

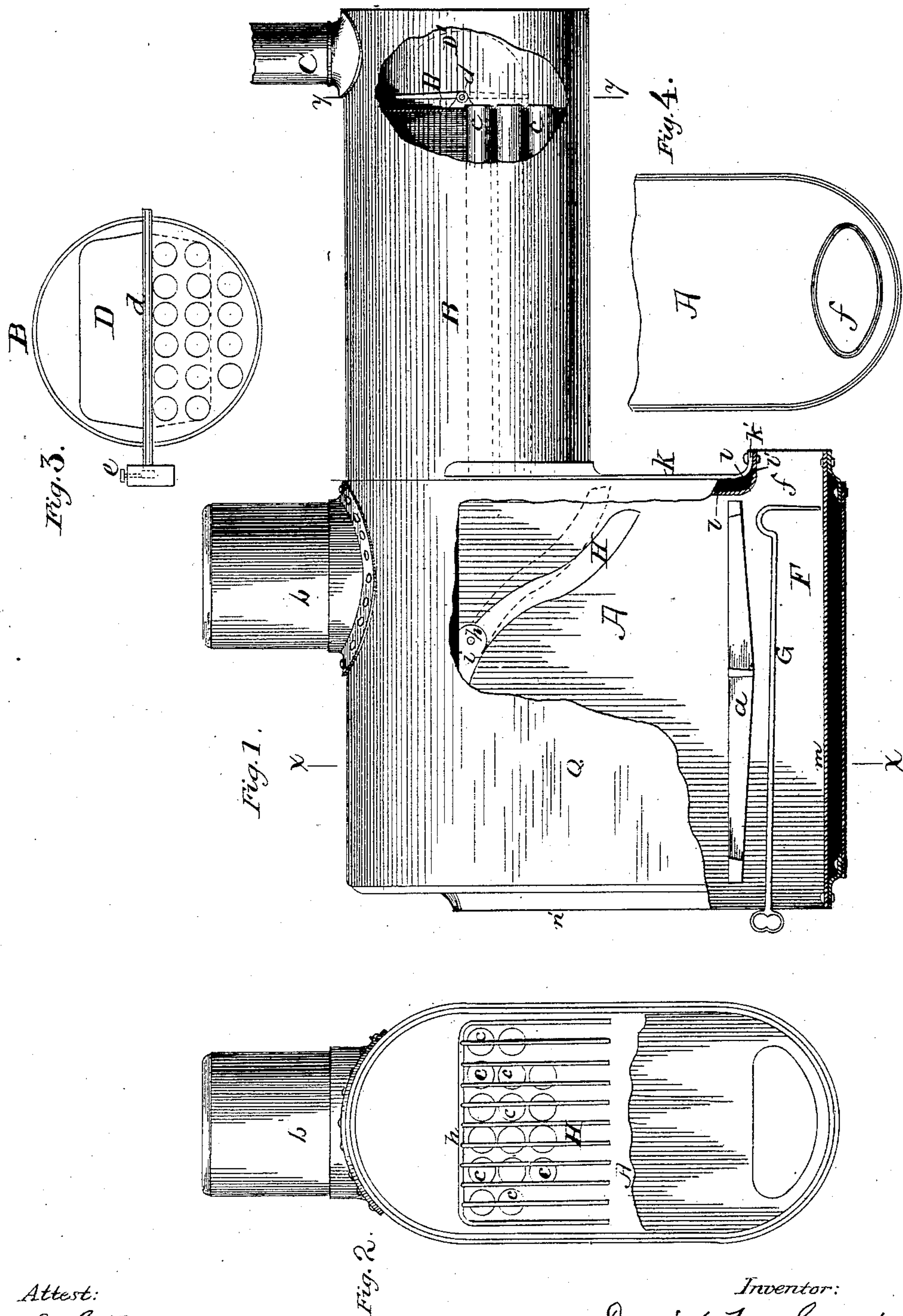
(No Model.)

2 Sheets—Sheet 1.

D. M. SWAIN.
STEAM BOILER FURNACE.

No. 310,153.

