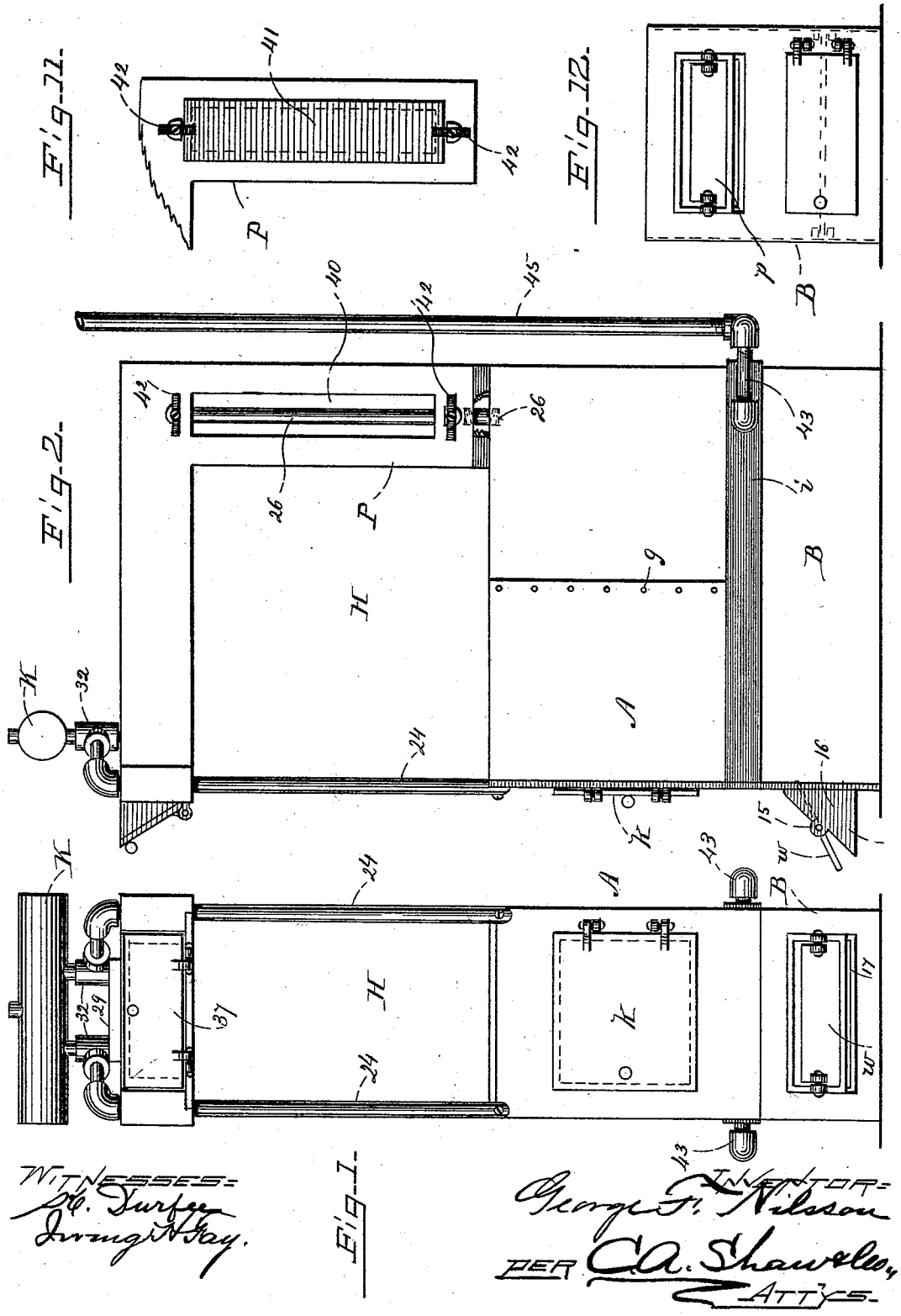
(No Model.)

3 Sheets—Sheet 1.

G. F. NILSSON.

STEAM BOILER.

No. 517,147. Patented Mar. 27, 1894.



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(No Model.) 3 Sheets—Sheet 2.

G. F. NILSSON.

STEAM BOILER.

No. 517,147. Patented Mar. 27, 1894.

