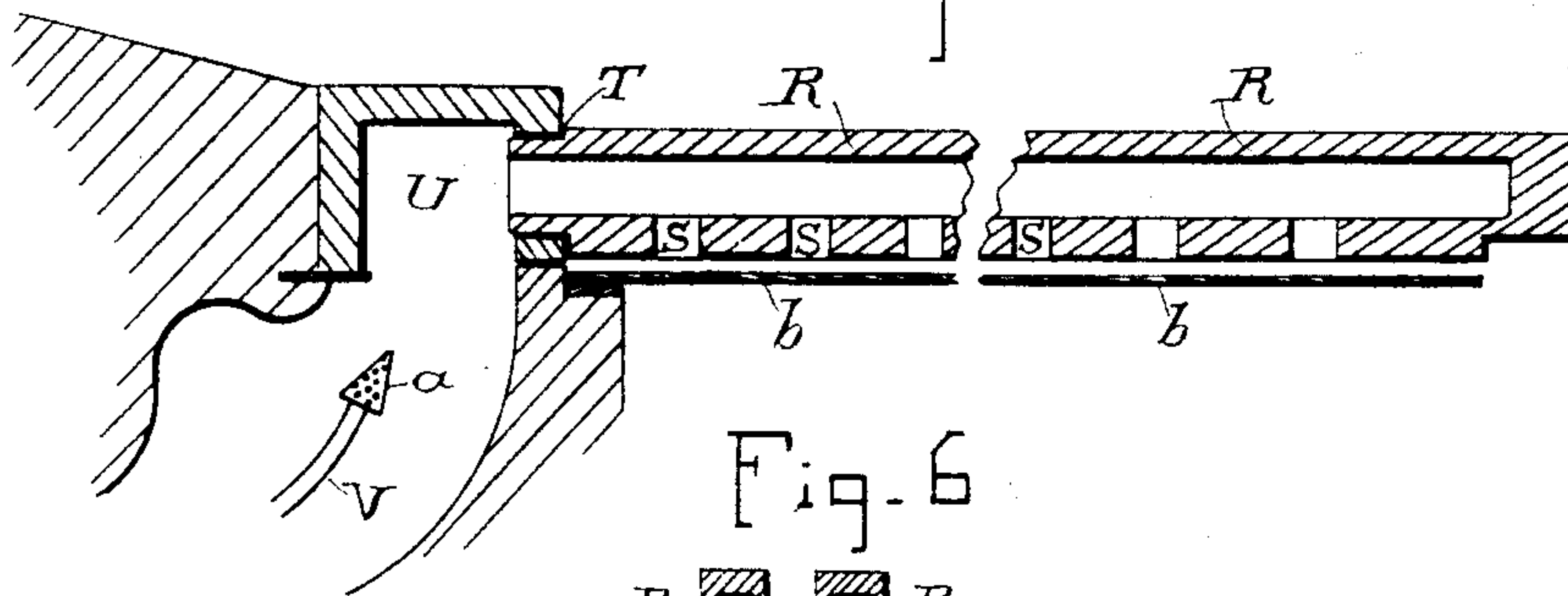
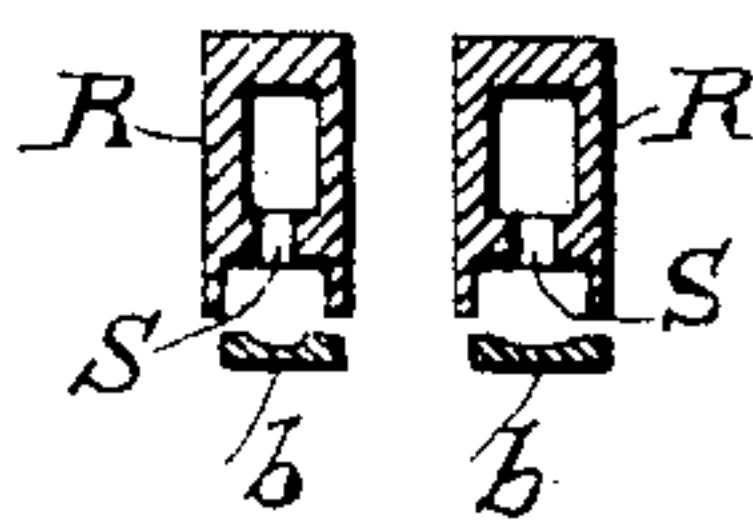


Fig. 6



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attys

UNITED STATES PATENT OFFICE.

EUGENE SHYDECKER, OF SAN FRANCISCO, CALIFORNIA, ASSIGNOR OF ONE-HALF TO HARVEY S. BROWN, OF SAME PLACE.