Patented Dec. 30, 1884.



Attest:
J. S. Barker
C. A. Barker.

Inventor:
David M. Swain
by Doubleday & Bliss

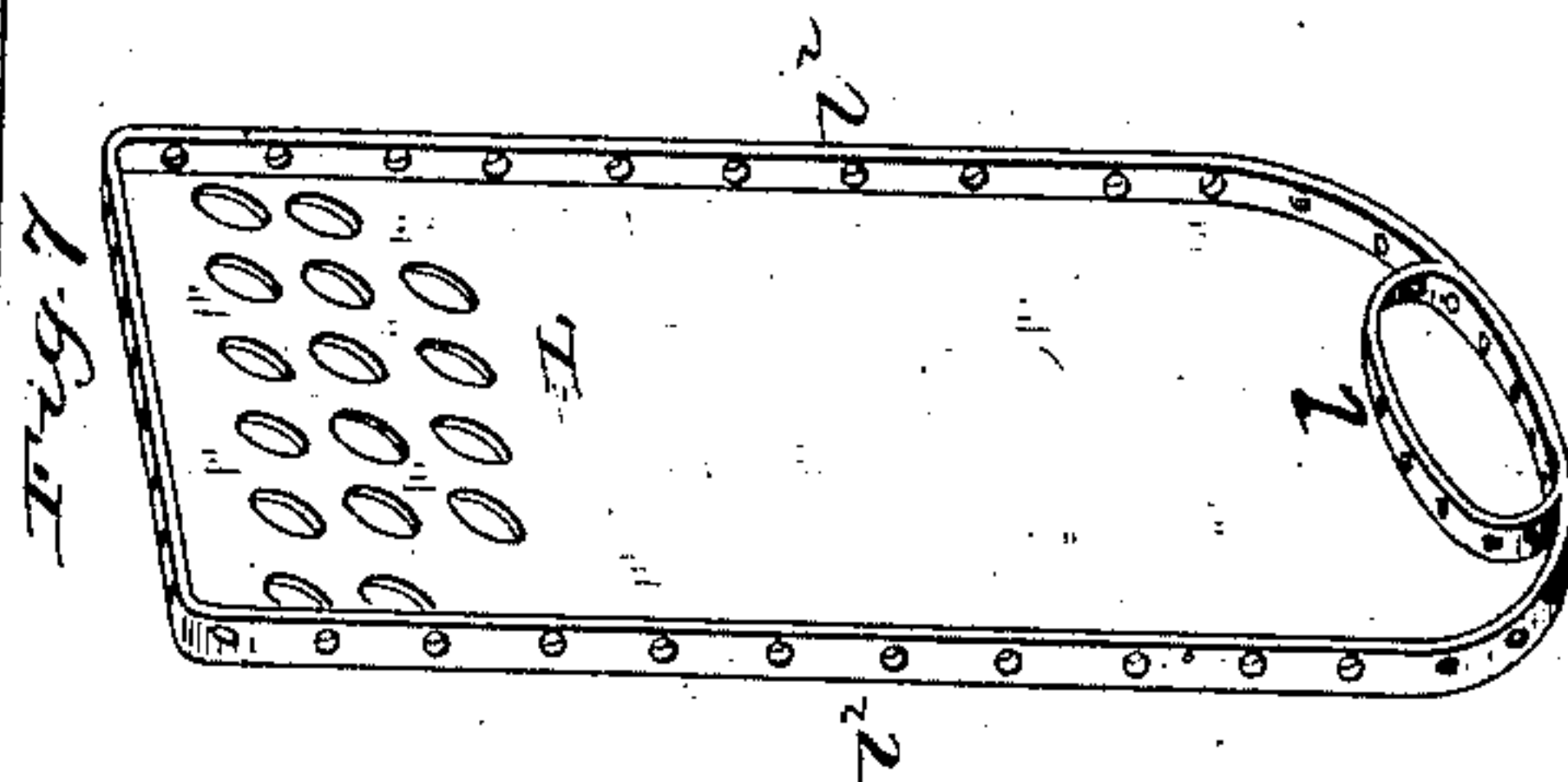
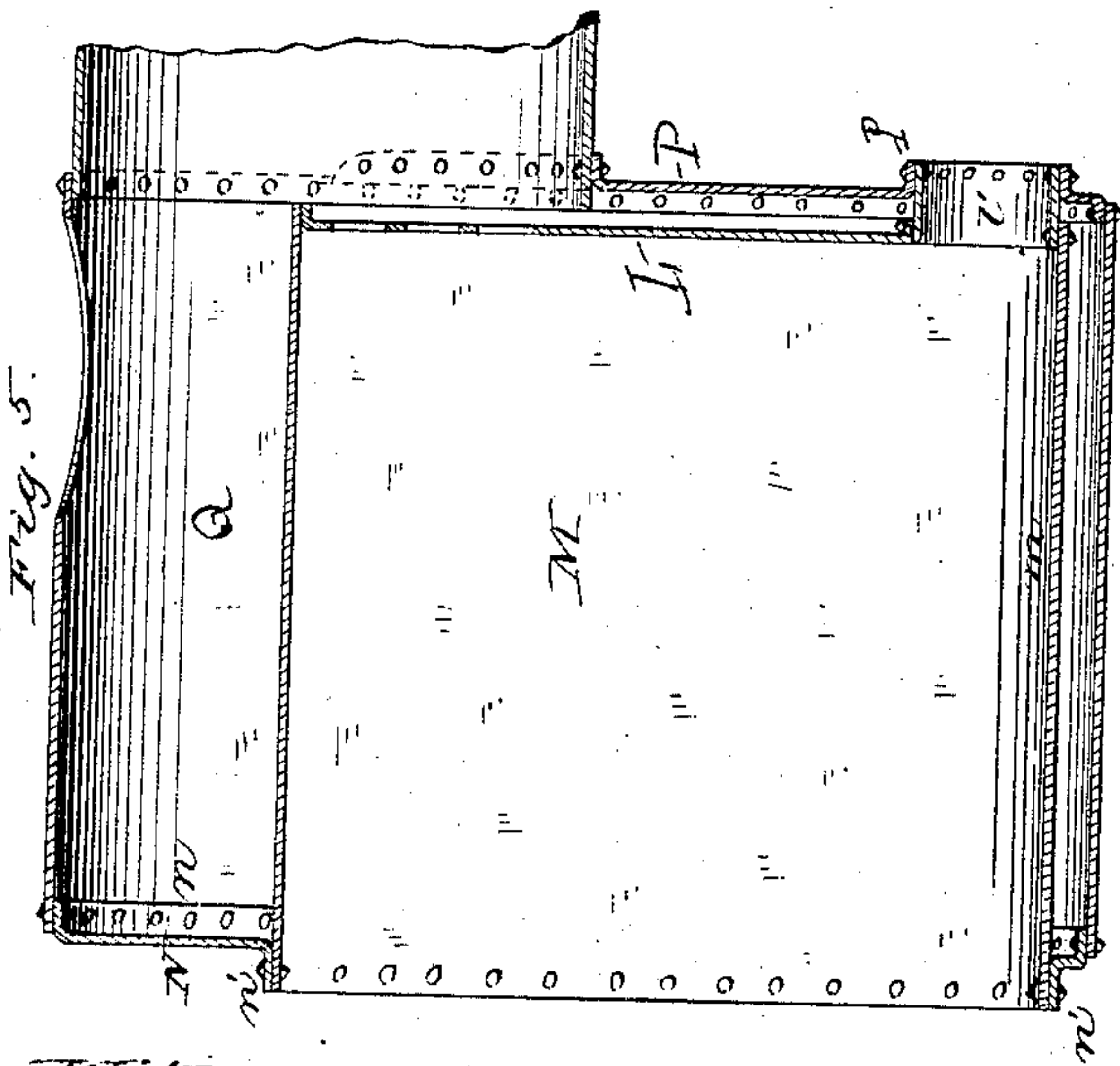
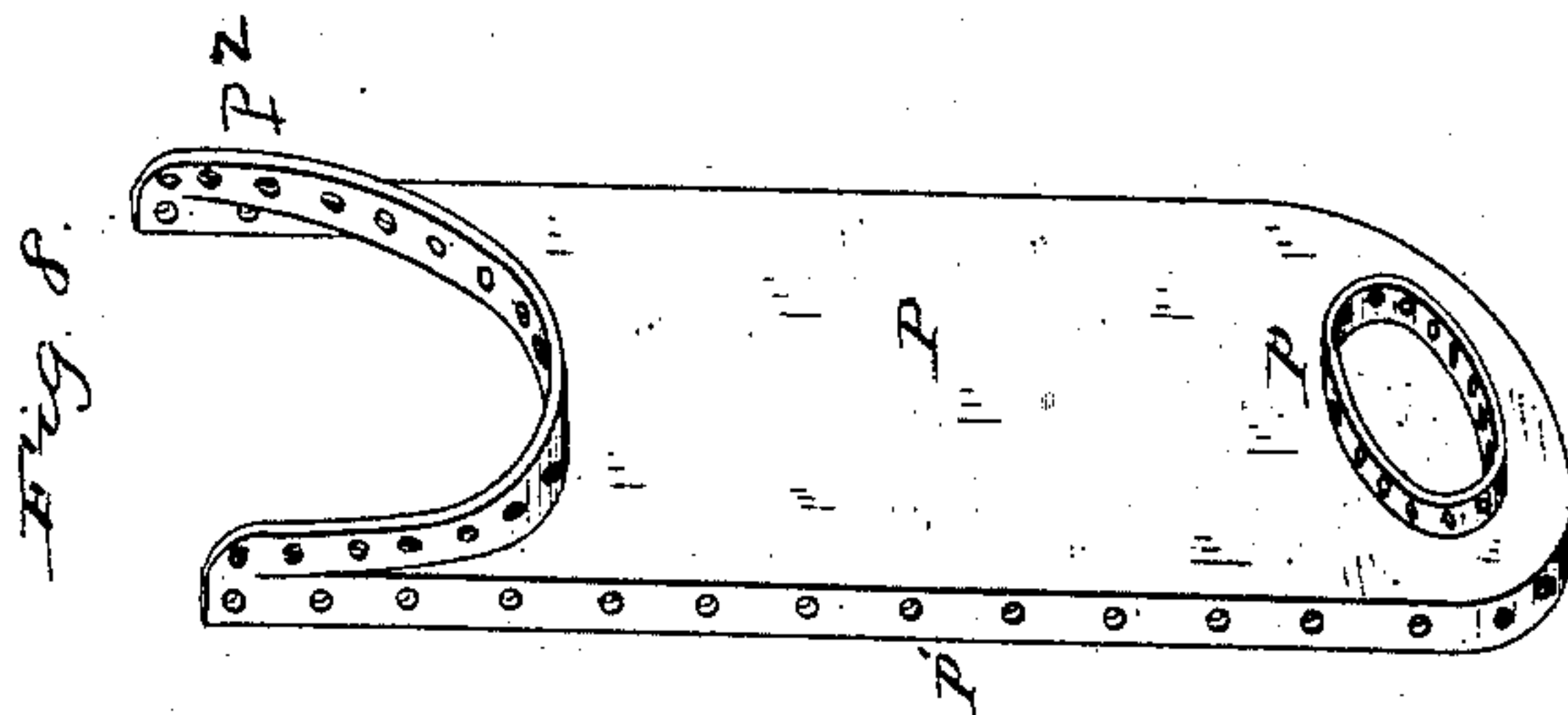
