

A. SCHROEDER.

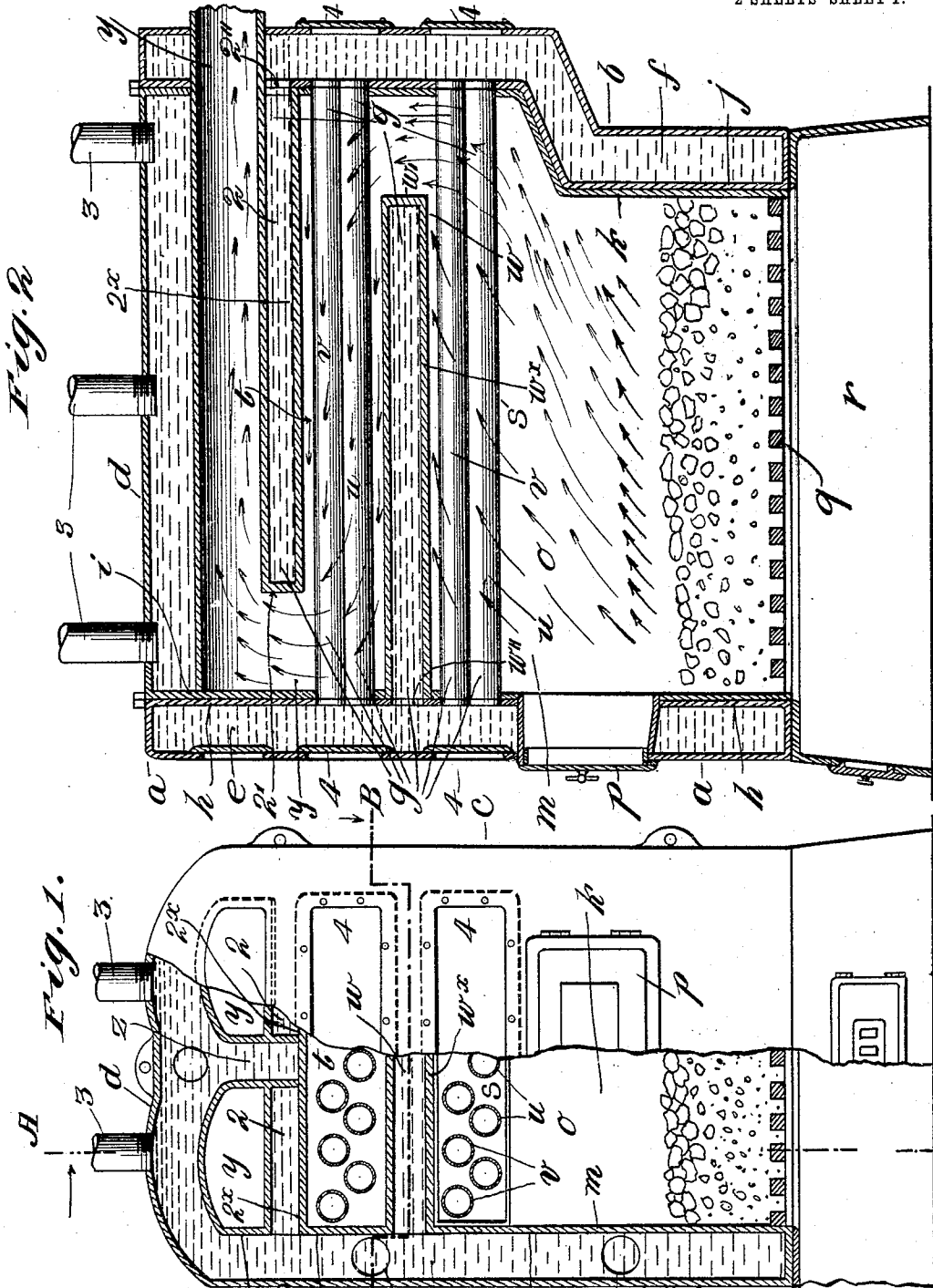
FURNACE.

APPLICATION FILED JUNE 13, 1911.

1,041,889.

Patented Oct. 22, 1912.

