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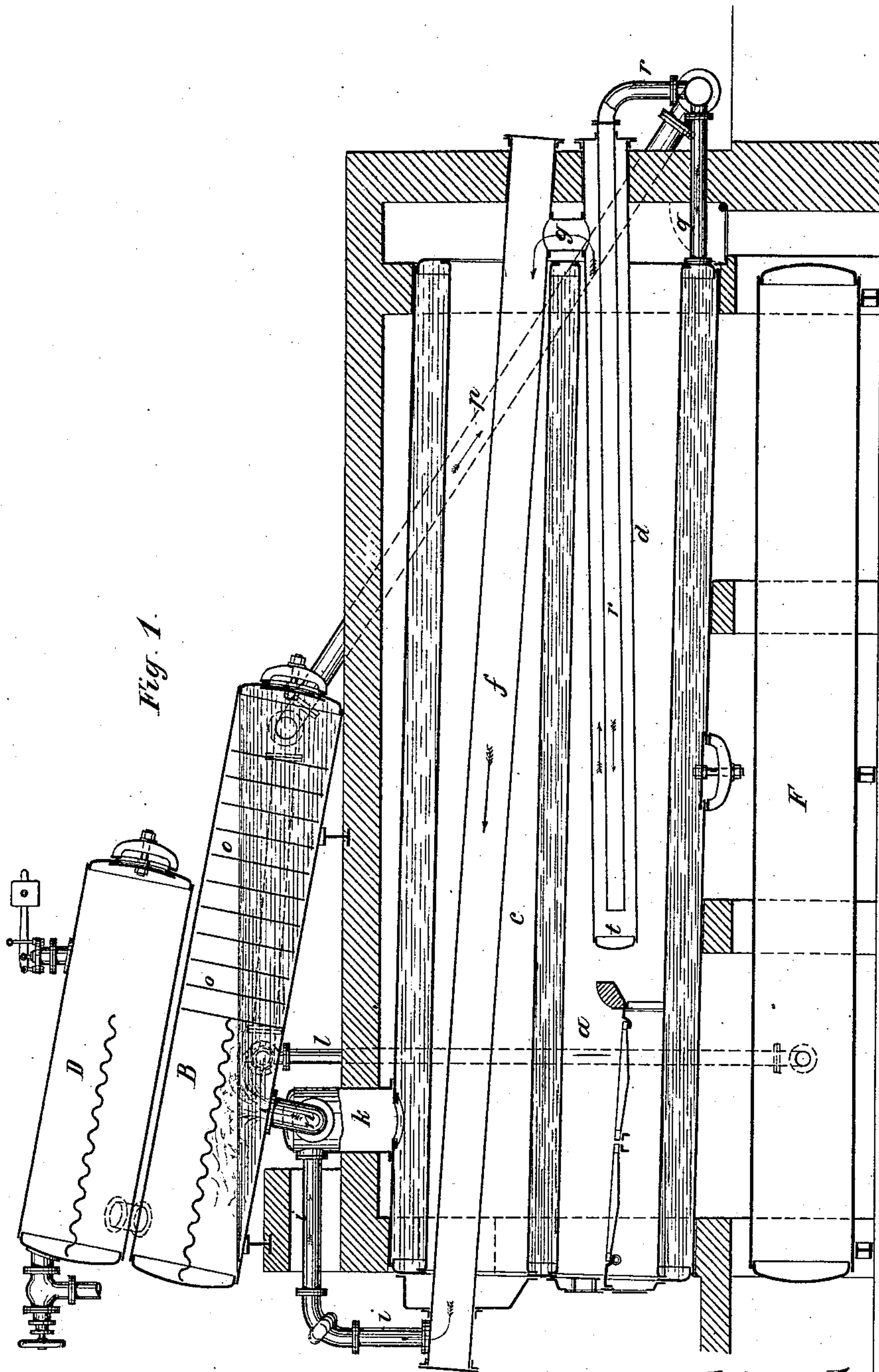
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H. STOLLWERCK.

CORNISH BOILER.

No. 306,661.

Patented Oct. 14, 1884.



*Witnesses:*  
*J. A. Rutherford*  
*Chas. S. Hyer*

*Inventor:*  
*Heinrich Stollwerck*  
*By*  
*James L. Norris*  
*Atty.*

(No Model.)

