

1,000,038.

A. B. RECK.
SECTIONAL BOILER.
APPLICATION FILED FEB. 8, 1911.

Patented Aug. 8, 1911.
3 SHEETS—SHEET 1.

Fig. 1.

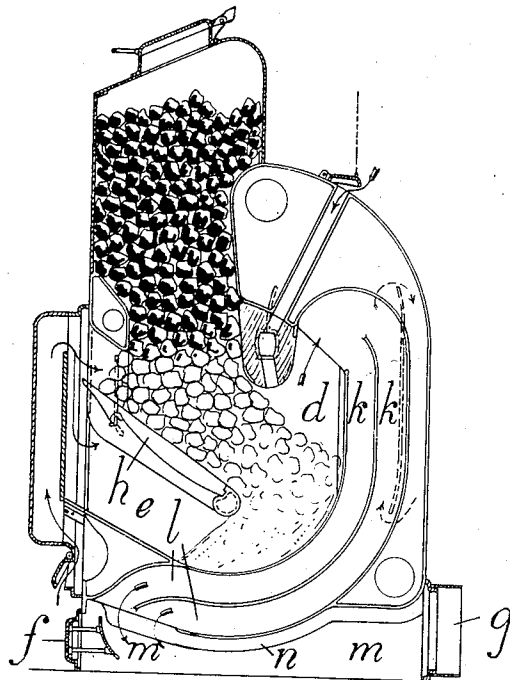
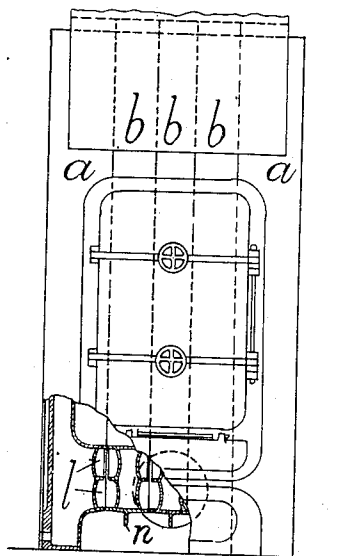


Fig. 2.



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3 SHEETS-SHEET 2.

Fig. 3.

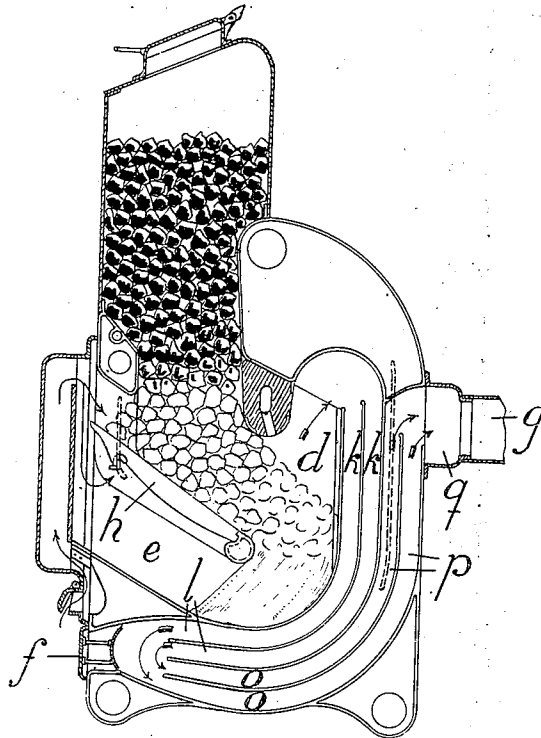
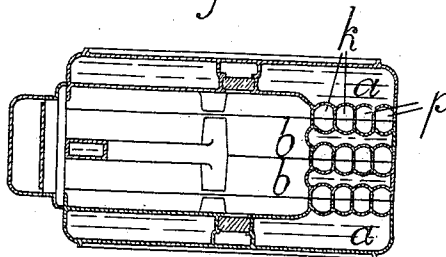


Fig. 4.



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3 SHEETS—SHEET 3.

Fig. 5.

