

(No Model.)

S. R. WAGG.  
PULP DIGESTER.

No. 440,242.

Patented Nov. 11, 1890.

Fig. 1.

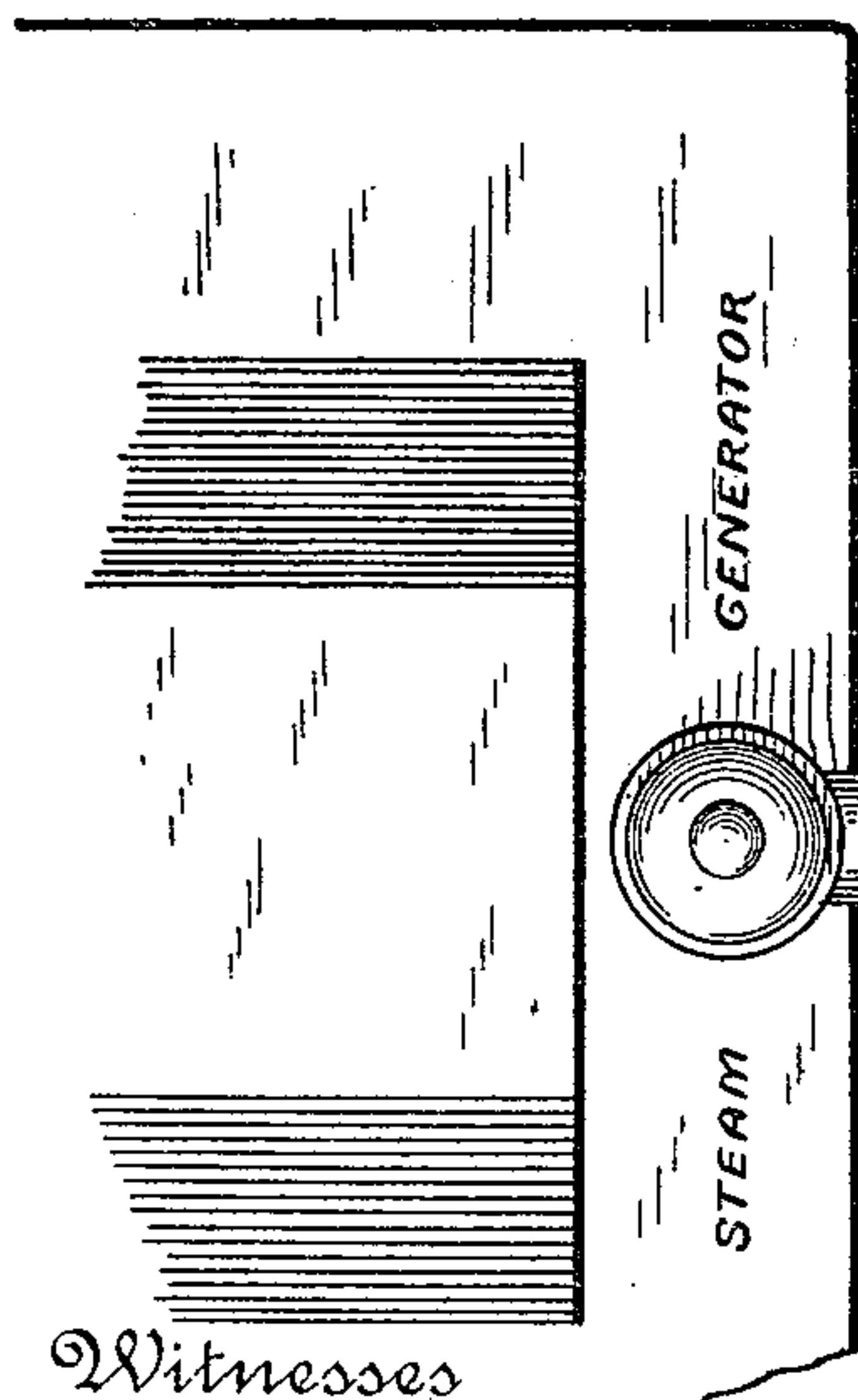
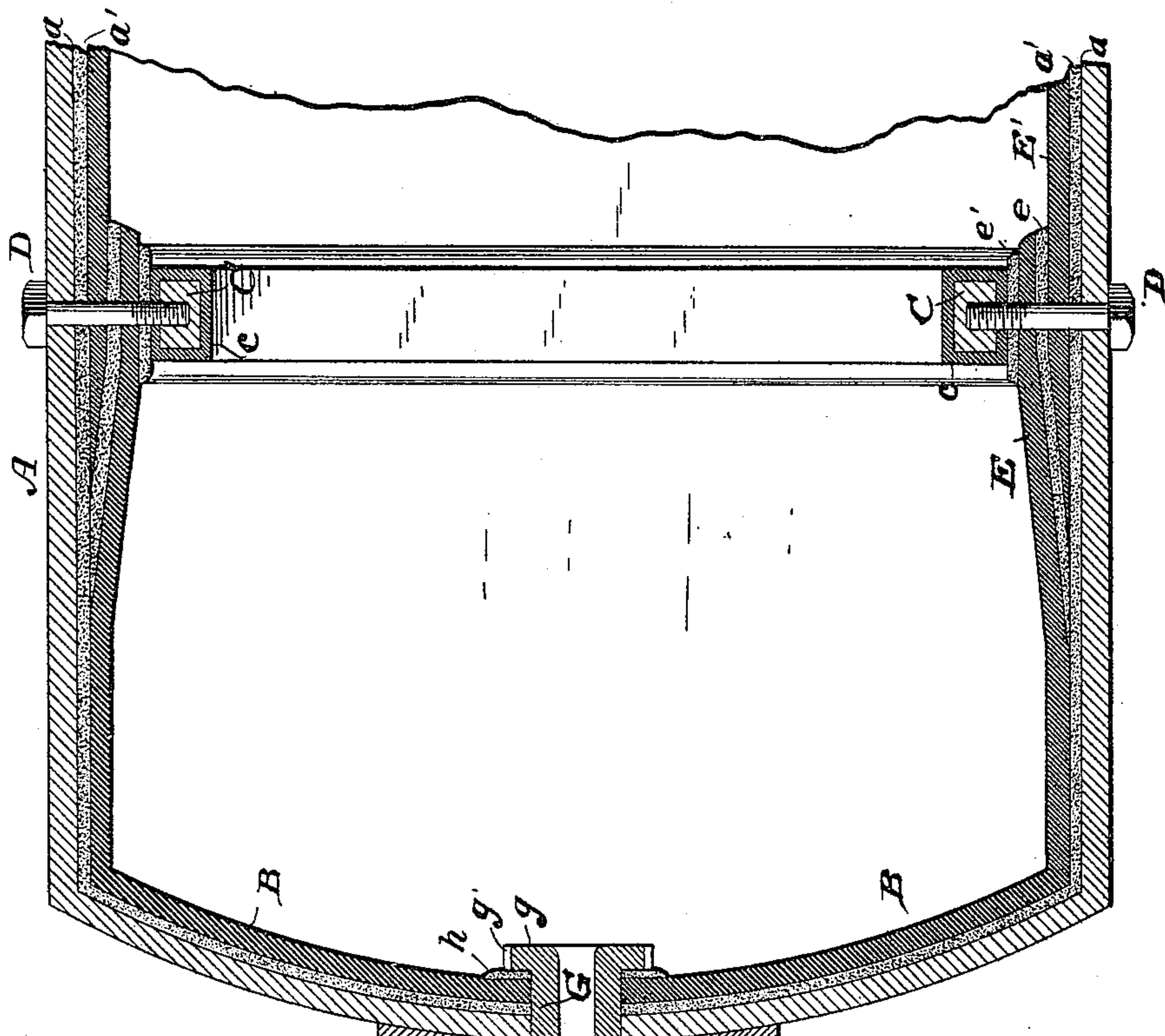