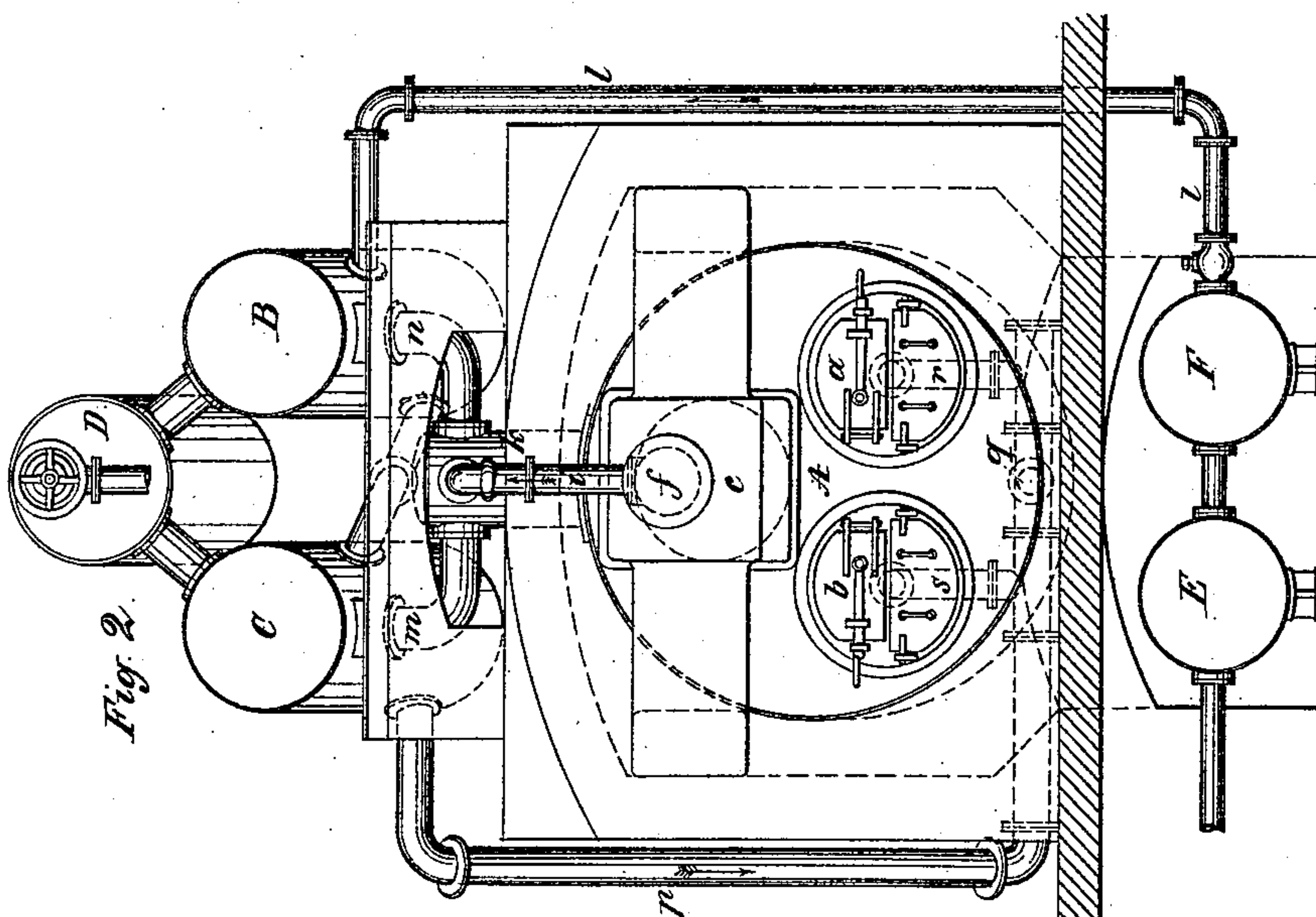
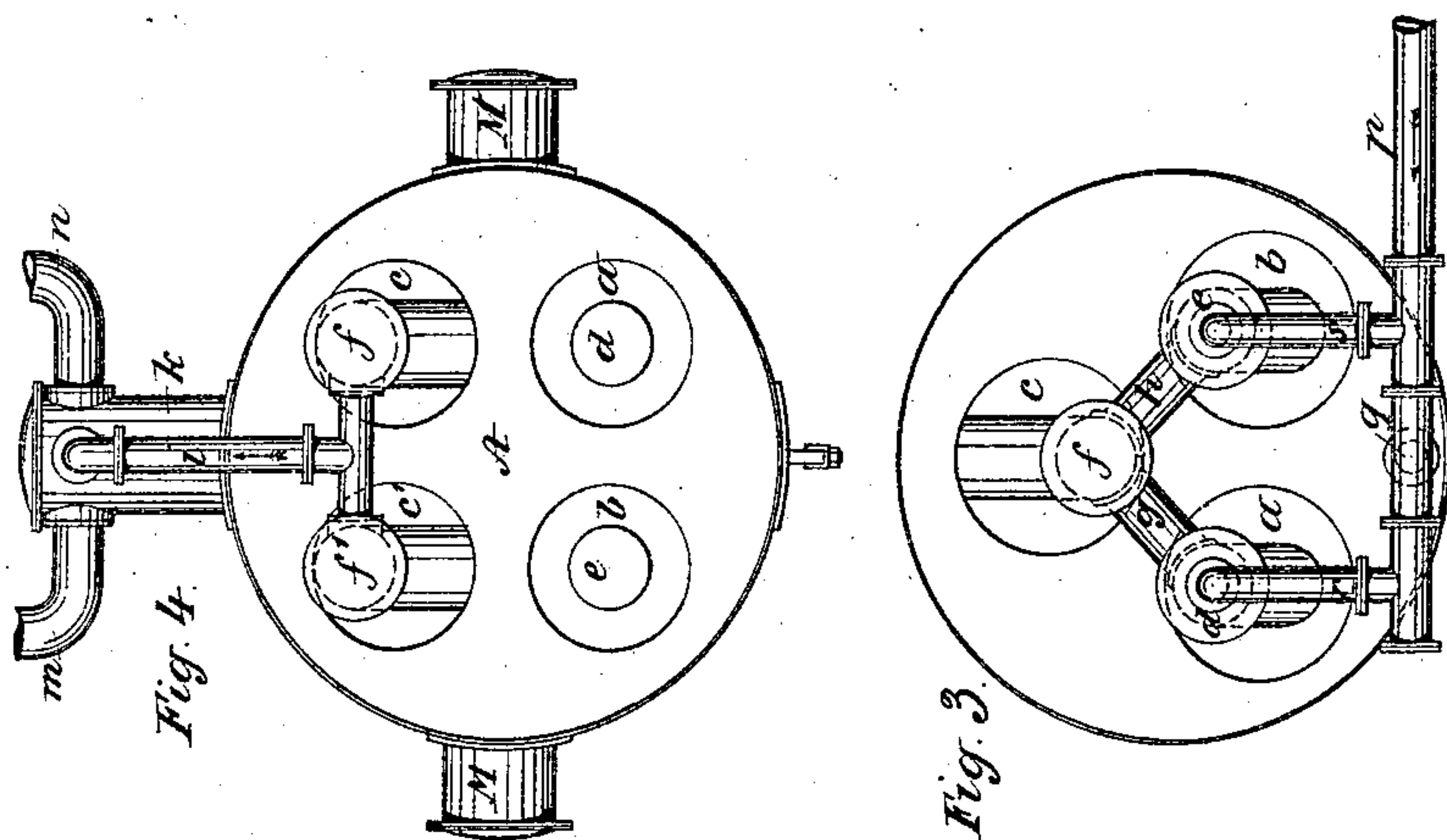
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Fig. 4.