2 SHEETS—SHEET 1.



Witnesses:
M. Hamilton
M. Reimer

Inventor
Anton Schroeder
 By his Attorney
James Hamilton

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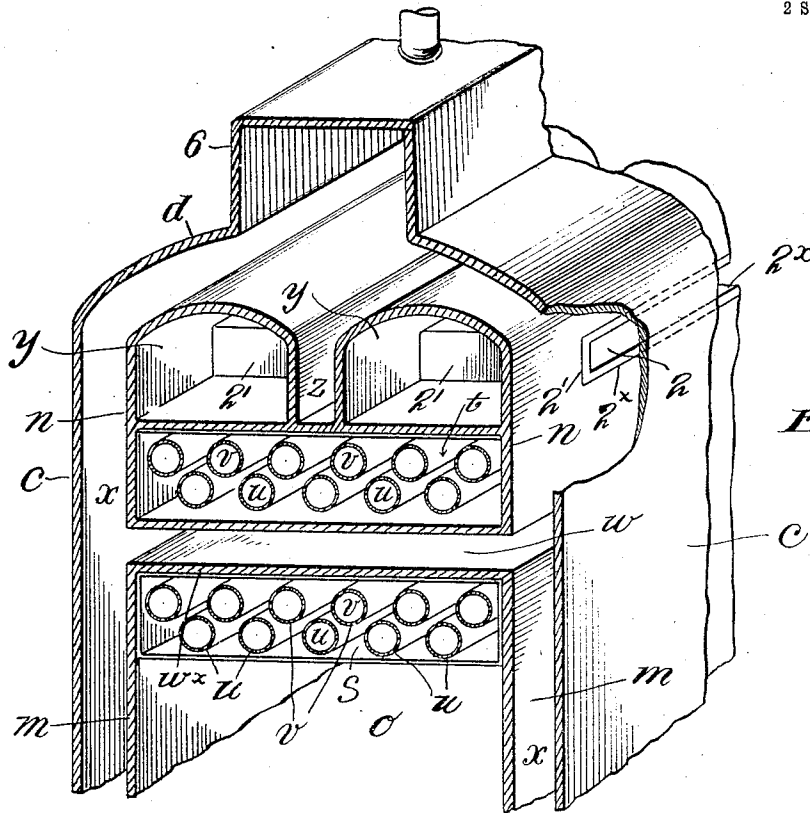
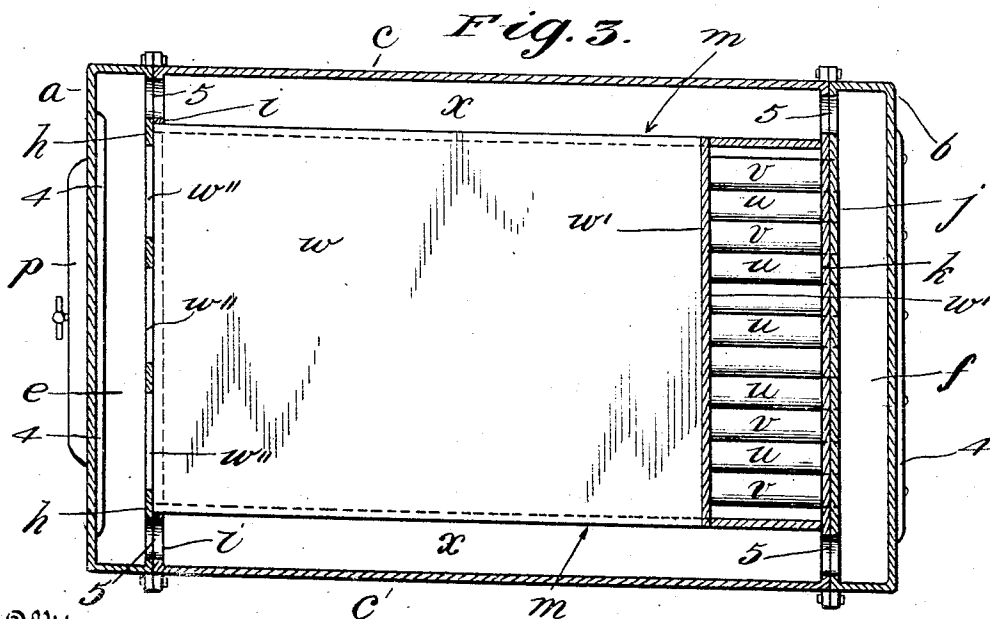


Fig. 4.



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UNITED STATES PATENT OFFICE.

ANTON SCHROEDER, OF BELLEVILLE, ILLINOIS.

