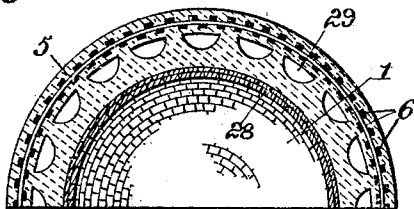


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Fig.1.



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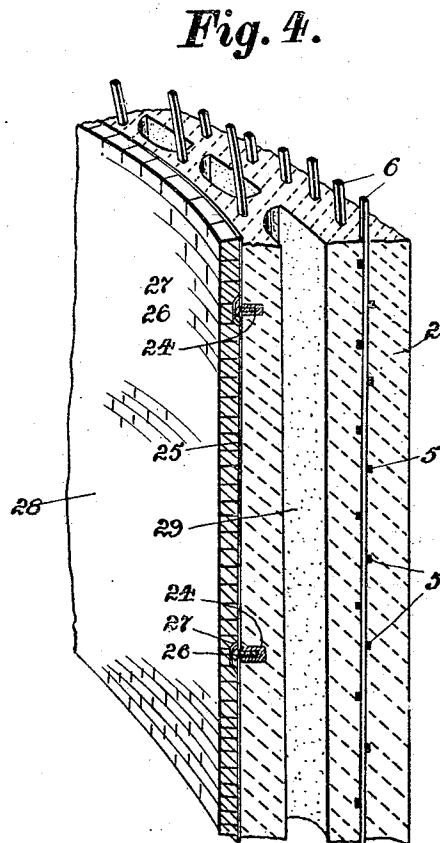
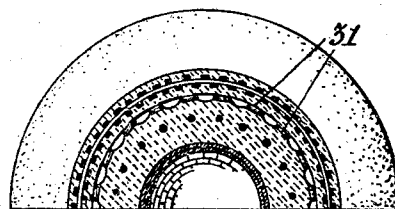


Fig. 3.



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DIGESTER AND THE LIKE.

959,314.

Specification of Letters Patent.

Patented May 24, 1910.

Application filed April 6, 1909. Serial No. 488,284.

To all whom it may concern:

Be it known that I, CHARLES HENRY CRAIGUE, a citizen of the United States of America, residing at the town of Berlin, in the State of New Hampshire, in the United States of America, have invented certain new and useful Improvements in Digesters and the Like, of which the following is a specification.

The invention relates to improvements in digesters, as described in the present specification, and illustrated in the accompanying drawings that form part of the same.

The invention consists essentially in the novel arrangement and construction of parts whereby the shell of a digester is molded from a plastic material suitably reinforced and having a plurality of flues arranged therein for the passage of a tempering fluid, and a substantially acid-proof lining having a near co-efficient of expansion with the shell of said digester.

The objects of the invention are to minimize the expense of the construction of digesters, to construct a digester which will have great strength and durability, be easy of access to all parts for repair, and have an approximately equal co-efficient of expansion between the walls and the lining and will give due warning of any crack or leak through said lining.

In the drawings, Figure 1 is a sectional elevation of the digester. Fig. 2 is a cross sectional view on the line A—B in Fig. 1. Fig. 3 is a cross sectional view on the line C—D in Fig. 1. Fig. 4 is a sectional perspective detail of a portion of a digester showing the construction of the reinforced shell and lining.

Like numerals of reference indicate corresponding parts in each figure.

1 is the digester of substantially upright cylindrical formation having the circular side walls 2 converging toward the top and bottom thereof to the inlet opening 3 and the outlet opening 4 respectively. The digester 1 is suitably reinforced by the expanded metal hoops 5 arranged at intervals throughout the height thereof and the expanded metal rods 6 vertically arranged at intervals around the wall of said digester. The reinforcing hoops 5 and rods 6 are embedded in the walls of said digester toward the outer surface thereof and are well-known means of reinforcing concrete, but it must be understood that other means, such as ex-

panded metal in mesh form may be used. The digester 1 stands upright and is here shown supported above the ground by the legs 7 built up of concrete, though it must be understood that any suitable base or support may be made for said digester.

8 is a tapered sleeve fitting in the inlet opening 3 in the top of the digester and having the radially slotted flange 9 extending around the top thereof, the said opening 3 being for the admission of the substance treated in the digester.

10 is a laterally-extending flange encircling the sleeve 8 intermediate of the height thereof and resting on the top of the side walls 2 around the said opening 3, said flange having orifices 11 therethrough at intervals and circumferentially arranged.

12 is a bronze sleeve lining fitting tightly in the sleeve 8 and preserving said sleeve from the action of the acids used in the digester.