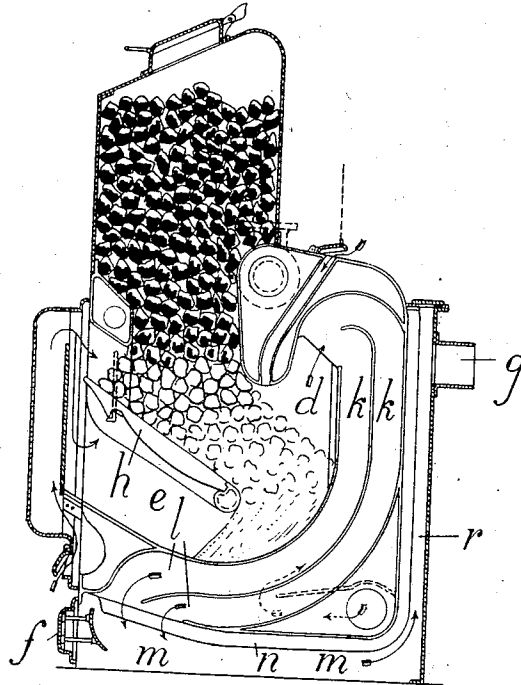
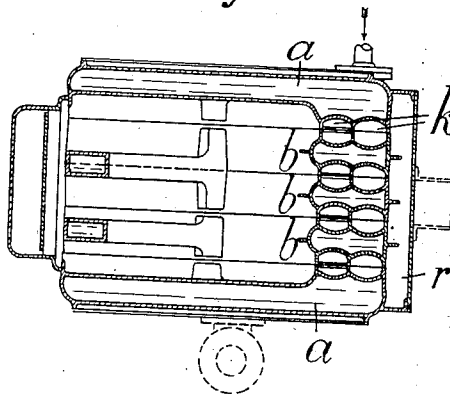


Fig. 6.



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UNITED STATES PATENT OFFICE.

ANDERS BORCH RECK, OF HELLERUP, DENMARK.

SECTIONAL BOILER.

1,000,038.

Specification of Letters Patent.

Patented Aug. 8, 1911.

Application filed February 8, 1911. Serial No. 607,369.

To all whom it may concern:

Be it known that I, ANDERS BORCH RECK, captain, a subject of the King of Denmark, residing at Hellerup, in the Kingdom of Denmark, have invented new and useful Improvements in Sectional Boilers, of which the following is a specification.

Cast-iron boilers consisting of vertical sections are generally classified into two main classes according to the arrangement of the flues between the combustion chamber and the smoke exit, one class having flues mainly of a direction right-angled to the planes wherein the boiler sections are in contact with each other whereas the other class has the flues lying between the sections in the said planes of contact themselves. A subclass of the class with the flues between the sections has the planes wherein the sections are in contact with each other rightangled to the front of the boiler. This special class of boilers has not only the special advantage of boilers with the flues between the sections, viz: that in boilers consisting of few sections the velocity of the flow of the products of combustion in the flues and therefore the effectiveness of their heating surface are not less than in boilers consisting of many sections—because the number of flues augments in direct ratio with the number of sections—but also the advantage that boilers consisting of many sections are as easy to attend to as boilers consisting of only few sections, because by this special arrangement only the width, and not the depth, of the grate is increased as the number of sections increases. But since high effectiveness of the heating surface as well as facility in attendance to the fire are some of the most essential and useful features in a boiler, no doubt sectional boilers, where all the flues lie in the planes, where the boiler sections are in contact with each other, and where the said planes are right-angled to the front of the boiler, would be much more used than they actually are were it not for certain obvious drawbacks that are inseparable from the different kinds of flues hitherto used in such boilers. Especially will it be found, in the forms of flues hitherto used, that a considerable part of the lower portion of the boiler sections is not used as a heating surface with the result that the boilers are too heavy and therefore too

costly in proportion to their heating capacity. Moreover most of the heating surface is situated in the uppermost part of the boiler, whereas it would be better that most of it was situated in the lower part of the boiler where the water—especially in hot water boilers—is coldest and the heating surface therefore most effective. Further it will be found that the low lying parts of the heating surface are difficult to keep clean because these parts are situated at the rear of the boiler, where direct access to them is difficult to obtain, especially if a number of boilers are standing closely side by side. Moreover, the length of the flues from the combustion chamber of the boiler to the smoke exit is seldom great enough to get the gases cooled down sufficiently.