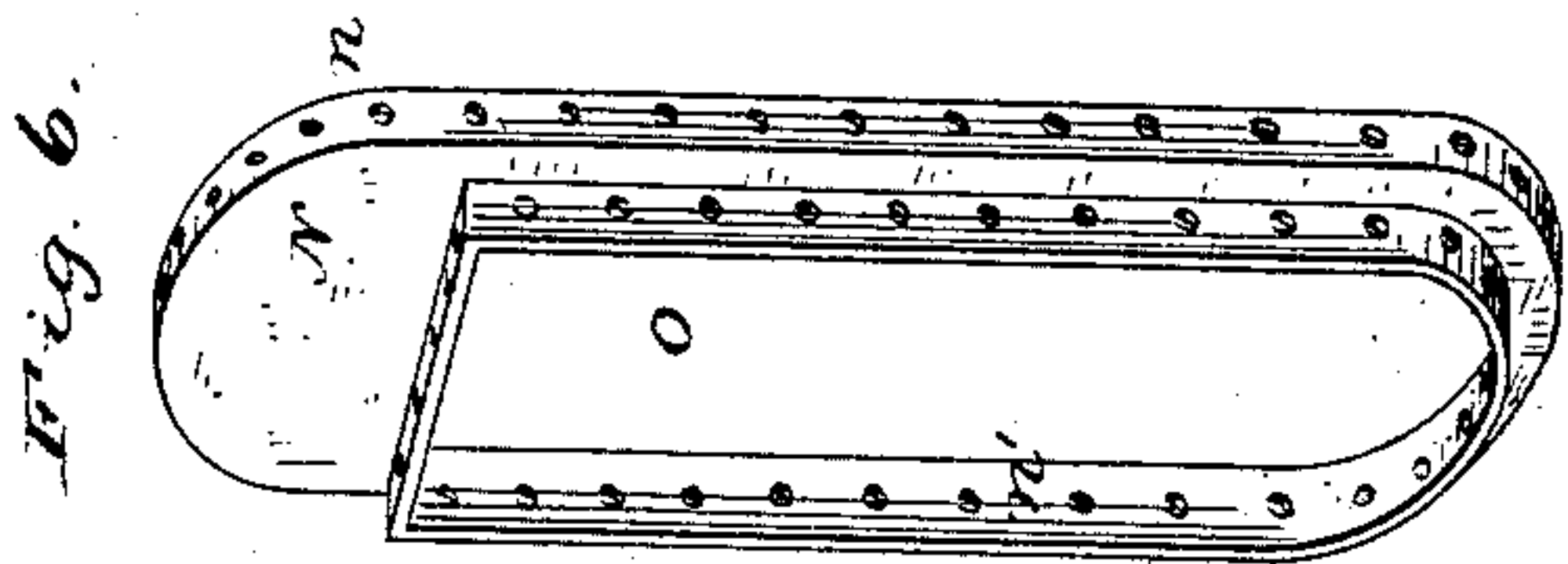
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2 Sheets—Sheet 2.

