(No Model.)

C. CURTIS & N. M. JONES.

PAPER PULP DIGESTER.

No. 485,000. Patented Oct. 25, 1892.

Fig. 1.

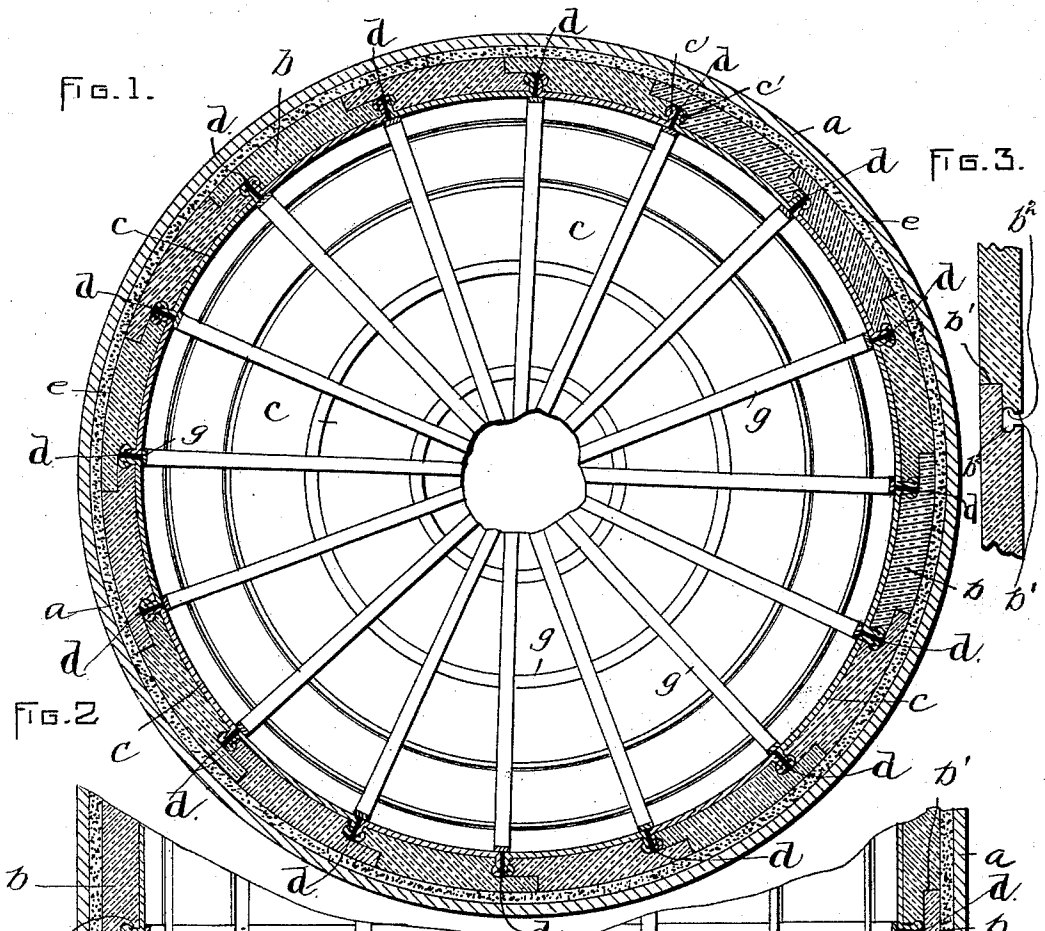
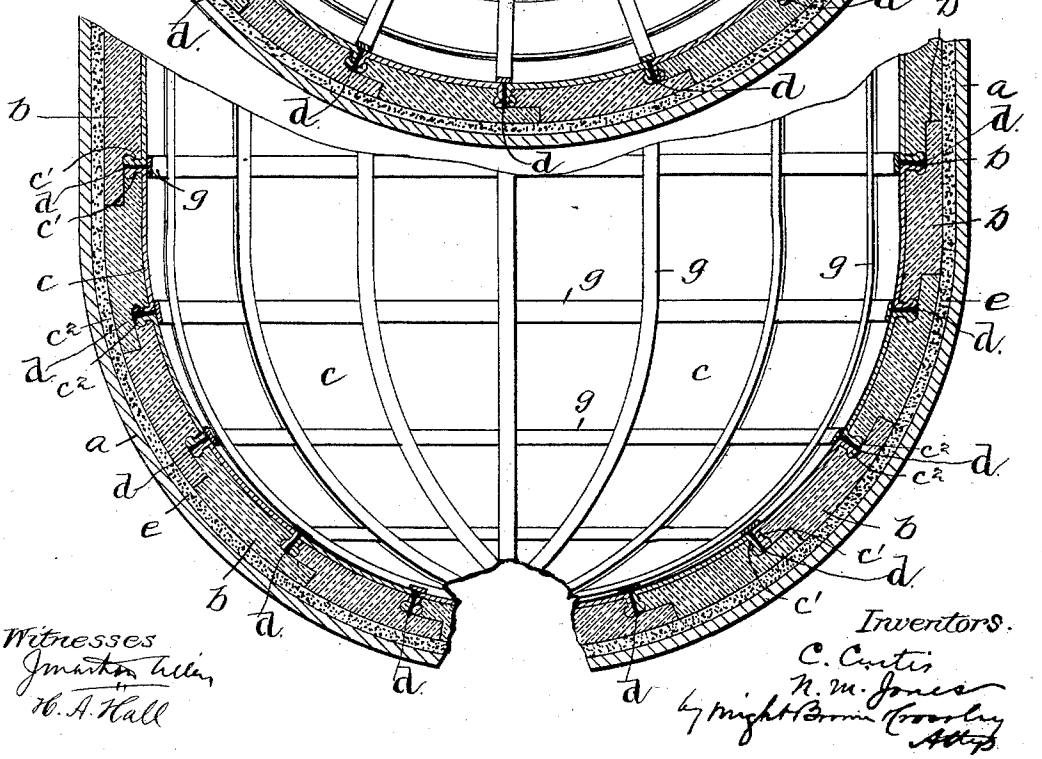


