

(No Model.)

T. M. REES.
STEAM BOILER.

4 Sheets—Sheet 1.

No. 574,001.

Patented Dec. 29, 1896.

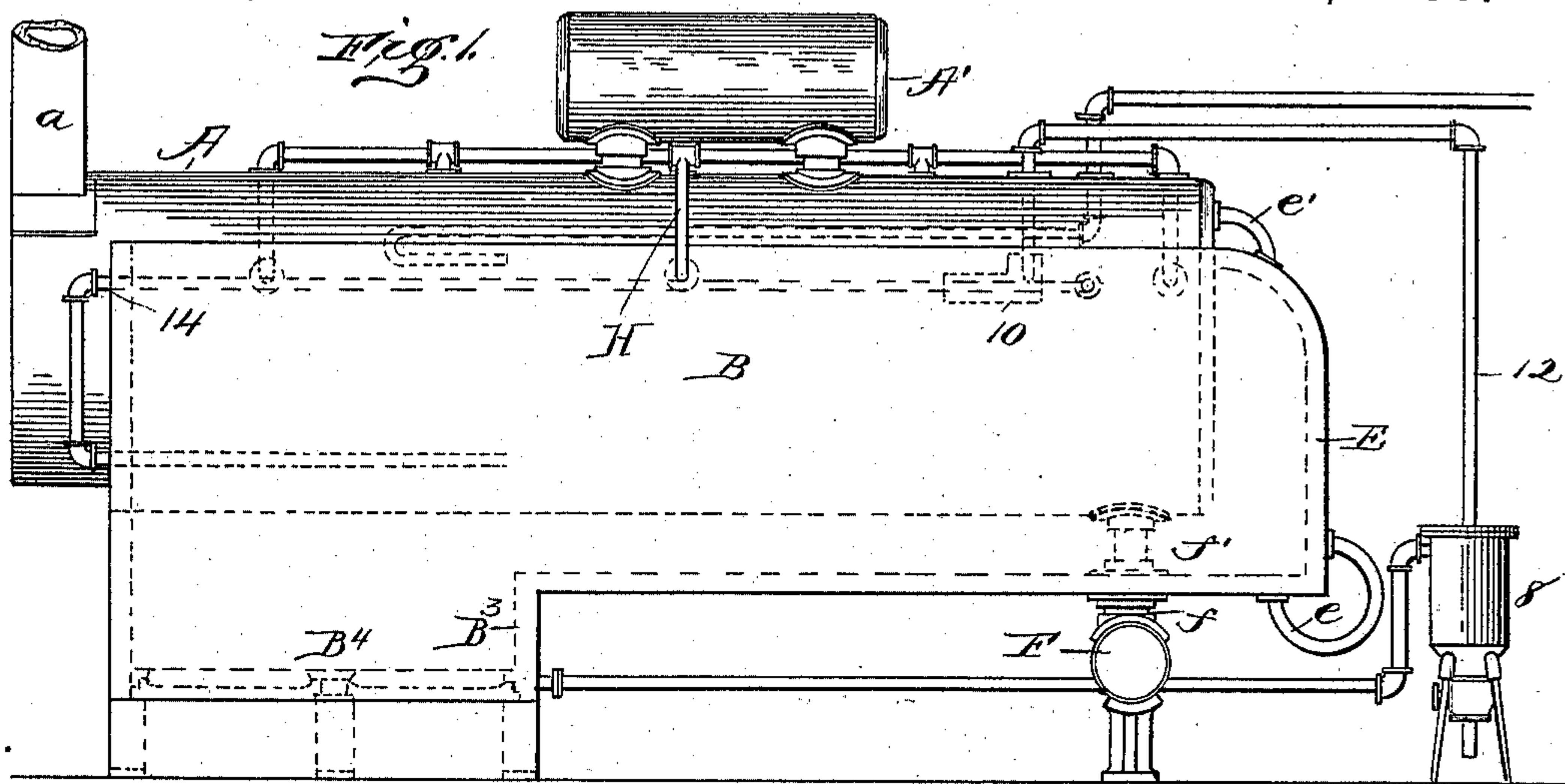
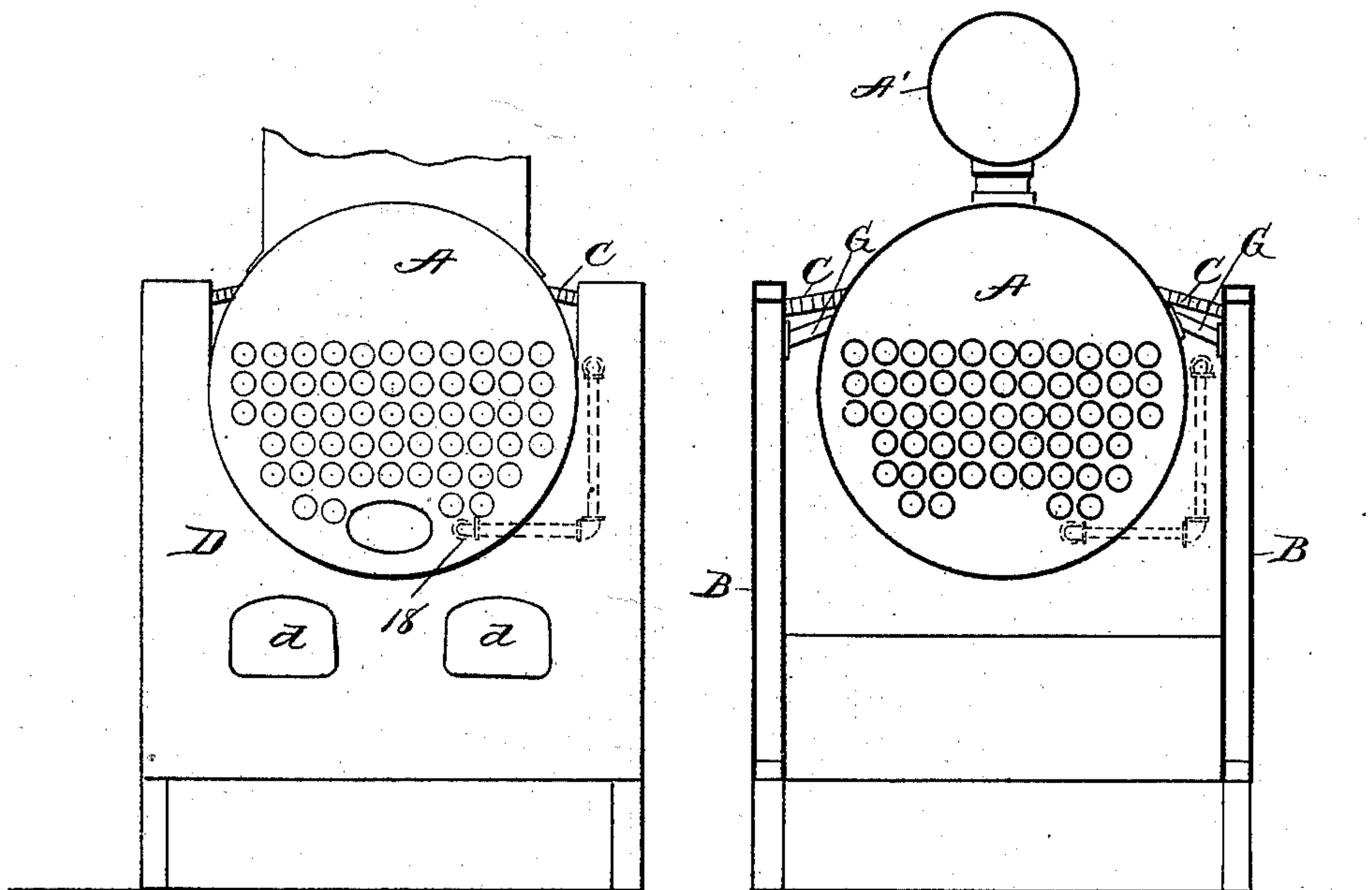


