

(No Model.)

W. O. & W. P. CROCKER.
DIGESTER.

No. 406,886.

Patented July 16, 1889.

Fig. 1,

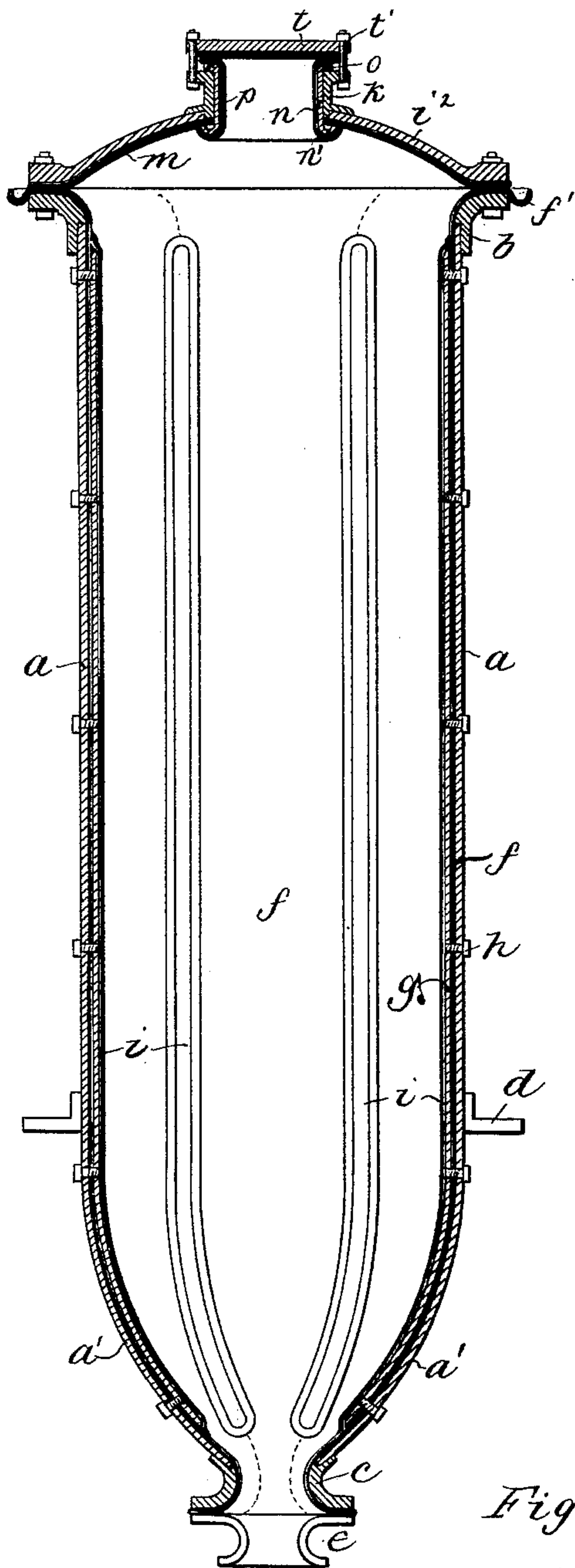