Fig. 3.

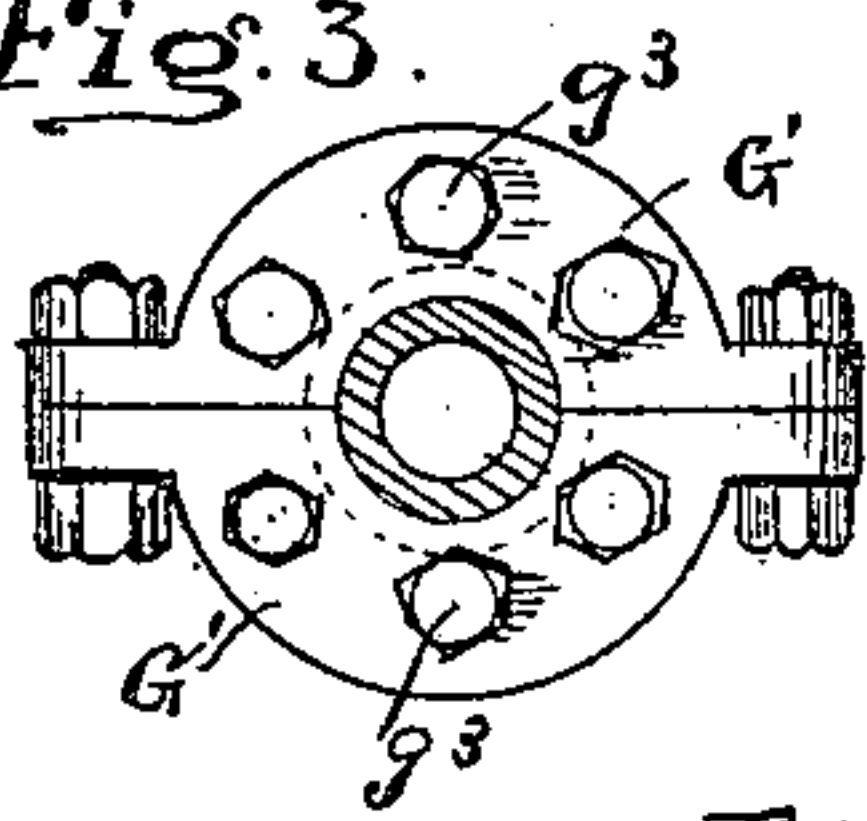
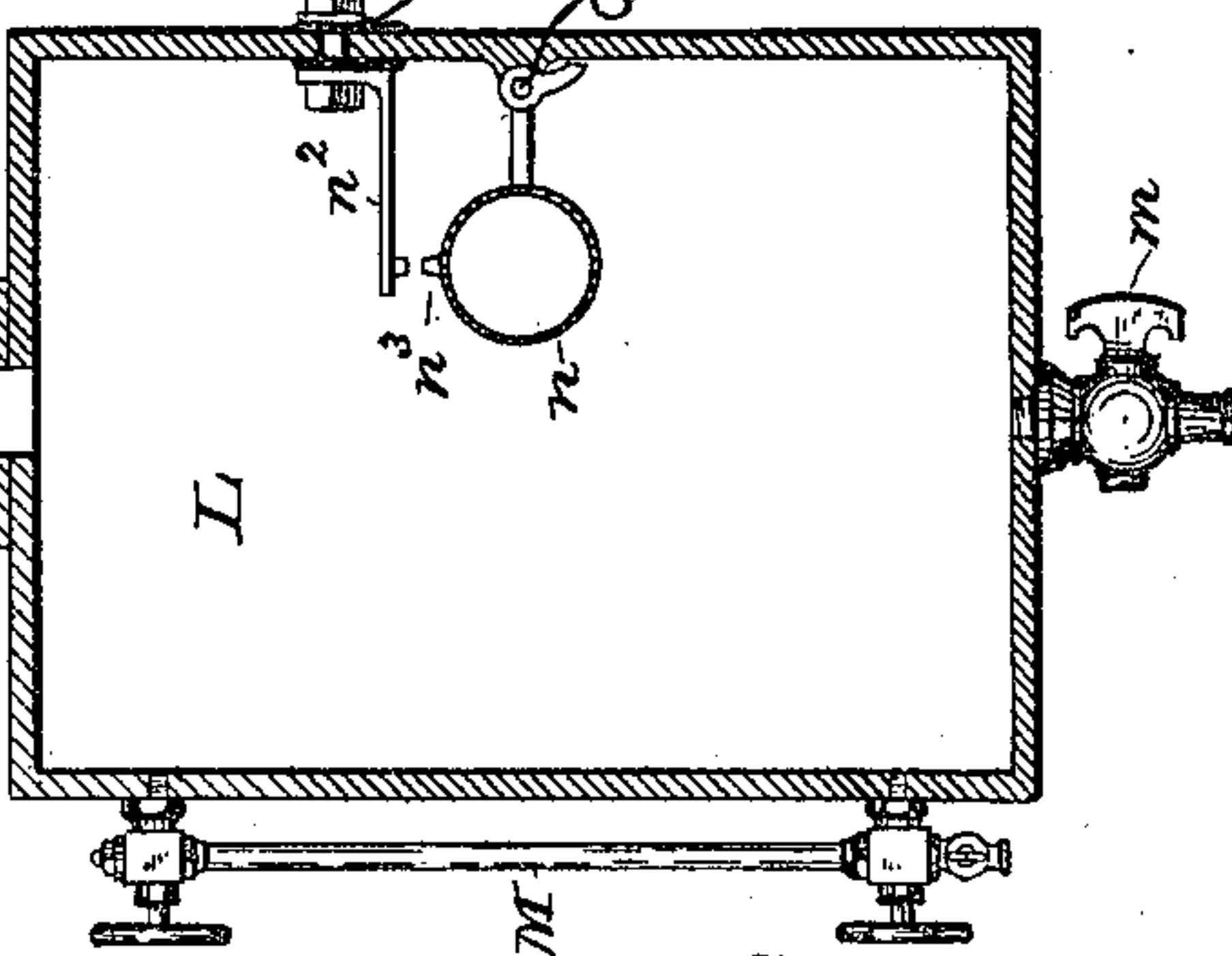