D. M. SWAIN.
STEAM BOILER FURNACE.

No. 310,153.

Patented Dec. 30, 1884.



Witnesses:

H. A. Low
J. S. Barker.

Inventor:

D. M. Swain
by S. M. Bledsoe & Bliss

UNITED STATES PATENT OFFICE.

DAVID M. SWAIN, OF STILLWATER, MINNESOTA, ASSIGNOR, BY MESNE ASSIGNMENTS, OF ONE-HALF TO E. S. BROWN, RECEIVER OF THE NORTH-WESTERN MANUFACTURING AND CAR COMPANY, OF SAME PLACE.

STEAM-BOILER FURNACE.

SPECIFICATION forming part of Letters Patent No. 310,153, dated December 30, 1884.

Application filed August 19, 1881. (No model.)

To all whom it may concern:

Be it known that I, DAVID M. SWAIN, a citizen of the United States of America, residing at Stillwater, in the county of Washington and State of Minnesota, have invented certain new and useful Improvements in Steam-Boiler Furnaces; and I do hereby 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 letters or figures of reference marked thereon, which form a part of this specification.

The object of the first part of my invention is to prevent the light materials which are used for fuel from being lifted from the furnace-bars or the grate and forced against the ends of the flues and clogging them; and to this end it consists in combining with the furnace a series of movable fingers, bars, rods, or other equivalent devices arranged within the furnace and near its forward end, as will be hereinafter explained.