Fig. 2,

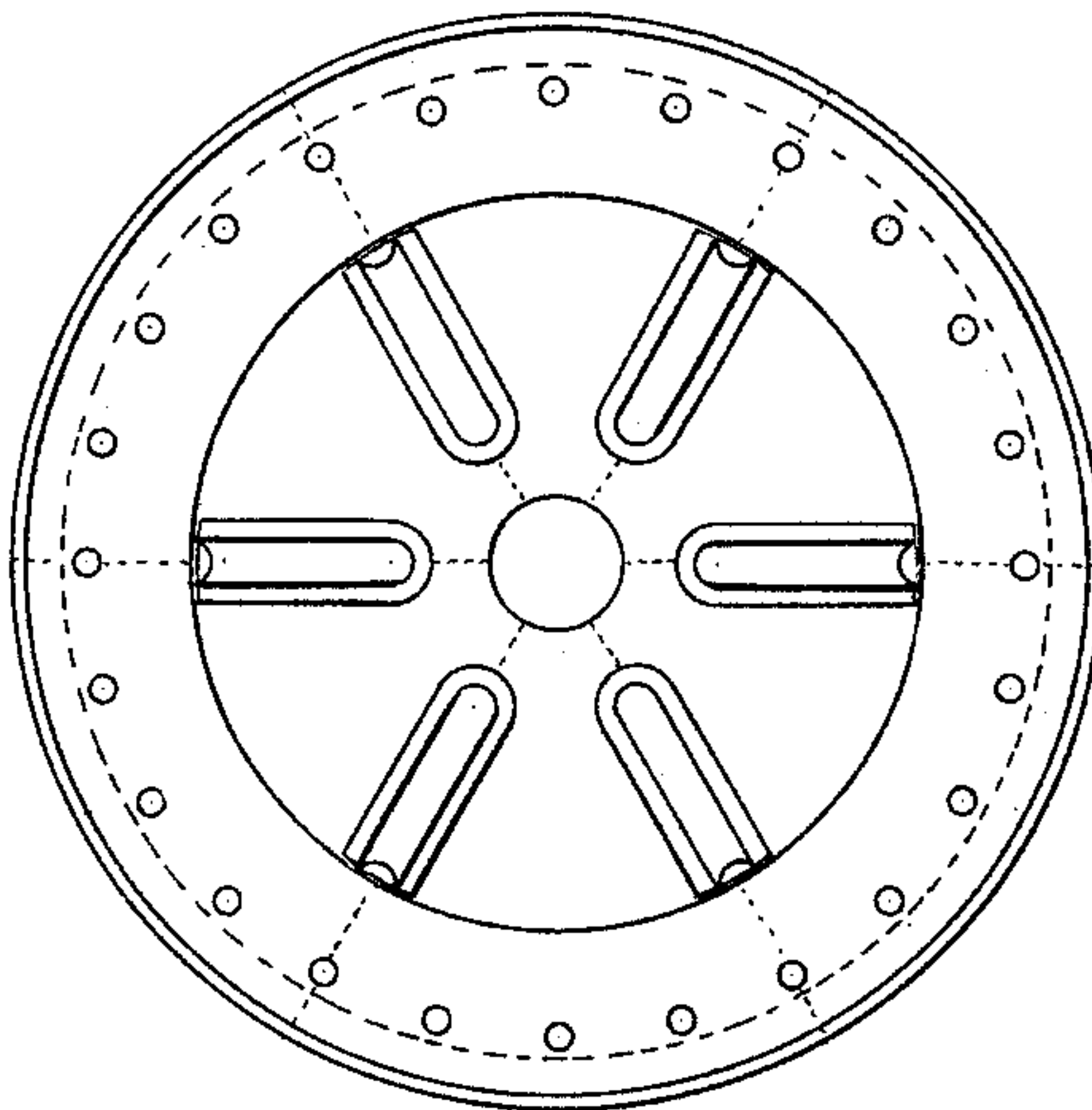


Fig. 3,

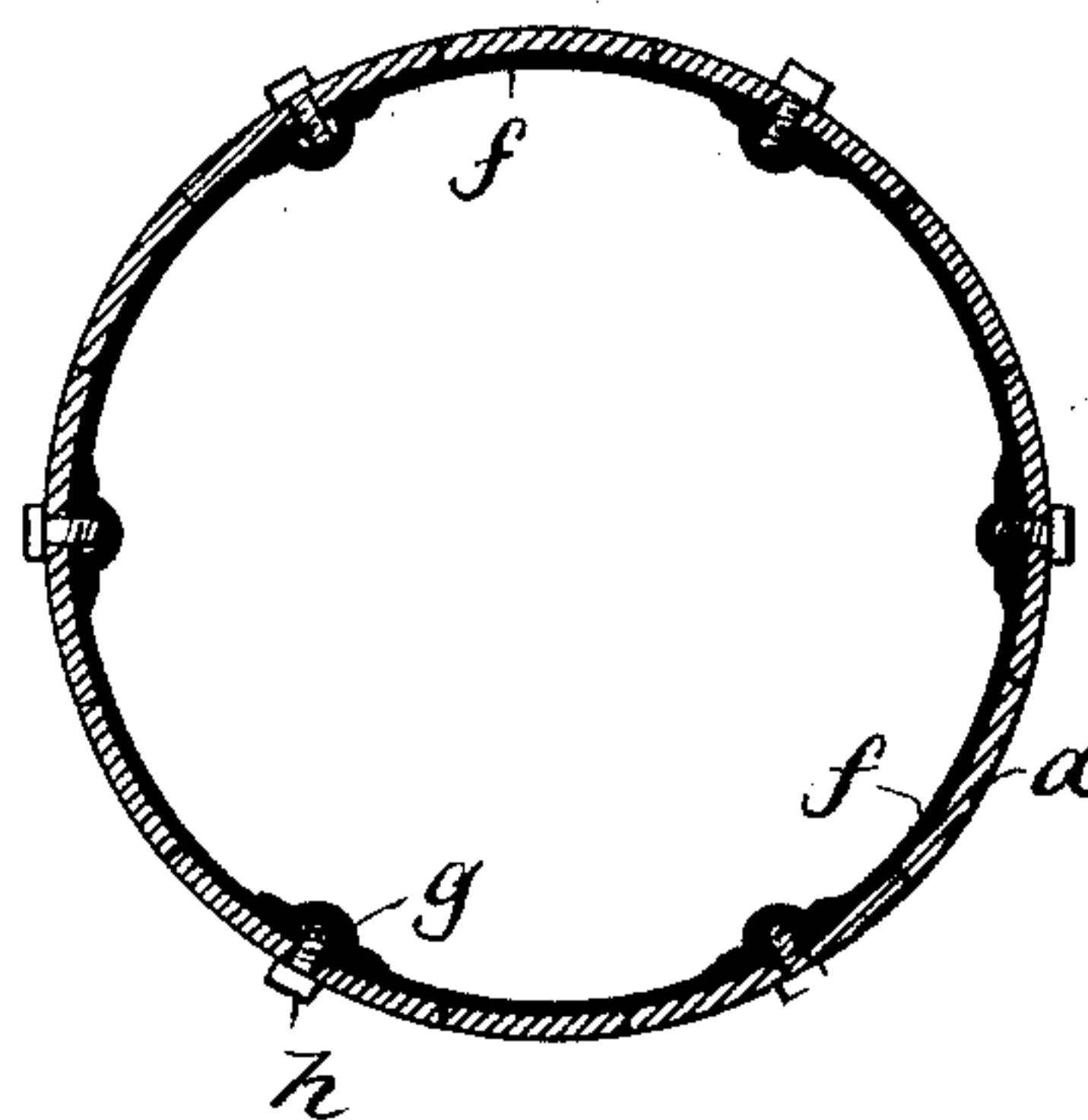


