

No. 704,259.

Patented July 8, 1902.

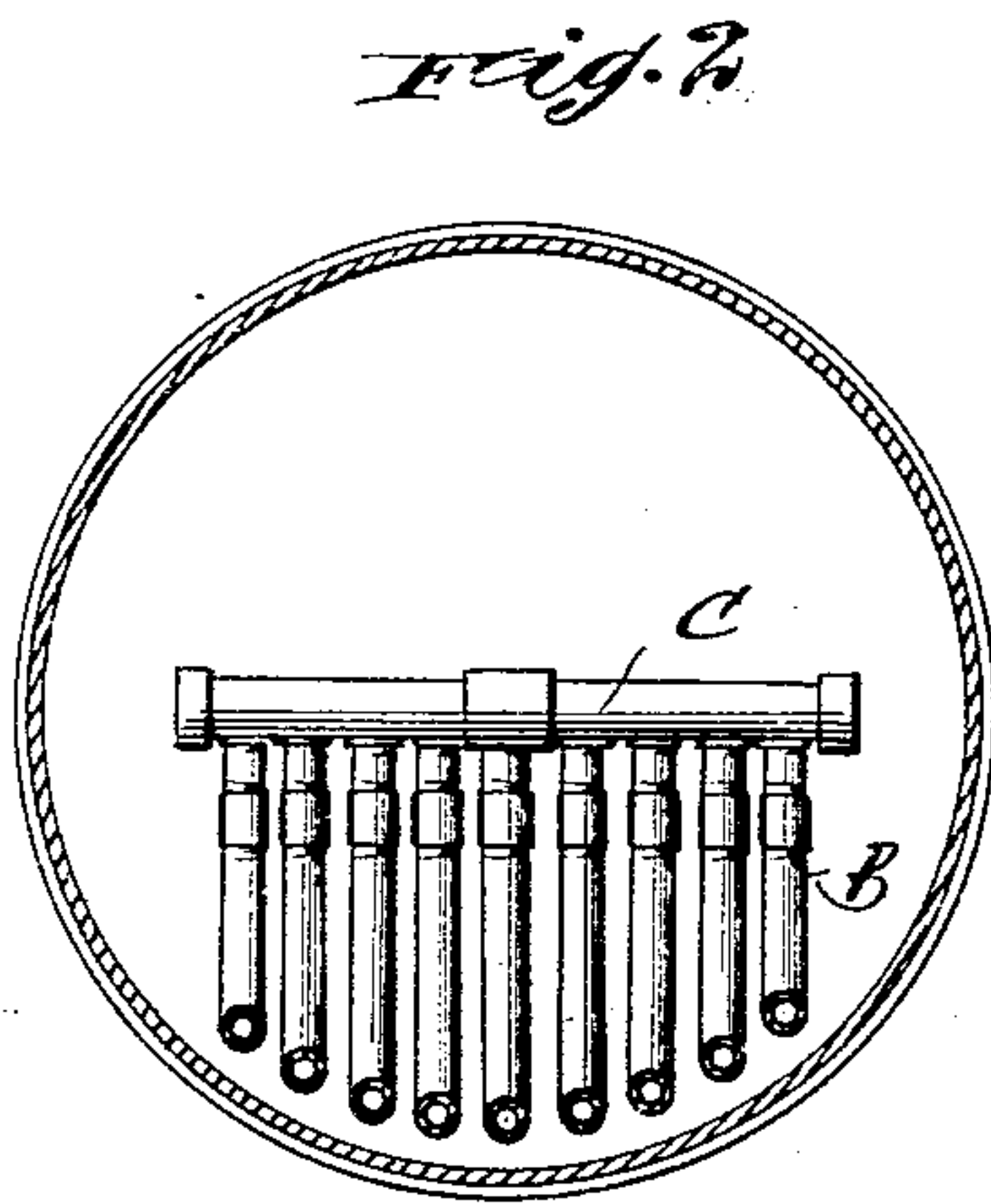
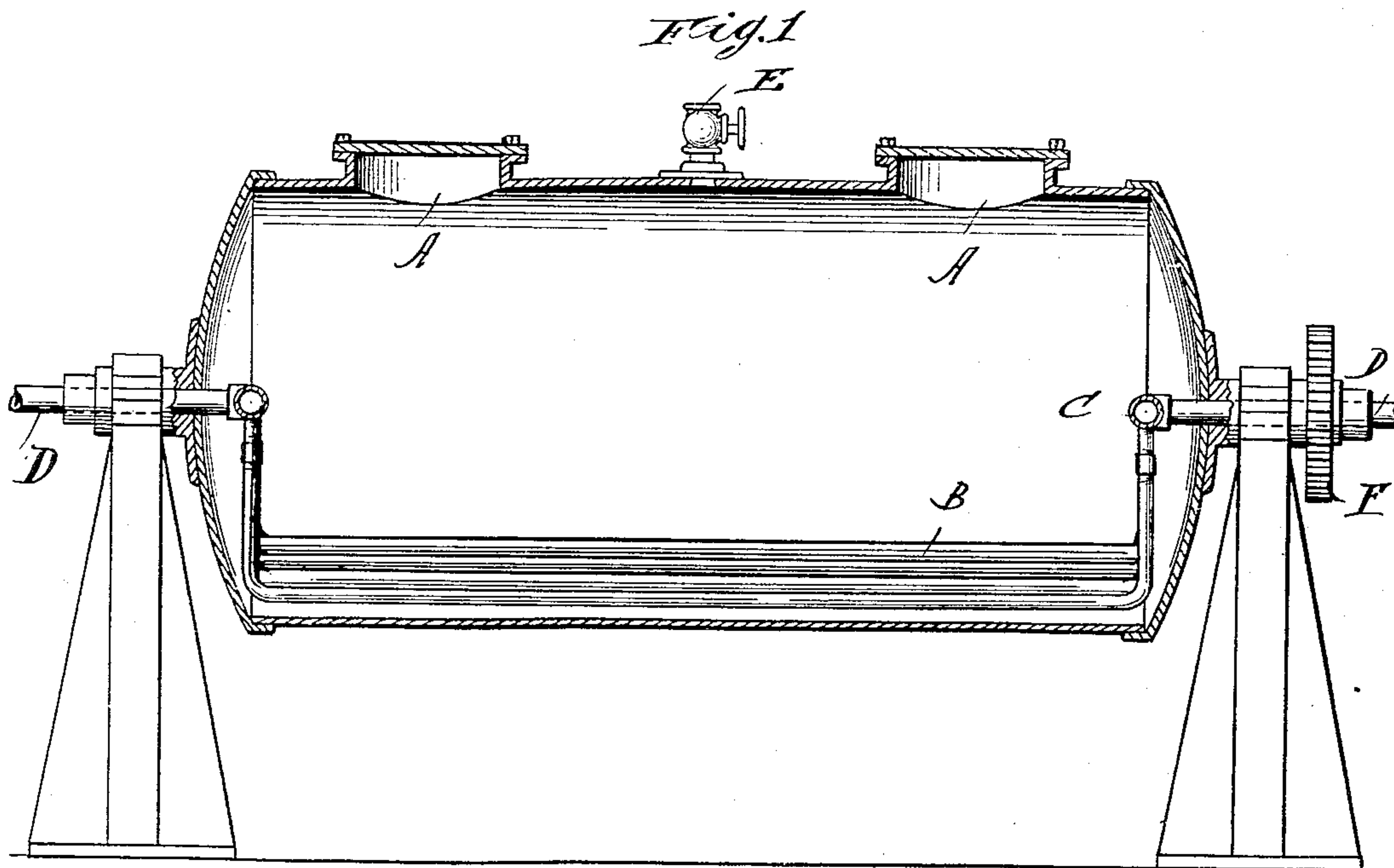
E. T. HOLMES.

