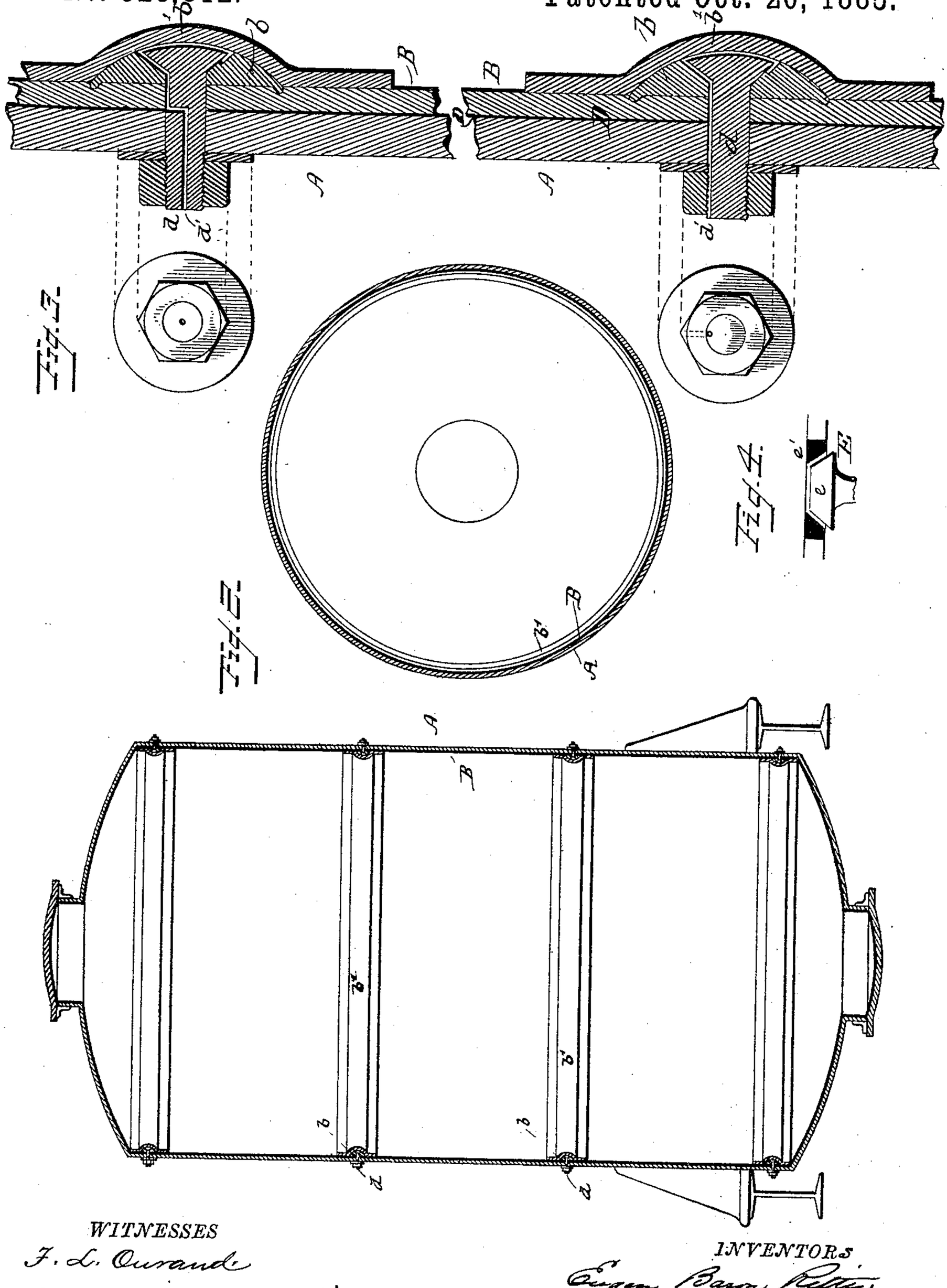
(No Model.)

EUGEN BARON RITTER & CARL KELLNER.

APPARATUS FOR THE MANUFACTURE OF CELLULOSE OR PAPER PULP FROM WOOD FIBER.

No. 328,812. Patented Oct. 20, 1885.



WITNESSES

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EUGEN BARON RITTER AND CARL KELLNER, OF PODGORA, NEAR GOERZ, AUSTRIA-HUNGARY, ASSIGNORS TO WILLIAM A. RUSSELL, TRUSTEE, OF LAWRENCE, MASSACHUSETTS.

APPARATUS FOR THE MANUFACTURE OF CELLULOSE OR PAPER-PULP FROM WOOD FIBER.

SPECIFICATION forming part of Letters Patent No. 328,812, dated October 20, 1885.