This invention has for its object to give the flues for boilers of the above mentioned specially advantageous class of sectional boilers such a shape, that (1) almost all the low-lying surface of the boiler sections can be utilized as flue surface whereby the greatest possible part of the total surface of the boiler sections becomes fire and flue surface and therefore the weight and the cost of the boilers are as low as possible in proportion to their heating capacity; (2) a proportionally great part of the flue surface will be situated in the lowest part of the boiler where the water is coldest; (3) direct access to the flues between the sections can be had through cleaning doors on the front part of the boiler, in such a manner that the said flues can be cleaned throughout their whole length through said cleaning doors; (4) the length of flues can be great enough for the object of extracting the essential part of the heat out of the gases of the combustion before they leave the boiler.

As the improvements in cast-iron boilers according to my English Patent No. 16336/07 also apply to cast-iron boilers having their flues located in the planes of contact of the sections, these planes of contact being rightangled to the front part of the boiler, so in the accompanying drawings there is shown, as by way of examples, how the invention can be carried into effect, in three ways, in connection with the above said improvements already patented.

Figure 1 shows a vertical section of a

steam boiler with the invention applied, the section being taken through the flues between two boiler sections. Fig. 2 shows a front view of the same boiler, the lower part of the boiler on the left hand side being shown in section taken parallel to the front part of the boiler through the water space and through the flues. Fig. 3 and Fig. 4 show respectively in vertical and horizontal section another steam boiler in which the invention is used. Fig. 5 and Fig. 6 show in vertical and horizontal section a hot water boiler in which the invention has also been used.

From Fig. 2 and Fig. 4 it will be obvious how each of the boilers shown in Fig. 1 and Fig. 3, in the same manner as the boiler described in my English Patent No. 16336/07, is built up of separate sections *i. e.* end-sections *a* and intermediate sections *b* touching one another in planes right-angled to the boiler front, which is supplied with doors. From the figures it is further to be seen that in all the boilers shown the flues *k* starting from the combustion chamber *d*, are located in known manner in the planes of contact between the sections. The ash-pit *e* is situated under the grate *h* in all the types of boilers shown here.

The new feature in all the three boilers shown in the drawings is that the products of combustion, after having passed from the combustion chamber *d* down through the flues *k* behind the furnace of the boiler, are forced to pass forward to the front part of the boiler through the horizontal flues *l* situated below the ash-pit between the sections and therefore in the water space of the boiler, the said flues *l* forming the prolongation of the flues *k*. It will be seen that the flues *k* as well as their prolongations *l* can be cleaned from the front of the boiler through cleaning doors *f* fitted on the boiler below the ash-door. By causing the combustion products to pass forward to the front part of the boiler, through flues located in the water space below the ash-pit, the following objects are obtained in a very easy manner, firstly the way, through which the combustion products have to pass through the boiler, is sufficiently long for the boiler to give a good efficiency relatively to the fuel burned, secondly all the flues between the sections can be cleaned from the front of the boiler and thirdly the lower part of the sections is of use not only by absorbing the heat that is radiated downward from the grate *h*, thereby preventing the grate from getting too hot, but also in an effective manner by cooling down the smoke that passes with great velocity through the horizontal flues *l* between the sections. Thus the horizontal flues *l* below the ash-pit make it possible to utilize the surface of the sections to its

greatest extent for cooling down the products of the combustion, and the weight of the sections is therefore reduced by aid of the said flues *l* to the least possible in proportion to the total heating surface of the sections. But when the weight of a cast-iron boiler is reduced, the cost of manufacturing it is pretty nearly reduced in the same ratio and therefore boilers having flues which are brought forward to the front part of the boilers as described above, will be very cheap to manufacture in proportion to the size of their heating surface. Furthermore the heating surface of the sections is made very effective by means of the flues *l* in such a manner that the heating power of the fuel will be utilized as much as possible. This is the result of the additional length imparted to the flues by means of the forwardly directed horizontal portions *l*, compared with boilers, which are not so fitted with these flues *l* but have the down going flues *k* discharging directly into the main exit flue below or behind the boiler. To understand this it must be remembered that the heating surface of a boiler is chiefly a product of the length of the flues and the circumference of their sections. According to this, it will be seen that if a certain area of heating surface is to be obtained and the length of the flues is increased then their section can at the same time be diminished if the sectional area of the flues be not reduced more than is advisable for ordinary chimney draft. But the more the area of the section of the flues is diminished the greater will the velocity of the smoke be in the flues, and the more intense will the contact be between the smoke and the interior surface of the flues (the heating surface) thus enabling the boiler to absorb more heat from the smoke. Furthermore for hot water boilers it is of great importance, for cooling down the smoke and for the efficiency of the boiler, that the horizontal flues *l* be situated in the lower part of the boiler where the water is coldest.