STEAM-BOILER FURNACE.

SPECIFICATION forming part of Letters Patent No. 538,885, dated May 7, 1895.

Application filed February 19, 1895. Serial No. 538,975. (No model.)

To all whom it may concern:

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

My invention relates to improvements in steam boilers and in furnaces designed to be used therewith.

It consists in details of construction which will be more fully explained by reference to the accompanying drawings, in which—

Figure 1 is a vertical longitudinal section taken through the boiler and furnace. Fig. 2 is a transverse section taken through xx of Fig. 1. Fig. 3 is a transverse section through yy of Fig. 1. Fig. 4 is a transverse section through zz of Fig. 1. Fig. 5 is an enlarged longitudinal section of the grate-bar. Fig. 6 is a transverse section of the same.

A is a boiler having a fire-place or furnace B beneath the front end, a chamber C at the rear technically called a "combustion chamber," into which the products of combustion from the fire-place are carried, as will be hereinafter described, and return tubes D through the boiler, through which the products of combustion pass to a chamber E at the front of the boiler, thence returning again through tubes D' to the chimney or smoke-stack F which extends upwardly at the rear of the boiler, and is separated from the chamber C by a movable non-conducting plate or damper G. This movable damper may be opened when a fire is to be started so as to give a direct draft from the furnace to the chimney or whenever the heat is so great as to make steam too rapidly, it may be opened so that the heat will pass directly up the chimney and not through the flues D and D' of the boiler. These flues D and D' are designed to pass through the water space of the boiler, and in order to increase the heating capacity, I have shown an electrical heater which consists of a series of large tubes H passing longitudinally through the boiler between the tubes D and D'. There may be one, two or more series of the tubes H as is found desirable. Within

these tubes are coils of wire, as shown at I, these coils being so arranged as to conduct a current of electricity which is brought to them by means of suitable wires as shown at J, Fig. 1.

The rear ends of the tubes H are permanently closed, passing through or into the rear end of the boiler, as shown in Fig. 1, while the front ends open into the chamber or space E at the front, and may be reached by removing a door or cover K which normally closes the chamber E.

The coils I are formed around a central core, and may be surrounded by any suitable heat diffusing medium molded into proper form to fit loosely within the tubes H, so that whenever it is desired, the coils I may be drawn out from the tubes for repairs or inspection, by removing the door K and disconnecting the wires J. When in operation a powerful current of electricity from a dynamo or other source of supply is passed through the wires within these tubes, and as the wires are so proportioned to the current passing that they offer a considerable resistance, they are heated to a high temperature, and the heat thus produced is diffused through the surrounding coating, and the tubes H within which the coils are contained, so that the water surrounding these tubes receives the heat thus produced, and the additional heat from this source will correspondingly reduce the amount of fuel necessary to be used upon the grate.

Within the upper part of the boiler and in the steam space thereof is a steam drum L, of desirable size, suitably supported entirely within the main boiler. This steam drum has tubes or flues M passing through it, open at both ends, so that the steam produced within the main boiler A, will pass freely through the tubes M.

N is a pipe opening at one end in the upper part of the boiler A, and extending downward below the drum L so that its opposite end opens into the interior of this drum L. The steam which arises from the water within the boiler is taken from the extreme upper part of the boiler and delivered into the drum L where it is essentially separated from the wet steam continually arising from the boil-

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ing water in the main boiler. This steam thus separated is dried out by the heat of the steam surrounding this interior drum L, and also passing through the tubes M so that it is
5 to a certain extent superheated by being separated from the direct contact with the wet steam continually arising within the main boiler.

O is a pipe leading from the opposite end
10 of the drum L to the engine P which it is employed to propel.

Any water which may condense within the drum L can be drawn off by means of a cock Q which is fixed in the pipe opening out from
15 the drum L through the end of the boiler A and through the surrounding masonry in which the boiler is set.

The grates R in the furnace are made hollow or tubular, as shown plainly in Figs. 1 and
20 5, and the lower parts of the grate bars have openings S made in them through which steam is allowed to escape as will be hereinafter described. The front ends of the grate bars are closed. The rear ends are open and are fitted
25 to and supported in openings T, Fig. 4, made in the front wall of a chamber U. Exhaust steam from the cylinder is led through a pipe or pipes V and is delivered into the chamber U through distributing nozzles *a* fixed upon
30 the end of the pipe V so that steam delivered into this chamber will pass into the hollow grate bars R and discharge through the passages S in these bars, and thus produce a vacuum that will draw the smoke downwardly from the combustion chamber. Below
35 each bar is a plate *b* extending longitudinally, and suitably supported so as to receive the impact of steam discharging through the openings in the lower part of the grate, and the
40 steam is spread and distributed by its impact against these plates and thence with any smoke or unconsumed gases which have been drawn down, rises between the grate bars into the fuel which is supported upon them, while
45 the intense heat of the fuel will decompose the vapor and produce hydrogen, which serves to increase the heat within the furnace.