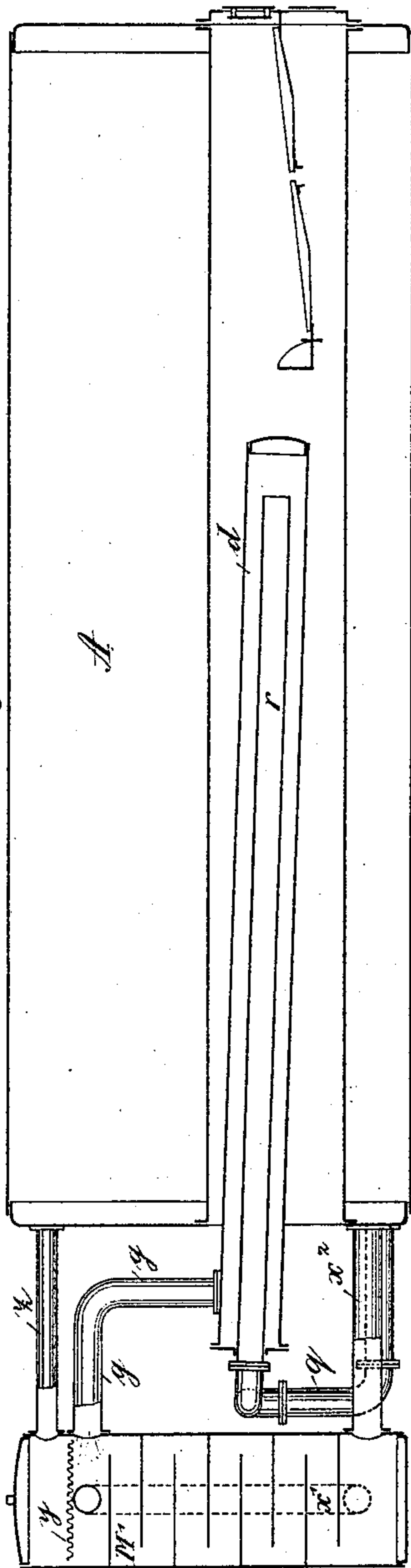


Fig. 6.

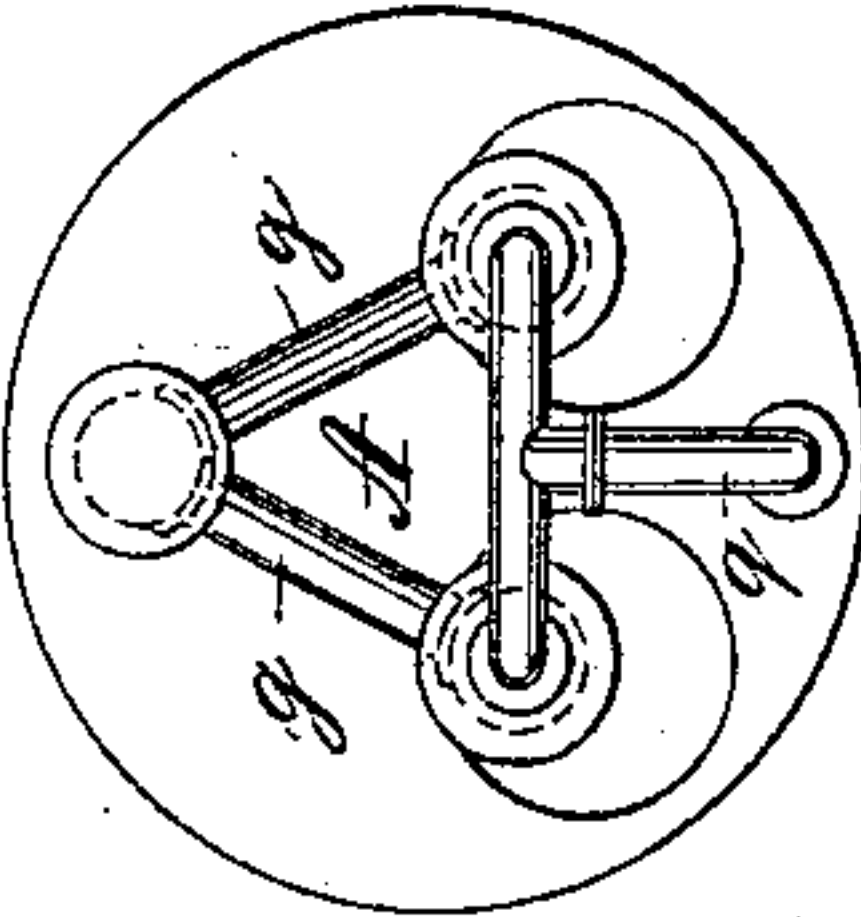


Fig. 5.

