(No Model.) 2 Sheets—Sheet 1.

F. SCHERR.

STEAM BOILER.

No. 336,441. Patented Feb. 16, 1886.

Fig: 1.

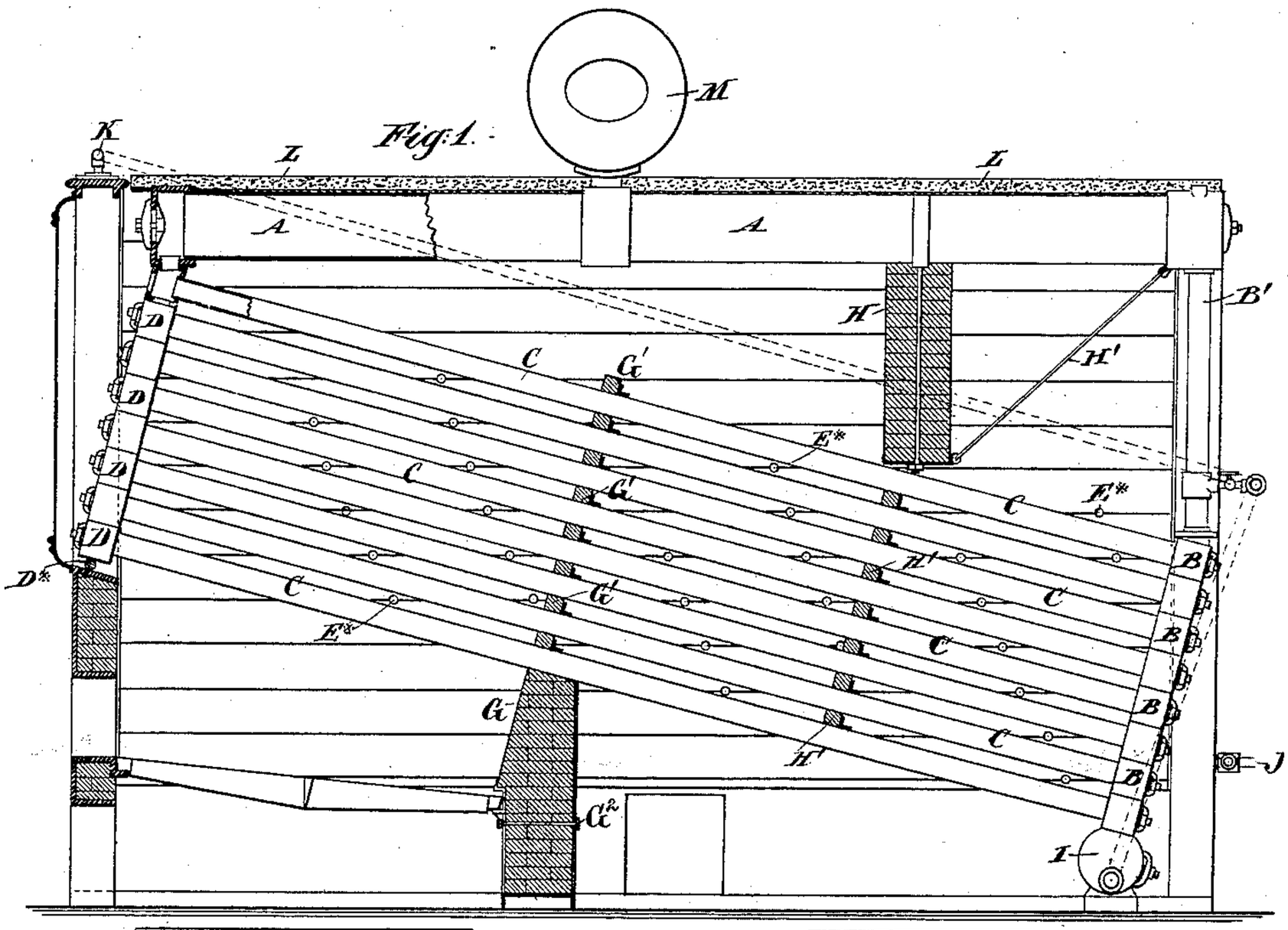


Fig: 2.