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1,041,889.

Specification of Letters Patent.

Patented Oct. 22, 1912.

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To all whom it may concern:

Be it known that I, ANTON SCHROEDER, a citizen of the United States, residing at Belleville, in the county of St. Clair and State of Illinois, have invented certain new and useful Improvements in Furnaces, of which the following is a specification, reference being had to the accompanying drawings.

This invention relates to improvements in furnaces and particularly to improvements in furnaces adapted for use with radiators in heating buildings.

An object of this invention is to provide a furnace which will combine the good features of the sectional furnace with the good features of the water-tube or tubular furnace.

Another object of this invention is the provision of a furnace of the character just mentioned in which there will be water-space wherever there are hot gases up to the point where the latter leave the furnace,—that is, up to the termination of the last flue.

A third object of this invention is to provide a furnace of the character just mentioned with increased boiler heating-surface without increasing the size of the furnace.

A fourth object of this invention is the provision in a furnace of the character just mentioned of a path for the heated gases which will insure that the latter will give up to the water a maximum proportion of their heat, whereby the efficiency of the boiler will be increased.

A fifth object of this invention is the provision of means for insuring a complete circulation of the water between the different sections of the boiler.

A sixth object of this invention is the provision of a furnace of the type just mentioned which will be equally well suited for use with a steam-heating system or with a hot-water heating system.

Other features of this invention will be pointed out in the description which follows.

In the drawings illustrating the principle of this invention and the best mode now known to me of applying that principle, Figure 1 is a front elevation of my new furnace, partly in section; Fig. 2 is a section on the line A--A of Fig. 1; Fig. 3 is a sec-

tion on the line B--B of Fig. 1; and Fig. 4 shows in perspective view my new furnace adapted for use with a steam-heating system and with the front broken away and parts shown in section for sake of clearness.

The shell of the furnace consists of the front wall *a*, the rear wall *b*, the sides *c* and the top *d*. The water-space within this outer shell is divided into three sections namely, the front water-space or section *e*, the rear water-space or section *f* and the middle water-space or section *g*. At the front of the furnace and within the outer shell there extends transversely thereof a wall *h* which is the rear wall of the front water-space *e*; and to this transverse wall *h* there is suitably fastened the transverse wall *i*, which is the front wall of the middle water-space *g*. An entirely similar construction is found at the rear of the furnace where the transverse wall *j* is the front wall of the rear water-space *f* and the transverse wall *k* is the rear wall of the middle water-space *g*, the walls *j*, *k* being suitably fastened together. The lengthwise extending walls *m*, *n* form the lateral or side wall of the middle section *g*. Speaking generally, it may be said that the front water-space *e* and the rear water-space *f* extend transversely of the furnace, while the water-spaces of the middle section *g* extend lengthwise of the furnace. The latter is provided with the usual fire-box *o*, the fire door *p* therefor, the grate *q* and the ash-pit *r* below the same. In the particular embodiment of this invention shown in the accompanying drawings, there are two sets *s*, *t* of water tubes; but it is obvious that the number of sets of water tubes may be varied to meet the requirements of the particular installation in hand. The lower set *s* of water tubes is arranged just above the fire box *o* and consists of two rows arranged one above the other, the tubes *u* of the lower row being staggered with relation to the tubes *v* of the upper row. Hence, the hot gases, which rise from the fuel-bed, will, in passing between the tubes *u*, be forced to divide and to strike the tubes *v* of the upper row. These water tubes *u*, *v*, extend lengthwise or from end to end of the middle section *g* and communicate with the front water-space *e* at their front ends and with the rear water-space *f* at their rear ends.

The arrangement of the upper set *t* of water tubes is entirely similar to that of the lower set *s* and need not be further described.