PROCESS OF TREATING FIBROUS SUBSTANCES.

(Application filed Mar. 1, 1900.)

(No Model.)

2 Sheets—Sheet 1.



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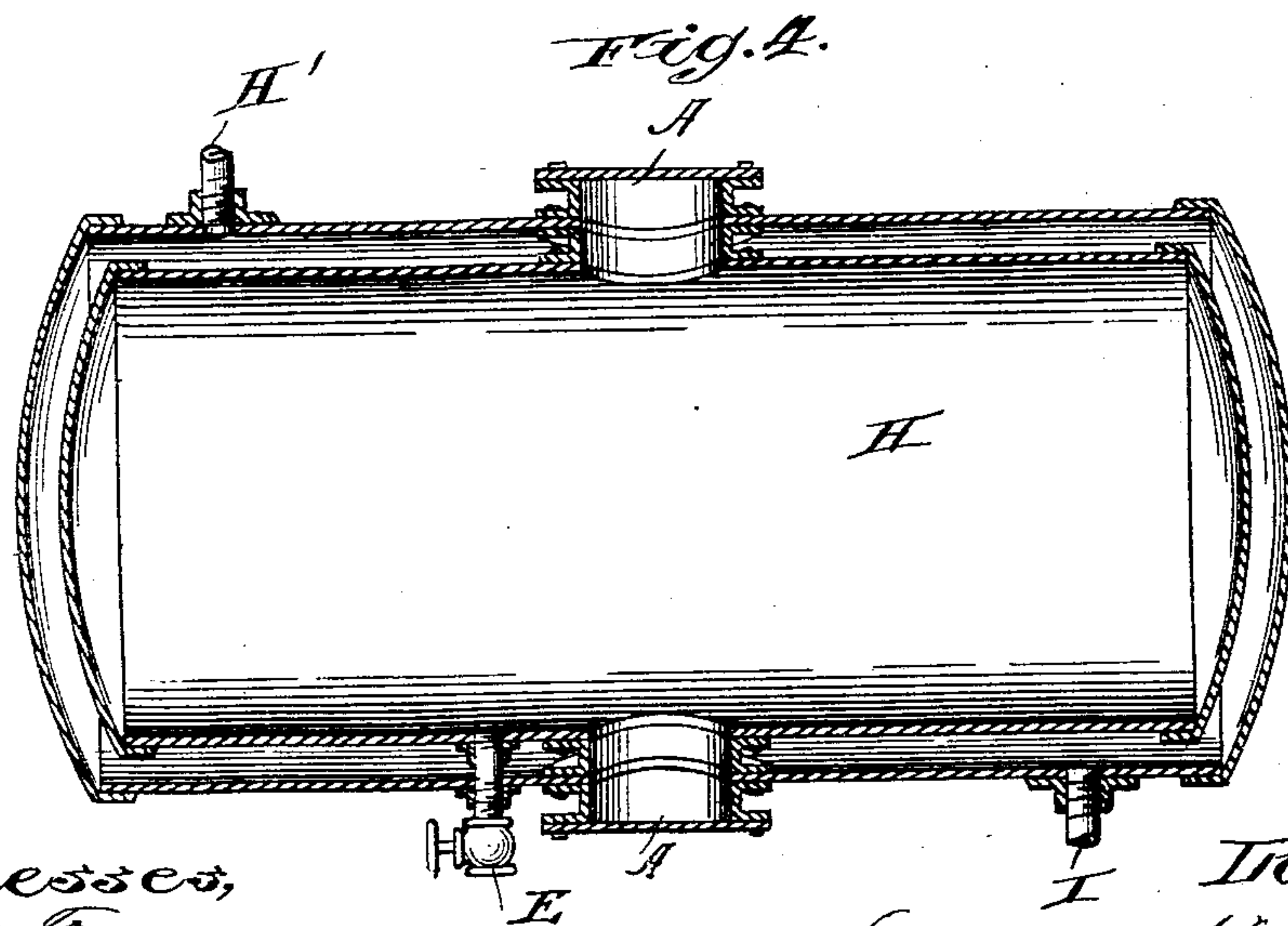
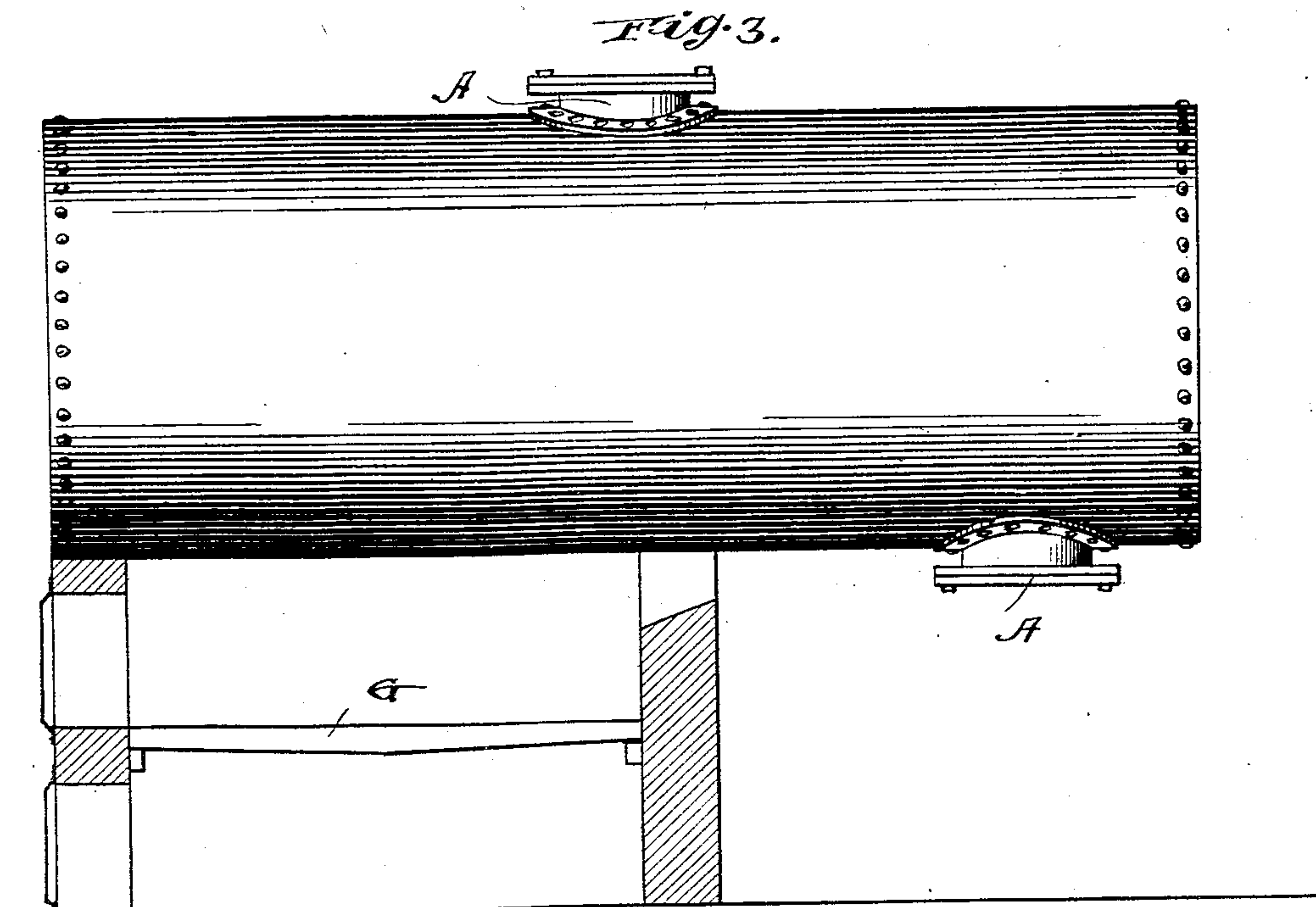
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UNITED STATES PATENT OFFICE.

