

No. 683,129.

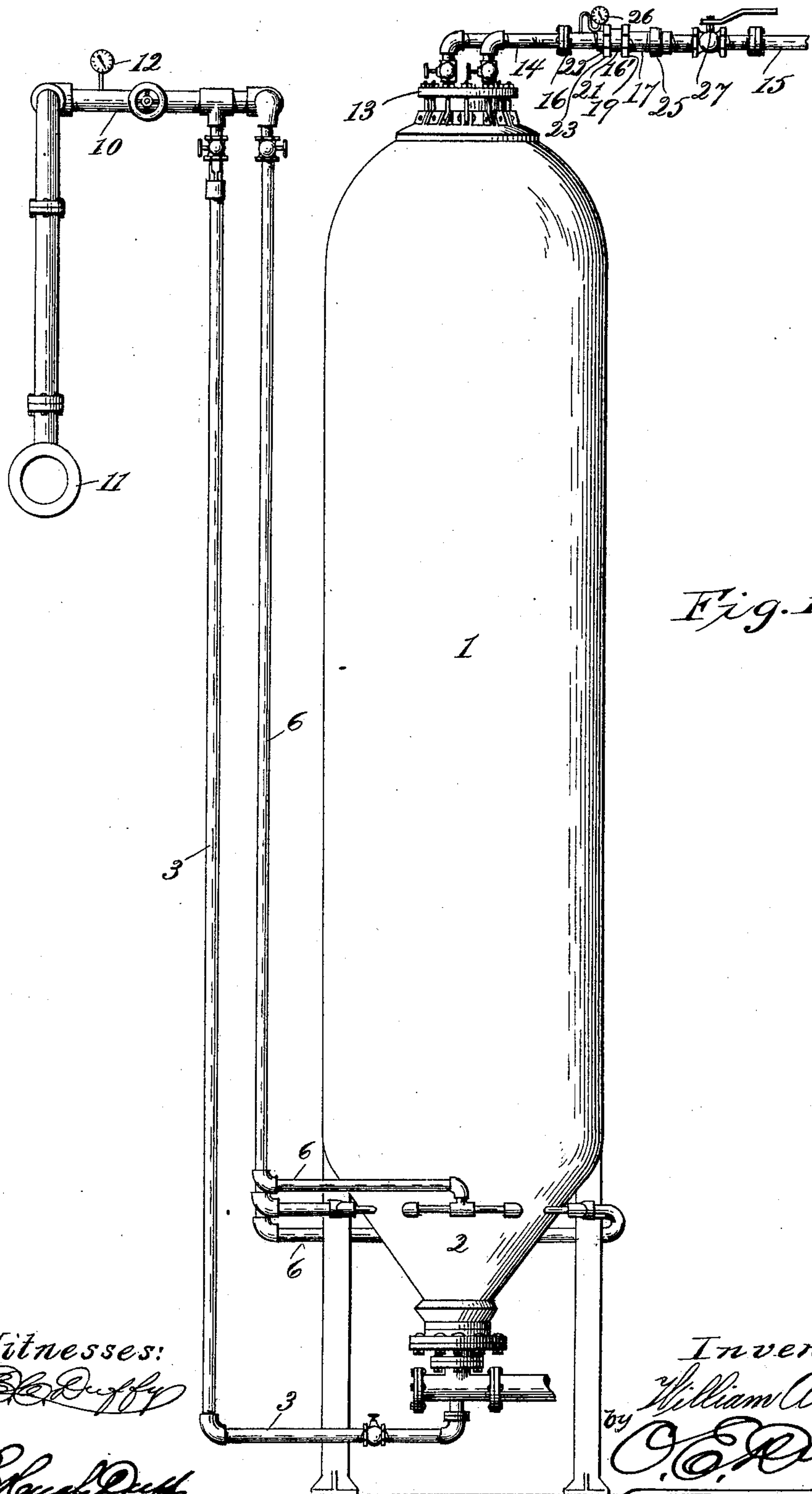
Patented Sept. 24, 1901.

W. A. LUKE.
SULFITE DIGESTER.

(Application filed Apr. 16, 1901.)

(No Model.)

4 Sheets—Sheet 1.



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4 Sheets—Sheet 2.

Fig. 2.