Between the sets *s*, *t* of water tubes there is mounted a shallow horizontal box-like section *w* which extends from side to side of the middle section *g* and which is entirely open at its sides, and, therefore, communicates most freely with the lateral water-spaces *x* of this section *g*. The horizontal box-like section *w* is closed at its rear end *w'* but it communicates through three holes *w''* with the front water-space *e*. As is best shown in Figs. 2 and 3, this rear wall *w'* is separated by a substantial interval from the rear wall *k* of the middle section, whereby a passage is provided for the hot gases. Above the upper set *t* of water-tubes are the two flues *y* between which is a water-space *z*. Extending into each of the flues *y* is a shallow box-like horizontal section 2 the front ends 2' of which are closed and the rear ends of which communicate through holes 2'' with the rear water-space *f*. At its outside (or the side next to a side-wall of the shell of the furnace), each box-like section 2 is open to one of the lateral water-spaces *x* of the middle section *g* but on its opposite side or inner side it is closed by the inside wall of the flue *y* in which it lies. Suitable pipes 3 are provided for the circulation of the water to and from the radiators. The front and rear walls *a*, *b* are provided with suitable panels 4 opposite the ends of the water tubes. When the panels 4 are removed, access is obtained to the interior of the shell of the furnace to permit the setting and rolling of the tubes and for the repair thereof. After the tubes have been set and rolled or a defective tube replaced by a new one, these panels 4 may be replaced and screwed up tight to the faces of the furnace and, when so screwed up tight, the panels are, of course, watertight. The heated products of combustion rise from the fuel bed in the fire-box *o*, divide and pass between the lower tubes *u* of the lower set *s*. They strike against the tubes *v* of the upper row and again divide and pass between the latter tubes. They then strike the bottom wall *w** of the lower box-like section *w* and pass to the rear of the latter. Since there is a substantial interval between the rear end *w'* of the box-like section *w* and the rear wall *k* of the middle section *g*, the heated gases are free to pass upwardly in the open space thus provided and contact in their upward flow with the rear end *w'* and the rear wall *k* of the middle section *g*. They next strike the upper set *t* of water tubes, pass between the tubes of this upper set in exactly the same manner as they did between the tubes of the lower set *s* and strike against the bottom walls 2* of the shallow box-like sections 2. They next pass

to the front end of the furnace and during their passage contact with the top wall of the lower shallow box-like section *w*, the bottom walls of the upper shallow box-like sections 2 and the tubes *t* between these sections *w*, 2; and since there is an interval between the front walls 2' of the box-like sections 2 and the front wall *i* of the middle section *g*, the gases are free to rise through the open space thus provided and in their upward passage contact with these walls *i*, 2'. The gases now flow over the top of the sections 2 and through the flues *y* to the rear of the latter and thence out to the smoke-stack. From the foregoing description it will be obvious that the heating surface in the combined sectional and water-tube furnace hereinbefore described is greater than it would be, were the furnace merely sectional and that the addition of the water-tubes makes the heating conditions much better. The heated products of combustion divide upon striking the lower row of tubes of each set and cannot possibly escape without striking the upper tubes of each set. Again the products of combustion strike against the bottom of the box-like sections *y*, 2 and flow over their closed ends and top walls. Thus, wherever there are heated gases in the furnace there is also water-space, until the termination of the last flue. During their passage from rear to front of the furnace, these hot gases will contact with the upper set *t* of water tubes, with the top wall of the lower box-like section *w* and the bottom walls of the upper box-like sections 2.

The circulation of the water is complete, as will be obvious from the foregoing description. The water-tubes very effectually connect the front water-space *e* and the rear water-space *f* and create a vigorous circulation of the water; and these water-spaces *e*, *f* communicate with the lateral water-spaces *x* of the middle section *g* (Fig. 4) by means of holes 5 formed in the walls separating the middle section from the front and rear sections, respectively (Fig. 1). In Fig. 4 the furnace is shown equipped with a steam dome 6.

The capacity or heating surface of the furnace may be increased by increasing the number of sets of tubes *v*, *u*; and it may also be increased by increasing the number of sections *g*, the furnace being enlarged by adding one or more sections *g*. A single section *g* is more easily constructed, of course, than is a larger unit and herein lies a great advantage of the hereinbefore-described furnace. An effective change by way of varying the capacity of the furnace may be made by removing the central section; and the furnace may be restored to its original capacity, of course, by replacing this central section. This removal and replacement of

the central section may readily be effected. Indeed, the central section is the only one necessary to be changed, in order to vary the capacity of the furnace within the limits demanded by the ordinary requirements of use.

I claim:

1. A furnace having a pair of end water-sections; water-tubes connecting said end water-sections; and an intermediate water-section which communicates with one of said end water-sections and which is mounted in proximity to said water-tubes and between the end wall of which and the opposed wall of the other of said end water-sections there is provided a substantial interval for the passage of the products of combustion.

