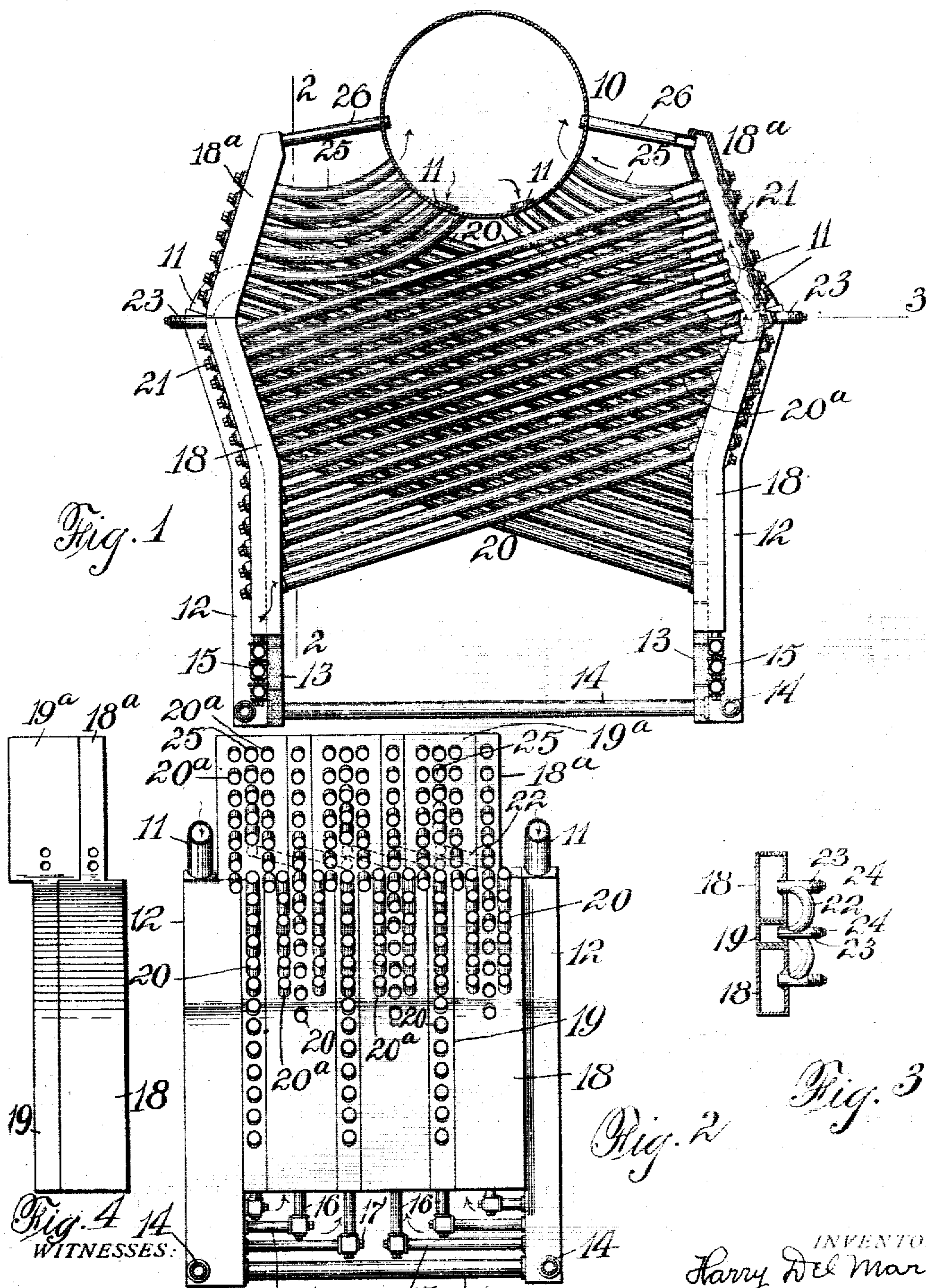


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PATENTED JUNE 5, 1906.

H. DEL MAR.
WATER TUBE BOILER.
APPLICATION FILED OCT. 17, 1905.



WITNESSES:
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UNITED STATES PATENT OFFICE.

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WATER-TUBE BOILER.

No. 822,857.

Specification of Letters Patent.

Patented June 5, 1906.