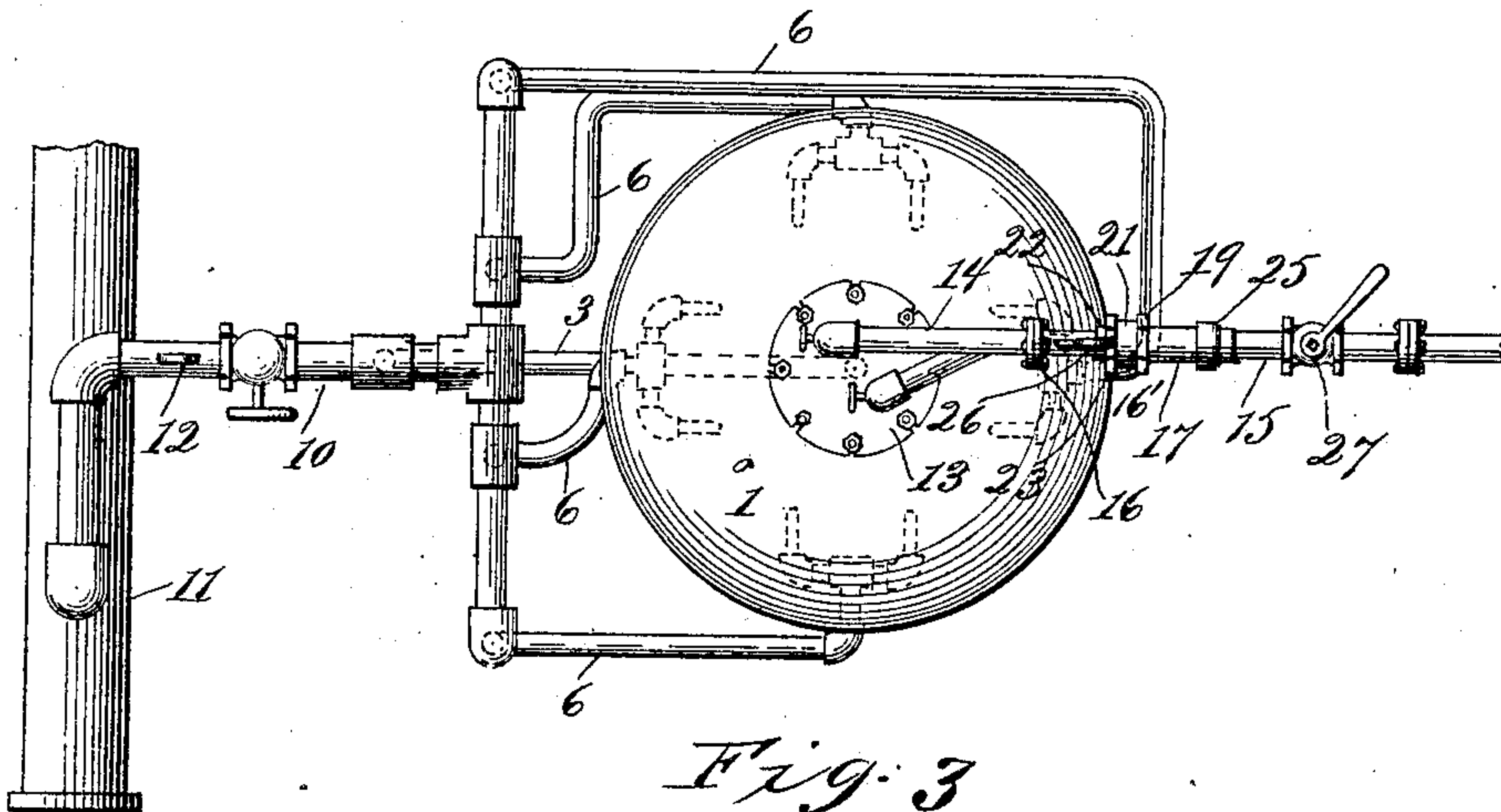


Fig. 3.

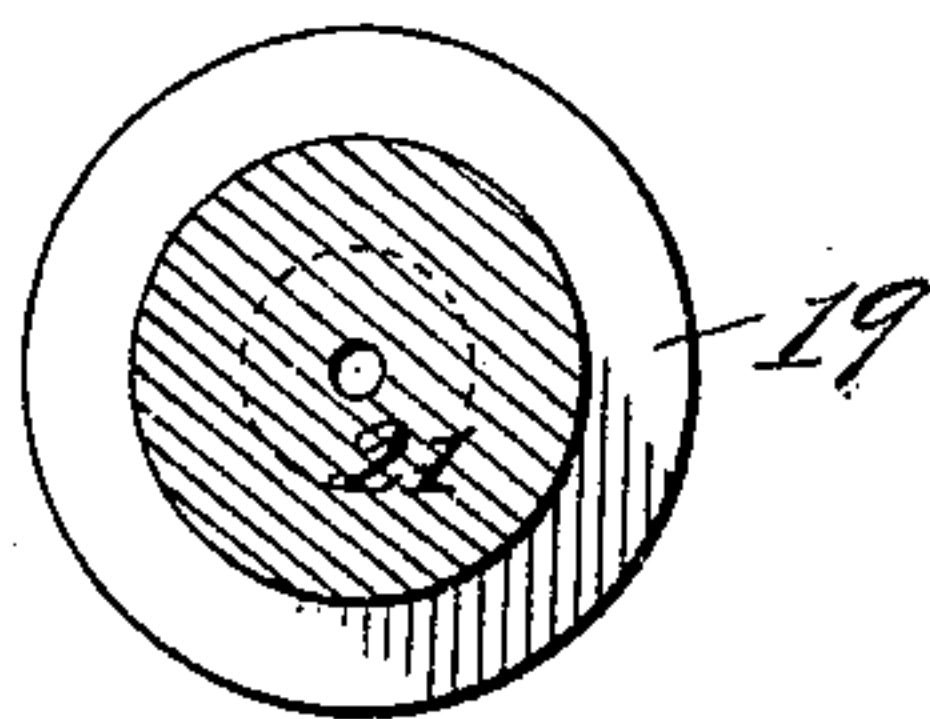


Fig. 4.