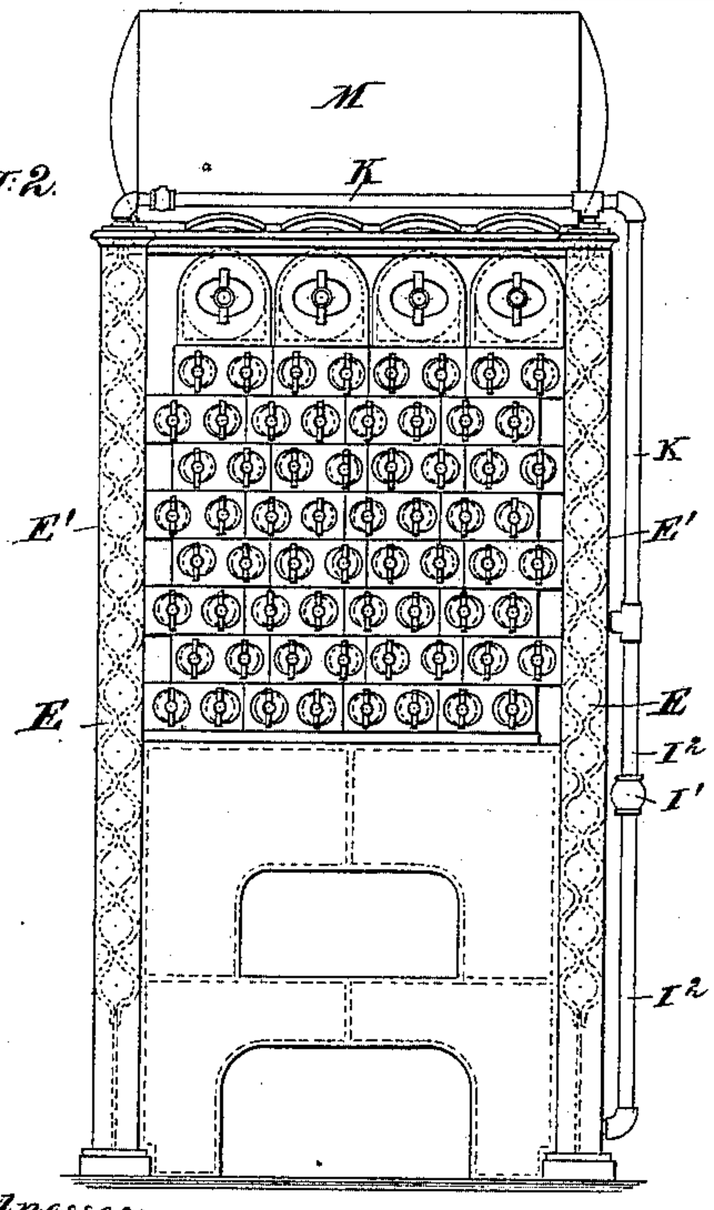
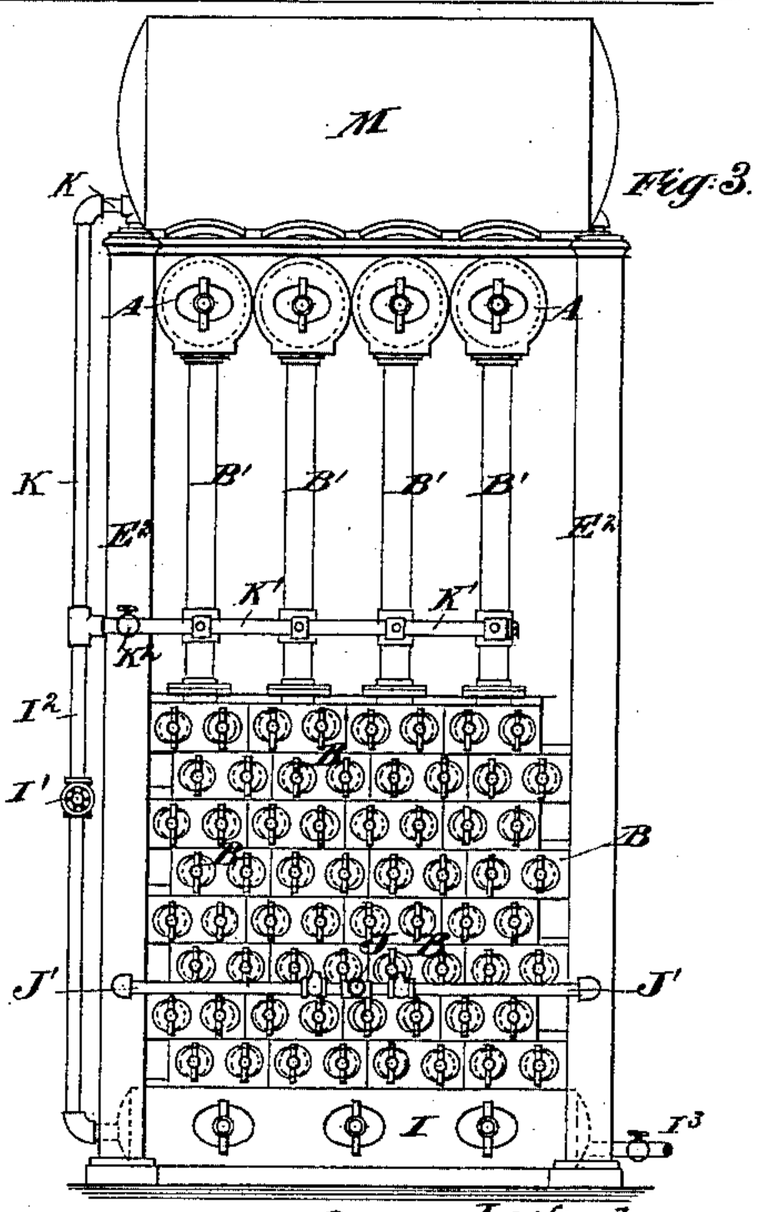