The second part of the invention consists in arranging a valve or damper in the flue or draft space at the front end of the boiler adapted to close such space when the engine is going uphill or downhill, for the purpose of checking the draft, and thereby reducing the intensity of the combustion in order to prevent the burning out of the flues while they are uncovered at one end by reason of the inclined position of the boiler.

The third part of the invention consists in so attaching the ash-receptacle, and so shaping and arranging the parts to which it is attached that the receptacle shall be formed of the inner wall of the water-chamber of the boiler, and shall be surrounded with water, whereby the heat of the metal is reduced and the heat is utilized in the water.

Figure 1 is a side elevation of one of the boilers, parts of the shell being broken away. Fig. 2 is an end view, partly in section. Fig. 3 is a vertical section on line *xx*, Fig. 1. Fig. 4 is a view of the front end of the fire-box and ash-pan. Fig. 5 is a vertical longitudinal section of the fire-box part of the boiler, a portion of the tubular part being shown in elevation. Fig. 6 is a detached view of rear verti-

cal plate. Fig. 7 is a detached view of the front flue-plate. Fig. 8 is a detached view of the gusset or throat-plate, and Fig. 9 is a detached view of the thimble of the ash-hole.

A is the furnace, having a grate of the usual construction, bars being shown at *a*.

B is the horizontal part of the boiler containing tubes or flues *c*, and carrying a steam-dome, *b*.

C is the smoke-stack communicating with the smoke-chamber, arranged at the front end of the tubular part B to receive the products of combustion which pass through the flues *c*.

D is a damper hung in the smoke-chamber on shaft *d*, which has its bearings in the walls of said chamber. As shown in the drawings, this damper is turned up into a vertical position above its shaft *d*, thus permitting a free passage of the products of combustion through the flues *c*, the smoke-chamber, and thence out through the smoke-stack C; but when the engine is moving up or down an incline the damper may be swung down into the position indicated in dotted lines, Figs. 1 and 3, and thus made to substantially close the front ends of the upper rows of flues, so as to greatly reduce the draft and intensity of combustion within these flues, thereby preventing them from becoming unduly heated at their exposed end, as they would otherwise become when in an inclined position with their ends uncovered by water. Under some circumstances it is not desirable to entirely shut off the draft through any of the flues, but to graduate the shutting off or closing of the flues from the upper ones downward, it being never, under ordinary circumstances, necessary to shut off the draft through the lower ones at all; hence the damper D is hinged on a line immediately above the flues, so as to swing outward and downward, and thus the closing of the upper flues may be effected to any desired degree. As the damper is laid in one piece and hinged in the manner described, it can be operated by a far simpler method than that which has been necessary with the shut-off mechanism heretofore used.

I am aware that with stationary boilers use has been made of a sliding damper arranged to almost entirely shut off some of the flues without partially shutting off the draft through

those below; and also aware that adjustable
slat-like guides have been employed with lo-
comotives to guide the currents to a central
point, and I do not claim such constructions.

5 It will be observed that this damper does not
cover the ends of the lower row of flues, and
that, therefore, sufficient draft is kept up to
maintain combustion of the fuel within the
furnace.

10 In Fig. 3 I have represented a weighted
arm or counterpoise, E, secured to shaft *d* by
set-screw *e*, and adapted to retain the damper
D in the position shown in full lines, so that
it will not be subject to casual displacement
15 in any position which the boiler will assume
under ordinary circumstances; but I do not
wish to be limited to the use of such counter-
poise or weighted arm, as I may employ some
other contrivance for moving the damper or
20 for retaining it in its upright position.

F is the ash-receptacle. It is arranged be-
low the furnace-grate, and is provided with an
opening, *f*, at its forward end, through which
the ashes and cinders may be discharged by
25 means of a rake or hoe, G. This ash-recep-
tacle is formed within the body of the water-
chamber of the boiler. The outer wall or
shell of the boiler or water-chamber has the
opening *f* formed therein, said wall or shell
30 extending entirely around said opening. The
inner wall of the furnace is composed of sheet
M, which is bent into the form of a tube hav-
ing a flat top, parallel straight sides, and
curved bottom, the front flue-plate, L, Fig. 7,
5 and rear vertical plate, N, Fig. 6. By an
examination of these figures it will be seen
that the plate N has its outer edge turned in-
wardly, forming a circumferential flange, *n*,
the edge which surrounds the opening O being
60 turned outwardly to form a flange, *n'*. The
flue-plate L has its outer edge turned out-
wardly to form a flange, *l'*. A portion of its
lower end is also swaged into a flange, *l*, to
receive a thimble or tubular extension, *l'*,
5 which is riveted thereto.