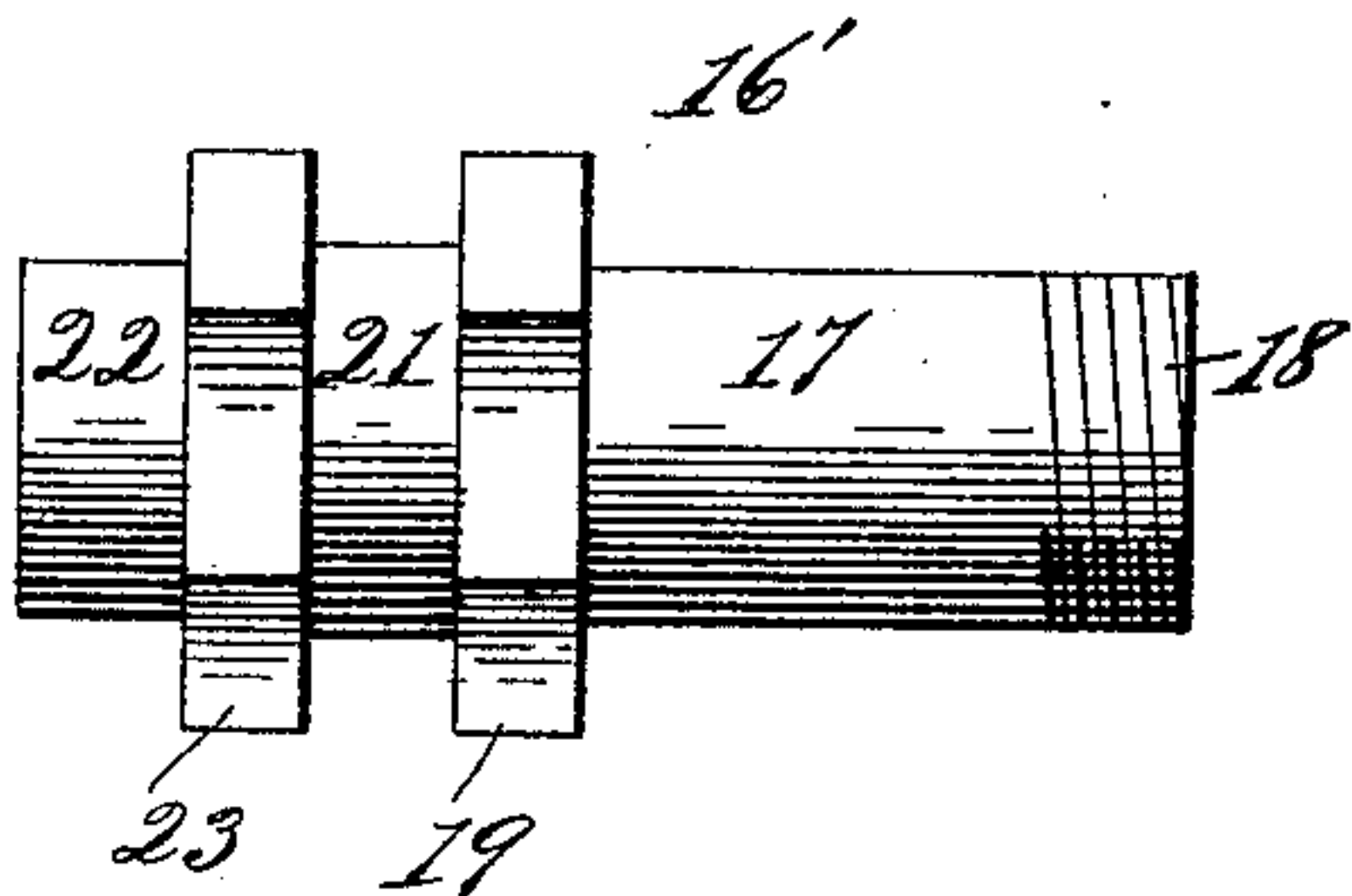


Fig. 5.