Fig: 3.



Witnesses:
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M. F. Boyle

Inventor:
Frederick Scherr
by his attorney
Thomas Drew Stetson

(No Model.) 2 Sheets—Sheet 2.

F. SCHERR.

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Fig. 5.

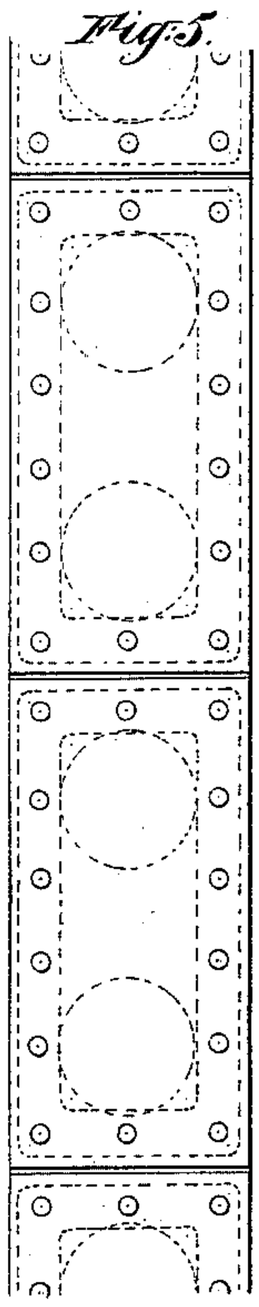


Fig. 4.