Fig. 2.

Fig. 3.



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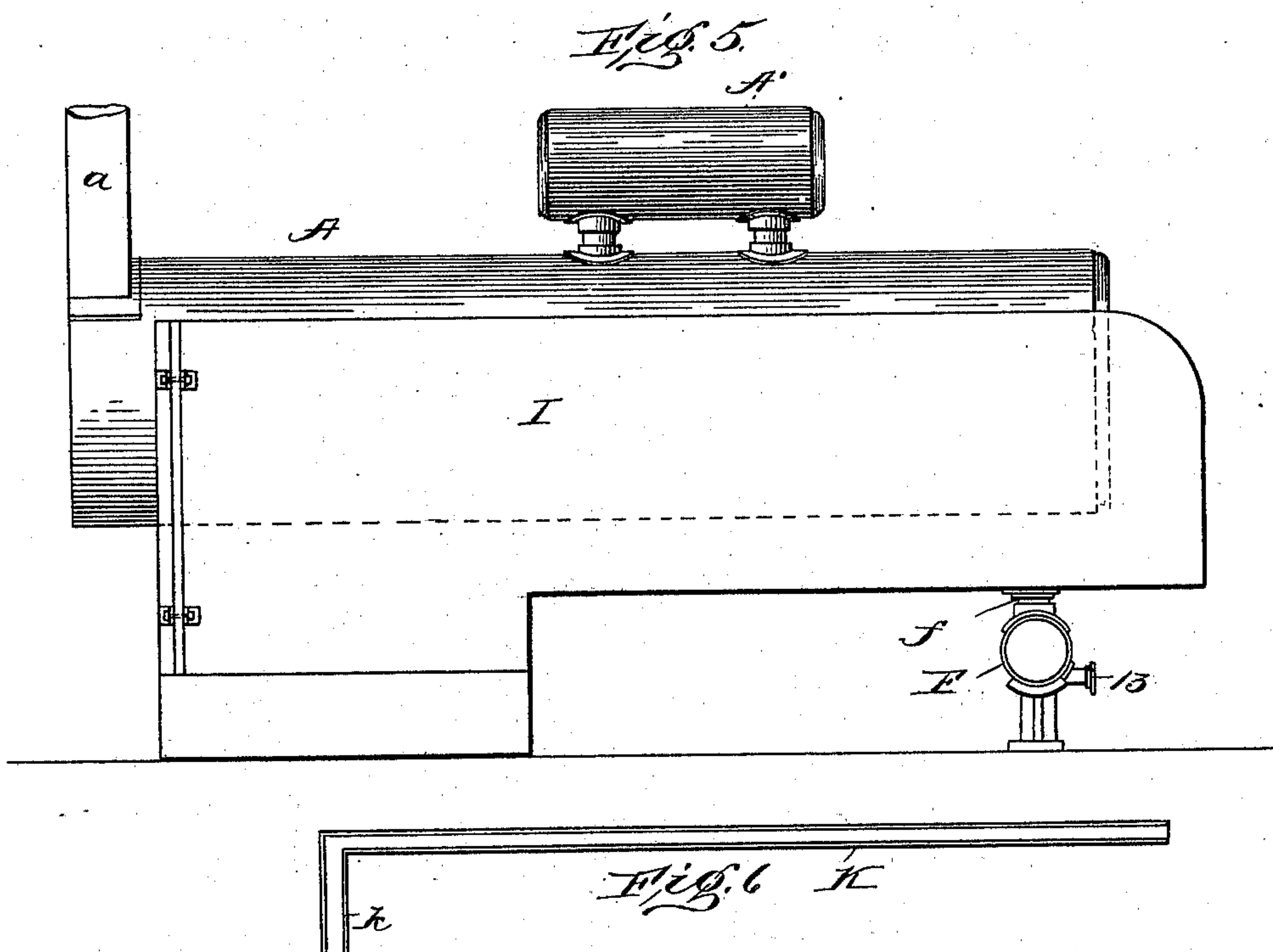