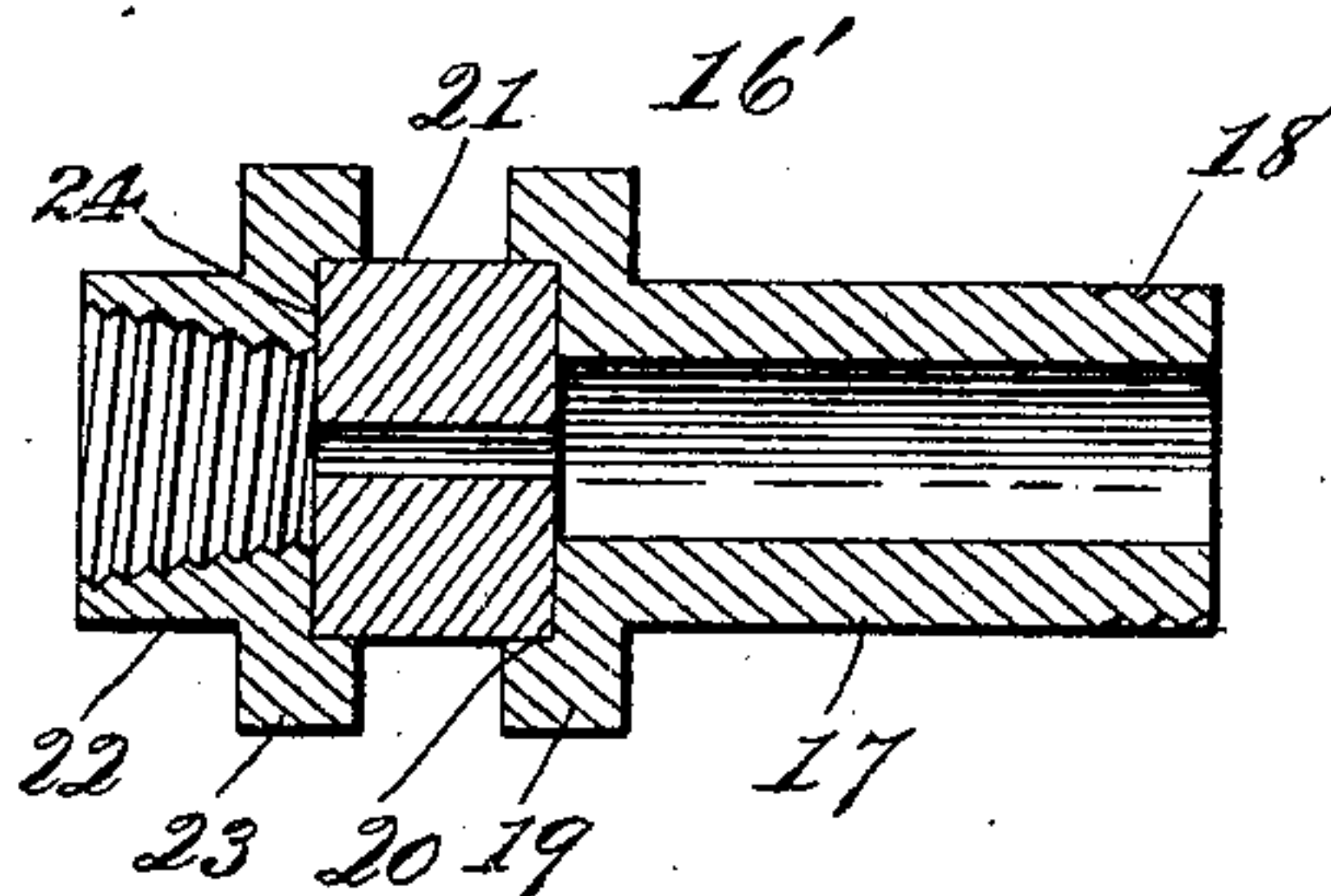
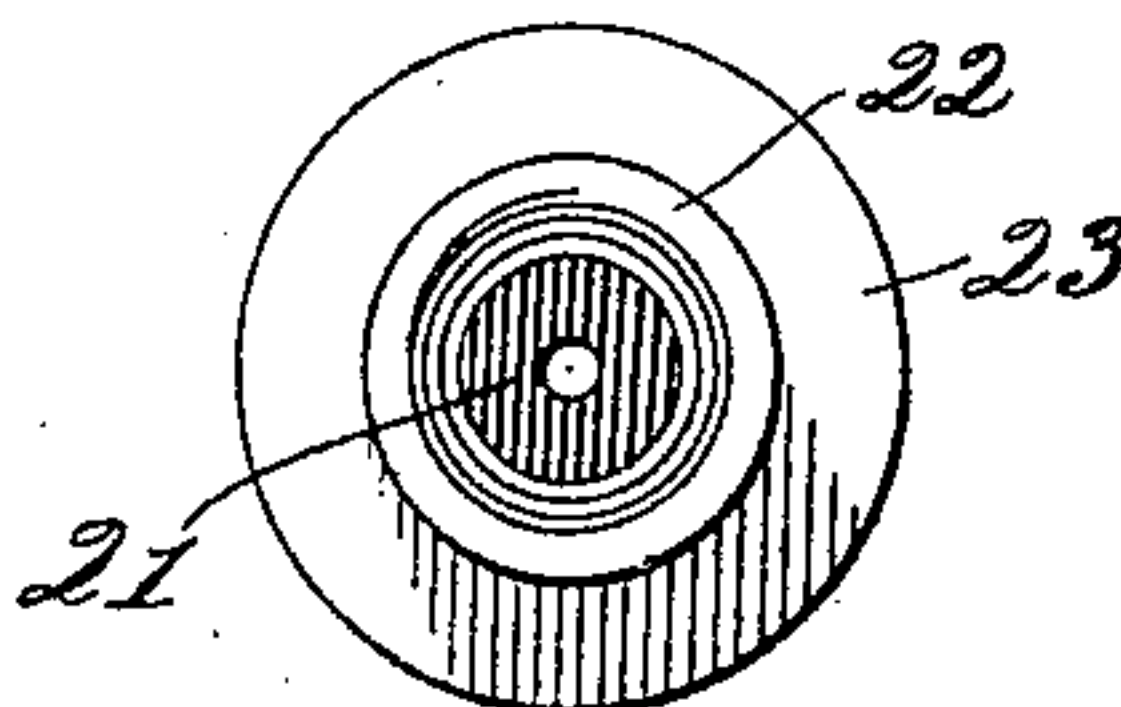