13 is a removable cover fitting on top of the sleeve 9 and firmly fastened thereto by the pivot bolts 14 and nuts 15, said bolts being pivotally secured to the sleeve 8 and extending upwardly through the radial slots in the top flange of said sleeve and the cover 13, so that on loosening the nuts 15 said bolts may be swung outwardly to clear the cover 13, which may then readily be removed and the digester filled.

16 is a bronze plate lining covering the under side of the cover plate 13.

17 is a sleeve secured to the bottom of the digester 1 around the opening 4 and having the flange 18 extending laterally therefrom.

19 is a bronze sleeve lining fitting the opening 4 at the bottom of the digester and securely bolted to the flange 18 of the sleeve 17.

20 are tie-rods embedded in the side walls 2 of the digester at the top thereof and having the anchor heads 21 at the lower ends thereof. The rods at the top extend through orifices in the flange 10 of the top sleeve 8 and are secured in place by the nuts 22.

23 is a blow-off pipe firmly bolted with the sleeve lining 19 to the flange 17 at the bottom of the digester and leading to a suitable receptacle to which it is desired to convey the contents of the digester after treatment.

24 are plugs extending inwardly for a short distance into the walls 7 of the digester

from the inside thereof, said plugs being arranged at intervals throughout the entire inner face of said digester.

25 is an inter-lining of sheet lead placed around the inside of the digester and secured by the bolts or screws 26 to the plugs 24.

27 are protective caps of sheet lead secured to the interlining 25 over the heads of the bolts 26 and protecting said bolts from the action of any acids which may be contained in the digester.

28 is a brick lining completely covering the interior of the digester 1, the bricks constituting said lining being embedded or laid with a substantially acid-proof cement or plaster suitable for the purpose.

An important feature in the use of concrete for the walls comprising the body of the digester is the near co-efficient of expansion between the concrete shell and the brick lining. This obviates the trouble heretofore experienced in digesters of the well-known type of steel and brick construction, as the heat generated within the digester expands the brick and concrete equally, and this prevents the cracking of the brick lining which occurs when the said lining is next to a steel shell, which expands readily and draws away from the lining. This object has long been sought for, and prevents the leaking of acid as customarily used in the treatment of wood pulp in digesters, through the lining.

In order to increase the factor of safety, the lead lining 25 is placed between the brick and the concrete side wall, the brick lining preventing the lead lining from being abraded or torn and from wearing by the constant action of the wood pulp treated in the interior of the digester.

It may be here mentioned that the additional expense of placing the lead lining between the brick and the wall of the digester is more than compensated for by the cheapness in construction of the concrete shell as compared with the steel shells customarily used. Furthermore in the formation of the walls 2 of the digester, passages or flues 29 are formed in the side wall intermediate of the thickness thereof. The passages 29 are spaced circumferentially around the wall 2 as shown in Figs. 2 and 3 and are preferably arc-shaped on the inner side to give the maximum strength in the construction of the walls 2 and extend throughout the entire height of said walls and open at both the top and bottom.

30 are cover plates secured on the top and bottom of the digester 1 over the passages 29.

31 are inter-communicating pipes arranged at the top and bottom of the passages 27 and forming a means of communication between the several passages around the wall 2.

32 is an inlet pipe extending from the wall 2 toward the bottom thereof and communicating with one of the passages 27 and with a suitable water supply.

33 is an outlet pipe extending through the wall 2 toward the top thereof and communicating with one of the passages 29.

The water entering through the pipe 32 is distributed by the inter-communicating pipes 31 to the several passages 29 and is forced upwardly through said passages to the inter-communicating pipes at the top thereof where it finds a common outlet in the pipe 33. A constant flow of water is thus circulated through the wall of the digester practically forming a water jacket, and preventing the heat generated in the interior of the digester from passing to the main reinforced outer portion of the wall 2. It will be readily understood that by thus keeping the wall cool, the concrete will be effectually prevented from all excessive expansion and contraction, and consequently any danger of cracking the concrete will be prevented. It may be found sufficient to line the passages 19 with a non-conducting material such as asbestos, or the cover plates may be removed and a circulation of air created through the said passages. After extensive and severe usage should a crack occur in any part of the lining of the digester and the acid used in the digester leak through it will naturally find its way through the concrete wall at the thinnest part, which is in front of the several passages 27, and if water is being circulated through said passages, the acid will be carried off by the circulation of the water, and if the crack through which the acid passes is of sufficient size, pressure will be added to the circulating water, and any suitable means for determining the increase in pressure can be used, which will give a clear indication of the leak. The passages 27 will be of sufficient size in the ordinary digester to admit a workman who can repair any part of the wall throughout the entire height thereof by removing the cover plate 30.