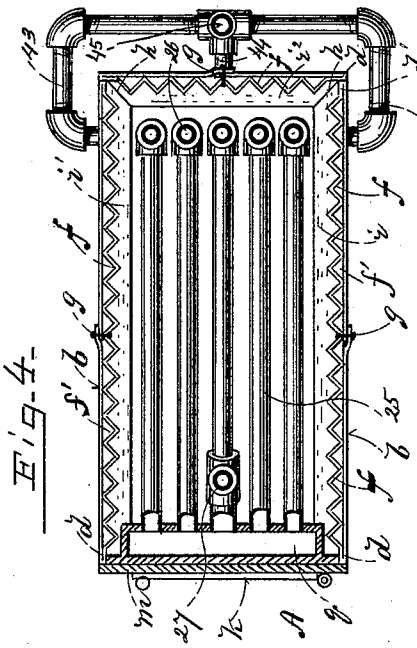

Fig. 4.

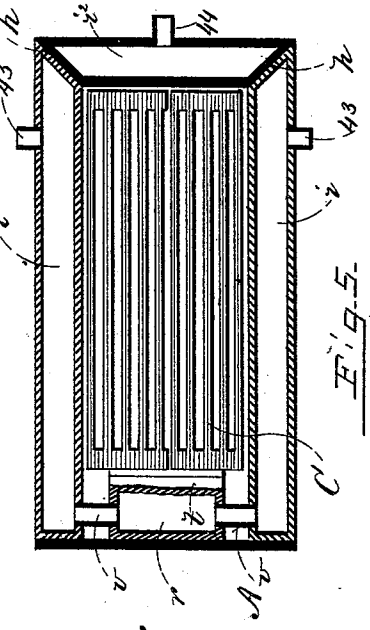

Fig. 5.

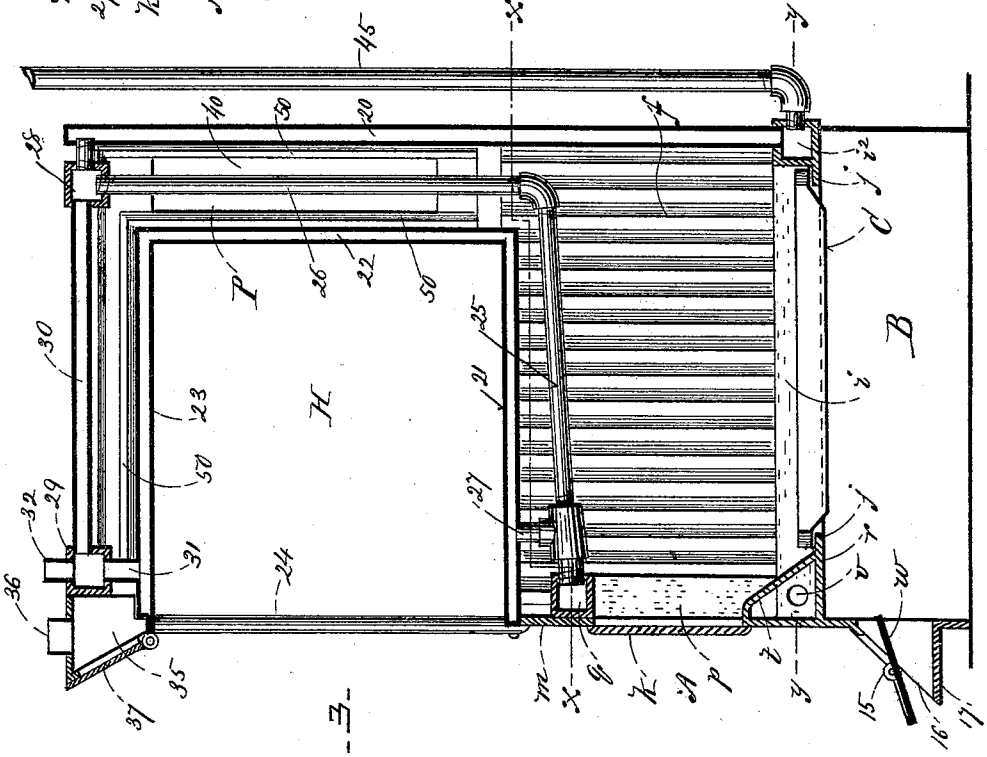

Fig. 3.

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(No Model.) 3 Sheets—Sheet 3.

G. F. NILSSON.

STEAM BOILER.

No. 517,147. Patented Mar. 27, 1894.