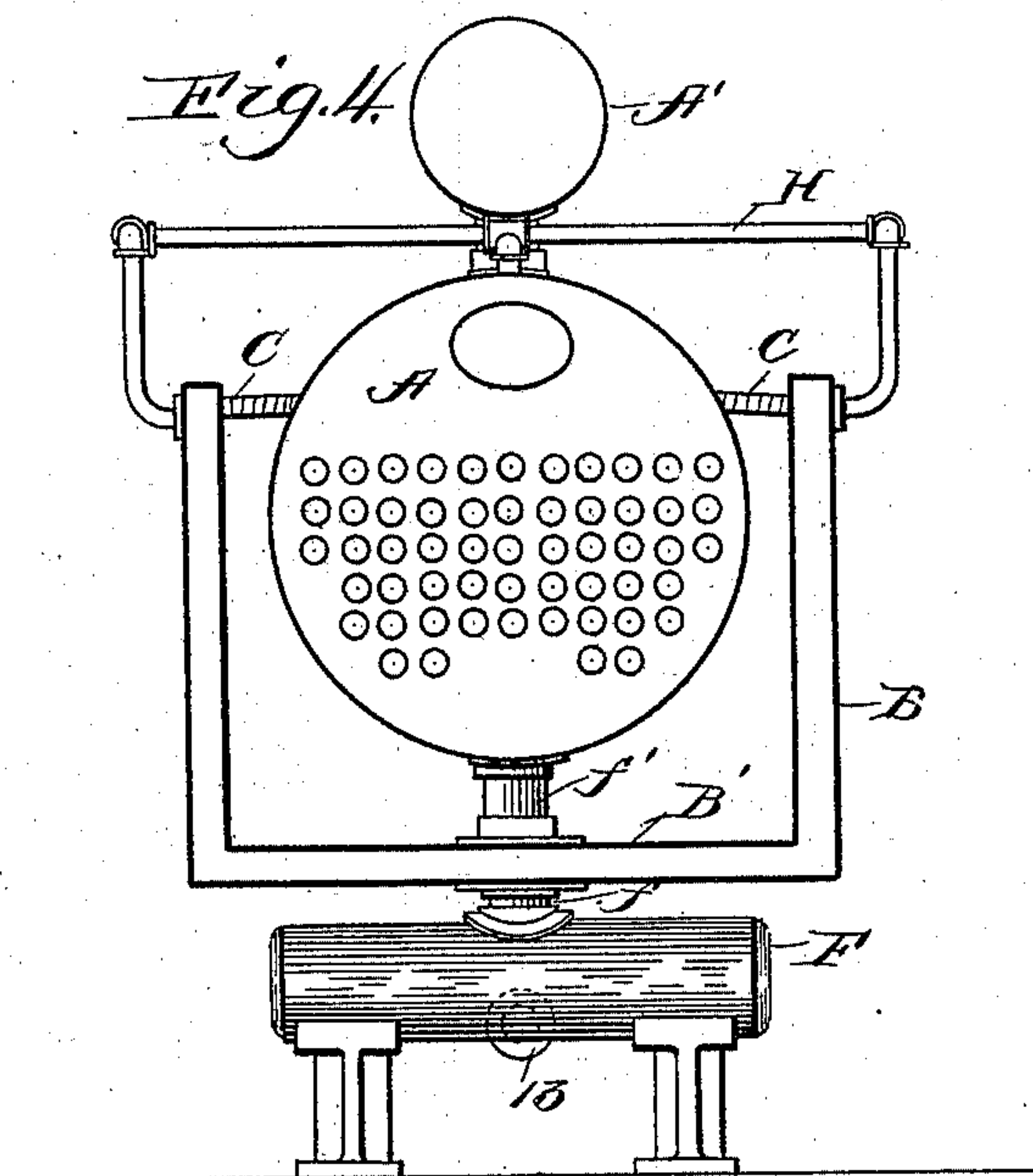
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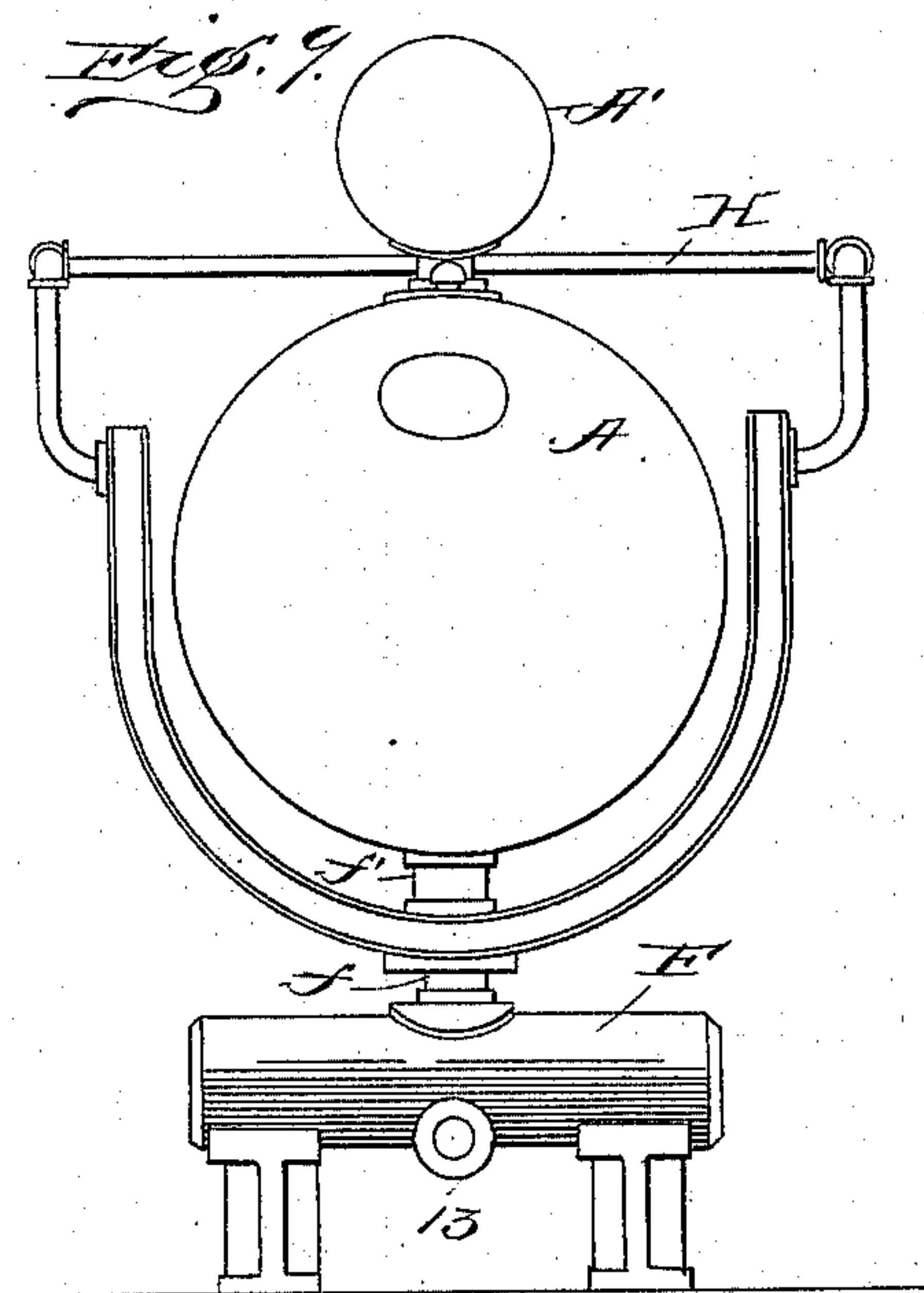