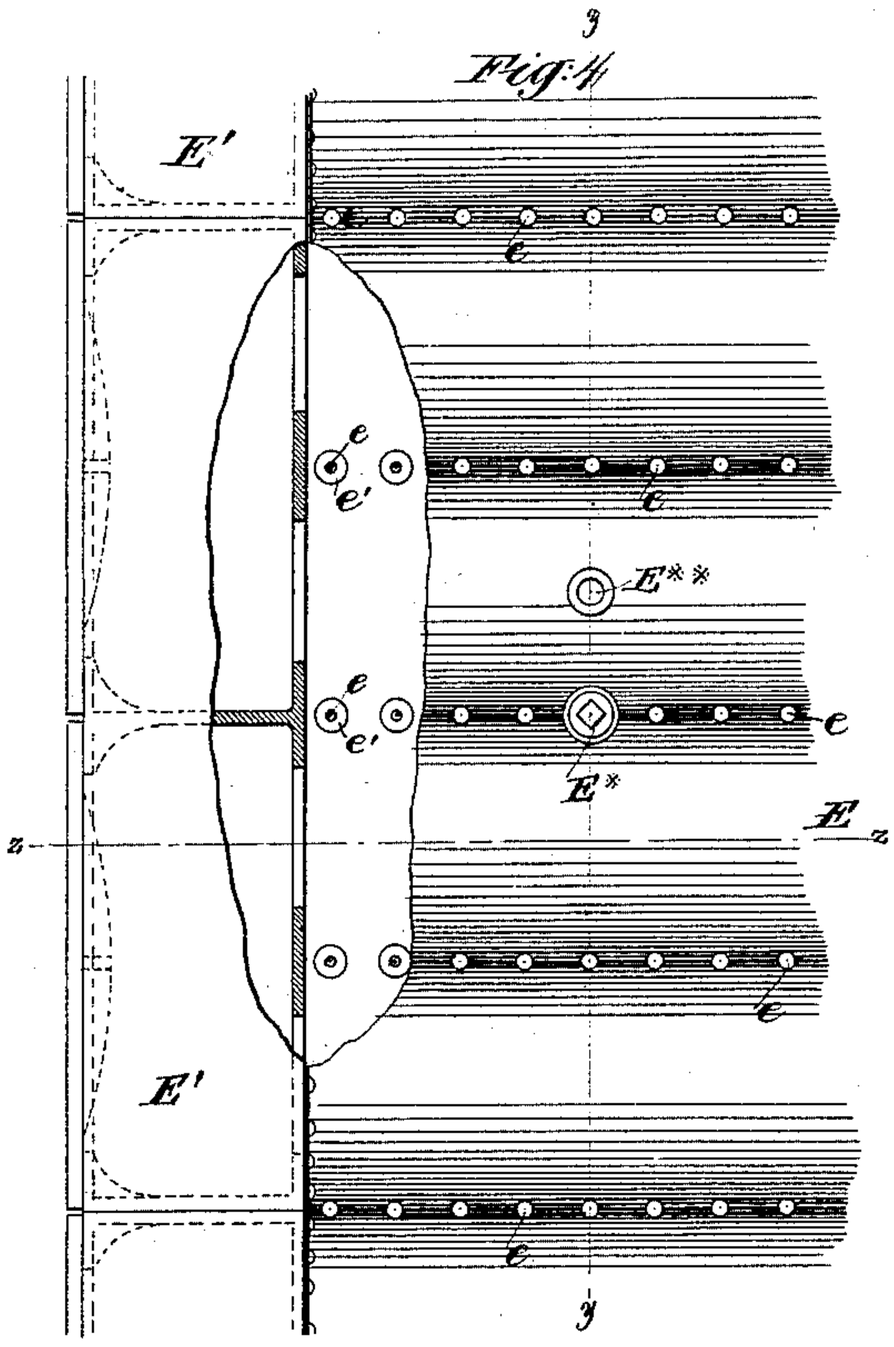


Fig. 6.

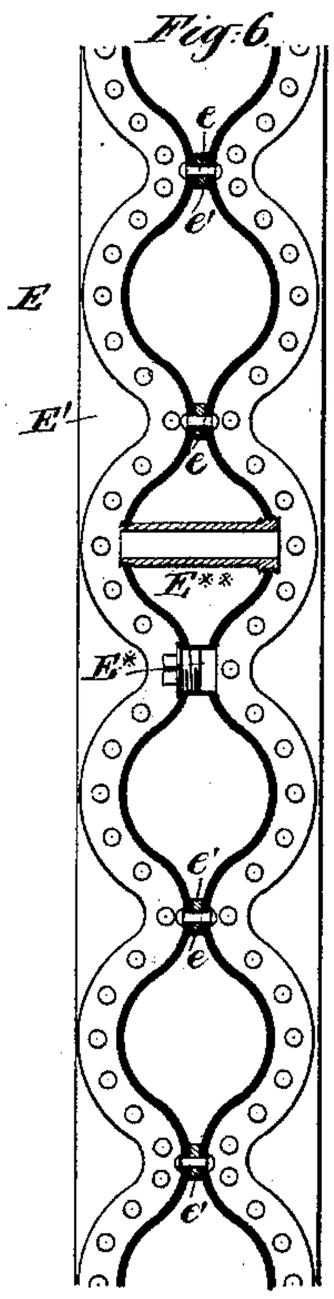


Fig. 7.