Fig. 5,

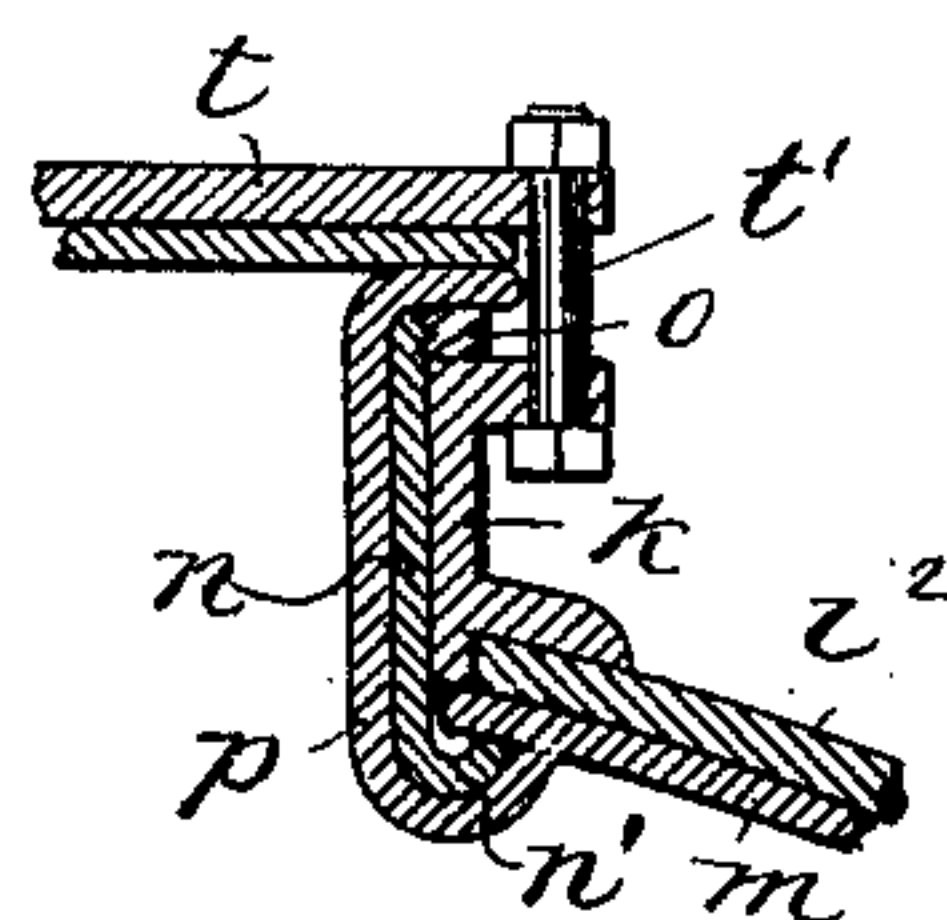
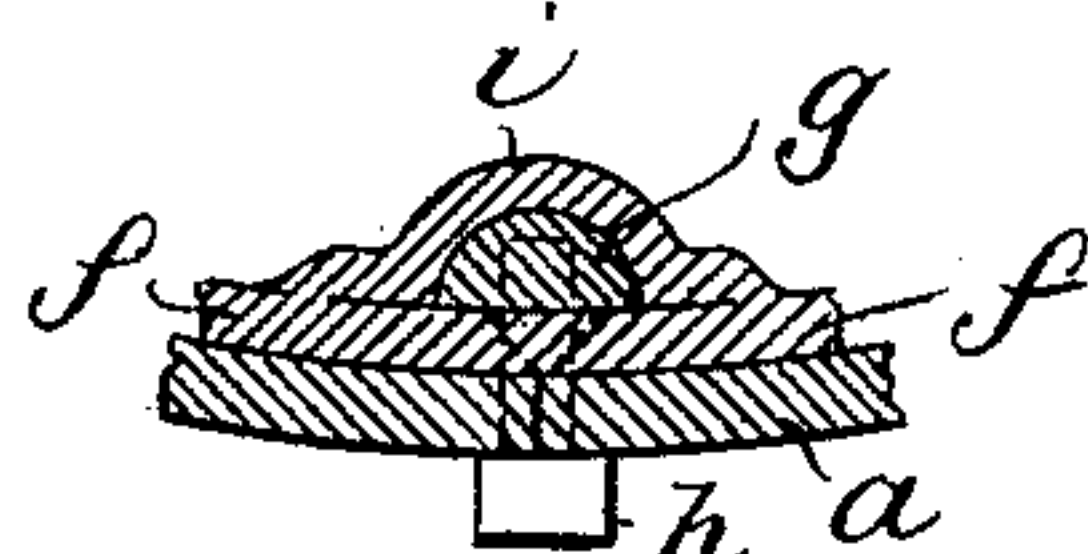


Fig. 4,



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UNITED STATES PATENT OFFICE.

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DIGESTER.