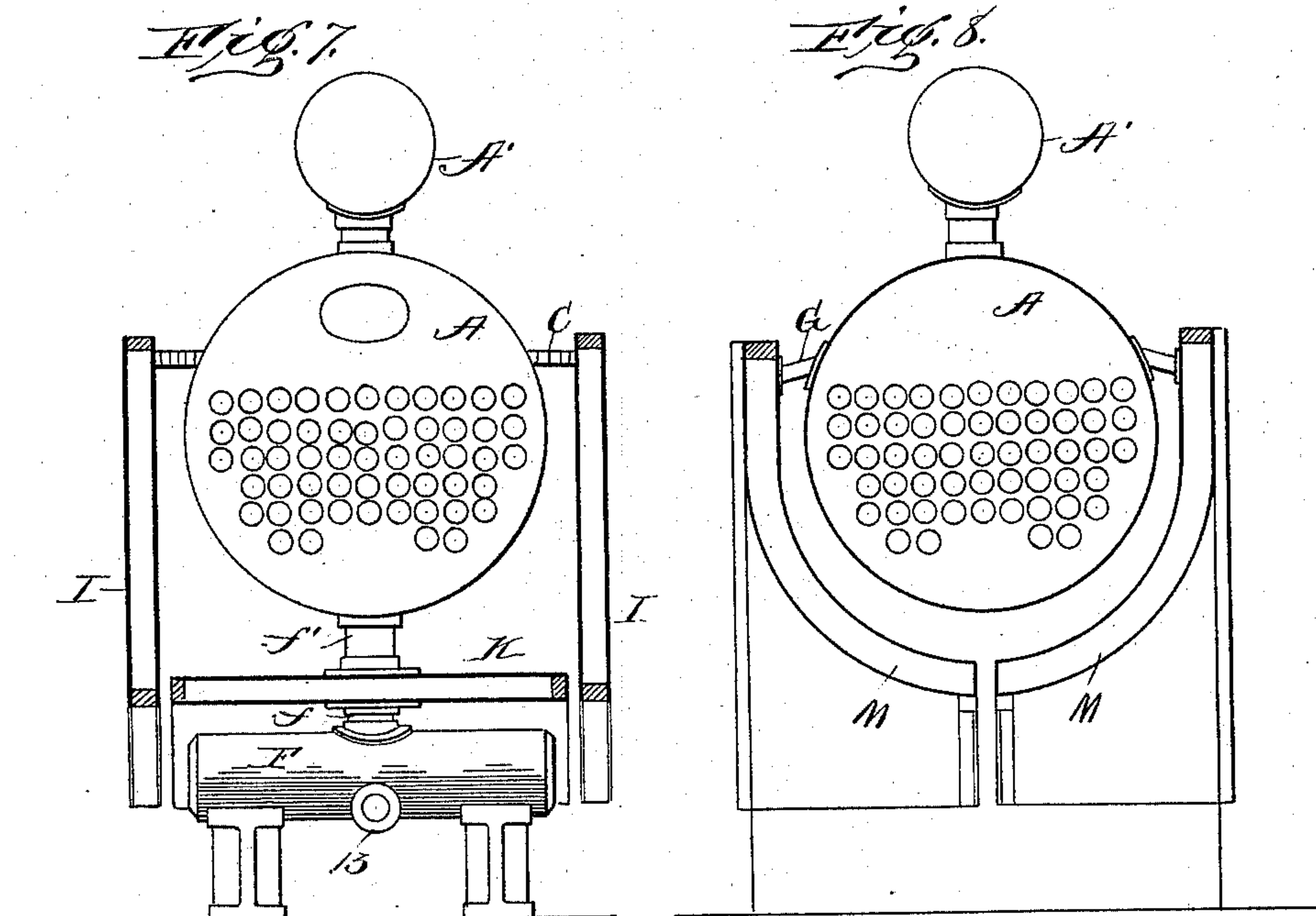
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Patented Dec. 29, 1896.



