

H. A. BOLZE.

BOILER.

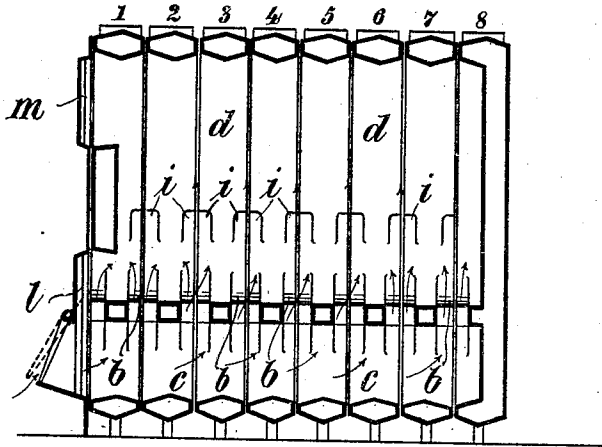
APPLICATION FILED FEB. 21, 1908.

898,548.

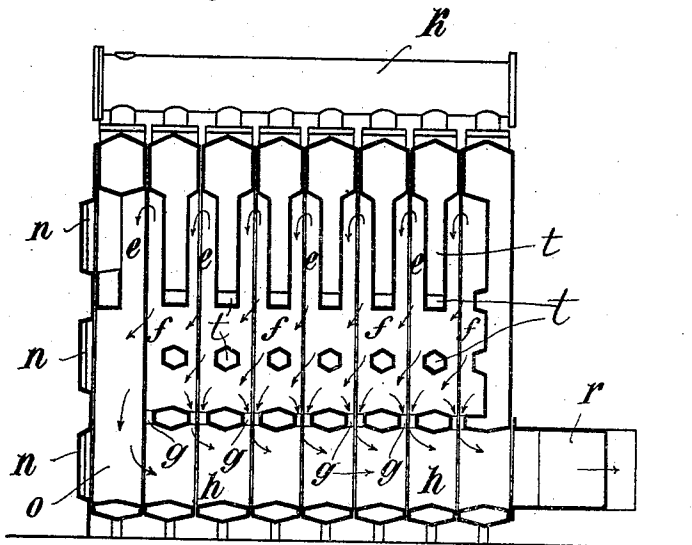
Patented Sept. 15, 1908.

3 SHEETS—SHEET 1.

*Fig. 1*



*Fig. 3*



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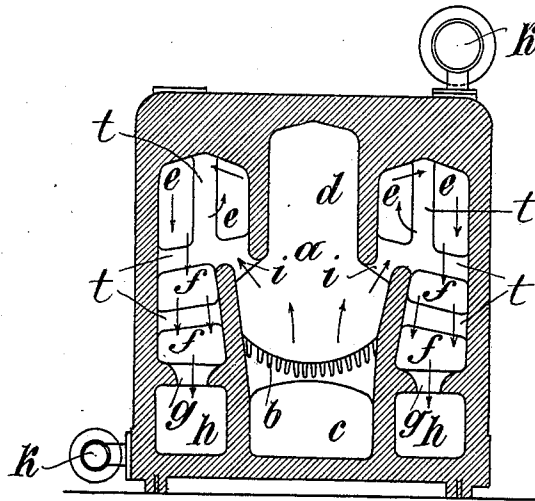
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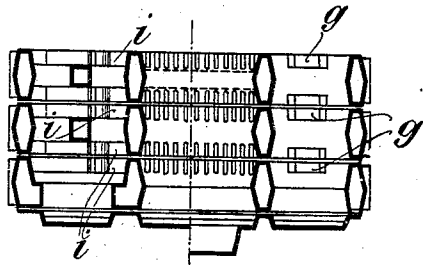
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3 SHEETS—SHEET 2.

*Fig. 2*



*Fig. 4*



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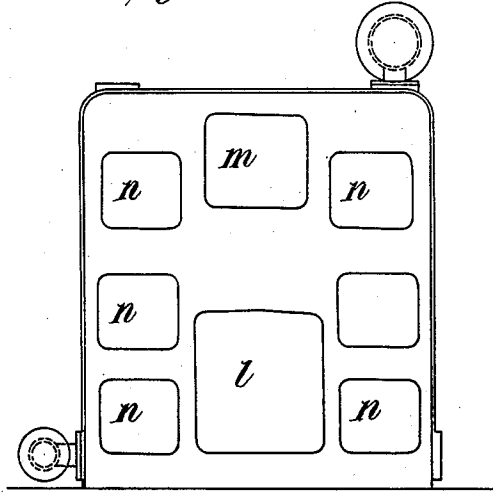
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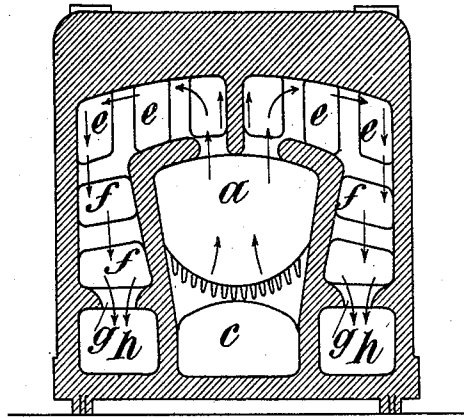
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3 SHEETS—SHEET 3.