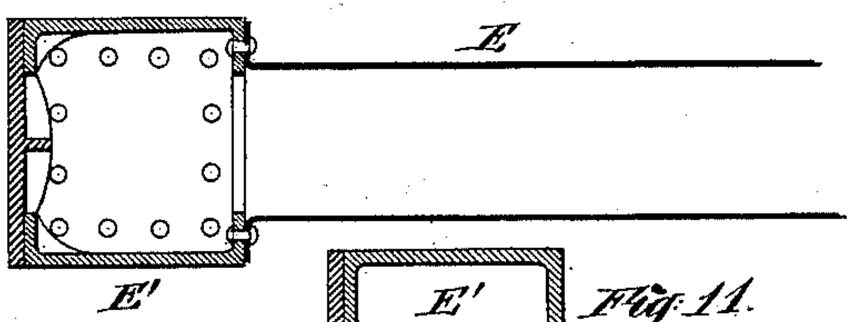


Fig. 10.

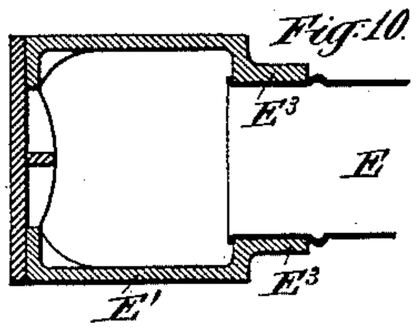


Fig. 11.

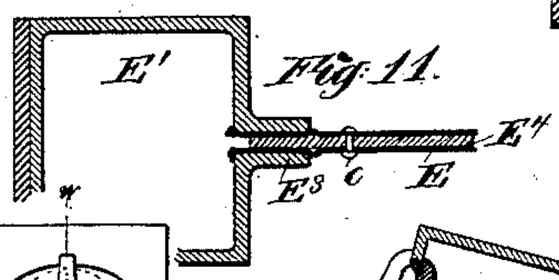


Fig. 8.

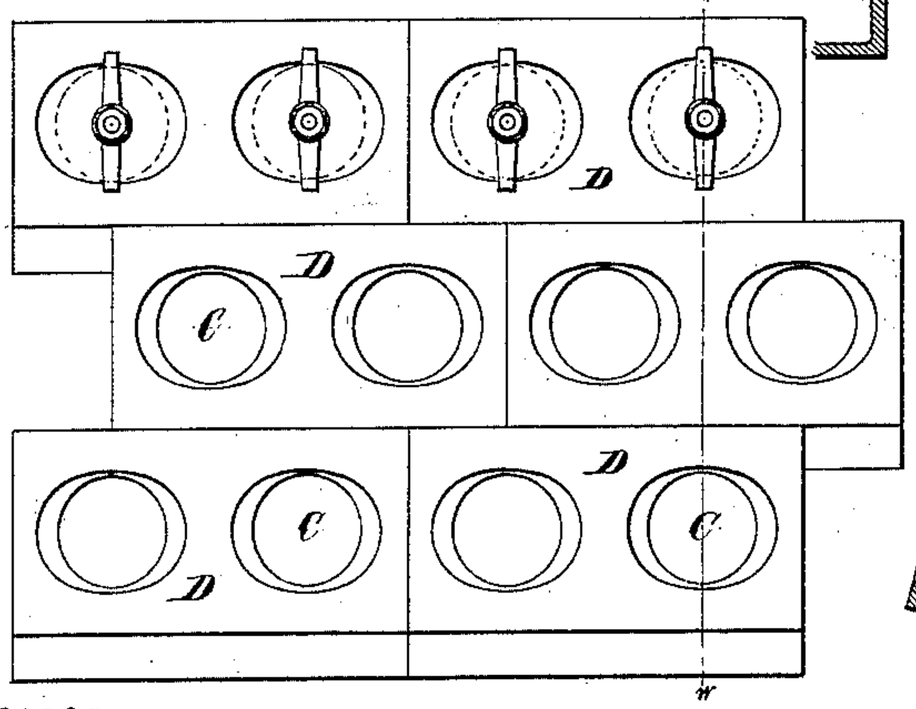
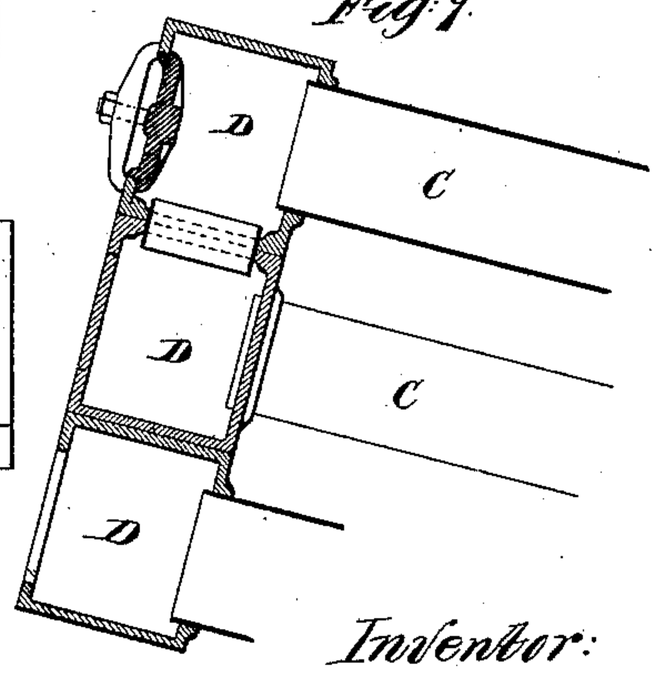