ENOCH T. HOLMES, OF CHICAGO, ILLINOIS, ASSIGNOR OF ONE-THIRD TO
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PROCESS OF TREATING FIBROUS SUBSTANCES.

SPECIFICATION forming part of Letters Patent No. 704,259, dated July 8, 1902.

Application filed March 1, 1900. Serial No. 6,960. (No specimens.)

To all whom it may concern:

Be it known that I, ENOCH T. HOLMES, of Chicago, Illinois, have invented certain new and useful Improvements in Processes of Treating Fibrous Substances, of which the following is a specification.

This invention relates to an improved process of treating fibrous substances, and particularly flax-straw for the manufacture of fiber for use in making paper-pulp and other articles of commerce; and the object of the invention is to enable such material to be treated in a more economical manner than heretofore and in such way as to produce a superior quality of fiber from a material readily obtainable at low cost, but which has not been utilized to as great an extent as desirable, because of defects in previous treatments.

In carrying out my invention I first take the flax-straw, and after thoroughly breaking it by heckling, breaking-rolls, or other devices it is cleaned from dust and other foreign substances and then subjected to a cooking process in an alkaline solution of a certain strength for such period of time and under such pressure as will thoroughly disintegrate the straw and dissolve and remove the silicious, albuminous, and woody matters and produce a superior quality of fiber. The several mechanical operations may be carried out by various types of apparatus. I have shown in the accompanying drawings several forms of apparatus in which the boiling or cooking of the flax may be conveniently and economically effected.

In said drawings, Figure 1 is a sectional elevation through a boiler intended to be heated by the circulation of steam through the pipes located therein. Fig. 2 is a transverse sectional elevation through said boiler and circulating-pipes. Fig. 3 shows a boiler which is intended to be heated by external heat, and Fig. 4 is a sectional elevation of a digester or cooking apparatus in which the interior vessel is steam-jacketed.