Fig. 6.



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Fig. 7

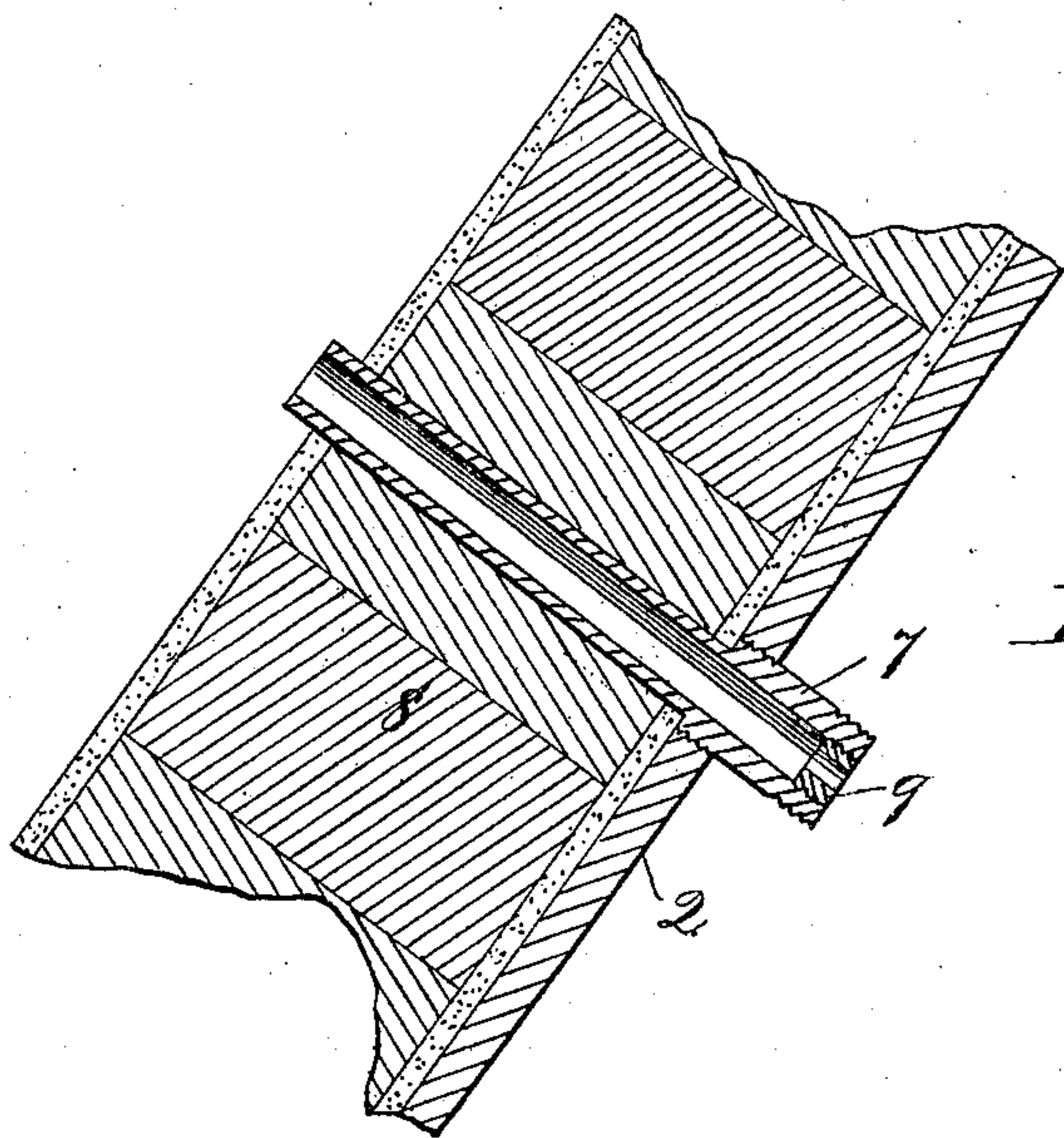
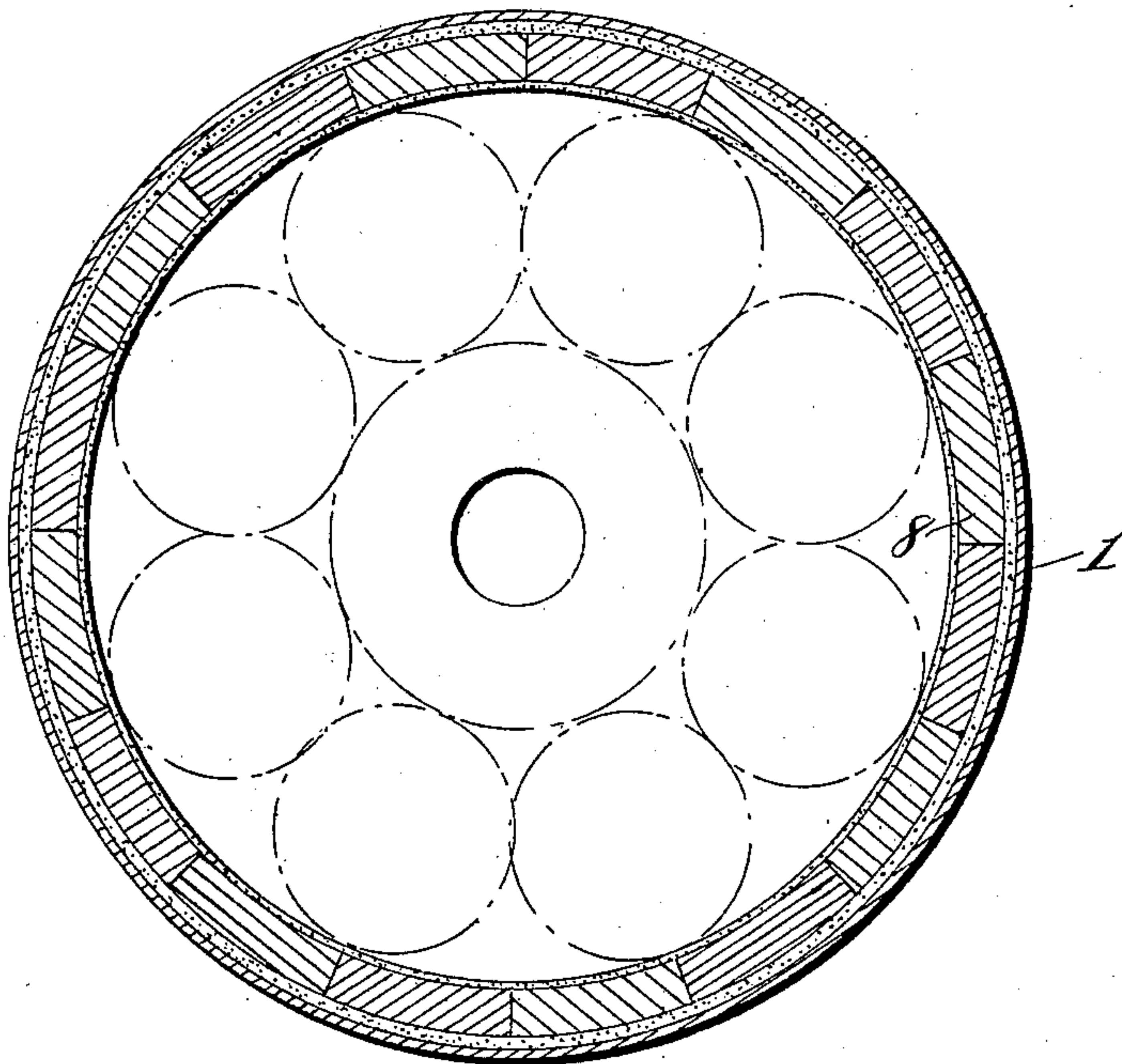