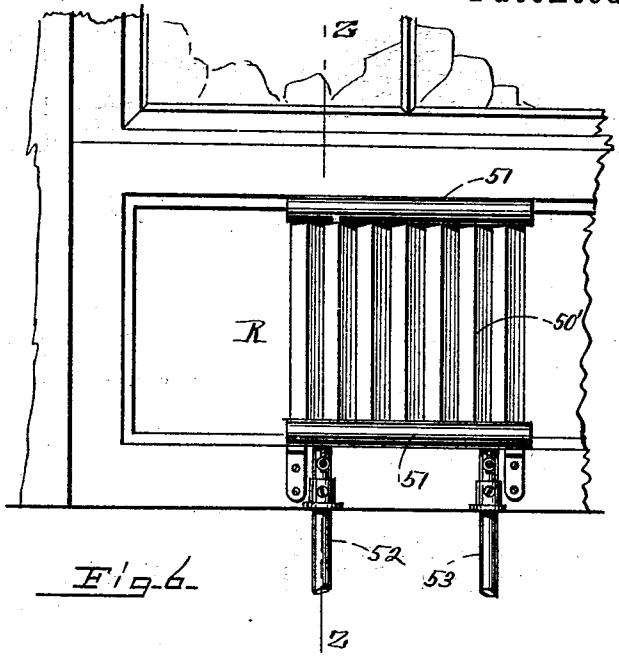

Fig-6-

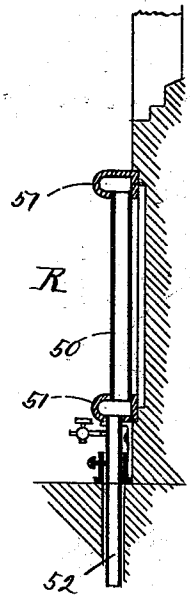

Fig-7-

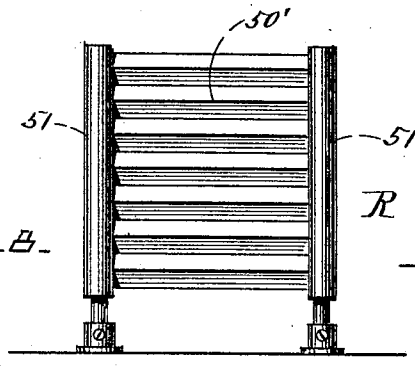

Fig-8-

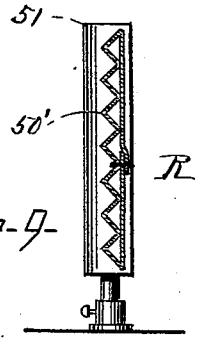

Fig-9-

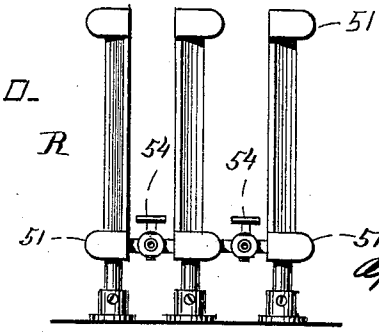

Fig-10-

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UNITED STATES PATENT OFFICE.

GEORGE F. NILSSON, OF WHITINSVILLE, MASSACHUSETTS.

STEAM-BOILER.

SPECIFICATION forming part of Letters Patent No. 517,147, dated March 27, 1894.

Application filed July 20, 1891. Serial No. 400,038. (No model.)

To all whom it may concern:

Be it known that I, GEORGE F. NILSSON, of Whitinsville, in the county of Worcester, in the State of Massachusetts, have invented certain new and useful Improvements in Steam-Boilers, of which the following is a specification.

The object of the invention is to construct a steam boiler which is simpler, cheaper and more effective than the boilers now in ordinary use.

The invention consists in certain novel features hereinafter fully set forth and claimed, whereby a maximum amount of steam is obtained from the fuel consumed.

Figure 1 represents a front elevation of my improved steam boiler. Fig. 2 represents a side elevation thereof. Fig. 3 represents a central vertical section. Fig. 4 represents a horizontal section taken on line *x*—*x* in Fig. 3. Fig. 5 represents a like view taken on line *y*—*y* in Fig. 3. Fig. 6 represents an elevation of a radiator connected with this boiler. Fig. 7 represents a vertical transverse section of the radiator taken on line *z*—*z* in Fig. 6. Fig. 8 represents a side elevation of a radiator in which the circulation is horizontal. Fig. 9 represents a vertical section thereof. Fig. 10 represents an end elevation of a series of connected radiators. Fig. 11 represents a side elevation of a part of one of the vertical flues of the boiler showing the door in position. Fig. 12 represents a front elevation of the ash-pit section provided with two doors.

