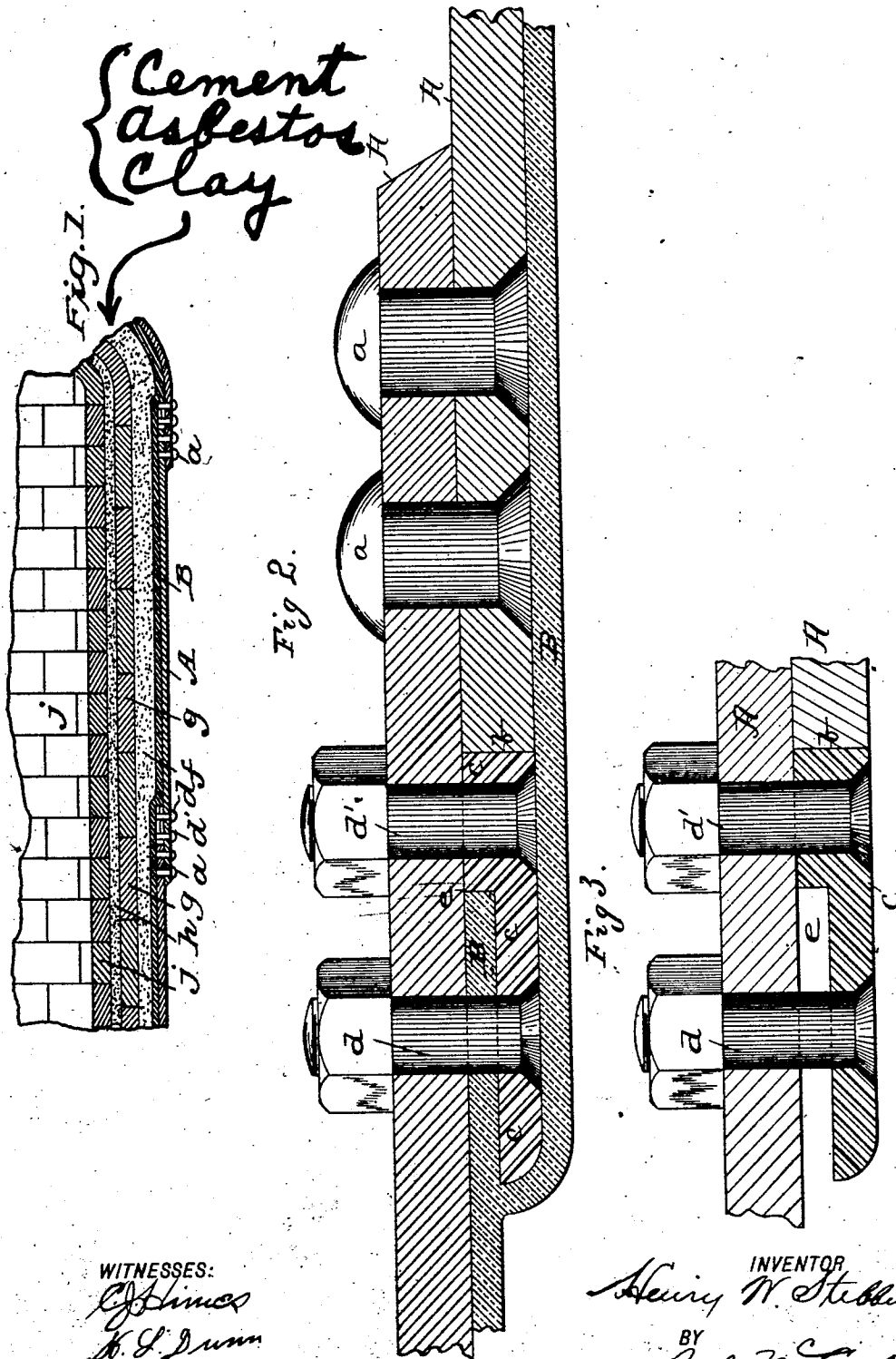


H. W. STEBBINS.
DIGESTER.

No. 528,400.

Patented Oct. 30, 1894.



WITNESSES:
W. L. D. D. D.
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UNITED STATES PATENT OFFICE.

HENRY W. STEBBINS, OF WEST CARROLLTON, ASSIGNOR OF ONE-HALF TO
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DIGESTER.