Application filed February 4, 1885. Serial No. 154,953. (No model.) Patented in Austria-Hungary August 2, 1883, No. 20,024 and No. 31,730; in France September 27, 1883, No. 157,754; in Belgium September 29, 1883, No. 62,746, and in Italy January 22, 1884, No. 16,316.

To all whom it may concern:

Be it known that we, EUGEN BARON RITTER and CARL KELLNER, subjects of the Emperor of Austria-Hungary, residing at Podgora, near Goerz, Austria-Hungary, have invented certain new and useful Improvements in Apparatus for the Manufacture of Cellulose or Paper-Pulp from Wood Fiber, (the said invention having been patented to us in Italy January 22, 1884, No. 16,316; in France September 27, 1883, No. 157,754; in Belgium, No. 62,746, September 29, 1883, and in Austria-Hungary August 2, 1883, Nos. 20,024 and 31,730;) and we do hereby declare the following to be a full, clear, and exact description of the invention, reference being had to the accompanying drawings, which form part of this specification.

Our invention relates to boilers or digesters in which wood is subjected to the action of sulphites and sulphurous acid in the manufacture of cellulose or paper-pulp. Such digesters heretofore have been lined with lead to prevent the deleterious action of the chemicals upon the boiler-shell; but, so far as our knowledge extends, as heretofore constructed such digesters have provided insufficient compensation for the unequal contraction and expansion of the shell and lining.

The object of our invention, speaking generally, is to obviate this objection and to provide a digester which will last a long time without renewal of its lining.

The first part of our invention relates to the method of uniting the shell and its lining securely, while permitting the lining to move freely upon the shell to compensate inequalities in the expansion of the two metals. This end we attain by uniting the shell and its lining by means of an interposed soft-metal alloy fusible at a temperature lower than that of either. The two are thus securely united, while the alloy being fusible under the normal working temperature of the digester, the lead lining can slide freely on the boiler-shell.

The object of the second part of our invention is to clamp the shell and lining securely together along certain lines, while permitting the lining to expand more than it contracts between the clamping-lines without rupture, and to protect the clamp mechanism securely from corrosion. These ends we attain by lining the boiler with sections or plates, tightly uniting them at their edges and securing them firmly to the shell by means of parallel annular bands, between which and the shell the lining-sections are interposed, and uniting the parts securely by fastening-bolts passing through the lining and the shell, each band and its bolt-heads being covered by a soft-metal strip united with the lining, so as to protect the band and bolts from corrosion.

The object of the third part of our invention is to detect leaks or ruptures in the lining of the digester. This end we attain by forming in the fastening-bolts channels which communicate with the space between the lining and the shell, through which, in case of leaks, the internal pressure would soon force the vapors or liquid contents of the digester, and thus indicate the locality of the leak.

The fourth part of our invention relates to the construction of the apparatus as a whole, and is, together with the other subject-matter herein claimed, specifically designated in the claims.

The next part of our invention relates to the valve mechanism of the digester. Its object is to prevent its corrosion by the acids employed, which end we attain by making the valve cone or ring and its seat of solid silver or coating or plating these parts with silver.

Some parts of our invention obviously may be used without the others.

In the accompanying drawings, which show so much of the apparatus only as is necessary to illustrate the invention herein claimed, Figure 1 represents a vertical central section; Fig. 2, a horizontal section; Fig. 3, a detail view of a wood-pulp digester embodying our improvements, and Fig. 4 is a section of the valve cone and seat.

The body of the boiler or digester, which in this instance is shown as constructed in a cylindrical form, consists of an outer shell, A, of hard metal, such as iron or steel, constructed in the usual manner, with suitable inlets and outlets for filling and discharging. The outer shell is coated internally with a lining, B, consisting of plates or sections of sheet-lead, the adjacent edges of which are united in well-

known ways to form a tight-joint. Strong annular bands or hoops *b* of hard metal, such as iron or steel, are arranged parallel to each other about eighteen inches apart, more or less, inside the digester. Fastening-bolts *d* pass through the outer shell, the lining, and the bands, and are provided with nuts. These bolts are formed with conical heads which are countersunk into the bands. By these means the lead lining is firmly clamped between the shell and the band. Each band and its bolts are covered with a strip, *b'*, of sheet lead, soldered or otherwise secured to the lead lining to prevent their corrosion. These clamping-bands, it will be seen, thus not only hold the lead in position and prevent its bulging away from the shell in consequence of its own weight, but also divide the lining into small sections, among which the expansion is divided so as to be absolutely uninjurious.

The bolts *d*, it will be observed, are constructed with suitable channels, *d'*, connecting the space between the outer shell and its lining, and also the space between the clamping-bands and the covering-strip *b'* with the outside of the boiler, so that any leak in the lining will be detected at an adjacent bolt.