Fig. 3.

Fig. 2



Witnesses
J. Martin Miller
W. A. Hall

Inventors.
C. Curtis
N. M. Jones
by Wright Brown Quinby & Woodley
Attys

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

CHARLES CURTIS, OF NEWTON, MASSACHUSETTS, AND NATHANIEL M. JONES, OF BANGOR, MAINE.

PAPER-PULP DIGESTER.

SPECIFICATION forming part of Letters Patent No. 485,000, dated October 25, 1892.

Application filed April 18, 1892. Serial No. 429,525. (No model.)

To all whom it may concern:

Be it known that we, CHARLES CURTIS, of Newton, in the county of Middlesex and State of Massachusetts, and NATHANIEL M. JONES, of Bangor, in the county of Penobscot and State of Maine, have invented certain new and useful Improvements in Paper-Pulp Digesters, of which the following is a specification.

This invention relates to digesters for cooking or disintegrating wood chips for the manufacture of paper-pulp, and particularly to that class of digesters for said purpose in which the digester is provided with a lining of a metal adapted to resist the acid solution or liquor employed in disintegrating the wood, lead being the metal usually employed. Much difficulty has been experienced in keeping the lead linings of digesters in proper condition, owing to the fact that the lead lining has been made practically continuous or of large sheets joined to constitute a practically-continuous lining, which rests upon the metal shell or body of the digester. The expansion of the shell and lead lining causes constant liability of the lining to separate from the the shell and to hang loosely and in many cases to crack or break, thus permitting the access of the acid liquor to the iron shell, the liquor attacking the shell and rapidly eating or corroding the same.

Our invention has for its object to provide a digester having a lining of lead or other acid-resisting metal in which the difficulties existing heretofore shall be obviated and the lining rendered durable and economical.

To this end the invention consists as a whole in a digester comprising an external metal shell, a lining composed of blocks or sections of artificial stone, and an inner lining composed of sheets of lead or other acid-resisting material placed upon the inner faces of the artificial-stone sections and suitably secured to the latter, the lining being composed of sections, each of which is secured independently of the others, so that the inner lining as a whole is secured to its support along a number of lines extending both horizontally and vertically, the liability of injurious separation of the inner lining from its support being thus prevented.

The invention also consists in certain improvements in the details of construction, all of which we will now proceed to describe.

In the accompanying drawings, forming part of this specification, Figure 1 represents a horizontal section of a cylindrical digester constructed in accordance with our invention. Fig. 2 represents a vertical section on line 2 2, Fig. 1. Fig. 3 represents sectional views of the ends of two adjacent blocks or sections composing the intermediate lining, which supports the inner lining

The same letters of reference indicate the same parts in all the figures.

In the drawings, *a* represents a metal shell, which may be of iron or steel and constructed in the usual or any suitable way, said shell being, if desired, of the construction common in digesters composed of an external shell and a lining of lead.