*Fig. 5*



*Fig. 6*



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# UNITED STATES PATENT OFFICE.

HEINRICH ATHANASIUS BOLZE, OF HANOVER, GERMANY.

## BOILER.

No. 898,548.

Specification of Letters Patent.

Patented Sept. 15, 1908.

Application filed February 21, 1908. Serial No. 417,047.

*To all whom it may concern:*

Be it known that I, HEINRICH ATHANASIUS BOLZE, a subject of the German Emperor, and residing at Hanover, Germany, have invented certain new and useful Improvements in Boilers, of which the following is a specification.

The subject-matter of the present invention is a sectional boiler having a new kind of construction of flues, and the fire-gases are likewise conducted through the boiler in a new manner.

An important object of the invention is to provide a boiler in which the fuel or fire-gases are particularly favorably utilized, the fire-box, grate, charging shaft and the flues being suitably arranged, and the latter being easily controlled and cleaned.

In order that the invention may be clearly understood, reference is made to the accompanying drawings in which one embodiment is represented by way of example, and in which:

Figure 1 is a vertical longitudinal section through the central axis of a sectional boiler, Fig. 2 a vertical section through a central section of the boiler, Fig. 3 a longitudinal section through the flues, Fig. 4 a horizontal section through part of the boiler, and Fig. 5 a front elevation of the boiler. Fig. 6 is a vertical section through a central section of the new boiler without a charging shaft.

The boiler represented in Figs. 1 to 5 consists of eight sections 1 to 8, namely the like central sections 2 to 7 and the sections 1 and 8 which form the ends of the boiler. The individual sections of the boiler are hollow bodies which are filled with water or with steam in their upper parts, the latter being the case when they are used as steam boilers.

The chambers of the sections which are filled with water or steam have their upper and lower parts connected with one another by collecting pipes K, K, as shown, or the chambers are connected directly with one another above and below in known manner.

Each central section has cavities or places left for the necessary parts of a boiler, namely for a fire-box *a*, grate-portion *b*, which is preferably likewise hollow and flowed through by water, ash-pit *c*, charging shaft *d* and the flues *e*, *f*, *g*, *h*, of which the two flues *h* form horizontal smoke channels which conduct the fire-gases to the smoke-pipe *r* connected with the end section of the boiler and

which connects the channels *h* with one another.

When the sections of the boiler are joined one to another, the individual parts of the boiler, such as the fire-box *a*, grate *b*, ash-pit *c*, charging shaft *d* and flues *e*, *f*, *g*, *h* increase in the correct proportion, when they are correct for the individual central sections. Thus the cavities of these sections and the grate *b* go through the entire length of the composite boiler until they are ended by the end sections and the cleaning doors.

The front section *i* has cavities for the fire-door and ash-pit door *l* (Fig. 1), the charging door *m* and the cleaning and controlling doors *n*, *n* of the flues; these doors close directly on the section of the boiler or they are arranged on a supporting plate which is fitted tightly against the front section and likewise contains the corresponding openings for the above mentioned parts.

The smoke-flue pipe *r* for connecting the boiler with the chimney is connected to the rear section 8 (Fig. 3).

One improvement of the boiler consists in the flues *e*, *e*, *f*, *f* passing through the entire boiler chamber, the flues *e*, *e* being situated above the fire-box *a* and at both sides of the filling shaft *d*, and the flues *f*, *f* at both sides of the fire-box *a*. The parts of the individual sections of the boiler shown hatched in Fig. 2 abut against one another, and the joints between the sections in the direction of the fire-box *a*, ash-pit *c* and flues *e*, *f*, *g*, and *h* are closed with fire-proof cement, so that the fire-gases must move through the boiler in the desired manner.