SPECIFICATION forming part of Letters Patent No. 406,886, dated July 16, 1889.

Application filed July 9, 1888. Serial No. 279,405. (No model.)

To all whom it may concern:

Be it known that we, WILLIAM O. CROCKER and WILLIAM P. CROCKER, of Turner's Falls, county of Franklin, and State of Massachusetts, have invented an Improvement in Digesters, of which the following description, in connection with the accompanying drawings is a specification, like letters on the drawings representing like parts.

Our invention relates to a digester, such as employed for producing pulp under steam-pressure in connection with chemicals. Digesters for this purpose have to be made strong to resist the pressure of the steam by which their contents are digested, and have to be lined with a material capable of resisting the action of the acids or other chemicals contained within them. The lining is usually of lead, and when the digester is of the usual cylindrical shape it is difficult to make a durable lining, as owing to the variation in contraction and expansion the lead creeps along the surface of the body of the digester and soon bulges and tears or opens at the joints, permitting the contents to attack the outer shell of the digester.

The object of the present invention is to produce a digester having a lead lining which is retained securely in place upon the body of the digester and the joints of which are strong and well protected, so that the lining has great durability.

The invention consists in features of construction of the outershell and its lining and in the means for fastening the said lining to the shell, and other details of construction hereinafter described, and referred to in the claims.

Figure 1 is a longitudinal section of a digester embodying this invention; Fig. 2, a plan view thereof with the top plate or head removed; Fig. 3, a transverse section, and Figs. 4 and 5 enlarged details to be referred to.

The side or main portion of the body of the shell *a* is mainly cylindrical in shape, but terminates at the lower end in a tapering or conoidal portion *a'*, the said shell being of

steel, iron, or other strong metal, provided at the upper end with a flange *b* and at the lower end with a flange *c*. A flange *d* surrounds the shell just above the tapering portion at the lower end, and constitutes a base upon which the digester may be supported, the lower end being open to form a discharge-passage, which may be connected with a discharge pipe or duct, a portion of which is shown at *e*, through which the flow of material is controlled in any suitable or usual manner.

The flanges *b* and *c* are rounded or curved at the inside, and are flush with the inner surface of the shell *a*, thus affording a smooth interior surface for the entire body of the digester without a sharp angle or shoulder from one end to the other. The said inner surface is lined with strips or sheets *f* of lead, each of which is continuous and unbroken from top to bottom of the shell, the said strips being properly shaped to fit the flaring and tapering surface at the upper and lower ends and coming together edge to edge on longitudinal lines in the body of the digester.

The edges of the breadths of lining material are beveled to form a V-shaped groove between them, and are then burned securely together, thus forming a lining having no transverse joint throughout the entire length of the digester.

It is found in practice that a lining made in longitudinal strips united by longitudinal seams is far more durable than a lining of the same material applied in strips extending around the interior of the shell and united by transverse seams around the shell, and such transversely-seamed linings are very frequently displaced and torn apart in the operation of blowing out the contents of the digester while under pressure—an accident which does not occur when the linings are made with longitudinal seams. There are also several advantages in the manner of applying the lining when made in longitudinal strips. In the first place there are less joints, as the linings when made in transverse strips must not only be united edge to edge by the

transverse circular joints, but each strip must have its meeting ends united by a short longitudinal seam. It is also comparatively easy to fit the longitudinal strips at the conoidal or tapering portion of the shell, such strips being accommodated to the tapering curved surface with but little stretching, while it is very difficult to fit transverse strips on a double-curved surface of this kind. It is also far easier to burn the seams, as the same may be burned while the shell is horizontal and the particular seam acted upon at its under side, so that the molten metal may flow along and remain in the seam, and it is only necessary to turn the shell the distance between two seams after each seam has been finished, while with curvilinear seams only a very short length of the seam can be burned with the shell in one position, after which the shell has to be turned so as to bring the part of the seam which is being burned lowermost, so that the molten metal will stay until properly united. Owing to such greater facility in manipulation more perfect seams are attained when made lengthwise than when made transversely to the shell. While a longitudinally-seamed lining is not so likely to tear off from the shell as a transversely-seamed one, the lining is in the present invention still further protected against lifting from the shell, and thus becoming torn, by fastening the same to the shell, such fastenings being shown as made along each of the seams by the following means.