Although the lead lining 23 has been described as interposed between the brick lining and the concrete shell of the digester, I do not wish to confine myself to the use of this lead lining, as it will be found that the brick lining in itself will be very efficient when the lead lining is not desired the cost of the digester being greatly reduced thereby.

The sleeve 8 fitting into the inlet opening in the top of the digester and having the bronze lining 12 is tapered as shown in order that the expansion and contraction of said sleeve due to the heating of the digester during the treatment of wood pulp and the later contraction, will not cause the said sleeve to break away from the sides of the opening which it fits. If the sleeve were straight the

expansion of the same would tend to elongate the sleeve and break it away from the sides of the opening 3. Whereas the expansion of the tapered sleeve will tend to tighten the same in the cement as the expansion forces it down, and in this way the continual difficulty of leaks at this point will be obviated. In fact this same arrangement of sleeve can well be used in connection with the boiler plate type of digester.

34 are bronze sleeves extending through the side wall of the digester intermediate of the height thereof for the purpose of using a thermometer and safety plug.

What I claim as my invention is:

1. A digester or the like formed of a plastic substance in its consistent state and of substantially cylindrical formation having openings in the top and bottom thereof, sleeves having a tapered portion fitted into said openings and anchor rods having enlarged heads embedded in the wall of said digester and secured to the sleeve in said top opening.

2. In a digester or the like, a shell molded of concrete suitably reinforced and having the interior thereof cylindrical in shape for the greater portion of its length and the ends converging to inlet and outlet openings, sleeves having a tapered portion fitting into said openings, anchor rods having enlarged heads embedded in the walls of said digester, and secured at the upper ends thereof to said top sleeves.

3. A digester or the like comprising a shell formed of plastic material in its consistent state, a lining of brick and an inter-lining of sheet lead.

4. A digester or the like comprising a shell formed of plastic material in its consistent state, tie-rods embedded in said shell from the inner side thereof, an inter-lining of sheet lead, bolts extending through said inter-lining into said tie-lugs, caps of sheet lead secured over the heads of said bolts and a lining of brick.

5. In a digester or the like, a shell molded of concrete suitably reinforced and having the interior thereof cylindrical in shape for the greater portion of its length and the ends converging to inlet and outlet openings, sleeves fitting said inlet and outlet openings, tie-rods embedded in the walls of said shell and secured at the upper ends thereof to said top sleeve, tie-lugs embedded in said shell from the inner side thereof, an inter-lining of sheet lead, bolts extending through said inter-lining into said tie-lugs, caps of sheet lead secured over the heads of said bolts and a lining of brick.

6. A digester or the like formed of a plastic substance in its consistent state having flue passages intermediate of the thickness of the wall thereof and extending

throughout the entire length of said digester, caps closing the ends of said passages and a substantially acid-proof lining on the interior of said digester.

7. In a digester or the like, a shell molded of concrete suitably reinforced and having the interior thereof cylindrical in shape for the greater portion of its length and the ends converging to inlet and outlet openings, a plurality of passages intermediate of the thickness of said shell and spaced circumferentially therearound and extending throughout the entire height of said digester, caps secured over the open ends of said passages, a plurality of inter-communicating tubes connecting said passages at the ends thereof, an inlet pipe connected with said passages and inter-communicating tubes toward one end of said shell and an outlet pipe connecting with said passages and said intercommunicating tubes toward the other end thereof.

8. A digester or the like formed of a plastic substance in its consistent state having flue passages intermediate of the thickness of the walls thereof and a substantially acid-proof lining.

9. A digester or the like having the wall thereof formed of a plastic substance in its consistent state suitably reinforced and having passages arranged therein for a tempering fluid and a lining of brick.

10. In a digester or the like, a shell molded of concrete suitably reinforced and having the interior thereof cylindrical in shape for the greater portion of its length and the ends converging to inlet and outlet openings, a plurality of longitudinally-extending passages intermediate of the thickness of said shell and spaced circumferentially therearound, a plurality of intercommunicating tubes connecting said passages at the ends thereof, an inlet pipe connecting with said passages and intercommunicating tubes toward one end of said shell and an outlet pipe connecting with said passages and intercommunicating tubes at the other end of said shell.

11. In a digester or the like having an outer shell and an inner shell of an acid-proof material, said outer shell having a lateral opening through the side walls thereof intermediate of its length, of a sleeve of acid-proof material fitting said lateral opening and having flanged ends fitting close against the inner and outer faces of said outer shell.

Signed at the town of Berlin, in the State of New Hampshire, in the United States of America, this sixth day of March, 1909.

CHARLES HENRY CRAIGUE.

Witnesses:

MATTHEW J. RYAN,
THOS. V. STUDER.