The fire-gases are burned and utilized as follows: The fuel is placed in layers on the grate *b* in the fire-box *a* and it may reach to the upper part of the filling shaft *d*. The fire-box preferably tapers downwards and is enlarged upwards, so that the area of the grate shall not exceed the necessary amount, in order to obtain neither excess air on account of a too large area of grate, nor a dead layer of fuel through which no air for combustion can be supplied, so that the air for combustion entering through the grate is uniformly distributed on the lower surface of the layer of fuel by means of the downwardly constricted fire-box with the relatively narrow grate. Moreover since a somewhat large store of fuel is preferable, and as the upper enlargement of the fire-box makes it

possible for the connecting channels *i, i* to lead upwards directly into the flues *e, e* from the fire-box *a*, the described arrangement of the fire-box and the connection with the flues is advantageous.

The connecting channels *i, i* situated at both sides of the filling shaft between all the sections, or some of the same, conduct the gases from the fire-box *a* in such a manner into the upper broad part of the flues that they must flow along the heating surface next to the filling shaft *d* until they are deflected aside in the highest part of the flues and fill the entire chamber *e, e* because the fire-gases entering through the channels *i* have a high temperature and enter with a pressure above that of the atmosphere, and the colder gaseous contents of the flues *f* and *e* can flow away downwards. A part of the gaseous contents of the flues *e* will also mix with the fire-gases when the same enter and lessen the otherwise injurious action of the jet of flame. The arrows drawn in Figs. 1 and 2 show the path of the air for combustion and of the ascending and descending fire-gases.

The connecting channels *g, g* which are between the flues *f, f* and horizontal channels *h, h* and which form cavities between all or some sections are narrower than the appertaining connecting channels *i* which are left open between two sections. In this manner the flues *f, f* are constricted at *g, g*, so that the fire-gases flow not only into the horizontal channels *h, h* through those channels *g, g* which are situated nearest to the smoke-flue or chimney, but they must be drawn away through all the channels *g, g*; and when more fire-gases must go through the flues, when the boiler is in full operation, than can issue through the channels *g, g* the fire-gases must move towards the front section where a free passage *o* to the flues is situated at the height of the channels *g, g* which passage must be selected so great that it, in combination with the channels *g, g*, admits of all the fire-gases issuing, as Fig. 3 shows. Clearly the cavity or part left open in the front section at *o* may, in case it is necessary, also be arranged in the second section, and the fire-gases should not only move from flues *e* and *f* to flue *h* from above downwards through the narrowed flues *g, g* when the boiler is fully utilized but also from the rear part of the boiler to the front, namely pass diagonally longitudinally through the boiler.

The flues *e, e* and *f, f* of the individual sections have also passed through them tubular bodies *t* for increasing the heating surface still more; hot water circulates through these bodies and the fire-gases can flow round them as they are not as deep as the sections of the boiler. These tubular bodies pass vertically or slantwise through the flues in order to enable the hot water to circulate better.

Fig. 6 shows the arrangement of the flues in a boiler with horizontal grate firing and without a filling shaft. The fire-gases enter here also through the connecting channels into the flues *e*, so that they first flow over the heating surfaces which are nearest to the central axis of the boiler; otherwise they move through this boiler as in that with a filling shaft above described.

It remains to be mentioned that the flues *e, f, g* and the horizontal channel *h* may also be arranged at one side of the fire-box *a*, grate *b*, and ash-pit *c*, as well as the filling shaft *d* when this is present, when the fire-gases are burned and utilized in the same manner.

What I claim as my invention and desire to secure by Letters Patent is:

1. In a boiler of the type described, the combination of a plurality of central sections in a row having openings forming a fire-box, flues (*f*) and smoke-channels (*h*) through the same, a front section closing said openings at the front, and a rear section closing said fire-box and flues at the rear, said flues being connected through openings (*i*) with said fire-box and connected in each section, with the exception of one or more preferably at the front of the boiler, with the smoke-channels through openings (*g*) which are smaller than said openings (*i*) connecting the flues with said fire-box.

2. In a boiler of the type described, the combination of a plurality of central sections in a row having openings forming a basket-like fire-box, lateral flues and smoke-channels below the latter through the sections, a front section closing said openings at the front, and a rear section closing said fire-box and flues at the rear, said flues being connected through openings (*i*) with said fire-box and connected in each section, with the exception of one or more preferably at the front of the boiler, with the smoke-channels through openings (*g*) which are smaller than said openings (*i*) connecting the flues with said fire-box, the arrangement of said fire-box and flues and the openings (*i*) connecting the same being such that the fire gases are able to pass from the fire-box through said openings (*i*) into the flues in such a manner that the gases, following their own tendency, rise in the already cool gaseous contents of the flues, mix with the same and then participate in the downward movement of the same.