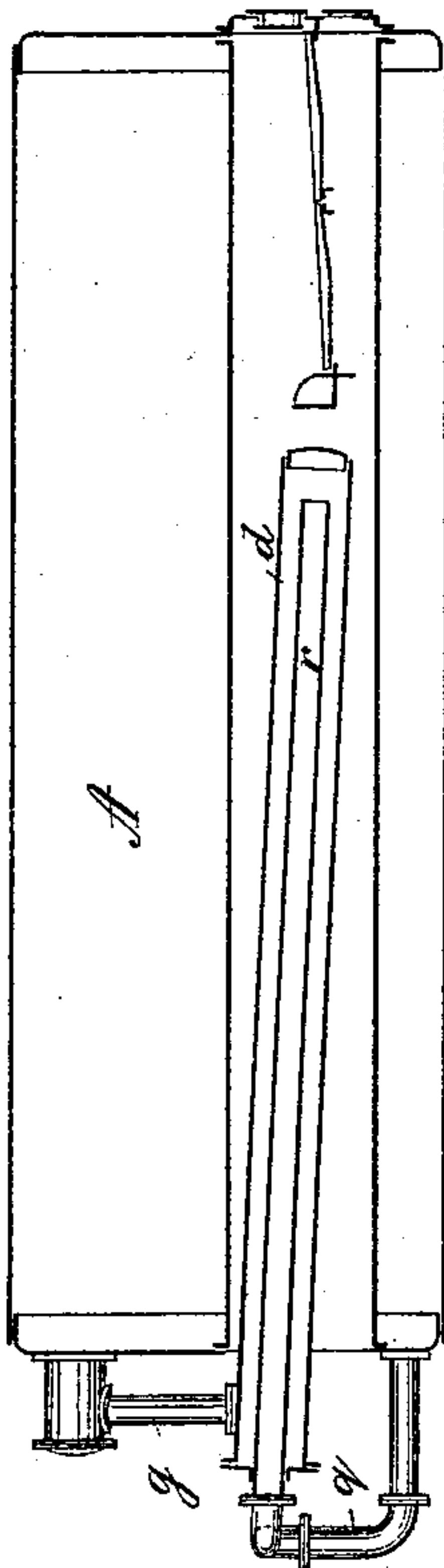
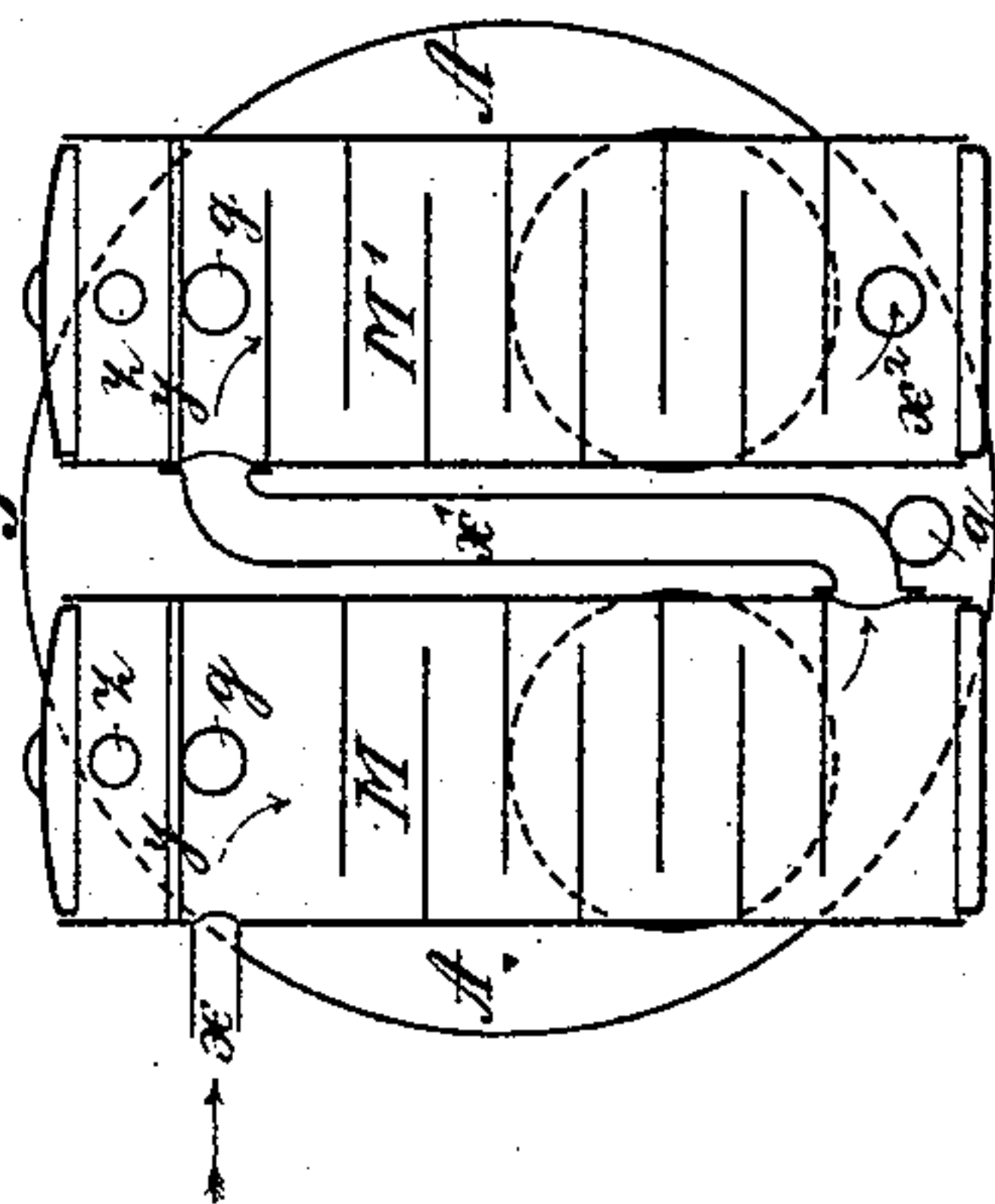