The detailed method of operation is as follows: I take flax, hemp, or other straw or fibrous materials and thoroughly break the straw, which may be done by the well-known operation of heckling or by means of break-

ing-rollers. After the straw is thoroughly broken it is cleaned of dust and other foreign substances, leaving only what pertains to the straw itself—viz., the fibrous and woody parts. I then take this straw so treated and place it in a suitable cooker, boiler, or digester and there treat it for its disintegration and reduction. Any suitable form of cooking apparatus may be employed. In Fig. 1 is shown a common form of cooker, comprising a cylindrical vessel having charging apertures or manholes A and heating-pipes extending longitudinally through the boiler and connected near the ends thereof with headers C, steam being supplied through the pipe D. E represents the draw-off valve, and F a gear whereby the cooker may be revolved. The steam is preferably caused to circulate through the pipes B, and for that purpose the pipe D and a similar pipe D' form the trunnions or journals of the cylinder, the steam being let in through one of said pipes and out through the other after circulating through the headers and pipes B. The pipes may be arranged in any convenient manner, that arrangement shown in Fig. 2 being well adapted for the purpose. In Fig. 3 I have shown an ordinary boiler or digester mounted in a stationary manner above a grate G, the boiler having charging and discharging openings A. In the cooker shown in Fig. 3 the material is treated by heat applied by means of an open fire built on the grate G. In Fig. 4 I have shown a steam-jacketed vessel H, steam being admitted to the heating-space through the pipe H' and allowed to pass out through the pipe I. The usual manholes A and draw-off valve E are supplied in this case. The material to be treated after being prepared and cleaned as above described is charged into one of the forms of cooker shown or into some other suitable form of cooker, and there is added to the straw an alkaline solution of caustic soda or caustic potash and having a strength of from 6° to 7° Baumé. Fifty gallons of such solution to one hundred pounds of clean flax-straw will produce good results. The mass is subjected to heat until the disintegration is completed, and I have found that the length of time the cooking must be carried on will depend somewhat upon the tempera-

ture attained and the pressure under which the cooking is effected. Thus if the cooking be continued for a period of four hours at a pressure, say, of one hundred and twenty pounds, such treatment will be substantially equivalent to, say, six hours' cooking at eighty pounds pressure or seven hours' cooking at seventy pounds. These treatments will effectually dissolve the shive and woody parts of the straw, leaving the fiber intact and in a condition to produce a superior quality of paper-pulp or other articles of commerce.

I am aware that flax-straw has been cooked in an alkaline solution; but so far as I am aware no one has hitherto used a solution of the strength which I employ. I have discovered that an alkaline solution testing within the limits above described will give a better result than a solution testing lower—say from one per cent. to three and one-half per cent.—as heretofore recommended and practiced. I have also discovered that by using a solution of the proper strength the cooking process may be varied as to the length of time employed, but that substantially the same results can be obtained by cooking at high pressure for a shorter period as by a lower pressure for a longer period within the limits above mentioned. I prefer to add the liquor hot, although it is not essential to the working of the process that it should be so used.

The methods of charging, drawing off, and other details of the operation are such as have been commonly employed and need no particular description.

The quantity of the solution in proportion to the straw will vary slightly, depending upon the strength of the solution itself and the character of the material undergoing treatment.

In whatever manner the cooking is carried on steam will be generated within the vessel,

and, as before stated, the length of time during which the operation is continued will be dependent to some extent upon the temperature employed and the pressure attained within the cooker.

It will be observed that the method of treatment above described employs steam indirectly as the heating agent, so that the strength of the solution is not weakened by condensation. It will further be observed that the generated pressure is practically the same whether the treatment be continued for the lowest stated time at the highest pressure or for the highest mentioned time at the lowest pressure, and by "generated pressure" I mean the indicated pressure multiplied by the time during which the process is continued, and I prefer to continue the treatment for a period of about six hours at a pressure of eighty pounds, thus giving what I have denominated a "generated pressure" of four hundred and eighty pounds; but, as before observed, the same result may be attained by continuing the treatment for a period of seven hours at seventy pounds or for four hours at one hundred and twenty pounds pressure.

I claim—

The herein-described process of treating fibrous substances, such as flax-straw, which consists in cooking said straw in an alkaline solution of 6° to 7° Baumé in about the proportion of fifty gallons of said solution to one hundred pounds of straw, at a pressure of from eighty to one hundred and twenty pounds, and for a length of time, within the limits of six to four hours, varying substantially in an inverse ratio to the pressure and temperature employed.

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Witnesses:

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