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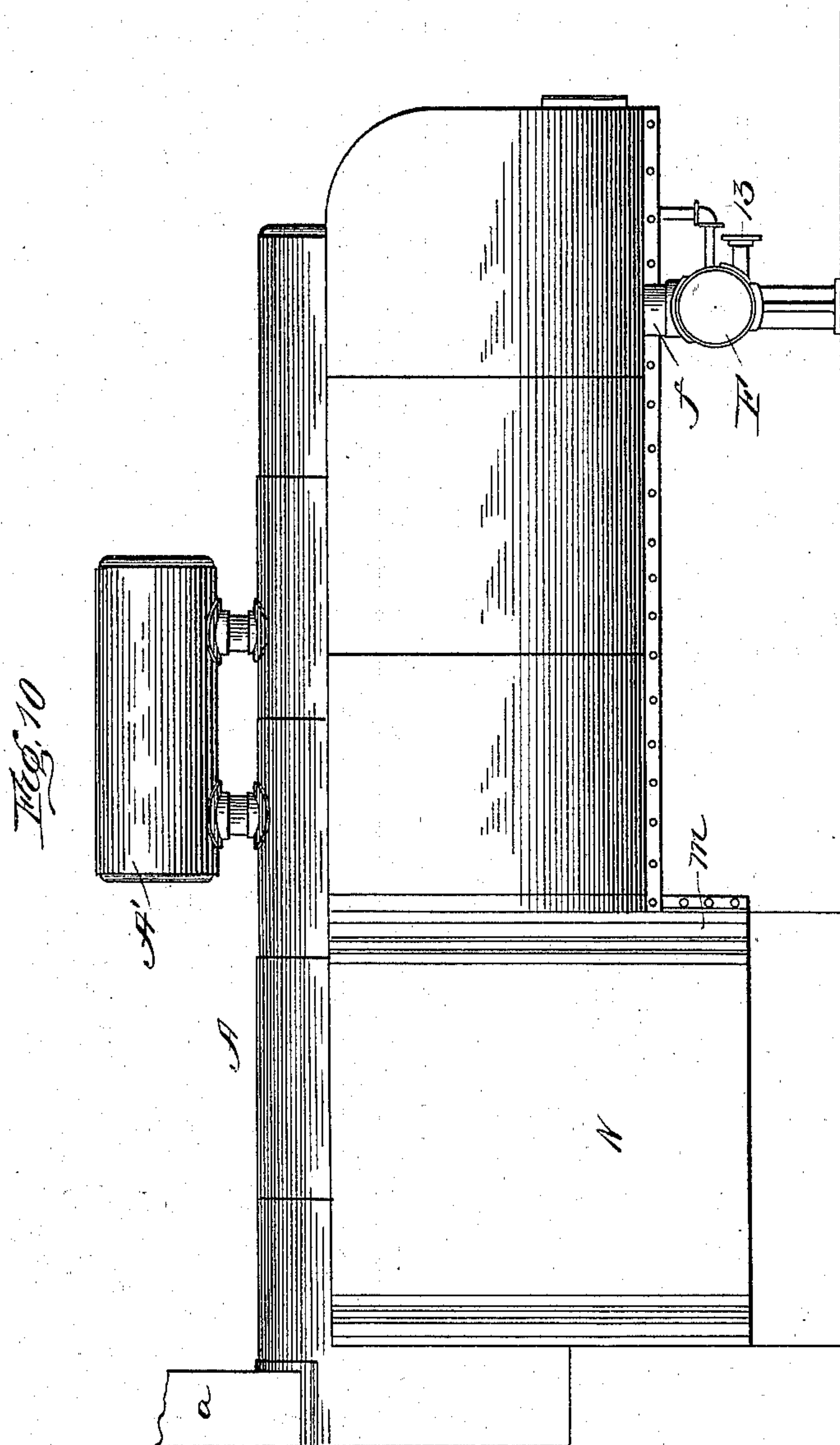
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T. M. REES.
STEAM BOILER.