Fig. 8.



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# UNITED STATES PATENT OFFICE.

HEINRICH STOLLWERCK, OF COLOGNE-ON-THE-RHINE, PRUSSIA, GERMANY,  
ASSIGNOR TO GEBR. STOLLWERCK, OF SAME PLACE.

## CORNISH BOILER.

SPECIFICATION forming part of Letters Patent No. 306,661, dated October 14, 1884.

Application filed April 30, 1884. (No model.)

*To all whom it may concern:*

Be it known that I, HEINRICH STOLLWERCK, of the city of Cologne-on-the-Rhine, in the Kingdom of Prussia and German Empire, have  
5 invented certain new and useful Improvements in Cornish Boilers, of which the following is a specification, reference being had to the accompanying drawings, and to the letters of reference marked thereon.

10 This invention relates to Cornish boilers, combined with certain devices for increasing the heating-surfaces of the former and causing a better circulation of water in the same.

The object of my said invention is to increase the heating-surfaces in Cornish boilers, so as to cause a more rapid generation of steam and a more thorough utilization of the heating-power employed, and at the same time  
15 facilitating the circulation of water in the same; and my invention therefore consists in providing such Cornish boilers having preferably three or more fire-tubes with a system of heating-tubes located within the said fire-tubes and communicating with each other in  
20 such a manner as to form a second boiler, as it were, within the said Cornish boiler, but having in common with the latter the same fire-space, and in some cases the same feed-water apparatus and the same steam and water chambers.  
25

To enable others skilled in the art to better understand the nature of my invention, I will now proceed to describe the same first as applied to a Cornish boiler having three and four  
30 fire-tubes, and used in combination with a device for freeing feed-water from incrustation, said device forming the subject of United States Patent No. 272,347.

In the accompanying drawings, forming  
40 part of my specification, Figure 1 is a vertical longitudinal section through a Cornish boiler having three fire-tubes and a device for freeing feed-water from incrustation, shown as combined with the said Cornish boiler containing my improvement. Fig. 2 is a front  
45 view of Fig. 1. Fig. 3 is an end view of the body of a Cornish boiler with three fire-tubes, showing my improvement. Fig. 4 is an end view of the body of a Cornish boiler having  
50 four fire-tubes, showing my improvement.

Fig. 5 is a vertical longitudinal section, and Fig. 6 is an end view, of the body of a common Cornish boiler having two fire-tubes, showing my improvement when such Cornish boiler is used without the device for freeing  
55 feed-water from incrustation above referred to. Figs. 7 and 8 are vertical longitudinal and transverse sections, respectively, of another form of combination of a Cornish boiler having two fire-tubes with a device for freeing  
60 feed-water from incrustation, showing a modified arrangement of my invention.