Over each of the seams or joints between the edges of the adjacent lining-piece is secured a continuous longitudinal stay *g*, (see Figs. 3 and 4,) securely fastened by bolts or rivets *h* to the outer shell, as shown in Figs. 1 and 3. These stays terminate a short distance from the extreme ends of the lining-pieces, as shown, and each stay is covered with a cap or strip *i*, made of lead, formed with a longitudinal groove that receives the stay within it. At either side of said groove the cap rests in contact with the lining, and both edges of each cap are securely burned to the main lining-sheets *f*, (see Fig. 4,) so that the stays *g* are wholly inclosed in the lining material, and the said stays and their fastenings *h*, as well as the primary joint between the two adjacent strips of lining material, are thus securely covered.

The lining strips or sheets *f* are extended at their top beyond the flange *b* and bent to form a gutter *f'* around the upper edge of the digester. The upper end of the digester is provided with an end piece or head *i*², having a central opening, upon which is supported a short flanged tube *k*, constituting the throat or man-hole. The said cover or end piece is lined up to the edge of this opening, as shown at *m*, and within the tubular throat is placed a sleeve *n*, having a curved flange *n'* at its lower edge, (see Fig. 5,) which

is drawn up against the edge of the lining *m* around the opening, clamping the said lining tightly against the end piece or head of the digester by means of a nut or threaded ring *o*, that screws upon the upper end of the sleeve and bears against the upper edge of the throat-piece *k*. The said sleeve is provided with a lining *p*, the lower edge of which is bent out over the flange *n'* at the lower end of the sleeve *n* and is burned to the lining *m* of the top piece, thus making the lining practically continuous over the under surface of the head and inner surface of the throat-piece, although said lining is securely fastened around the opening of the throat-piece by the clamping-sleeve.

The upper edge of the lining for the sleeve or throat-piece is turned out over the upper edge of the sleeve and serves as a packing, against which the removable cover or bonnet *t* is pressed by the bolts *t'*.

By the herein-described construction the entire lining is made without transverse seams or joints and is securely fastened to the outer shell throughout, substantially the entire length thereof, at any desired number of points around its surface, and thus cannot creep or bulge, like the linings commonly employed, having numerous transverse seams, which quickly get out of repair in using the digester.

It is not essential that the precise means specified should be employed for fastening the lining to the outer shell, or that such fastening should be along the seams, although such construction is believed to be the best, as it affords additional tightness and security in the seams while attaching the lining to the shell. The inner surface of the digester is smooth and unbroken lengthwise of the same, having neither transverse projections nor recesses to collect the materials that are being acted upon in the digester.

We claim—

1. A digester composed of an outer shell substantially cylindrical through the main portion of its length, combined with a lining composed of longitudinal strips of lining material united along their edges by longitudinal seams, substantially as and for the purpose described.

2. The main outer shell of a digester and longitudinal strips of lining material extending from one to the other end of the side walls of said shell and meeting at their edges, combined with stay-pieces overlapping the meeting edges of two adjacent lining-strips and being fastened to the main shell, and caps of lining material over the said stay-pieces united at their edges with the main lining, substantially as described.

3. The combination of the head or end piece of a digester, having a central opening, with a lining-sleeve extending through the

said central opening, provided with a flange
at its lower edge that engages the edge of
the lining around the opening in the end
piece, and a lining for said sleeve extending
5 over the flange thereof and being united with
the lining of the end piece, substantially as
described.

In testimony whereof we have signed our

names to this specification in the presence of
two subscribing witnesses.

WILLIAM O. CROCKER.
WILLIAM P. CROCKER.

Witnesses:

EDWARD R. MARSHALL,
FRANK H. BROM.