2. A furnace having a pair of end water-sections; water-tubes connecting said water-sections; lateral water-spaces between and communicating with said water-sections; and an intermediate water-section which communicates with one of said end water-sections and with said lateral water-spaces and between the end wall of which and the opposed wall of the other of said end water-sections there is provided a substantial interval for the passage of the products of combustion.

3. A furnace having a pair of end water-sections; a plurality of sets of water-tubes connecting said water-sections; and an intermediate water-section which communicates with one of said end water-sections and which is mounted between said sets of water-tubes and between the end wall of which and the opposed wall of the other of said end water-sections there is provided a substantial interval for the passage of the products of combustion.

4. A furnace having a pair of end water-sections; an intermediate water-section which communicates with one of said end water-sections and between the end wall of which and the end water-section opposed to said end wall there is provided a substantial interval for the passage of the products of combustion; a second intermediate water-section which communicates with one of said end water-sections and between the end wall of which and the end water-section opposed to the last-named end wall there is provided a substantial interval for the passage of the products of combustion; and water-tubes which communicate with said end water-sections and which are mounted between said intermediate water-sections.

5. A furnace having a pair of end water-sections; an intermediate water-section which communicates with one of said water-sections and between the end wall of which and the end water-section opposed to said wall there is provided a substantial interval for the passage of the products of combustion; and a pair of sets of water-tubes

which connect said end sections and between which is mounted said intermediate water-section.

6. A furnace having a pair of end water-sections; a plurality of sets of water-tubes connecting said water-sections; lateral water-spaces between and communicating with said water-sections; and an intermediate water-section which communicates with one of said end water-sections and which is mounted between said sets of water-tubes and between the end wall of which and the opposed wall of the other of said end water-sections there is provided a substantial interval for the passage of the products of combustion.

7. A furnace having a pair of end water-sections; lateral water-spaces between and communicating with said water-sections; an intermediate water-section which communicates with one of said end water-sections and between the end wall of which and the end water-section opposed to said end wall there is provided a substantial interval for the passage of the products of combustion; a second intermediate water-section which communicates with one of said end water-sections and with said lateral water-spaces and between the end wall of which and the wall of the end water-section opposed to the last-named end wall there is provided a substantial interval for the passage of the products of combustion; and water-tubes which connect said end water-sections and which are mounted between said intermediate water-sections.

8. A furnace having a pair of end water-sections; lateral water-spaces between and communicating with said water-sections; an intermediate water-section which communicates with one of said end water-sections and with said lateral water-spaces and between the end wall of which and the end water-section opposed to said wall there is provided a substantial interval for the passage of the products of combustion; and a pair of sets of water-tubes which connect said end sections and between which is mounted said intermediate water-section.

9. A furnace having a pair of end water-sections; a pair of reversely-disposed intermediate water-sections one of which communicates with one of said end water-sections and the other of which communicates with the other of said end water-sections, the end walls of said intermediate water-sections being separated by a substantial interval from the end water-sections opposed to them to permit the passage of the products of combustion; and water-tubes which are mounted between said intermediate water-sections and which connect said end water-sections.

10. A furnace having a pair of end water-sections; lateral water-spaces between and

communicating with said end water-sections; a pair of reversely-disposed intermediate water-sections which communicate with said lateral water-spaces and one of which communicates with one of said end water-sections and the other of which communicates with the other of said end water-sections, the end walls of said intermediate water-sections being separated by a substantial interval from the end water-sections opposed to them to permit the passage of the products of combustion; and water-tubes which are mounted between said intermediate water-sections and which connect said end water-sections.

11. A furnace having a pair of end water-sections; lateral water-spaces between and communicating with said water-sections; a flue; an intermediate water-section which is mounted in the latter and which communicates with one of said end water-sections and with said lateral water-spaces and between

the end wall of which and the end water-section opposed to said wall there is provided a substantial interval for the passage of the products of combustion; and water-tubes which connect said end sections.

12. A furnace having a pair of end water-sections; a flue; an intermediate water-section which is mounted in the latter and which communicates with one of said end water-sections and between the end wall of which and the end water-section opposed to said wall there is provided a substantial interval for the passage of the products of combustion; and water-tubes which connect said end sections.

Signed at Belleville, Illinois, this 10 day of June, A. D. 1911, in the presence of the two undersigned witnesses.

ANTON SCHROEDER.

Witnesses:

CONRAD GEIL,
EDW. LEOPOLD.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."