Fig. 9.



Witnesses:
Charles R. Seare,
M. F. Boyle

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by Frederick Scherr
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Thomas Drew Stetson

UNITED STATES PATENT OFFICE.

FREDERICK SCHERR, OF BROOKLYN, NEW YORK.

STEAM-BOILER.

SPECIFICATION forming part of Letters Patent No. 336,441, dated February 16, 1886.

Application filed April 11, 1885. Serial No. 161,886. (No model.)

To all whom it may concern:

Be it known that I, FREDERICK SCHERR, of Brooklyn, Kings county, in the State of New York, have invented certain new and useful Improvements in Steam-Boilers, of which the following is a specification.

My improved boiler is of that general class in which a sufficient drum or steam-chamber is connected with a system of tubes through which the water circulates actively and is exposed to the heat from a furnace arranged to circulate its products of combustion through the spaces between said tubes. I connect the tubes in sections, so that the circulation is complete in each independently of the others, and provide a cross-drum, to which each complete section is independently connected. Each side of the furnace is formed with a water and steam chamber peculiarly corrugated and staid and having but little width or lateral dimensions, while it has great depth and length. I provide a mud-drum extending across the bottom of all the sections and connected independently to each, with provisions peculiarly arranged for blowing out the mud or semi-solid contents which accumulate therein. A covering of brick or other suitable non-conducting material incases the whole. The partitions which deflect the gases on their way from the furnace to the uptake are suspended to the upper portions of the boiler, so that when, from expansion and contraction or any cause, there is a displacement of one part relatively to the casing all the parts tend to move together.

The accompanying drawings form a part of this specification and represent what I consider the best means of carrying out the invention.

Figure 1 is a longitudinal vertical section; Fig. 2, a front view with the front door which covers the front headers removed, and Fig. 3 is a rear view. The remaining figures show certain portion, on a larger scale. Fig. 4 is a side elevation of one of the side chambers, partly in vertical section. Fig. 5 is a corresponding front elevation. Fig. 6 is a vertical section on the line *y y* in Fig. 4. Fig. 7 is a horizontal section on the line *z z* in Fig. 4. Fig. 8 is a front view of a few of the headers, on a larger scale. Fig. 9 is a corresponding vertical section on the line *w w* in Fig. 8. Figs. 10 and 11 show a modification. They are horizontal sections. Fig. 10 corresponds to Fig. 7. Fig. 11 is on a different plane.

The drawings represent the novel parts with so much of the ordinary parts as is necessary to show their relation thereto.

Similar letters of reference indicate corresponding parts in all the figures where they occur.

A A, &c., are large horizontal tubes. They may have a diameter of twelve inches, (more or less.) B are a series of back headers, and B′ vertical pipes connecting them with the back ends of A.

C C, &c., are inclined tubes, and D front headers. All the headers in a vertical row are joined to each other, and the front headers are joined to the front ends of the tubes A by expanded thimbles.

G is the fire-bridge, and G′ a series of fire-bricks of suitable form supported in the spaces between the tubes, so as to practically extend the bridge across the series of tubes C.

H is a hanging bridge, and H′ an extension thereof, down nearly or quite to the bottom of the series of tubes C.

I is a mud-drum extending across the bottom of the back headers, B, and connecting freely therewith.