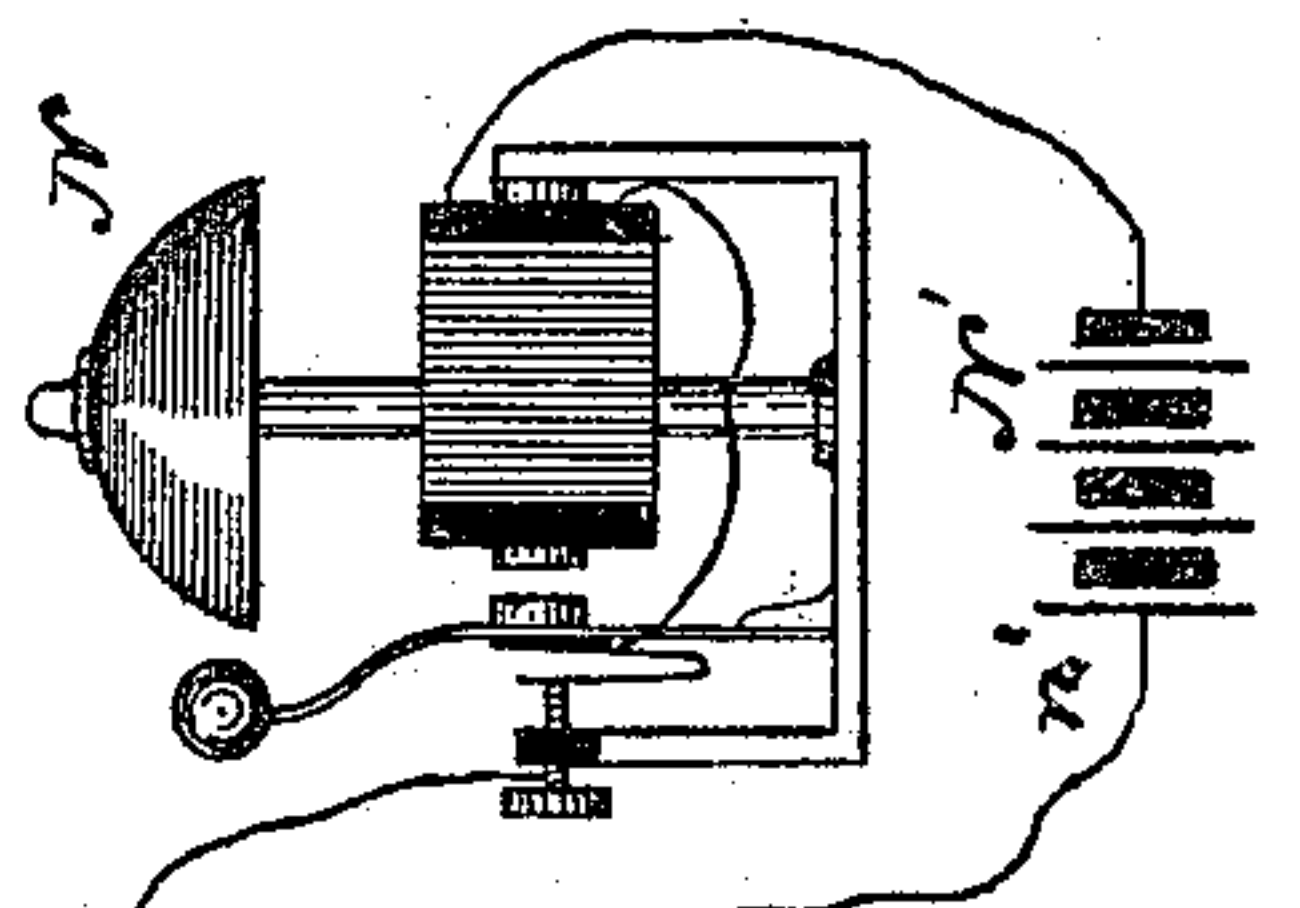
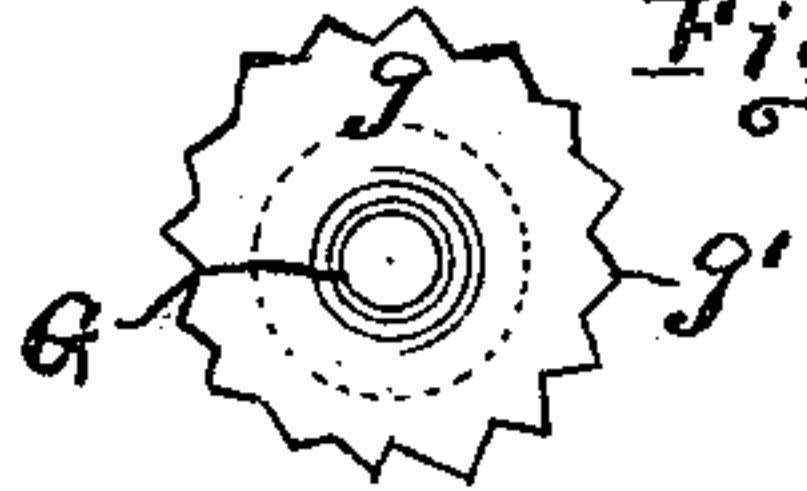