Reference being had to the accompanying drawings, forming part of my specification, *d*, *e*, *f*, Figs. 1, 2, and 3, and *f'*, Fig. 4, represent  
65 heating-tubes arranged within the fire-tubes *a*, *b*, and *c*, Figs. 1, 2, and 3, and *c'*, Fig. 4, of a Cornish boiler, in such a manner as to allow of their contracting and expanding independently from the fire-tubes of the boiler  
70 surrounding them. The said heating-tubes in the lower fire-tubes extend from the rear of the fire-bridges, where their ends are closed, along the entire length of the fire-tubes, communicating with the heating tube or tubes of  
75 the upper fire tube or tubes by means of the connecting-pipes *g* and *h*, Fig. 3, while the upper heating tube or tubes communicate with the dome of the boiler by means of the pipe *i*. The feed-water pipe *r* enters the lower heat-  
80 ing-tubes, *a*, *b*, extending into the latter almost to the ends of the same nearest to the fire-bridges. The dome *k* communicates with the upper boilers, C and B, by means of the pipes  
85 *n* and *m*.

*l* is a pipe for introducing fresh feed-water from the heaters E and F into the upper boiler, B, and *p* is a pipe for conducting the mixture of fresh feed-water and circulating  
90 water into the branch pipes *r*, *s*, and *q*, which deliver into the feeding-pipes *r* of the heating-tubes *d*, *e* and into the main boiler A, respectively.

In the modified arrangement as shown in Figs. 7 and 8, the heating-tubes *d* are shown as  
95 communicating directly with the boilers of the apparatus for freeing feed-water from incrustation by means of the pipes *g*, instead of discharging into the dome of the Cornish boiler, while in the arrangement shown in  
100



Figs. 5 and 6, where the Cornish boiler is used without the apparatus for freeing feed-water from incrustation, the heating-tubes  $d$  communicate with the upper part of the Cornish boiler through the pipe  $g$ .

In the modification as shown in Figs. 7 and 8,  $x$  is the pipe for introducing fresh feed-water into the vertical boiler  $M$ .  $x'$  is the pipe connecting the latter with another vertical boiler,  $M'$ , and  $x^2$  is a pipe through which the feed-water enters the main boiler  $A$ .  $zz$  are pipes connecting the upper ends of the said vertical boilers  $M$   $M'$  with the upper steam-space of the main boiler  $A$  near the level of the water in the latter.

Having thus described my improvement, I will now proceed to describe its operation.

Referring first to Figs. 1 to 4 of the drawings, the feed-water, previously freed from incrustation by means of my patented apparatus shown as combined with the Cornish boiler, enters the lower heating-tubes,  $d$   $e$ , through the pipes  $r$   $s$ , Fig. 3, discharging into the same at  $t$ . This point being quite near to the fire, it is obvious that steam will be at once generated, and a most rapid agitation and circulation of steam and water will ensue, extending through the entire system of heating-tubes and causing the mixture of steam and water to be carried upward through the connecting-pipes  $g$  and  $h$  into the upper heating tube or tubes,  $f$ , whence it is discharged into the dome  $k$ . The steam generated in the Cornish boiler  $A$  entering in the said dome  $k$  simultaneously with the mixture of steam and water from the heating-tubes, as above described, it naturally results that the latter mixture is forced through the pipes  $m$  and  $n$  into the boilers  $C$  and  $B$  of the apparatus for freeing feed-water from incrustation. The said mixture of water and steam here meeting the fresh feed-water entering the said boilers  $C$  and  $B$  through the pipe  $l$  from the heaters  $E$  and  $F$ , or any other suitable source, carries the same along through the sieve-like or perforated plates arranged inside the boilers  $C$  and  $B$ , as described in United States Letters Patent No. 272,347, causing it to deposit on the said perforated or sieve-like plates the greater part of its incrustation, while the steam is collected in the steam-reservoir  $D$ , after having been freed from its water by condensation in coming into contact with the plates of corrugated sheet metal arranged within the said boilers in the manner described in the Letters Patent above referred to. The steam may then be taken from the steam-reservoir above described in a dry state, while the feed-water, after having thus been freed from its incrustation, leaves the boiler  $C$  by means of the pipe  $p$ , whence it passes through the branch pipes  $q$ ,  $r$ , and  $s$  partly into the Cornish or main boiler  $A$  by means of the pipe  $g$ , and partly into the lower heating-tubes,  $d$  and  $e$ , through the pipes  $r$  and  $s$ , discharging into the same at  $t$  in close proximity to the fire-bridges, as already stated,

thus feeding the Cornish boiler as well as the heating-tubes with feed-water free from incrustation.