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To all whom it may concern:

Be it known that I, HARRY DEL MAR, of
the city, county, and State of New York,
have invented a new and Improved Water-
Tube Steam-Boiler, of which the following is
a full, clear, and exact description.

My invention relates to steam-boilers of the
water-tube type, and particularly to im-
provements in sectional cross-tube boilers.

An objection to many of these boilers is that
their connections are of such a nature that
they are likely to be clogged and a whole sec-
tion burned out before repairs can be made.

Also the connections are arranged in such a
way that they are incased in brickwork of
necessity and are not readily accessible.
Furthermore, the water-tubes are not always
arranged in the most economical manner.

The object of my invention is to produce
a sectional cross-tube boiler in which rows of
straight inclined tubes are alternated, in
which the headers are arranged alternately,
so that each header will receive three or more
rows of tubes, one row at its narrower and
two or three at its wider portion, and in which
the headers of opposite sides are oppositely
arranged, so that the cross-tubes shall ex-
tend from each header to the corresponding
part of the header opposite.

My invention also provides for having ver-
tical mud-drums which are free of brickwork
and are connected in such a way that the
pipes are also free of brickwork, and, further,
I provide connections at top and bottom of
each section or header, so that in case one
connection is clogged the circulation may still
be effected another way. I also provide
means for readily getting at any tube to re-
pair it, and I also utilize a series of supple-
mentary bent tubes to connect the headers
with the steam-drum, so that practically the
entire available heating-space is utilized for
making steam. In short I produce a simple
compact economical boiler which is intended
to steam readily and which has all its parts
readily accessible.

With these ends in view my invention con-
sists of certain features of construction and
combinations of parts, which shall be herein-
after described and claimed.

Reference is to be had to the accompanying
drawings, forming a part of this specification,

in which similar figures of reference indicate
corresponding parts in all the views.

Figure 1 is a cross-section of the boiler
embodying my invention with parts of the
tubes broken away. Fig. 2 is a vertical sec-
tion on the line 2 2 of Fig. 1. Fig. 3 is a detail
sectional view on the line 3 of Fig. 1, showing
the outside connection between the headers
on one side of the boiler; and Fig. 4 is a detail
view in elevation of two adjacent headers.

The boiler is provided with the customary
steam-drum 10, from opposite ends of which
extend downward and outward the down-
take-pipes 11, which are curved, as shown,
and delivered into the tops of the vertical
mud-drums 12, which are arranged at the cor-
ners of the boiler, and are offset from the head-
ers 18 and 19 hereinafter referred to and as
shown by dotted lines in Fig. 1. The mud-
drums are protected on the inner side by fire-
brick 13 and are connected both ways of the
boiler—that is, across the ends and sides—by
the pipes 14. The mud-drums 12 also con-
nect near the bottom by the elbow-pipes 15
and 16 with the headers 18 and 19, the joints
of the pipes 15 and 16 being provided with
plugs 17, so that the pipes can be easily gotten
at when necessary.

The headers 18 and 19 are arranged in
pairs, each header 18 having a relatively nar-
row top extension 18^a, and each header 19
having a relatively wide top extension 19^a, so
that the headers interlock, as shown in Fig. 2,
to form the side of a boiler.

Headers on opposite sides are connected by
the inclined water-tubes 20, these being ar-
ranged in rows, each row connecting the nar-
row part of a header 18^a or 19^a, as the case
may be, with the narrow part of the header
opposite. The rows of tubes 20 are also ex-
tended down, so that they extend from the
narrow part 19 of a header to the wider part
18 of the header opposite, which arrangement
brings the tubes well down in the narrow
parts of the headers, but leaves a blank space
on the wider parts of the opposite headers 18,
as shown clearly in Fig. 2. This arrange-
ment enables the space to be substantially
filled with tubes. The wider parts of oppo-
site headers are connected also by two rows
20^a of tubes. The outsides of the headers are
provided opposite the pipes with screw-plugs

21, which can be removed easily in case any pipe needs to be scraped or repaired. To provide for circulation in case the pipes of any header become clogged or in case any connections are interfered with, I arrange on the outer side of the boiler-wall couplings 22, which connect from header to header, as shown in Fig. 3, and the couplings have straight legs 23, which are screw-threaded on the outer side, so that certain special appliances can be attached thereto for repairing or scraping a tube, and the straight legs are closed by plugs 24.

