(No Model.)

T. P. BURGESS.

METHOD OF LEAD LINING METALLIC VESSELS.

No. 421,161. Patented Feb. 11, 1890.

Fig. 1.

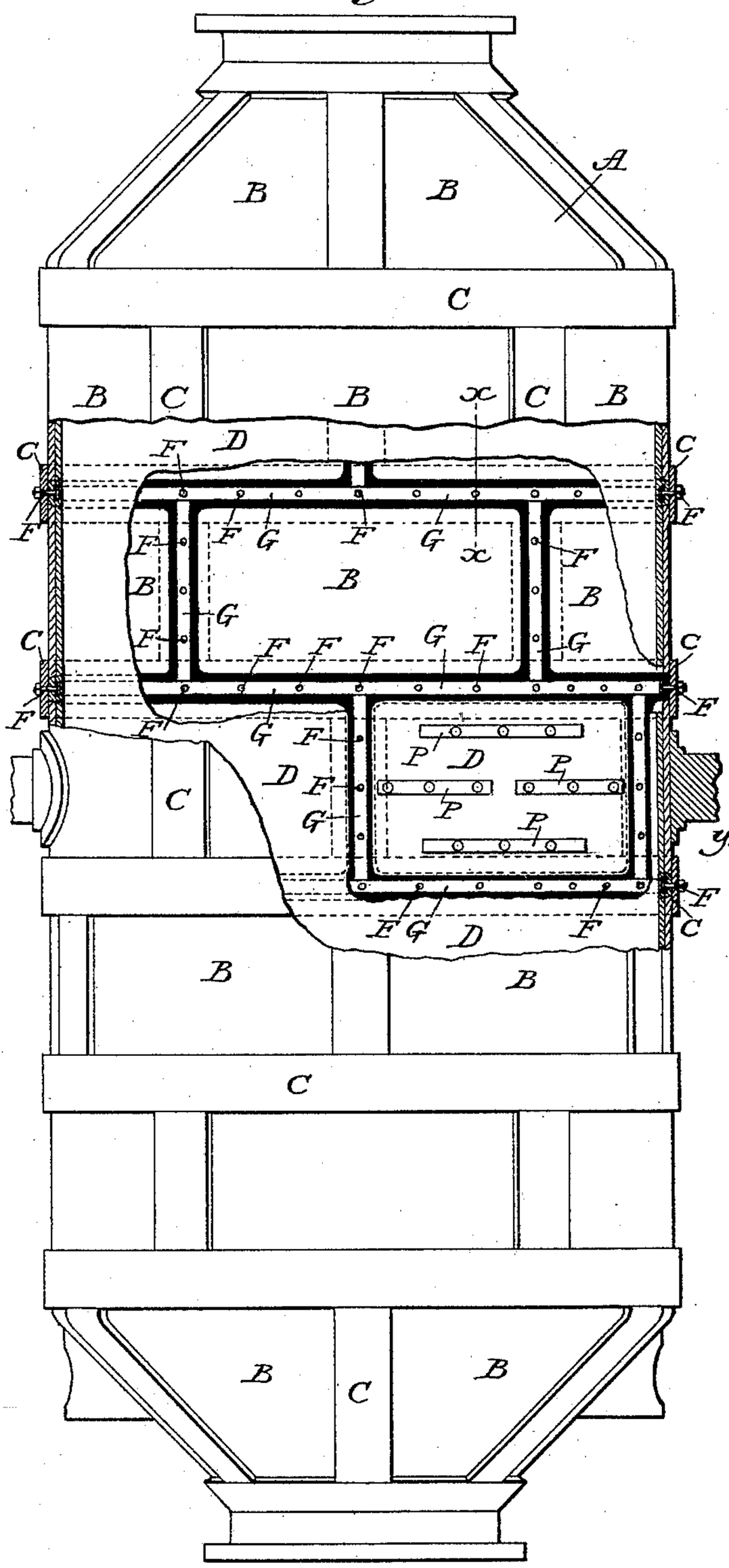


Fig. 2.