Like letters and numerals of reference indicate the same parts in all the figures.

This invention relates especially to steam boilers for steam and hot water heating purposes.

In the drawings A represents the fire box, B the ash-pit, and C the grate. The fire box is preferably rectangular in form and each wall thereof is preferably constructed of a single sheet of sheet metal, *b*, bent upon itself at, *d*, and corrugated at, *f*, said sheet being extended the required length and bent again upon itself at, *d'*, and extended with a smooth surface to the point of beginning, where the meeting ends are riveted together at, *g*. These walls are joined by miter joints *h*, as shown in Fig. 4. Below the corrugated faces, *f*, each wall is provided with a rectangular chamber, *i*, *i'*, i^2, respectively, said chambers having an inwardly projecting lip or flange, *j*, upon which the grate C rests, as is best shown in Fig. 3. These chambers *i*, *i'*, and i^2 extend around the top of the ash-pit B.

A door, *k*, opens through the front wall, *m*, into the fire box A. Vertical rectangular pipes, *p*, are disposed at opposite sides of the door, *k*, and serve to connect the front ends of the chambers *i*, *i'*, with a horizontal pipe, *q*, arranged above the door, *k*. A water chamber, as *r*, having an inwardly inclined wall, as *t*, is formed below the door, *k*, and is connected by ducts, as *v*, with the chambers *i*, *i'*, as shown in Fig. 5.

The corrugations, *f*, with the outer wall, *b*, form small water spaces *f'*, which open at their lower ends into the water chambers *i*, *i'*, and i^2 and at their upper ends into a water jacket 21 arranged at the top of the fire box and extending over a portion thereof. This construction is more compact in form than the separate tubes heretofore in use and can be constructed more cheaply, the corrugations and the outer facing, *b*, all being made from a single sheet of metal. These corrugations also give an immense heating surface and no water jacket is required on the outside thereof as is necessary in most corrugated cast-iron casings.

A vertically arranged thin water jacket, as 20, opens into the top of the chamber *i*. This water jacket 20 forms the back of the boiler and is extended above the fire box. Pipes 43 tap the side chambers *i*, *i'*, and a similar pipe 44 taps the rear chamber i^2. A vertical return pipe 45 connects said pipes 43 and 44 as is shown in Figs. 4 and 5.

The water jacket 21 disposed at the top of the fire box unites at its rear end with a vertical water jacket 22 which connects at its upper end with a water jacket 23 disposed near the top of the structure. This water jacket 23 is supported at its outer end by standards, as 24, which are attached at their lower ends to the front wall, *m*, of the fire box. The inner walls of the water jackets 20, 21, 22, 23, and 30 are corrugated in like manner as the side walls of the fire box as indicated by shade lines 50, in Fig. 3. By

this arrangement of the water jackets 21, 22 and 23 an open space, as H, is formed above the fire box. This space H is the result of my particular arrangement of jackets and pipes which is a salient feature. By directing the water pipes, as described, vertically and horizontally forming the open space H I am enabled to direct the flame in a thin sheet over the water pipes for an extended distance, the flame being directed against the jackets on both sides and against both sides of the pipes, 26, forming an extended heating surface. The space H may be closed and form an oven if desired.

The ash-pit B is provided with a door, *w*, pivoted centrally on a horizontal axis, 15, and counterbalanced to swing in an inclined mouth, 16. This mouth 16 is provided with a horizontal lip, 17, in its lower portion, as best shown in Fig. 3. This door serves to regulate the draft through the ash-pit and under the grate. When adjusted in any given open position it remains in that position and affords two draft openings, one above and one under it.

A rectangular pipe, *q*, is arranged above the fire box door *k*, and is tapped by a series of pipes 25, which incline upwardly toward the rear of the fire box. A series of vertically arranged pipes 26 is connected with the inner ends of said pipes 25 and extends upwardly between the water jackets 20 and 22. One of the pipes 25 is connected by a branch pipe 27 with the water jacket 21. The tops of the pipes 26 open into a rectangular chamber 28, as is shown in Fig. 3.