No. 574,001.

Patented Dec. 29, 1896.



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UNITED STATES PATENT OFFICE.

THOMAS M. REES, OF PITTSBURG, PENNSYLVANIA.

STEAM-BOILER.

SPECIFICATION forming part of Letters Patent No. 574,001, dated December 29, 1896.

Application filed June 15, 1896. Serial No. 595,566. (No model.)

To all whom it may concern:

Be it known that I, THOMAS M. REES, of Pittsburg, in the county of Allegheny, State of Pennsylvania, have invented certain new and useful Improvements in Steam-Boilers; and I do hereby declare the following to be a full, clear, and exact description of the same, reference being had to the accompanying drawings, forming a part of this specification, and to the figures and letters of reference marked thereon.

This invention has for its object to provide an improved steam-boiler which will generate steam economically and which may be constructed in simple parts readily assembled in working position when the boiler is set up, the parts being of such shape and size as to be readily transported without undue labor and expense.

The invention consists in certain novel details of construction and combinations and arrangements of parts, all as will now be described, and pointed out particularly in the appended claims.

Referring to the accompanying drawings, Figure 1 is a side elevation of a boiler embodying my present invention. Fig. 2 is a front elevation. Fig. 3 is a vertical section taken through the fire-box. Fig. 4 is a similar section taken through the structure in rear of the fire-box. Fig. 5 is a side elevation showing the manner of assembling the parts of the structure shown in Figs. 1, 2, 3, and 4 and also showing a modified arrangement of the inclosing boiler. Fig. 6 is a longitudinal sectional view through the bottom of the shell of the external boiler. Fig. 7 is a vertical section showing the modified arrangement of the external boiler previously mentioned. Figs. 8 and 9 are vertical sections showing still further modifications in the arrangements of the shell of the external boiler. Fig. 10 is a side elevation showing the modifications of Figs. 8 and 9.

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

The letter A indicates an ordinary cylindrical return-tube boiler of any desired or preferred special construction, preferably having a smoke-box and smoke-exit to the chimney *a* at the front end and a dry-steam chamber or steam-dome A' at the top, from which the

steam is taken to the engine or other apparatus where it is to be utilized. With such a construction of boiler it is customary to locate the fire-chamber beneath the front end of the boiler-shell and convey the products of combustion to the rear end of the boiler, where they are deflected and passed forward through the tubes of the boiler and finally escape into the smoke-stack. With such an arrangement the boiler is heated by the radiant rays from one side only of the body of flame and heated gases or products of combustion, except for the small proportion of energy which is reflected or deflected from the walls of the setting, the heat from the balance of the body of flame or fuel and gases being absorbed by the setting or passing off through the smoke-box to the stack.

In my present arrangement I propose to utilize a larger proportion of the heat from the heating products than can be utilized in the arrangement first described, and in order to accomplish this I entirely surround the fire-box and the combustion-chamber passing to the rear of the boiler, including the front end and rear ends, with an exterior or supplemental boiler adapted to be connected with the main boiler by suitable connections, whereby steam generated in the exterior boiler finds ready access to the steam-dome, and whereby the circulation of water through both the main and supplemental boilers is established and the feed-water entering the boiler is gradually heated in its passage to the main boiler, avoiding danger of suddenly reducing the temperature of the latter and causing a fall in the pressure. The supplemental boiler is preferably made in sections, the size of which sections, however, may be greatly varied, together with the shape of the sections, the idea being to as nearly as possible conform to the shape of the most approved boiler-setting and fire-box.

Referring now particularly to Figs. 1 and 4, it will be seen that the central portion of the exterior or supplemental boiler is formed in one section, with side portions B, extending up with their upper edges in proximity to the shell of the main boiler, and a horizontal portion B', extending beneath the main boiler and forming the bottom of the combustion-chamber. At the forward end of

the portion B' there is a relatively small vertical section B³, constituting the rear side of the fire-box, and extending forward on each side of the fire-box are the downward extensions B⁴. The upper edges of the sides B lying in proximity to the wall of the main boiler makes it comparatively easy to bridge the space between the two by fire-brick tiling C, Fig. 3, thus forming a chamber extending way through from the fire-box to the rear end of the main boiler. The front of the fire-box and the front of the supplemental boiler are formed by a section D, Fig. 2, having in it suitable fire-door openings *d*, the upper edge of this section *d* being made to conform to the shape of the exterior of the main boiler, thus serving to close the front of the fire-box, making in effect a complete water fire-box except for the bottom portion, in which the usual grate-bars and ash-pit are located, these latter portions of the device being of the usual construction, and hence needing no further description. The rear end is closed by a curved boiler-section E, which fits accurately between the sides B of the supplemental boiler and has its upper end curved over and resting against the rear end of the main boiler above the tubes, forming a combustion-chamber which is completely closed by sections of the boiler.

Below the whole boiler I preferably locate a mud-drum F, of any preferred construction, which mud-drum F is connected to the supplemental boiler by a short leg *f*, and immediately over this opening there is a second leg *f'*, connecting the main and supplemental boilers. Thus sediment from both boilers is free to drop into the mud-drum and, what is perhaps of greater importance, a ready communication is formed between the two boilers for the circulation of the water. The sides B of the supplemental boiler preferably extending up to or above the normal water-level and approximately at such water-level pipes G connect the two boilers, so as to form circulating-channels at the top of the two boilers.

In order to carry off and collect the steam generated in the supplemental or outer boiler, steam-pipes H extend therefrom up into the dome connection at suitable points, as shown clearly in Figs. 1 and 4, and in order to keep up the circulation in the rear section E, I provide a pipe connection *e* at the bottom of the same extending between the rear ends of the two sections of the outer or supplemental boiler, and at the top of this section E, I provide a pipe connection *e'* extending into the main boiler.