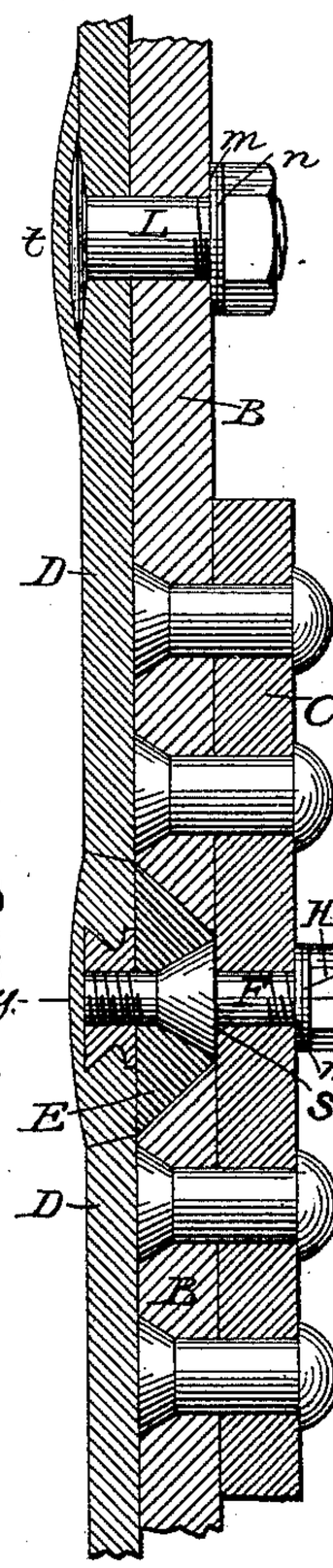


Fig. 3.

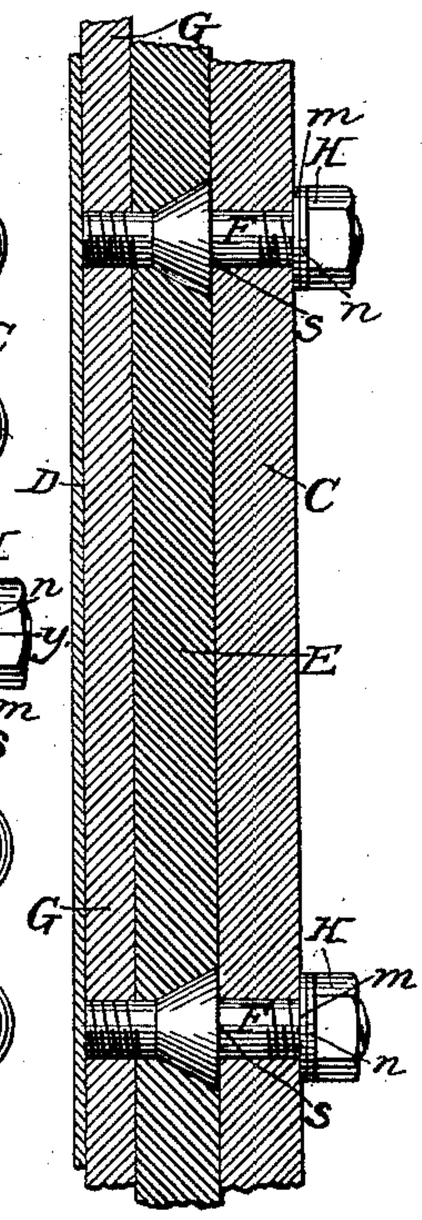


Fig. 4.

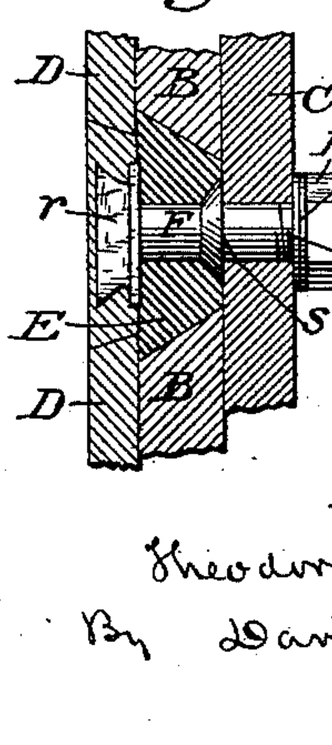
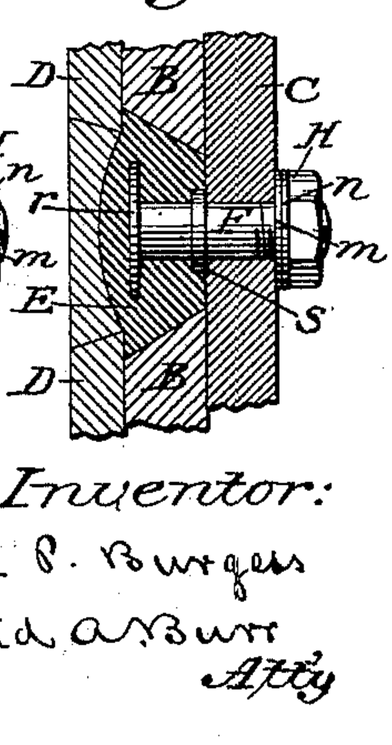


Fig. 5.