3. In a boiler of the type described, the combination of a plurality of central sections in a row having openings forming a fire-box, horizontal flues (*f*) and smoke-channels (*h*) under the latter through the sections, a front section closing said openings at the front, a rear section closing said fire-box and flues at the rear, said flues being connected through openings (*i*) with said fire-box, and con-

5 nected in each section, with the exception of  
one or more preferably at the front of the  
boiler, with said smoke-channels through  
openings (g) which are smaller than said  
openings (i) connecting the flues with said  
fire-box, and water-tubes passing slantwise  
through said flues, whereby not only is the  
heating surface increased, but a better cir-  
culation of water is obtained in the slanting  
water-tubes, and when bubbles of steam  
form in the water-tubes they are able to rise  
easily.

4. A boiler comprising a series of trans-  
verse sections arranged in a row and having  
openings forming a fire box, horizontal flues  
for the fire gases, a horizontal smoke chan-  
nel extending through all of the sections,  
passages connecting the fire box to the flues,  
passages connecting the flues to the smoke  
channel, some of these latter passages being  
smaller than the passages connecting the  
fire box to the flues, some of said latter pas-  
sages being larger than the others, said larger  
passages being near one end of the boiler.

5. A boiler comprising a series of trans-  
verse sections arranged in a row and having  
openings forming a fire box, horizontal flues  
for the fire gases, a horizontal smoke chan-  
nel extending through all of the sections,  
passages connecting the fire box to the flue,  
passages connecting the flues to the smoke  
channel, some of these latter passages being  
smaller than the passages connecting the  
fire box to the flues and some of said latter  
passages being larger than the others, said  
larger passages being near the front end of  
the boiler.

6. A boiler comprising a series of trans-  
verse sections arranged in a row and having  
openings forming a fire box, horizontal flues  
for the fire gases, a horizontal smoke chan-  
nel extending through all of the sections,  
passages connecting the fire box to the flue,  
passages connecting the flues to the smoke  
channel, some of these latter passages being  
smaller than the passages connecting the fire  
box to the flues and some of said latter pas-  
sages being larger than the others, said  
larger passages being in the front section of  
the boiler, substantially as described and for  
the purpose set forth.

7. A hollow section for a sectional boiler  
provided with a central opening to form a  
fire box chamber, horizontal flues on each  
side of said central opening for the passage  
of the fire gases, horizontal smoke channels  
below the flues and at the bottom of the sec-  
tion, passages being formed to connect the  
fire box with the flues, and other passages  
being formed to connect the flues with the  
smoke channels, these latter passages being  
smaller than the passages connecting the fire  
box with the flues, and a hollow grate por-

tion extending across the fire box, its ends  
being in communication with the interior of  
the boiler section.

8. A boiler comprising a series of trans-  
verse sections arranged in a row and having  
openings forming a fire box chamber and  
also having openings near the fire box cham-  
ber to form horizontal flues for the passage  
of the fire gases, other openings being formed  
through said sections to form a horizontal  
smoke channel extending through all of the  
sections, passages connecting the fire box to  
the gas flues, other passages connecting the  
flues to the smoke channel, some of these  
latter passages being smaller than the pas-  
sages connecting the fire box to the flues and  
some of said passages being larger than the  
passages connecting the fire box to the flues,  
said larger passages being near the front of  
the boiler, a front section and a rear section,  
a smoke outlet being provided in the rear  
section in communication with the rear end  
of the smoke channel, whereby a portion of  
the gases will travel forward in the gas flues  
and will enter the smoke channel at the front  
of the boiler.

9. A boiler comprising a series of trans-  
verse sections arranged in a row and having  
openings forming a central longitudinal fire  
box chamber and also having openings on  
each side of the fire box chamber to form  
horizontal longitudinally extending flues for  
the passage of the fire gases, other openings  
being formed through said sections below the  
flues and on each side of the fire box cham-  
ber to form longitudinally extending smoke  
channels near the bottoms of the sections, re-  
stricted passages connecting the gas flues to  
the fire box chamber, said passages being sub-  
stantially uniform in size throughout all of  
the boiler sections, other passages being  
formed in each section to connect the lower-  
most gas flues with the adjoining smoke  
channel, some of these passages being  
smaller than the passages connecting the  
fire box chamber with the gas flues and other  
of said passages being larger than the pas-  
sages from the fire box chamber to the gas  
flues, these larger passages being formed  
near the front of the boiler, a front section  
provided with a channel connecting the flues  
to the smoke channel, a rear section closing  
the rear ends of the flues and provided with an  
outlet for the smoke channels, whereby a por-  
tion of the products of combustion will travel  
forward in the gas flues and will enter the  
smoke channel at the front of the boiler.

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

HEINRICH ATHANASIVS BOLZE.

Witnesses:

ROBERT V. BÜLOW,  
H. BERLINER.