The throat-plate or gusset P, in addition to
the usual flanges *p'* *p''*, is provided near its
lower end with an outwardly-projecting
flange, *p*, (see Figs. 5 and 8,) to which the
60 outer end of the thimble or tube-section *l'* is
riveted, thus forming an ash-hole, through
which the ashes may be discharged from the
ash-receptacle below the grate-bars. The
outer shell or jacket of the fire-box portion of
5 the boiler extends entirely around the boiler,
and is riveted at its rear edge to the inwardly-
projecting flange *n* of plate N, and is at its
front edge riveted to the shell of the boiler
and to the flange *p'* of the gusset P. Within
60 the furnace are a series of vibrating rods or
fingers, H, pivoted at their upper ends upon
a transverse rod, *h*, which in turn is supported
from the wall of the furnace by means of
brackets or ears *i*, one ear being preferably
5 employed at each end of the rod; or a grate
or a perforated sheet of metal may be used in
place of the independently-vibrating arms H,

said plate or grate being hinged by its upper
edge at some convenient point to the inner
wall of the fire-box. It will be readily seen 70
from an inspection of the drawings that such
fingers, grating, or plate will prevent light
fuel—such as straw—from being carried by
the draft against the rear open ends of the
flues, and thereby prevent any undue check- 75
ing of the draft, as I have found that without
such device loose straw will sometimes be
forced against the flues and close or partially
close them, such closing reducing materially
the effectiveness of the boiler. Some of the 80
smaller and lighter pieces of the burning
straw will almost necessarily pass the fingers
and bars and accumulate more or less between
said fingers and the boiler-sheet. By my con-
struction such accumulation of refuse can be 85
readily removed at any time by vibrating or
moving the fingers, pulling them outward a
little at the lower ends, the hinged connection
at the upper ends permitting this movement.

I am aware that water-tubes have been rig- 90
idly and permanently attached in front of the
ends of the flues, and also aware that station-
ary rods have been used at the inner or farther
end of the fire-flue in return-flue boilers, and
I do not claim such constructions; but by 95
situating the fingers at the furnace end of the
boiler I prevent the straw from being carried
inward by the strong blast, and by attaching
them in the manner that I have shown upon a
hinging rod they can be readily detached at 100
any time, if such detaching is rendered nec-
essary, either by the burning out of the fingers
or in order that the coal or other heavy fuel
can be used instead of straw.

I am aware that it is old to surround the 105
fire-boxes and ash-pans of steam-boilers by a
water-jacket, and hence do not claim such a
construction, broadly; but I believe a furnace-
chamber constructed of the parts which I have
described possesses advantages which are not 110
incident to any other construction of which I
am aware.

What I claim is—

1. In a boiler-furnace for burning light fuel,
the combination, with the flues *c* and the fur- 115
nace, of a series of movable fingers or bars
between the grate and the furnace end of the
flues, substantially as set forth.

2. In a steam-boiler, the combination of the
inner tubular sheet, M, the flue-plate L, pro- 120
vided with flanges *l* *l'*, the gusset or throat-
plate P, provided with flanges *p* *p'* and the
thimble *l'*, the rear flanged plate, N *n* *n'*, and
the outer shell or jacket, Q, whereby there is
formed an ash-receptacle provided with a front 125
opening for the discharge of ashes, the tubu-
lar wall of which, together with the bottom of
the ash-pan, may be surrounded with water,
substantially as set forth.

In testimony whereof I affix my signature in 130
presence of two witnesses.

Witnesses: DAVID M. SWAIN.

H. J. CHAMBERS,
W. S. GOODHUE.