SPECIFICATION forming part of Letters Patent No. 528,400, dated October 30, 1894.

Application filed January 26, 1894. Serial No. 498,156. (No model.)

To all whom it may concern:

Be it known that I, HENRY W. STEBBINS, of West Carrollton, county of Montgomery, State of Ohio, have invented a new and useful
5 Improvement in Digesters; and I do 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, reference
10 being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

This invention relates to digesters or boilers in which the preliminary treatment of raw
15 material, such as wood or other fibrous substance takes place and whereby a reduction of said material to the condition of cellulose for paper-making and other purposes is effected, by the use of acids, steam heat, and
20 pressure. The acid most commonly used in the treatment of said material, is sulphurous acid, and is combined with a base, usually lime, and thereby forms a bi-sulphite of lime solution. Owing to the volatile nature of the
25 acids used within the digester, and their corrosive and otherwise destructive action upon the various metals that possess sufficient tensile strength to withstand the resulting pressure that is generated the steam used in
30 the digester, it is essential that the inside of the metallic shell be protected. To these ends various means have been employed for protecting the interior surface of the metallic shell, forming the digester, from said injurious effects. Principally among these, is the
35 use of an acid-resisting metal, such as lead, variously applied to the interior surface of the hard metallic shell, each having for its object a method by which to overcome the
40 difficulties met in associating metals having different ratios of expansion and contraction.

The object of the present invention is to provide means for securing the lead sheathing or lining to the hard metallic shell, and
45 to this extent is an improvement on the digester shown and described in Letters Patent No. 405,279, granted to myself June 18, 1889. In addition to the difficulties resulting from the association of metals having such varying
50 natures, it is found in practice that when

lead is subjected to the requisite pressure, and high and varying degrees of temperature, the quality of expansion, even to a degree necessary to meet that of the harder metal, is impaired, and the lead assumes a porous nature, becomes brittle, and its elasticity in consequence, is materially lessened, all of which renders it useless for the purposes. Therefore, a further object of this invention is to provide means by which the inner lead lining, and the outer hard metal shell, are subjected to uniform degrees of pressure and temperature, to the end that the efficiency of the digester will be greatly enhanced, and its durability increased. These ends are accomplished, first, by the use of a lining placed next to the inner surface of the lead lining, composed of a combination of materials, preferably of a porous nature, and when formed into a composition, has a low heat conductive power and transmits only a minimum quantity of heat, and, secondly, by the use of a lining, next to that adjacent to the lead, composed of material of a non-porous nature, and of sufficient density to absorb and retain
75 an amount of heat sufficient to counteract any change of temperature occurring within the digester, when in operation, and that would otherwise be imparted to the shell. By the application of these various substances to the inner surface of the metallic lining and shell, a range of temperature is imparted to the soft metal lining and outershell, that has less variation than that due to ordinary atmospheric changes, whereby the difficulties
85 before mentioned are obviated.

Referring to the annexed drawings forming a supplement to the specification, Figure 1, is an enlarged detailed sectional view of the shell and lining; Fig. 2, an enlarged section of one of the joints; Fig. 3, a similar section showing one of the pockets with the lead removed.

In the following description similar letters of reference will be used to indicate corresponding parts.

A indicates the annular sections, that when united, form the outer hard metal shell of the digester, with its ends terminating in conoidal shape. These sections are preferably of iron

or steel, and are placed one on the other with the edges over-lapping and made secure by means of rivets (a) the heads of which can be headed on the inner surface, but are preferably seated in counter-sunk holes in the inner-lapping contact portions of said sections. When the sections A are so united there is a series of interior annular ledges or shoulders (b), formed by the upper or inner edge of each section.

c is a series of sectional annular bands, constructed of hard metal, and abutting with the annular shoulders (b) upon which said bands have a normal bearing. These bands are secured to the lower or over-lapping portion of the shell sections A, by screw-threaded bolts d', a series of bolts d also pass through the annular bands and steel shell, and have for their function the securing of the lead-lining B, through which said bolts also pass. Both series of bolts d' and d are made to fit counter-sunk holes in the inner surface of the bands (c), so that said bolt heads lie flush with the inner surface of said bands, and there is presented, on the interior surface of the shell, a regular and uniform surface. It will be seen from Fig. 3 that a portion of the band (c) has a less thickness than the remaining portion, which has a thickness equal to that of the shell A. The object of constructing these bands of unequal thickness, is to form a series of annular recesses or pockets (e) between said bands and the shell, and thereby provide efficient means for securing the lead lining, without constructing the shell sections A, with the inwardly bent annular offsets at their upper edges as is described in the patent hereinbefore referred to.