Fig. 8

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4 Sheets—Sheet 4.

Fig. 9

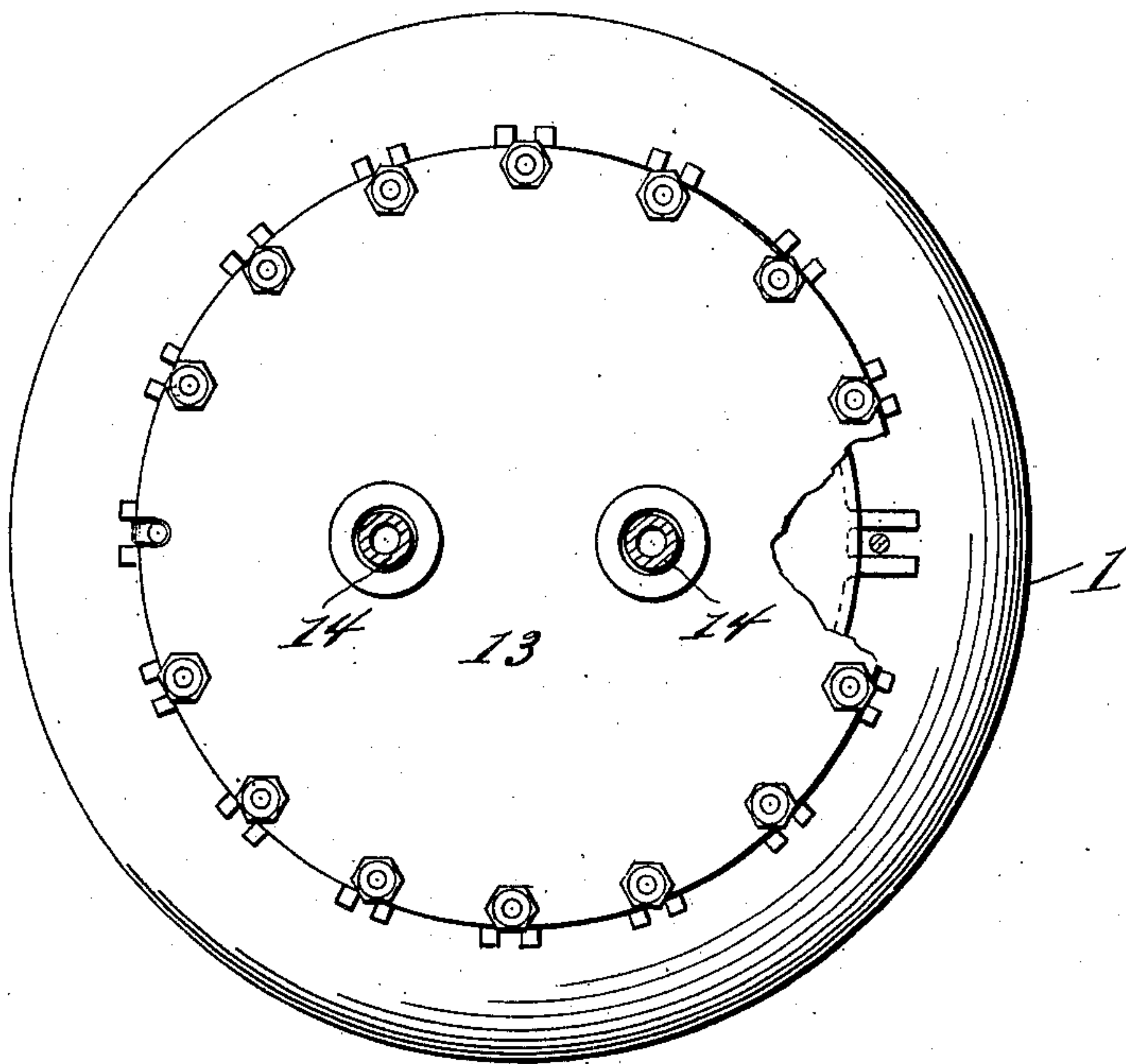


Fig. 10

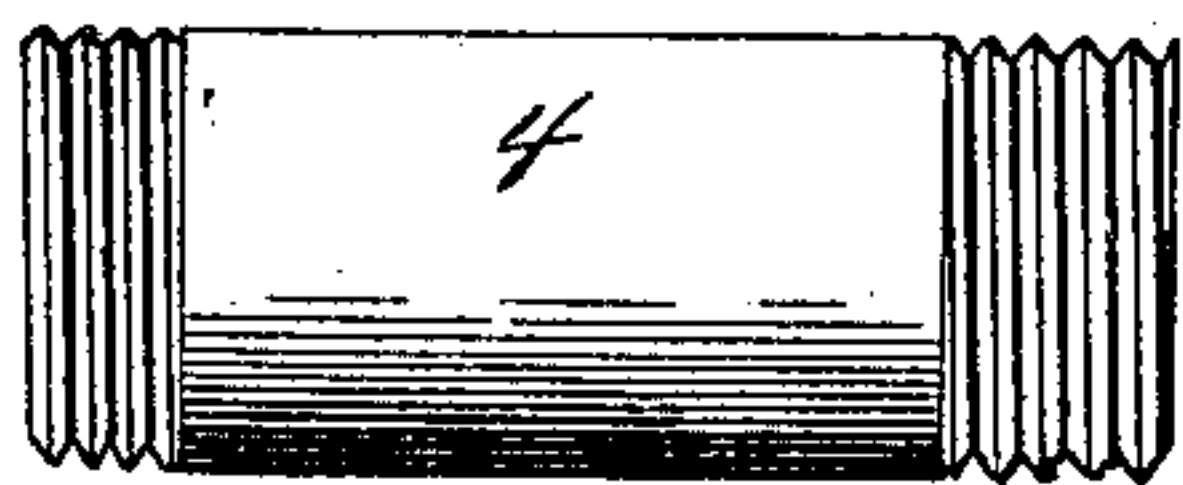


Fig. 11

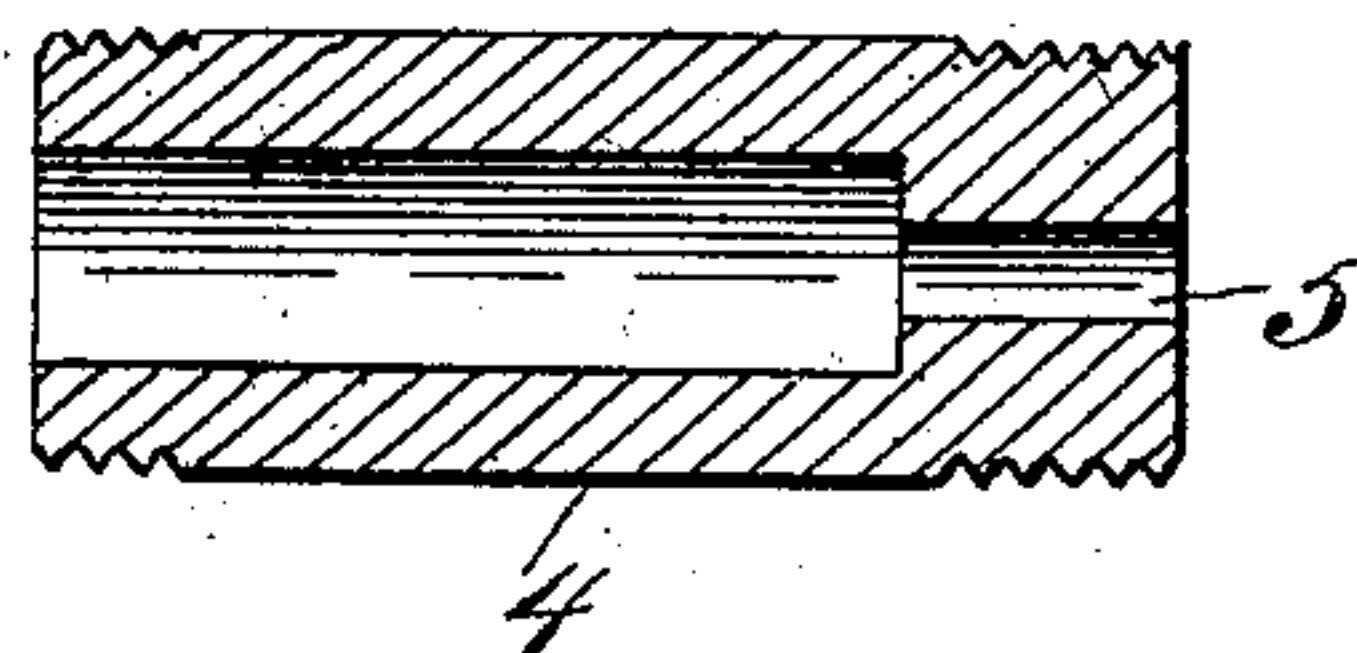
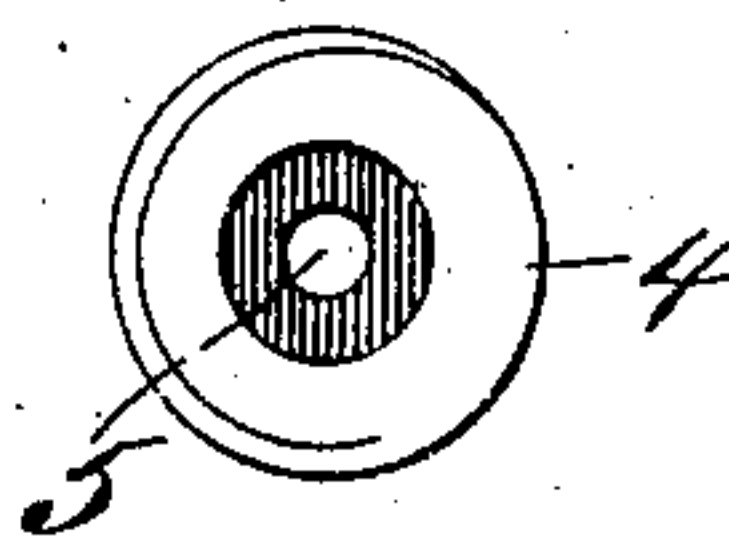