Over the forward end of the water jacket 23 a rectangular chamber 29 is disposed which is connected by a pipe 31 with the water jacket 23 and by a horizontally arranged jacket 30 with the chamber 28. The chamber 29 is tapped by vertical ports 32 upon which a steam dome K is mounted.

The space between the jackets 20, 22, 30 and 23 forms a flue P leading from the fire box, said flue opening into a chamber 35 from which a chimney 36 leads. A hinged door 37 closes the front of the chamber 35 and affords space for cleaning the horizontal portion of the flue. In the side walls of the flue, P, vertical cleaning openings 40 are formed, said openings being closed by detachable doors 41 held by buttons 42 as shown in Fig. 2.

In Figs. 6 and 7 radiators R are shown, which are constructed in like manner as the boiler walls from a single sheet of metal folded upon itself, one face thereof being corrugated at 50′. At the ends of the corrugations transverse pipes 61 connect the supply and discharge 52 and 53 from the boiler opening into opposite ends of the lower pipe 51. The corrugations may be arranged horizontally and the pipes 51 vertically in the form shown in Figs. 8 and 9 or the corrugations may be arranged vertically and the pipes 51 horizontally as shown in Figs. 6 and 7.

The radiators may be arranged in series as in Fig. 10, and the lower pipes 51 connected by suitable couplings 54. Constructed in this form the radiators are greatly lessened in size or number and a largely increased radiating surface afforded by the corrugations.

In the use of my improved boiler the fire passes from the box A across the horizontal bottom thereof up through the vertical portion of the flue P and horizontally again across the top of the boiler making practically a length of flue in contact with the water spaces of over six feet to the stack. Whereas, if the space H, were done away with and the pipes run vertically up through said space the play of the fire from the fire box would only strike about two feet of heating surface. Whereas by drawing the fire back into the rear of the casing then vertically and horizontally forward I get an extremely large surface compared with the size of the boiler even though the space H were waste space and not utilized as an oven. And again this particular form is extremely compact enabling me to put the boiler into spaces which would be substantially impossible were the same amount of heating surface disposed in any other arrangement. The disposition of the chamber *r* with its inclined wall *t*, at the front of the fire box enables the fire to be raked by the ordinary implements.

The cleaning out doors 37 and 41 occupy very little space and the rectangular form of the flue enables all parts of the heating surface to be readily reached.

It will be seen that my improved boiler contains a very small amount of water in comparison with boilers of common construction only that amount being employed which is necessary for perfect circulation and the protection of the surface exposed to the heat. These qualities render the boiler economical to run, the outside radiator being greatly reduced and the heating surface enlarged by the peculiar formation of the jackets.

By removing the steam-dome the boiler may be utilized as a hot water heater, the particular form of radiator described being especially applicable for this purpose.

I claim as my invention—

1. A water chamber consisting of a plain wall and a corrugated wall forming a plurality of channels, said walls being composed of a single piece of sheet metal folded upon itself, the meeting edges thereof being overlapped and chambers into which the ends of said channels open.

2. A sectional water jacket for fire boxes, each section comprising an inner and an outer wall both composed of a single sheet of folded sheet metal, the meeting ends of which are overlapped and riveted, the inner wall being corrugated, and the several sections being united at their ends by miter joints, substantially as described.

3. In a steam generator, the combination of a fire box provided with the flue P, a pipe *q* at the front of the fire box, a pipe 28 at the

top of said flue, and bent pipes 25 extending through the upper part of the fire box and through said flue and connected with said pipes q and 28.

4. In a steam generator, the combination of a fire box provided with the flue P, a pipe q at the front of the fire box, a pipe 28 at the top of said flue, and bent pipes 25 extending through the upper part of the fire box and through said flue and connected with said pipes q and 28, and water jackets connected with said pipes.

5. In a boiler the fire box, A, having the corrugated water jacket forming walls therefor and extended to form the flue P, in combination with the base pipes i, i', and i^2 and the circulation pipes 25 and 26, connecting sections of said jackets and disposed within said box and flue, substantially as described.

6. In a boiler, the ash-pit, and base pipes i, i', i^2, and chamber r, mounted thereon, in combination with the grate, the fire box comprising the corrugated water jacket opening into said pipes and forming a wall therefor, the angular flue formed by extension of said jacket, the circulation pipes and steam dome, arranged substantially as described.

GEORGE F. NILSSON.

Witnesses:
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O. M. SHAW.