B denotes the lead lining, constructed of endless bands in sections, and of any desired thickness, and a length sufficient to extend around the interior surface of the shell. These sections are placed in position in the following manner. An edge of each section is placed in its respective annular pocket (e) and is provided with holes through which the bolt (d) may pass. The other edge of said section reaches to the top of the next adjacent pocket which has likewise been filled with another section of lead, and the two sections at that point are fused or melted together by the use of an oxyhydrogen blow pipe. This operation is repeated until the entire interior of the digester is lined with one continuous lining of lead. The lead so placed is prevented from leaving the pockets by the bolts (d) if through any cause such would be the tendency.

As a further protection to the outer hard metal shell, and a means for preserving the lead lining in a serviceable condition, I place next thereto, two continuous linings (f) and (g) each having low heat-conducting qualities, and may be composed of any suitable mixture of substances possessing these qualities. I prefer for this composite lining (f) a mixture composed of Portland cement, asbestos, and broken burned brick clay, made acid-re-

sisting by the addition of non-corrosive substances such as lamp black, sulphate of barium, litharge and silicate of soda. The lining (g) consists of blocks made from brick clay, free from magnesia, lime, or other ingredients that would be affected by the acids. These blocks are hydraulic pressed, hard burned, and porous when completed, and when applied are set in cement. Besides having the desired heat features they are an efficient means of adding strength to the composite lining (f).

Adjacent to the linings (f) and (g), I place a further composition filling (h) composed preferably of a mixture of Portland cement, and crushed stone or sand with a large percentage of silica. An acid-resisting quality is imparted to this composition by the addition of non-corrosive substance such as lamp black, sulphate of barium, and litharge, and next to this I place an inner lining (j), composed of blocks, brick or tile, made from fire clay or other suitable material and combined with the filling (h) has the power of absorbing and retaining maximum quantities of heat. These act in connection with the linings (f) and (g) and together effectively counteract the variations of temperature that take place in the digester when it is in operation, and that would otherwise be imparted to the lead lining and outer shell.

Having fully described my invention, what I desire to claim and secure by Letters Patent is—

1. In a digester, the sections A, of hard metal, arranged to over-lap each other and form a continuous shell or boiler, the annular shoulders (b) formed by the inner-lying edges of each section, a series of bands having two degrees of thickness, abutting with said shoulders and made rigid to the over-lapping edges of the sections, whereby a series of annular recesses or pockets is formed in the interior of the shell, in combination with a lining of pliable metal arranged to extend in and over said pockets, whereby a continuous lining thereof is formed and maintained in position by said pockets, and by the bolts (d) passing therethrough, substantially as described.

2. The combination as herein described, of a digester shell and internally arranged bands forming annular pockets therein, a lining of lead adjacent to said shell and maintained by said pockets and bolts passing therethrough, a heat-absorbing and acid-resisting lining composed of Portland cement, asbestos, lamp black, sulphate of barium, litharge and silicate of soda in suitable proportions, by means of which a minimum and uniform degree of pressure and temperature is maintained, and the soft metal lining and the hard metal shell thereby preserved, substantially as herein described.

3. The combination substantially as set forth, of a digester shell, bands forming annular pockets on the interior thereof, and the interior of said shell presenting a uniform and

regular surface, a lining of soft metal placed
against said shell, the heat-absorbing and
acid-resisting lining (f) herein described, ad-
jacent to said soft metal lining, the lining (g)
5 composed of porous blocks, to further pre-
vent the transmission of heat and to rein-
force or strengthen the lining (f), the lining
(h) having a heat-absorbing and acid-resisting

nature, and the glazed tile (j) all combined
and arranged substantially as specified.

In testimony whereof I have hereunto set
my hand this 27th day of December, 1893.

HENRY W. STEBBINS.

Witnesses:

A. M. SULLIVAN,
H. L. DUNN.