Fig. 12



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UNITED STATES PATENT OFFICE.

WILLIAM A. LUKE, OF COVINGTON, VIRGINIA.

SULFITE-DIGESTER.

SPECIFICATION forming part of Letters Patent No. 683,129, dated September 24, 1901.

Application filed April 16, 1901. Serial No. 56,100. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM A. LUKE, a citizen of the United States, residing at Covington, in the county of Alleghany and State of Virginia, have invented certain new and useful Improvements in Sulfite-Digesters; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to the manufacture of paper-pulp, but more particularly to "sulfite-digesters."

The objects of my invention are, first, to so improve a digester as to materially improve the quality of the pulp and at the same time decrease the boiling time, and, secondly, to provide a means whereby the heat and pressure are better under the control of the workman and whereby the "relief" of the digester can be ascertained and regulated with certainty. In the first instance sulfite-digesters now in common use are provided with one central steam-pipe located at the lowest point in the cone-shaped bottom of the digester for the purpose of admitting the steam. With this construction I have found by long experience that the boiling of the pulp is most uncertain, sometimes coming off quickly and very good in quality, while perhaps at the very next boiling the pulp would be a long time coming off and of a very poor quality. In fact, each successive boiling might be different both in time and quality of pulp produced, varying all the way from very good to extremely poor pulp. This uncertainty has always been a source of embarrassment to the pulp-makers, as the boiling of the pulp was entirely a matter of guesswork, every pulp-boiler having his own system, gained only by long experience.

It is for the purpose of more uniformly "cooking" the pulp in the digester that I have made my present invention, and I have found by experience that digesters provided with my invention will uniformly turn out a better quality of pulp and in a shorter period of time than the ordinary forms of sulfite-digesters now in common use. The result obtained is also due largely to my means of relieving the digester, whereby the heat and

pressure are under better control, which is the second object of my invention. There does not seem to have been a means of ascertaining correctly the relief of sulfite-digesters up to the time of this invention, nor have I been able to find any means heretofore employed for controlling the heat and pressure within the digester. With properly sized steam-nozzles suitably arranged the quantity of steam passing into the digester is the same for each and every "cook," which steam passes in with steadiness and regularity. Then when pressure on digester reaches the proper point the relief-nozzle comes into use, and said nozzle being proportioned to the capacity of digester controls the relief, thus being able to maintain and regulate pressure and heat at will. Knowing, therefore, that the pulp will cook in a certain length of time, it can be readily seen that a better and more uniform quality of pulp can be produced with much more satisfaction and in a shorter period of time.

With these objects in view my invention consists in the novel arrangement and location of steam-nozzles in the bottom cone of the digester and also in the novel arrangement and construction of the nozzle on the relief-pipe which leads from the top of my digester.

My invention also consists in certain other novel features of construction and combination of parts, which will be hereinafter fully described and afterward specifically pointed out in the appended claims.

Referring to the accompanying drawings, Figure 1 is an elevation of a pulp-digester arranged in accordance with my invention. Fig. 2 is a top plan view of the same. Fig. 3 is a section across the plug of what I term my "relief-nozzle." It can be also made in other ways, but as shown and described is preferable. Fig. 4 is a side elevation of my relief-nozzle. Fig. 5 is a longitudinal section through the same. Fig. 6 is an end view from the left of the same. Fig. 7 is a cross-section through the digester, the area within the same which is covered by the steam-nozzles in the cone of the digester being shown in dotted lines. Fig. 8 is a fragmentary section through the side of the digester and one of the steam-nozzles. Fig. 9 is a top plan view of the top

of digester. Fig. 10 is an elevation of the steam-nozzle placed in steam-pipe supplying steam at the bottom of the digester. Fig. 11 is a section through the same. Fig. 12 is an end view thereof.

Like numerals of reference indicate the same parts throughout the several figures.

1 is a digester having the usual cone-shaped bottom portion 2.

3 is a steam-pipe leading to the bottom of said cone-shaped section, said pipe having a nozzle 4 just under the inlet-steam valve at upper end thereof, as shown in Figs. 10, 11, and 12. The bore of said nozzle 4 is made very much smaller in its outer end, as shown at 5, this construction being for the purpose of providing a constant and uniform flow of steam, it being a well-known fact by physicists that a properly-constructed nozzle under uniform pressures will deliver exactly uniform quantities of steam or gas.