In Fig. 3 is shown a central longitudinal perforation through the bolt to a point somewhat near that where the lining rests on the outer shell, running thence to the outer surface of the bolt and extending to its head in the form of an external groove. The channel might, however, be made entirely in the form of an external groove instead of that of a central perforation. Any leakage in the lining will readily be detected by the odor of the escaping vapors, and the lining may be readily repaired when the digester is recharged.

We prefer to construct the cone *e* and seat *e'* of the valves E of silver, in order to prevent their corrosion by the acids employed.

We sometimes unite the lining and shell of the digester by an interposed soft-metal alloy, D, fusible at the normal working temperature of the digester, which is of course lower than that of the lead lining. This alloy may be prepared and applied in the following manner:

For a digester working under from three to five atmospheres of pressure we prepare an alloy consisting of twenty-two parts of lead, twenty-four parts of tin, and eight parts of bismuth, which alloy melts at a temperature corresponding to a steam-pressure of from three to five atmospheres. This alloy may be kept in a molten state in a bath of oil or paraffine while being used by the workman in the interior of the boiler. He first brushes over the boiler with chloride of zinc, or chloride of zinc ammonium, and the alloy heated with a soldering-flame and in a molten condition is then spread over the boiler-shell by a metallic brush. The sheets or plates of lead are also brushed over with the same alloy, and being heated are coated with the alloy and, if necessary, rolled. These plates are firmly attached with the side which is coated with the alloy against the shell, also coated with alloy, and the edges are soldered in the ordinary manner. When completely lined in this manner, the vessel is tightly closed and dry steam, preferably superheated, of at least five atmospheres, is introduced, the heat of which makes the lead supple, and the pressure forces it strongly against the outer shell, so that the melting alloy upon the lining unites with that upon the shell, the two flowing together. During this process any water of condensation must be discharged from the vessel. After standing in this manner for some hours, the steam is allowed slowly to escape and the vessel to cool. The shell and lining being soldered together, adhere firmly. The solder, however, becomes so soft, when in use at a temperature corresponding to three atmospheres, that the lining can stretch to any necessary extent, which would not be the case if the lead were soldered directly on the iron without this intermediate coating, as has heretofore been the case with the ordinary lead linings.

Instead, however, of applying the alloy in the manner described, the shell as well as the lining may be coated with soft solder, (lead and tin,) and the lining, when finished, or each section or plate separately, can be applied to the shell and heated with a blast-flame until the intermediate solder melts and unites them together.

We are aware that it has been proposed to interpose a cement of tar and pitch between a boiler-shell and its lining, but such material is objectionable in apparatus of this class, as in case of leakage or rupture in the lining the pulp would be injured by the tarry products; besides, the shell and lining would not be as perfectly united as by our plan.

Having thus fully described our invention, what we claim as new, and desire to secure by Letters Patent, is—

1. The combination, substantially as herein set forth, of the hard-metal outer shell of the digester, with its inner soft-metal lining, united by means of an interposed soft-metal alloy fusible at a temperature lower than that of either the shell or lining, thus securing their perfect union while permitting the lining to move freely on the shell when the digester is heated to its normal working temperature.

2. The combination, substantially as herein set forth, of the hard-metal outer shell of the digester, its inner soft-metal lining, the parallel annular hard-metal clamping-bands between which and the outer shell the lining is interposed, the fastening-bolts passing through the shell, the lining, and the clamping-bands, and the continuous soft-metal lining-strip covering each clamping-band and its fastening-bolts.

3. The combination, substantially as herein set forth, of the outer shell, its inner lining, the parallel annular hard-metal clamping-bands, the fastening-bolts having conical heads countersunk into the bands and passing

through the shell, the lining, and the clamping-bands, and the continuous soft-metal lining-strip covering each clamping-band and its fastening-bolts.

4. The combination, substantially as herein set forth, of the hard-metal outer shell of the digester, its inner soft-metal lining, the clamping-bands, the fastening-bolts, and the channel through the bolts communicating with the space between the shell and its lining, to permit the escape of confined air or gas, and to indicate leaks in the lining of the digester.

5. The improved paper-pulp digester herein described, consisting of the combination, substantially as herein set forth, of an outer hard-metal shell, a soft-metal lining, a soft-metal alloy fusible at a temperature lower than that of the shell or lining, uniting the shell and lining, internal annular clamping-bands, and fastening-bolts passing through the bands, the lining, and the shell, to unite the parts securely while permitting the lining to expand freely under the normal working temperature of the digester without injurious effects.

6. The valve-cone and its seat, both constructed, as set forth, of silver, or coated with silver, to resist corrosion.

In testimony that we claim the foregoing we have hereunto set our hands.

EUGEN BARON RITTER.
CARL KELLNER.

Witnesses:
GEORG MARTEN,
JOHANN LUTTMANN.