Fig. 2.



Witnesses

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# UNITED STATES PATENT OFFICE.

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## PULP-DIGESTER.

SPECIFICATION forming part of Letters Patent No. 440,242, dated November 11, 1890.

Application filed September 15, 1888. Serial No. 285,496. (No model.)

*To all whom it may concern:*

Be it known that I, SOLOMON R. WAGG, a citizen of the United States, residing at Appleton, in the county of Outagamie and State of Wisconsin, have invented certain new and useful Improvements in Pulp-Digesters, of which the following is a specification.

My improvement relates to that class of digesters intended for the preparation of paper-pulp from any cellulose fiber-producing material, or what is known as the "acid-bisulphite process." It is well known to those familiar with paper-making that the acid used in said process is very destructive to nearly all kinds of metal from its corrosive nature, lead being the only metal of available cost to successfully resist its action. Lead lining, however, has proved very troublesome, as it has not the power when expanded under heat to restore itself to its original condition upon cooling. The most favorable formation of a boiler to be lined with lead is the globe-rotary or spherical, this formation best keeping the lead in shape and controlling its expansion; but some important mechanical defects yet remain unsolved. Lead is very sensitive, much more so than is generally supposed. In a boiler of the rotary type the construction of necessity has a greater thickness of metal at or near the journals than at some other points, and it may be said to be true of all boilers that every one has in its construction some places thicker than others—as, for instance, where the laps in the boiler-sheets come—and here the heat is held longer than at thin points. At such points the lead lining is subjected to an uneven heat and soonest cracks and gives out, letting the acid through to the boiler-shell with corrosive and rapidly-destroying results. In such a case the usual custom has been to get a plumber to put on a patch by burning lead together; but after a little time it is found that this patch has begun to crack at the edges, in consequence, I believe, of its being double the thickness of the other parts of the lining, so that the action of heat in its destructive effects is concentrated at this particular spot. To avoid this tendency to crack at thickened points and to crawl or creep and ridge up along the whole surface, a large number of plans for applying lead lining have been pro-

posed and patented; but so far as I am aware no method has yet been devised for putting in a complete boiler-lining of lead without plumbing at any point or having two or more thicknesses of lead sheets in contact at some point.

The object of my invention is to improve the structure of lined digesters.