6 represents the steam-pipes which lead to the side of the digester at points equidistant circumferentially and near the top of the cone-shaped portion, each of said pipes having two inlets. These pipes can have one, two, or more inlets into the digester. One, or at the most two, is preferable, however, as clearly shown in Fig. 1. Said pipes connect to nozzles 7 in the shell of the digester, as shown in Fig. 8, said nozzles 7 being constructed of acid-resisting bronze and extending entirely through the lining 8 of the digester and a short distance beyond. In the outer end of said nozzles I provide a plug 9, threaded therein, said plug having a bore considerably smaller than the bore of the nozzle proper, for a purpose above described. I construct the plug with threads, so that it may be removed, thus being able to regulate the size of the steam-inlet. The steam-pipes 3 and 6 are connected by a pipe 10, of greater diameter, to the main pipe 11, and upon said pipe 10 I provide a steam-gage 12, as usual, for the purpose of indicating the pressure of the incoming steam.

Figs. 1 and 7 show eight side nozzles, which are preferable for large digesters, said nozzles and steam-pipes 6 being smaller than the central nozzle 4 and steam-pipe 2. Having calculated the area of the cross-section of the digester, I have for purpose of illustration in Fig. 7 divided said area into nine imaginary sections or zones, as shown in dotted circles, thus showing clearly the area covered by each nozzle.

From the size and number of the nozzles and the area of the digester I have calculated the area which is covered by each of said nozzles, these calculations being unnecessary here in a patentable sense. The removable top 13 of the digester is provided with two relief-pipes 14. While two are not necessary, yet they are preferable to one for a large digester, and which lead into the main relief-pipe 15, said relief-pipe being provided with a coupling 16, so that said top 13 of the diges-

ter may be removed in order to charge the same. In the main relief-pipe 15 I provide my relief-nozzle 16', which is shown in detail in Figs. 3, 4, 5, and 6. Said relief-nozzle is constructed of a hollow stem 17, having one end externally threaded at 18 and the other end provided with a flange 19 and a circular recess 20 in the face thereof. Fitting snugly into said circular recess is a plug 21, having a bore therein very much smaller than the bore of the nozzle and relief-pipe, said bore to be of size to suit capacity of digester.

22 is an internally-tapering threaded collar which is provided with a flange 23 and a circular recess 24, similar to that just described. Between these flanges the plug 21 is interposed, and said flanges are then firmly secured together by any substantial means, but preferably by bolts. (Not shown.) Said collar 22 of the relief-nozzle is threaded over one section of the relief-pipe 15, while a collar 25 is employed to connect the other end of the nozzle to the other section of the relief-pipe, thus making a neat and substantial connection. Between said relief-nozzle and the coupling 16 I provide on the relief-pipe a gage 26, and behind said nozzle I provide a cock 27 for the purpose of cutting off the relief entirely.

Having thus described the several parts of my invention, its operation is as follows: When the digester is charged, the steam is admitted therein through the central and side nozzles and mixes with liquor and chips, heating same with uniform rapidity, which heat ascends to the top of the digester.

I have described the method and advantages of the side nozzles and will not dwell upon them further.

The steam which heats the liquor and chips, making pressure at the same time, is relieved through the top of the digester when the proper pressure is reached by means of the relief-pipes 14, which are firmly secured in said top and which are provided with strainers (not shown) directly under said top for the purpose of preventing the pulp from filling up and clogging the relief-pipes 14. The relief is very necessary, because if digester-pressure gets too high no more steam can get into the digester and the boiling comes to a stand; hence the very great importance of an arrangement which will show just how the relief is progressing.

The pressure of the incoming steam can be seen by referring to the steam-gage 12 on the steam-pipe 10. The pressure from digester in its passage through the relief-pipe 15 must pass through the plug 21 in the relief-nozzle. The bore of said plug being very much smaller than the bore of the relief-pipe, said pressure cannot pass through as quickly as it can enter the relief 14. There is consequently a pressure within said relief-pipe between the digester and the relief-nozzle, and this pressure is indicated by the gage 26, secured to said relief-pipe in front of the relief-nozzle. This gage

indicates the pressure within the relief-pipe, or, in other words, indicates the relief of the digester. I use a third gage communicating with the inside of digester, as is customary to ascertain pressure on digester. It can thus be seen that certain fixed and uniform pressure can under all circumstances and conditions be maintained within the digester, which fact makes it possible for the first time to boil uniformly, and thus produce a pulp in a definite time and of a uniform quality.

It might be well to state here that the strainers at times become partially or completely stopped up with pulp during the process of boiling. The gage 26 between digester and relief-nozzle 16 will then show less pressure, thereby indicating this condition. Without my relief this difficulty cannot be known with any degree of certainty. With my system of inlet and relief nozzle this clogging of the strainers is reduced to a minimum, so much so that it has become of unusual occurrence. Heretofore there was no way of indicating this; but by my relief arrangement I can tell instantly the condition of the strainers and regulate the pressure in the digester accordingly. It is thus obvious that with my invention I can produce a pulp in a shorter period of time and of a more uniform quality, thus materially increasing the efficiency of the digester, thereby facilitating in a great measure the manufacture of paper-pulp.

Having thus fully described my invention, I do not wish to be understood as limiting myself to the exact construction herein set forth, as various slight changes might be made therein by those skilled in the art which would fall within the limit and scope of my invention, and I consider myself entitled to all such changes and modifications.

What I claim as new, and desire to secure by Letters Patent of the United States, is—

1. In a digester, the combination of the central steam-inlet nozzle, the side steam-inlet nozzles located at points above central nozzle, a gage to indicate the pressure of incoming steam, a relief-pipe, a relief-nozzle secured in said pipe, whereby the pressure may be maintained within said relief-pipe, and a gage to indicate said relief-pressure substantially as described.

2. In a pulp-digester, the combination with the shell thereof, of a central steam-nozzle having the bore of its outer end made smaller than the bore of the nozzle proper, a series of steam-nozzles located at points above said central nozzle, hollow plugs secured in the outer end of said latter nozzles, substantially as described.

3. In a pulp-digester, the combination with the top thereof, of a relief-pipe suitably connected thereto, a relief-nozzle secured in said pipe, and means for determining the pressure within said pipe, substantially as described.

4. In a pulp-digester, the combination with the top thereof, of a relief-pipe suitably connected therewith, a collar having a flange thereon, a stem having a flange thereon, a plug interposed between the flanges of said collar and stem, having smaller bore than said collar and stem, and a gage interposed between said collar and digester, substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

WM. A. LUKE.

Witnesses:

THOS. LUKE,
L. J. LA MAR.