Through the masonry which forms the rear of the furnace is made an inclined passage *c*,
50 one end of which opens just above the grate, extending the full width, and the other and rear end opens into the lower part of the combustion chamber C, being narrowed about one-half at the rear end of this passage, where it
55 also has a downward curvature, as shown at *c'*, so that the products of combustion, passing through the passage, are thrown downward at this point before being delivered into the chamber C, and move more rapidly by
60 reason of the concentration. Above this passage *c* is a chamber *d* situated beneath the boiler and into this chamber opens pipes *e* bringing exhaust steam from the cylinders and having jet nozzles *f* upon their ends so
65 that the steam is distributed through the chamber *d*. Inclined passages *g* are made through the bottom of this chamber and open-

ing into the passage *c* so that the steam which is super-heated by its discharge into this chamber, is delivered through these passages *g* and
70 mingles with the products of combustion in the inclined passage *c c'*. The inclination of the passages *g* is such that the discharge is in the direction of the flow of the current within the chamber *c*, and they thus assist in
75 the draft.

h are side passages made in the masonry upon each side of the furnace and leading from the chamber U, so as to deliver any surplus steam from the chamber U into the
80 chamber *d* from which it passes through the passages *g* as previously described.

i is a pipe leading from the exhaust of the engine and connecting with one of the four
85 lowermost flues D² of the boiler, as shown in Figs. 1 and 4. As the bottom of a boiler is always cooler than the upper part, or even the exhaust steam, this steam is returned back and forward through these flues, and its heat is imparted to the water in the lower part of
90 the boiler, after which it escapes through the discharge nozzle *k*. By this means a part of the exhaust steam is utilized to impart heat to the cooler water in the bottom of the boiler, and a part to assist in the combustion of the
95 fuel and in the draft through various parts of the heat passages of the furnace and boiler, and by means of these steam jets the draft can be increased or diminished at will, the whole producing a very perfect and complete
100 means for generating steam.

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

1. A main boiler having flues or heat pas-
105 sages in the lower and middle section, and supplemental tubes of larger diameter interposed between the lower and middle section with electrical coils fixed within them through
110 which a current of electricity may be passed so as to heat the tubes by reason of a resistance within the coils said coils being removable endwise through one end of the furnace, a drum contained within the steam space of
115 the boiler having tubes extending through it for the free circulation of steam, pipes by which steam is admitted into the lower portion of the drum from the upper part of the main boiler and delivered from the opposite
120 end to pass to the engine.

2. An engine boiler containing flues for the passage of the furnace heat, and front and rear combustion chambers with which said flues connect, and a drum contained within the
125 steam space in the upper part of the boiler, a furnace for the reception of fuel having hollow grate bars closed at one end and communicating at the other end with a transverse chamber, into which exhaust steam from the engine is delivered, openings in the lower part
130 of the grate bars through which a portion of said steam is discharged into the ash-pit, and distributing plates beneath the bars whereby it is distributed so as to arise between the

bars into the incandescent fuel thereon, a converging passage leading from the furnace to the rear combustion chamber, a chamber situated above said passage between it and the rear portion of the boiler, pipes by which exhaust steam is delivered into said chamber, inclined passages through which said steam is discharged into the converging passage leading from the furnace to the rear combustion chamber.

3. A boiler consisting of a main outer shell set in masonry having combustion chambers at both ends, and a furnace beneath, a passage by which products of combustion are led from the furnace to the rear combustion chamber, and a means comprising a chamber into which exhaust steam is admitted, having inclined passages discharging into the passage from the furnace, for mingling exhaust steam with said products of combustion, a movable damper or partition by which the rear

combustion chamber may be separated into two parts, one above the other, flues through the lower part of the main shell of the boiler through which the products of combustion are returned from the lower part of the rear combustion chamber to the front combustion chamber, other flues in the upper part of the water space of the boiler through which the products of combustion pass from the front to the rear chamber and thence to the chimney, pipes leading into the lowermost flues of the boiler, whereby the exhaust steam is circulated through the cooler water space of the boiler before escaping.

In witness whereof I have hereunto set my hand.

EUGENE SHYDECKER.

Witnesses:

S. H. NOURSE,
GEO. II. STRONG.