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THEODORE P. BURGESS, OF SAUGERTIES, NEW YORK.

METHOD OF LEAD-LINING METALLIC VESSELS.

SPECIFICATION forming part of Letters Patent No. 421,161, dated February 11, 1890.

Application filed July 10, 1889. Serial No. 317,032. (No model.)

To all whom it may concern:

Be it known that I, THEODORE P. BURGESS, of Saugerties, in the county of Ulster and State of New York, have invented certain new and useful Improvements in the Method of Lining Digesters and other Steel or Iron Vessels with Lead; and I do hereby declare that the following is a full and exact description thereof, reference being had to the accompanying drawings, and to the letters of reference marked thereon, making a part of this specification.

This invention relates to the construction of lead-lined vessels for use in manufactures in which acids are employed under pressure, and more especially of digesters for the disintegration of vegetable fibers.

It has for its object to facilitate the confinement of the inner lining of lead with the outer walls of the vessel and to render the connection more secure; and it consists in an improved method, as hereinafter described and claimed, for securing the lining-sheets by means of inwardly-projecting bolts and by metallic strips interposed between the edges of the lining-sheets, in combination with leaden strips covering and attached to the bolts and strips, and to which the lining-sheets are secured by fusion.

In the accompanying drawings, Figure 1 is an elevation of a digester for the manufacture of paper-pulp, with a portion of its wall or shell broken away to bring to view its inner surface, part of which is represented as stripped of its lead lining to illustrate more fully the several devices by which it is secured; Fig. 2, a section in line *x x* of Fig. 1 on a greatly-enlarged scale; Fig. 3, a transverse section in line *y y* of Fig. 2; Figs. 4 and 5, sectional details illustrating modifications in the form of the bolts and the means of securing the same.

The shell or outer wall of the digester A is constructed, as is usual, of a number of iron or steel plates B B, which are severally riveted near their edges to outer strips C C of metal in such manner as to leave an open space or recess along each and every joint or seam between the adjacent plates and the outer covering-strip. These spaces are filled in with hard lead applied thereto in a molten state and made to adhere by the previous application to the inner surfaces of a suitable soldering solution or flux in manner as is well known to the art. Lining-sheets D D of lead (see Figs. 2 to 5) are then secured upon the inner side of the vessel in such manner as that the edges of the sheets shall just lap upon these lead-filled seams to admit of being soldered thereto, so that the whole interior of the vessel when completed shall present an uninterrupted surface of lead.

Heretofore in the construction of this class of vessels the open longitudinal spaces along the seams have been made to present in cross-section a dovetailed or enlarged recess, obtained by beveling off the outer edges of the sheets B B so that they shall be inclined outwardly toward the outer covering strip or band. Thus the joining-line for the lead sheets to the hard-lead band between the steel plates has been comparatively narrow and too weak for the wear and tear of the lead from its alternate expansion and contraction during use. Moreover, the alternate expansion and contraction of the lead here produces its worst effects, because such methods of confining and securing the hard-lead strips admit of no "give" in time of expansion; also, the leads sheets gradually sag down by virtue of their own weight for want of sufficient support.

My invention is designed to provide a more perfect fastening for the lead lining by securing the lead filling or anchoring strips in the open seams more firmly than has heretofore been done, and by allowing more bearing-surface of lead along the seams upon which to secure the inner lead lining-sheets and by affording a solid shelf-like support upon which to rest said inner lining-sheets of lead. To accomplish this end, I bevel the inner edges of the plates B B, constituting the sheet, instead of their outer edges, thereby producing a recess E upon the underlying covering-strip C to receive the lead filling along each and every seam, which shall widen toward the inside of the digester, as shown in Figs. 2, 4, and 5, instead of outwardly, as has heretofore been the case, so that when filled with hard lead, in manner as hereinbefore described, the recess E will present a wide surface of lead between the iron or steel plates upon which to lap and secure the edges of the inner lining-plates D D of soft lead. To secure these strips of hard lead between the inwardly-flaring edges of the plates B B, I insert bolts F F, having wide heads of