In carrying out our invention we line the shell *a* in the following manner: We take a series of slabs or sections *b* of artificial stone composed, preferably, of cement and powdered quartz treated with silicate of soda or water-glass. Said sections are formed previously to their application to the shell, and they are molded so as to conform to the curvature of the inner surface of the shell in case the latter is cylindrical. The sections *b* are preferably provided with rabbeted edges *b'*, the rabbet of the edge of each plate overlapping that of the adjacent plate both in the horizontal and vertical sections of the digester, as shown in Figs. 1 and 2. Each of these sections *b* is preferably formed with the rabbets of two of its edges on the inner face of said section and with the rabbets of the other two edges on the outer face of the section, as indicated in the drawings. To the inner surfaces of the sections *b* we apply sheets or plates *c*, of lead or other suitable acid-resisting metal, said sheets entirely covering the inner surfaces of the sections *b* and being preferably formed to be turned over upon the edges of said sections, as shown in Figs. 1 and 2, the turned-over portions constituting flanges *c'*, interposed between the adjacent edges of the sections *b*. Said flanges may be engaged with the sections *b* in any suitable way to prevent them from being withdrawn, a suitable means

of engagement being beads or enlargements c^2, formed on the inner edges of the flanges, and grooves b^2, formed in the sections b, as shown in Fig. 3, to receive said beads, and thus lock the flanges c' between the sections b. We prefer to pack the joints between the flanges of the plates c by means of a suitable acid-resisting filling or packing d, which may be of cement or any other suitable material. The object of protecting, as by lead sheets, the exposed faces of the sections, which are in themselves almost practically acid-proof, is to provide against the possibility of the cracking of the section or block, and also to provide against the possibility of the corrosion of the section or block, because cement is sometimes liable to become corroded, owing to the presence of free lime or carbonates. It will be seen that the sections b and the lining-plates c, secured to the inner surfaces of said sections, constitute a sectional lining of which the sections b constitute the rigid or supporting portion and the plates c the acid-resisting or acting portion, the inner lining being composed of a large number of comparatively-small sheets or sections, which are secured to their support independently of the other section, so that the inner lining as a whole is secured at a large number of points or lines to its rigid support. Hence there is no possibility of any extended separation of the inner lining from its support in consequence of the expansion of the material of the inner lining, the comparatively-small size of the plates c preventing any material displacement of the material of the lining by expansion. Since the drawings illustrate only parts of the digester and do not include the manholes thereof, it will be readily understood that the construction and arrangement of the parts at such manholes may be of any preferred mechanical construction.

By the employment of an intermediate lining or rigid support composed of blocks of artificial stone as a means for holding the inner lining we reduce to the minimum the expansion and contraction of the support for the lining, the artificial stone having a much smaller coefficient of expansion and contraction than the shell a. Moreover, the sections b, being of considerable thickness, prevent the heat from the interior of the digester from materially affecting the shell a.

We do not limit ourselves to the employment of lead as the lining, and may use any other suitable acid-resisting metal.

We do not limit ourselves to the particular means here shown for securing the lining-plates c, and may secure the same in any other suitable manner.

We prefer to interpose a layer e of any suitable cement between the shell a and the blocks b, said layer being applied in a plastic state while the blocks b are being placed in position and serving to hold said blocks in place.

Strips g of any suitable acid-resisting metal may be soldered or otherwise secured to the inner lining in position to cover the joints between the plates c thereof.

We claim—

1. A digester comprising in its construction an external metal shell, a lining of blocks or sections of artificial stone, and an inner lining composed of independent plates or sheets of acid-resisting material, each of said plates or sheets being engaged independently with one of the said blocks or sections, as set forth.

2. A digester composed of an external metal shell, a lining of blocks or sections of artificial stone, and an inner lining composed of plates or sheets c, having their edges bent to form flanges which are interposed between the said blocks or sections, as set forth.

3. A digester comprising in its construction an external metal shell, a lining of blocks or sections of artificial stone, and an inner lining composed of independent plates or sheets of acid-resisting material, each of said lining plates or sheets being engaged at its margin with the margin of one of said blocks, as set forth.

4. The combination, in a digester, of the blocks or sections of artificial stone having grooves b^2 in their abutting edges and the lining plates or sheets having beaded flanges the beads of which are engaged with said grooves, as set forth.

5. A digester comprising an external shell, a lining composed of blocks or sections of artificial stone, acid-resisting lining-plates placed on the inner surfaces of said blocks, and strips of acid-resisting material covering the joints between said plates.

In testimony whereof we have signed our names to this specification, in the presence of two subscribing witnesses, this 8th day of April, A. D. 1892.

CHARLES CURTIS.
NATHANIEL M. JONES.

Witnesses:
C. F. BROWN,
A. D. HARRISON.