It appears clear that with the above-described arrangement the Cornish boiler is completely filled with water, the same extending even upward into the boilers of the apparatus for freeing feed-water from incrustation, filling the latter about half. It is thus rendered possible to work with a very high water-level, all danger of the water-level sinking below the fire-tubes being removed, so that the latter can hardly ever become overheated. The combination of a Cornish boiler containing the said improvement with the apparatus for freeing feed-water from incrustation furthermore allows of an increasing of the heating-surface to nearly double its extent, while the volume of the boiler proper, its ground-space and masonry-work, may be reduced to about one-half.

In the arrangement as shown in Figs. 7 and 8, where a suitable apparatus for freeing feed-water from incrustation, instead of being mounted above the Cornish boiler  $A$  in an inclined position, is arranged in a vertical position at the end of the Cornish boiler having but two fire-tubes, as usual, the heating-tubes are fed with water free from incrustation directly from the Cornish boiler  $A$  through the pipe  $g$ , as shown in Figs. 7 and 8, the heating-tubes  $d$  discharging the mixture of steam and water through the pipes  $g$  into the respective boilers  $M$   $M'$  of the apparatus for freeing feed-water from incrustation. Here, meeting the fresh feed-water entering the first of the said boilers  $M$  through the feed-water pipe  $x$ , the process of freeing the said feed-water from incrustation takes place in the manner already described with reference to Figs. 1 and 2, and the feed-water, having entered the second boiler,  $M'$ , through the connecting-pipe  $x'$ , leaves the boiler  $M'$  through the pipe  $x^2$ , which discharges the said feed-water in a state free from incrustation into the lower part of the Cornish boiler  $A$ . The steam collected in the boilers  $M$  and  $M'$  mounts to the upper part of the same, and, having been freed from its water by condensation in coming into contact with the plates of corrugated sheet metal  $y$ , passes from the said boilers into the upper part or steam-space of the Cornish boiler  $A$  through the connecting-pipes  $zz$ .

In applying my invention to a Cornish boiler with two fire-tubes, and not combined with the apparatus for freeing feed-water from incrustation, as above described, the heating-tubes  $d$ , Figs. 5 and 6, are fed from the lower part of the Cornish boiler  $A$  by means of the pipe  $g$ , which connects with the inner or feed pipes,  $r$ , of the heating-tubes  $d$ , the latter in their turn communicating with and discharging the water and steam directly into the upper part of the Cornish boiler  $A$  again through the connecting-pipes  $g$ , entering the body of the boiler at a point situated approximately on the



water-line of the boiler A, by which means the desired circulation is in this instance likewise established.

I wish it to be understood that I propose to  
5 apply my improved heating-tubes to Cornish and similar boilers of any suitable construction, and that in some cases where the fire-place is underneath the boiler I may arrange the said heating-tubes underneath the boiler likewise  
10 without otherwise deviating from the nature of my invention, as shown in and described with reference to Figs. 5 and 6 of the drawings.

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

1. In a Cornish boiler, a series of fire-tubes, in combination with a series of heating-tubes for steam and water within said fire-tubes, and  
20 communicating with one another and indirectly with the boiler, the heating-tube in one of the fire-tubes terminating adjacent to the fire-grate or bridge therein, and the heating-tubes being free to expand independently of  
25 the boiler, substantially as described.

2. In a Cornish boiler, a series of fire-tubes, in combination with a series of heating-tubes

for steam and water within said fire-tubes, and communicating with one another, the heating-tube in one of the fire-tubes terminating adjacent to the fire grate or bridge therein, and the series of heating-tubes having communication with the same feed, steam, and water space as the boiler, and also with the boiler, substantially as described. 35

3. The combination, with the boiler A, of a series of water-heating and steam-generating tubes within the same communicating with each other, one of said tubes terminating adjacent to the fire grate or bridge of the boiler, and the series having the same feed, steam, and water space as the boiler, and a depositing-chamber, substantially as described, wherein the feed-water is freed from its incrustation, connected with the heating-tubes and boiler, substantially as and for the purpose set forth. 45

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

HEINRICH STOLLWERCK.

Witnesses:

SAMUEL SPACKMAN,  
PH. PUTMAN.