the thickness, or nearly so, of the lead lining-sheets (see Fig. 4) from within through the outer strips C C at suitable intervals along the length thereof centrally between the edges of the plates B B. The wide heads *r r* of these bolts are made of the same thickness as the lead sheet and flat, and the stem of each bolt is formed with an encircling-shoulder *s* to engage the strip C and prevent the bolt from passing through it, the length of the stem above the shoulder being so proportioned as that the flat under surface of the head *r* of the bolt, when it is made fast, shall be flush with the inside level of the adjacent steel or iron plates B B, between which it projects, thus bringing the outer surface of the head flush with the inside surface of the lead sheeting. The bolts, instead of having a separate head each, are preferably screwed into or otherwise attached to longer hard-metal bars G, whose sectional dimensions are the same as those of the bolt-head. Thus this continuous shelf-like supporting-band G extends along the middle of the seams parallel with them, as shown in Figs. 2 and 3, and at one and the same time secures the hard-lead strips and offers a shelf-like support to the soft-lead sheeting, as well as leaving bare on its either side a strip of the hard-lead filling to which the soft-lead lining-sheets are united. The bolts and their shelf-like hard-metal support may be adjusted and secured to the binding steel digester-bands before these bands are riveted to the digester-plates. The bolts, the connecting pieces or heads, and the recess are previously treated, as is customary, with a soldering solution or flux, so as to insure the intimate adhesion of the hard lead thereto. After the digester shall have been completed, the strips G adjusted, the bolts F made fast, and the surfaces chemically treated to receive the hard lead the hard lead is poured in a molten state into the space along the seam, so as to flow around the bolts and completely fill up the spaces left in the seams to the level of the inside surface of the steel or iron digester-plates and allowed to harden. The bolt-heads or shelf-like strips are thus left extending at right angles from the inner surface of the (now made smooth) digester, and to a distance equal to the thickness of the soft-lead lining-sheets. The soft-lead sheets are then adjusted, as already stated, and secured by fusion, and all is poured over smoothly with lead, so as to present a continuous lead surface on the inside.

The bolts F F are made fast, in the customary manner, by means of nuts H H on their outer ends, which project through the outer joint-strips C C. Two washers—one *m* of rubber or other equivalent elastic material and the other *n* of metal—are interposed under the nut, thus allowing some give in time of expansion.

In Figs. 4 and 5 the seam-bolts F F are represented as employed to anchor the lead filling E independently of a longitudinal connecting strip or plate G.

To further prevent the soft-lead lining-plates D D from sagging downward between the joints, wide-headed anchoring-bolts may be employed, as is customary, to confine and support the lead plates intermediate the joints, as is illustrated at L in Fig. 2, the exposed surface of the bolt-heads being burned over and fully covered with a coating of lead, as shown at *t* in Fig. 2, so that the whole interior of the vessel presents an unbroken surface of lead firmly supported, tied, and secured to the outer shell of steel or iron.

While it is preferable to make the sides of the recesses along the seams with outwardly-flaring sides, I contemplate making them with parallel sides.

I claim as my invention—

1. The method, substantially as described, of securing a lead lining within an iron or steel vessel, which consists in forming recesses in the inner wall of the vessel, securing flat-headed bolts at intervals in said recesses, then filling said recesses with lead to encircle and cover the bolts, and joining and fixing the edges of the lead lining-plates to the lead confined in said recesses by the bolts, substantially in the manner and for the purpose herein set forth.

2. The method, substantially as described, of securing a lead lining within an iron or steel vessel, which consists in forming recesses in the inner wall of the vessel, securing narrow metallic strips longitudinally in said recesses to project within the vessel and afford support to the edges of the inner lining-sheets, then filling the remaining vacant spaces in the recesses and covering the strips with lead, and finally joining and fixing the edges of the lead lining-plates to the lead attached to the strips, substantially in the manner and for the purpose herein set forth.

3. The method, substantially as described, of securing a lead lining within an iron or steel vessel, which consists in fixing longitudinal metallic strips to the shell of the vessel to project inwardly between the edges of the lead lining-sheets, covering said strips with lead, and uniting the lead sheets to the lead covering upon the strips, substantially in the manner and for the purpose herein set forth.

4. The method, substantially as described, of securing a lead lining within an iron or steel vessel, which consists in fixing a series of bolts to project within the vessel, embedding said projecting bolts in hard lead, and uniting the lead lining-sheets to the hard lead confined by the embedded bolts.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

THEODORE P. BURGESS.

Witnesses:

A. N. JESBERA,

E. M. WATSON.