M is a horizontal cylindrical drum extending across the entire structure, connected, as shown, with each of the tubes A.

E E are peculiarly-constructed side chambers. The two are alike, and the description of one will suffice for both. Each is formed of two plates of strong boiler-iron or soft steel of a quality adapted for flanging, and corrugated horizontally, with their edges flanged outward. The plates are applied together and united by rivets *e*, and interposed thimbles *e′*, arranged in the contractions or throats between the several horizontal channels thus formed, as shown in Figs. 4 and 6, so that the halves are strongly united at each internal bend, and yet held a sufficient distance apart to allow a limited circulation of the contained fluid upward through such spaces. The corrugations may be on a two-inch radius. The spaces between the two sides at the nearest approach may be a half-inch. The rivets *e* may be three inches apart and the thimbles *e′* three-fourths inch in diameter.

The flanged ends of the corrugated plates forming the side walls, E, are riveted to vertical columns E′ at the front, and to corresponding vertical columns E^2 at the back. These columns are peculiarly chambered, and connected by lateral openings with the horizontal channels formed by the corrugations in E. The relation of these parts is shown clearly in Fig. 4.

A chamber in the front column, E′, forms a free communication between the lowest and next adjacent channels in the side wall, E; a chamber in the rear column, E^2, connects between the second channel and the throat; a chamber in the front column, over the one first described, forms a free communication between the third channel and the fourth, and so on to the top.

J is a pipe connecting with the feed-pump, (not represented,) with a transverse pipe, J′, which connects through suitable check-valves with the rear column, E^2, on each side.

K is a pipe connecting with the top of each front column, E′, and, leading in an inclined direction downward and backward, communicates with a pipe, K′, which extends across the back and connects with each of the upright pipes B′.

A steam-pipe, which may be of any ordinary or suitable character and provided with a safety-valve, leads the steam away from the upper portion of the transverse drum M. The grate and furnace-front may be arranged as shown.

K^2 is a valve in the pipe K′, which can be closed at intervals in the act of blowing off, to be described farther on.

I^2 is a pipe which connects from the pipe K to one end of the mud-drum. It is controlled by a valve, I′. I^3 is the blow-off pipe connected to the opposite end of the mud-drum.

L is a non-conducting covering which extends across over the tubes A. It will be understood that felt or other suitable non-conducting covering also protects the drum M and the pipes B′ from the radiation of heat.

E* are blow-holes provided through the spaces between the channels in the side chambers, E. E** are tubes extending transversely across the channels in the side chambers, E. These blow-holes allow the introduction of suitable nozzles, connected by hose or otherwise with the steam-space of the boiler, to blow out ashes and dust, which is liable to accumulate on the several tubes C. The hanging bridge H is suspended to straps, which encompass the several tubes A, and is braced by diagonal bars H′, as shown.

G^2 are braces, which correspondingly contribute to stiffly support the bridge-wall G.

Man-holes and hand-holes are employed as required. Some of these important but well-understood provisions are indicated in the drawings. More may be introduced as required.

Operation: When the boiler is in operation, feed-water is received, either previously heated or not, through the pipes J and J′ into the lowermost chamber in E^2 on each side. The circulation on both sides will be alike. The water flows forward through the lowermost channel in E, upward through the lowermost chamber in E′, rearward through the second channel in E^2, by which I mean the channel above the lowermost chamber, thence upward through the second chamber in E^2, and thence forward again through the third channel in E^2. The feed-water is thus traversed forward and backward through the channels and chambers until it reaches the upper chamber of each front column, E′. From thence it is taken through the pipe K rearward and downward, and is distributed through the transverse pipe K′ into the several upright pipes B′, where the feed-water, now well heated, is allowed to mingle with the general circulation of the boiler. This general circulation is downward through the pipes B′ and rear headers, B, forward and upward through the several inclined pipes C, thence upward through the front headers, D, into the front ends of the large horizontal pipes A. The quantity of water should be such that with the ordinary amount of ebullition these pipes A will be filled partly with water and partly with steam. The entire horizontal section of A is available for separating-surface. The water flows backward through the several pipes A, parting with its steam, and flows downward from the rear ends of A through the vertical pipes B′, receiving the fresh feed-water, and entering again on another circuit. The spaces provided between the several horizontal channels in the side chambers, E, allow a moderate vertical movement of the water across between these several channels. In the extreme cases, where steam may be generated in any part of these side chambers, the steam may rise through these spaces; but the main body of the water will, under ordinary conditions, make the extended circuit described. No steam will ordinarily be made in these parts, the side chambers, E, being utilized mainly or entirely as feed heaters. The steam separated from the water in the pipes A rises into the drum M, and is retained in a dry condition, ready for delivery and use. The mud-drum I holds water in a quiescent condition. It tends to collect the mud, which accumulates in a more or less soft stratum, filling all the lower portion, and in extreme cases filling the entire mud-drum. On operating a suitable valve to open the blow-off pipe, opening the valve I′ and closing the valve K^2, the feed-water is delivered through the pipe J′ into the opposite end of the mud-drum I in a vigorous stream. The effect is to stir up the mud, while the escape from the blow-off pipe induces a gentle downward current of the water from the headers, so that the muddy water will not circulate upward. The effect is to wash out the mud from the mud-drum very rapidly, when the valves may be again restored to their original condition and the