In the drawings, Figure 1 represents a vertical longitudinal section through a digester lined according to my invention and through the overflow-reservoir and supply-pipe connecting the generating-boiler. Figs. 2 and 3 are details showing the tight joint around the man-hole.

A represents the boiler-shell, which may be of any well-known type desired; but personally I prefer the globe-rotary over any other. I first properly prepare the internal boiler-wall and give it an electroplating of phosphor-bronze or other equivalent acid-resistant material for the primary insurance of the boiler-walls against injury in case any possible leak occurs through the lead lining at any time; or in place of electro-deposition I may substitute a coat of the porcelain applied to kitchen utensils in the usual way of its application. The application of the phosphor-bronze or porcelain, or whatever the coat may be, can be made before or after the plates are built up into a boiler or during the process of construction of such boiler. This bronze or porcelain coating is, however, to be understood not as a necessity, but purely as a matter of safety, and can be omitted when so desired by a builder or buyer. I then proceed to place in as large-sized pieces as possible over this primary coating any suitable acid-resistant non-conductor *a*—such as asbestos—that has or has not been submitted to treatment for making it better withstand the action of water or liquid. A mixture for such treatment may be composed of black oxide of manganese, red lead, litharge, and white lead mixed with boiled linseed-oil, the proportions to be varied to suit the character of the work being done, and in which the asbestos is to be soaked until saturated, or nearly so. Instead of the asbestos, a rubber-sheet back may be used that will withstand 300° or more of heat, and in case this rubber is used I deem it advisable to apply



a good coat of linseed or its equivalent oil to the boiler-wall, placing the rubber upon this oil, which will cause it to stick very closely and tenaciously to the boiler-wall when the latter is heated up, so that it cannot after a few days of heating be got off, except by chopping away with tools for the purpose. This of itself and without any regard to any primary coating will prove a good protection against acid reaching the body of the shell in case of a crack in the interior lining at any time while the boiler is charged. On this lining of non-conducting material I place the final or interior lining B, of pure lead or its equivalent, in such shape and size as is desired, being partly governed by the size and shape of the boiler to be lined. Whatever that shape may be I place near the marginal edge, but not quite up to the edge, a compression-frame C, extending along the said edge. This frame can be in one piece or in sections to suit the places and conditions where it is used. It is formed of any hard metal desired, with an acid-proof covering *c* on all of its exposed parts. I prefer fastening this frame to the boiler-shell by passing a stud tap-bolt D through the shell and piercing the frame, but not passing through it. If the frame is corrosive and applied to the sheet or plate of lead, as in Fig. 1, the acid-resistant coating or covering may be phosphor-bronze plated with silver instead of lead, or it may be porcelain or enamel.

In Fig. 1, E is a lead lining-sheet lapped over a second sheet E' and having intervening between the two, where they overlap, an acid-resistant non-conductor *e*—as, for instance, a sheet of asbestos packing suitably prepared, the whole surrounded by the just-mentioned compressing-frame or section, with a second interposed packing-strip *e'* of non-conducting material to hold the compressing-frame from heat contact with the lining and all parts clamped together by tap-bolts passing from the exterior of the boiler through the laps of the lining and packing into the compressing-frame, thus forming an acid-tight joint in which each thickness of the overlapping lead is separated from the other thickness by non-conductors and therefore independent of the other in its contraction and expansion.

F is a tubular journal having a flange bolted to one end of the boiler-shell and resting in a bearing F' of any suitable construction. This journal is necessarily lined with some acid-resistant, and to this end I place within it a second tube G, properly coated with some material that will not be corroded by the acid solutions in the bisulphite or other processes to which the digester is subjected. This lining-tube has at its inner end an annular flange *g*, advisably serrated around its edge, as at *g'*, to rest on the packing and form a close joint, and near its outer end the lining-tube has an annular groove *g*<sup>2</sup>, which receives the split collar G', the halves of

which are united together by bolts or otherwise. At suitable distances around this split collar set-screws *g*<sup>3</sup> are threaded therethrough, their upper ends being headed to receive a wrench, and their lower ends resting upon the exposed end of the journal, so that by setting these screws in the lining-tube may be drawn up through the journal, bringing the flange at its inner end firmly against the non-conducting packing-gasket *h*, arranged between it and the lead lining of the boiler-shell, and clamping said lead lining and gasket until a sufficiently tight joint is formed.