It will be noticed that the arrangement of tubes and headers makes both parts very accessible and utilizes heating-space of the boiler to a great extent; but there is still a little space above the rows 20 of tubes, and in this space I arrange the bent tubes 25, which extend from the upper portions of alternate headers, as shown in Fig. 1 and Fig. 2, to the steam-drum 10. Thus it will be seen that by the compact arrangement of tubes 20 and 25 I utilize the whole heating-space, and the boiler will therefore steam economically. The upper end of the headers are also connected to the steam-drum by short pipes 26.

It will be observed that the arrangement of vertical mud-drums, the connection between the mud-drums and the steam-drum and the connection between the mud-drums, headers, and water-tubes, and between the latter and the steam-drum, is such that a perfect circulation is provided and such also as to make injurious clogging very unlikely. It will be noticed, too, that there is an ample downflow connection through the pipes 11 from the steam-drum to the mud-drums, that there is a sure connection between the latter and the headers 18 and 19, and that the headers being connected at top and bottom with steam-drum and mud-drums, and also connected together by the couplings 22, are little likely to be injuriously clogged or affected. It will be seen, too, that the connections are so ample between the headers and between the headers, mud-drums, and steam-drum that in case a connection or more becomes clogged the circulation can continue through other connections. It will be seen also that the lower water-tubes, which are most likely to burn, can be taken out or inserted through the fire-box without disturbing a header.

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

1. A boiler of the kind described comprising alternating headers forming the boiler sides, each header having a relatively wide section and a relatively narrow section with said wide and narrow sections alternately arranged, cross-tubes arranged in rows and extending from the narrow part of one header to the narrow part of the opposite header the same row also connecting with the wider

part of the header opposite and also between the wide parts of the opposite headers, whereby there are three rows of tubes connecting opposite headers, a steam-drum connected with the headers, vertical mud-drums forming the boiler corners and connected to the headers, and downflow-pipes extending from the steam-drum to the mud-drums.

2. A steam-boiler comprising a series of headers forming its side walls, the headers on each side being alternately arranged and constructed so that one is wider at the bottom and narrower at the top, the next narrower at the bottom and wider at the top and so on, inclined cross-tubes extending from header to header, there being at least three rows of tubes entering the wider parts and a single row entering the narrow parts and suitable steam and mud drums connected with the upper and lower parts of the headers.

3. A boiler comprising a series of headers forming its side walls, the headers on each side being alternately arranged and interlocked and being alternately wide at the bottom and narrow at the top, a double row of cross-tubes connecting the wider part of one header with the wider part of the header opposite, a second row of tubes between the said double row of cross-tubes connecting the narrow part of one header with the narrow part of the header opposite and also extending into the wider part of the header opposite, couplings connecting the several headers on a side, and suitable steam and mud drums having connections with the upper and lower parts of the headers.

4. A steam-boiler comprising a series of headers forming the boiler sides, the headers being constructed so as to be wide at one end and narrow at the other and being alternately arranged on each side, three rows of tubes connecting opposite headers, the middle row connecting the narrow part of one header with the wide part of the opposite header and extending also into the wider part of the header and the outer rows connecting the wider parts of the opposite headers, a steam-drum, and a series of tubes arranged above the said middle row of cross-tubes and extending from the upper portions of the headers to the steam-drum.

5. A steam-boiler comprising a series of headers forming its sides, the headers on each side being each constructed with one wide portion and one narrow portion and the said headers on the side being alternated and placed side by side, vertical mud-drums at the ends of each side of the boiler, said mud-drums connecting with the lower parts of the headers, rows of cross-tubes extending from the upper part of one header to the lower part of the header opposite, a steam-drum, rows of tubes connecting the steam-drum with the headers of each side, the said steam-drum pipes being located above certain rows of the

cross-tubes, and downtake-pipes extending from the steam-drum to the mud-drums.

5 6. In a steam-boiler, the combination of the alternating headers forming the boiler sides, the headers of each side being interlocked and having alternately wide and narrow top and bottom portions, groups of at least three inclined rows of cross-tubes connecting opposite headers, the middle row of
10 each group connecting the narrow part of one

header with the narrow and wide parts of the header opposite, a steam-drum, and rows of tubes arranged above the aforesaid middle rows and connecting the upper part of the headers with the steam-drum.

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Witnesses:

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