With such a construction of boiler it will be seen at once that the parts may be assembled with the greatest facility, and in connecting up the boiler for use I preferably employ an automatic blow-off, surface blow, and precipitator 8, with a surface-blow skimmer 10 connected therewith by means of a pipe 12. The mud-drum may be provided with the usual blow-off or a blow-off opening 13, and

in order to supply feed-water to the boiler I preferably make use of a feed-water pipe 14, which may extend along between the two boilers beneath the fire-brick tiling, through the front end of the outer or supplemental boiler, and into the main boiler, as shown at 18. This arrangement insures the heating of the feed-water before entering the main boiler.

As before intimated by me, it is obvious that the sections in which the outer or supplemental boiler is formed may be greatly varied, as shown, for instance, in Figs. 5, 6, and 7, where the two sides, in this instance lettered I, are formed separately and independent of any of the other connections, and a bottom section (lettered K) is formed for forming the bottom of the combustion-chamber, this section K having a depending front end *k*, constituting the rear side of the fire-box. The contour of the sides I is similar in every respect to the contour of the sides B, and the front and rear end sections are also similar to the construction previously described, and hence need not be specifically described again.

In Figs. 8, 9, and 10 the outer or supplemental boiler, forming the outside of the combustion-chamber and fire-box, is formed in rear of the fire-box of semicylindrical shape in cross-section, instead of being rectangular, as in the former instance. It may also be made sectional, as shown particularly in Figs. 8 and 10, wherein it will be seen that the rear portions of the outer or supplemental boiler are formed in two halves, (lettered M,) each having an extension *m*, forming a portion of the rear side of the fire-box. The sides of the fire-box are formed by separate sections N, Fig. 10, while the front and rear ends of the outer or supplemental boiler are formed as in the first-described structure. In all of these structures I prefer to close the space between the two boilers at the top by means of fire-brick tiling, and in every instance the bottom portions of the boilers are permanently connected together by the water-leg, and suitable pipe connections are formed at the top for promoting the circulation of water and for taking off steam from the outer or supplemental boiler at the highest points.

From the foregoing it will be seen that the fire-box and the products of combustion are entirely inclosed by the boiler until they escape into the stack, and consequently the heat of the products being consumed is utilized to the greatest advantage, there being no possibility of the radiate rays being carried off through the setting without first imparting their heat to the water, and, furthermore, the flame and products of combustion are brought into contact with the effective heating-surface of the boiler at every point.

Having thus described my invention, what I claim as new is—

1. In a steam-boiler the combination with the cylindrical main boiler having the return-flues therein, of the supplemental or exterior

boiler having the bottom portion extending beneath the main boiler in rear of the fire-box with the downward extension forming the rear wall of the fire-box, the sides having the downward extensions forming the sides of the fire-box and the two independent end sections for closing the front and rear spaces in the outer or supplemental boiler, with pipe connections between the main and supplemental or exterior boiler; substantially as described.

2. In a boiler the combination with the cylindrical main boiler having the return-flues therein and the steam dome or chamber, of the exterior or supplemental boiler having the side extending up in proximity to the main boiler the water-circulating pipes connecting the main and supplemental boiler at top and bottom, and steam-circulating pipes connecting the top of the supplemental boiler with the steam dome or chamber; substantially as described.

3. The combination with the cylindrical main boiler having the return-flues therein, of the supplemental or exterior boiler formed in sections, with upwardly-extending sides having their upper edges in proximity to the shell of the main boiler and with the space between said main and supplemental boilers closed by fire-brick tiles, said supplemental-boiler sections having depending portions forming the fire-box and independent sections closing the front and rear ends of the supplemental boiler to form a completely water-jacketed box and combustion-chamber; substantially as described.

4. In a steam-boiler the combination with the main boiler and the sectional supplemental boiler inclosing the main boiler and forming an inclosed fire-box and combustion-chamber, of a mud-drum located beneath the supplemental boiler and a water-leg connect-

ing said mud-drum with the supplemental boiler and with the main boiler; substantially as described.

5. The combination with the cylindrical main boiler and the sectional supplemental boiler inclosing the lower portion thereof to form a water-jacketed fire-box and combustion-chamber, of a water-leg connecting the main and supplemental boilers at the bottom and a mud-drum connection with the supplemental boiler located in line with and immediately below the water-leg; substantially as described.

6. The combination with the main boiler having the return-flues and the supplemental boiler surrounding the lower portion of the main boiler to form the water-jacketed combustion-chamber, of an independent curved section for closing the rear end of the supplemental boiler extending into contact with the end of the main boiler fitting between the sides thereof and above the return-flue and pipe connection between the upper end of said curved section and the main boiler and a pipe connection between the lower end of said curved section and the supplemental boiler; substantially as described.

7. The combination with the main boiler and a supplemental boiler having the sides extending in proximity to the main boiler and the downward extensions forming the sides of the fire-box, of the front section having its upper edge conforming to the shape of the main boiler for closing the front end of the supplemental boiler and having the fire-door openings formed therein; substantially as described.

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Witnesses:

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WM. M. REES.