A pipe H leads from the journal-lining to a conical bearing *h* in the feed-pipe or supply-pipe K from the generating-boiler. This connecting-pipe between the journal-lining and the feed-pipe is, as usual, screwed into the journal-lining, so that it may be set up into its bearing to form a tight joint. Beyond the point where the connection is made with the supply-pipe the latter is extended to enter a reservoir L placed below the level of the hollow journal or inlet-pipe. It will sometimes happen that the pressure in the generating-boiler will suddenly fall to a point less than the pressure in the digester, when the preponderating pressure in the latter will at once force the acid liquor contained therein back through the feed-pipe into the generating-boiler with resulting damage. This reservoir is intended to anticipate, catch, and hold such overflow-liquor, thereby preventing it from going back into the generating-boiler.

To increase the efficacy of the overflow-reservoir, I intend to apply thereto a glass gage M, whereby the presence of acid therein can be detected by the color seen through the glass and by opening the drip-cock *m* at the bottom of the reservoir. This acid can be drawn away at once through a suitable steam-trap and the drain continued until the requisite pressure is restored to the generating-boiler. As a further provision for safety, I propose attaching an electric alarm-bell N to give timely and prompt notice of any accumulation of acid in the reservoir. This may readily be done by arranging a ball-float *n* within the reservoir and connecting therewith one pole *n'* of the battery N', while the other pole connects through the bell with a contact-bar *n*<sup>2</sup>, arranged within the reservoir above the float, so as to be struck by a lug *n*<sup>3</sup> on the latter and establish a circuit whenever said float is raised by the accumulation of acid or other fluid within the reservoir.

I claim—

1. The combination, substantially as hereinbefore set forth, with the boiler-shell, of the lead lining composed of sheets of lead over and under lapping at their edges or seams, and compression frames or strips placed upon the overlaps adjacent to the edges thereof, and bolts clamping said frames and seams tightly to the boiler-shell.

2. The combination, substantially as hereinbefore set forth, with the boiler-shell, of the



lining composed of sheets of lead over and under lapping at their edges, compression frames or strips placed upon the overlaps of said lining, and a packing of asbestos or  
5 other non-conducting material inserted between the frame and the surface of the lining.

3. The combination, substantially as here-  
inbefore set forth, of the boiler-shell, the  
coating of porcelain or equivalent material  
10 upon its interior wall, the asbestos lining laid thereon, and the lead lining laid upon the  
asbestos lining.

4. The combination, substantially as here-  
inbefore set forth, of the boiler-shell, the lead  
15 lining having overlapping seams, and the  
packing or gasket of asbestos or equivalent  
non-conducting material inserted between  
the overlapping thicknesses of the lining.

5. The combination, substantially as here-  
inbefore set forth, of the boiler-shell, its lead  
20 lining overlapping at the seams, the non-con-  
ducting packing or gasket inserted between  
the overlapping and underlapping thick-  
nesses, the compression-frame placed upon  
25 the overlapping thickness adjacent to its  
edge, and the non-conducting packing or gas-  
ket between said frame and the lead sheet.

6. The combination, substantially as here-  
inbefore set forth, with the boiler-shell, of its  
30 lead lining, its hollow journal, the tubular  
lining to said journal having a flange at the  
interior of the boiler, the split collar encircling  
the exterior end of said lining, and the set-

screws passing through said collar and bear-  
ing against the journal end.

7. The combination, substantially as here-  
inbefore set forth, with the boiler-shell and  
its lead lining and hollow journal, of the tubu-  
lar journal-lining having an internal flange,  
and a packing of non-conducting material 40  
between said flange and the boiler-lining.

8. The combination, substantially as here-  
inbefore set forth, with the digester and its  
steam-generator and supply-pipe, of an over-  
flow-reservoir to receive and intercept acid 45  
solutions escaping from the digester on the  
way to the steam-generator.

9. The combination, substantially as here-  
inbefore set forth, with the digester and its  
steam-generator and overflow-reservoir, of the 50  
gage for detecting the escape of acid solution.

10. The combination, substantially as here-  
inbefore set forth, with the digester and its  
steam-generator and supply-pipe and the  
overflow-reservoir, of an alarm apparatus for 55  
announcing the escape of acid solutions from  
said digester.

11. The combination, substantially as here-  
inbefore set forth, with the digester and its  
steam-generator and overflow-reservoir, of the 60  
electrical alarm for announcement of the es-  
cape of acid solution therefrom.

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Witnesses:

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