feed-water again directed into the general circulation of the boiler. Cleaning in this manner should be effected at intervals, depending on the quality of the water.

I attach importance to the fact that each tube A is connected with the vertical series of headers B at one end and D at the other end, and with the series of tubes C connecting these headers, thus constituting a complete circulating system independent of the other corresponding sections, while each section receives the feed-water from a common cross-pipe, J′, and delivers its steam into a common cross-drum, M. I can aggregate any required number of sections between a single pair of chambers, E.

I attach importance to the fact that the headers B and D, receiving each two of the tubes C, are set alternately to the right and left to a sufficient extent to give the required joggled positions to the tubes.

The mud-drum rests firmly on the earth, or on a suitable firm foundation. The front headers, D, rest on a roller, D*, which is free to move backward and forward on an inclined way provided under it. This allows the tubes C and the connected tubes A to expand and contract freely. These parts are disconnected from the side chambers, E, and their several attachments, including the top covering and any side covering (not shown) which may be employed to reduce the radiation of heat. Each part may expand and contract independently.

The columns E′ E² are made of cast-iron, cast-steel, or other suitable material, in the form represented, with lips E³, curved so as to exactly correspond to the corrugated sheets which form the chambers E.

I fit in each throat, at the edges of the plate where they are embraced between the lips E³, a horizontal bar, E⁴, of sufficient length, and properly perforated to receive the next adjacent rivet, *e*, so as to insure its remaining reliably in place. Thus braced, the plates composing the sides of each chamber E are able to support a strong pressure from the outside. I make the joint between the corrugated metal and the lip E³ tight by two means: first, I introduce the well-known device known as an "expander," and traversing it around in the several swells. This effects a tight junction of the metal over something like half the length of the joint. The remainder of the space is made tight by calking. I prefer for most cases the flanged construction shown in Figs. 4, 5, 6, and 7.

I claim as my invention—

1. In a steam-boiler, the side chambers, E, of corrugated sheets, having the throats a little open, so that there may be a sufficient passage for steam to rise directly when such is generated, in combination with the chambered columns E′ E², for allowing an active circulation through the horizontal channels, and suitable tubes, headers, and cross-connection, all arranged for joint operation, substantially as herein specified.

2. The pipe K and controlling-valve I′, in combination with the sections A B C D and cross-connection M, and with the branch feed-pipe K′ and its controlling-valve K², mud-drum I, and blow-off passage I³, all arranged to serve as herein specified.

3. The side chambers, E, composed of corrugated metal arranged to form channels, in combination with the chambered columns E′ E², connected as shown, and with the inclined tubes C, their connections A B D, and a furnace inclosed in the space between said side chambers, all arranged for joint operation, as herein specified.

4. In a steam-boiler, the side chambers, E, constructed of corrugated metal, having the throats braced apart, so that there may be a limited circulation across from one channel into the next, the chambered columns E′ E², connections for receiving and delivering water, and the tubes A C, headers B D, and suitable steam-connection, M, all arranged for joint operation, substantially as herein specified.

In testimony whereof I have hereunto set my hand, at New York city, New York, this 2d day of April, 1885, in the presence of two subscribing witnesses.

FREDERICK SCHERR.

Witnesses:

M. F. BOYLE,

CHARLES R. SEARLE.