For boilers, according to Fig. 1 and Fig. 2 the smoke is gathered from all the flues *l* in the main flue *m* below the boiler, this main flue *m* being supplied with a smoke exit *g*. In order to enable the smoke in the main flue *m* to give off as much heat as possible to the boiler, the intermediary sections *b* can be provided with projections *n* on their lower surfaces.

Fig. 3 and Fig. 4 show boilers differing from those shown in Fig. 1 and Fig. 2 in so far that the height of the boiler sections below the ash-pit is so great that there is not only room for the forwardly going flues *l* between the said sections but also room under them for the backwardly going flues *o*.

From Fig. 3 it will be seen how the flues

o can be prolonged vertically upward as flues p located behind the flues k until they discharge into a main flue q with smoke exit g. Of course, the ascending flues p can be omitted, it being possible to place the flues q at the same height as the flues o. As can be seen from Fig. 3 it will in all cases be possible for all the flues located between the sections to be cleaned through the cleaning doors f on the boiler front.

Fig. 5 and Fig. 6 show a hot water boiler for which the said invention has come into use. In these figures is shown a special arrangement of a smoke exit flue from the main flue m, the smoke instead of passing directly from the flue m to the chimney first passes up along the rear wall of the boiler through the exit flue r, with the result that the rear side of the sections will serve as a heating surface just as well as their bottom. This arrangement can of course also be used for boilers as shown in Fig. 1 and Fig. 3.

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

1. In a sectional boiler for heating water or generating steam in combination a furnace with grate and ash-pit, water containing boiler sections being rightangled to the front wall of the boiler and having on their side surfaces projecting parts forming flues between the boiler sections, said sections stretching out behind and below said furnace and ash-pit, flues descending behind the said furnace, flues located between the boiler sections and prolonging said descending flues forwardly to the front wall of the boiler below the ash-pit of the furnace a smoke exit from the boiler, and smoke flues connecting the said forwardly going flues with the said smoke exit.

2. In a sectional boiler for heating water or generating steam in combination a furnace with grate and ash-pit, water containing boiler sections being rightangled to the front wall of the boiler and having on their side surfaces projecting parts forming flues between the boiler sections, said sections stretching out behind and below said furnace and ash-pit, flues descending behind the said furnace, flues located between the boiler sections and prolonging said descending flues forwardly to the front wall of the boiler below the ash-pit of the furnace a smoke exit from the boiler, smoke flues connecting the said forwardly going flues with the said smoke exit and cleaning doors located on the

front wall of the boiler giving access to the said forwardly going flues.

3. In a sectional boiler for heating water or generating steam in combination a furnace with grate and ash-pit, water containing boiler sections being rightangled to the front wall of the boiler and having on their side surfaces projecting parts forming flues between the boiler sections, said sections stretching out behind and below said furnace and ash-pit, flues descending behind the said furnace, flues located between the boiler sections and prolonging said descending flues forwardly to the front wall of the boiler below the ash-pit of the furnace backwardly going flues located between the boiler sections below the said forwardly going flues and leading from the front wall of the boiler to its rear wall, means for connecting the said forwardly going flues with the said backwardly going flues a smoke exit from the boiler, and smoke flues connecting the said backwardly going flues with the said smoke exit.

4. In a sectional boiler for heating water or generating steam in combination a furnace with grate and ash-pit, water containing boiler sections being rightangled to the front wall of the boiler and having on their side surfaces projecting parts forming flues between the boiler sections, said sections stretching out behind and below said furnace and ash-pit, flues descending behind the said furnace, flues located between the boiler sections and prolonging said descending flues forwardly to the front wall of the boiler below the ash-pit of the furnace backwardly going flues located between the boiler sections below the said forwardly going flues and leading from the front wall of the boiler to its rear wall, means for connecting the said forwardly going flues with the said backwardly going flues a smoke exit from the boiler, smoke flues connecting the said backwardly going flues with the said smoke exit and cleaning doors located on the front wall of the boiler giving access to the said forwardly going flues and the said backwardly going flues.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

ANDERS BORCH RECK.

Witnesses:

A. SCHMIDT,
O. JACKUTY.