(No Model.)

C. E. BALL.

DIGESTER FOR PAPER PULP.

No. 336,078. Patented Feb. 16, 1886.

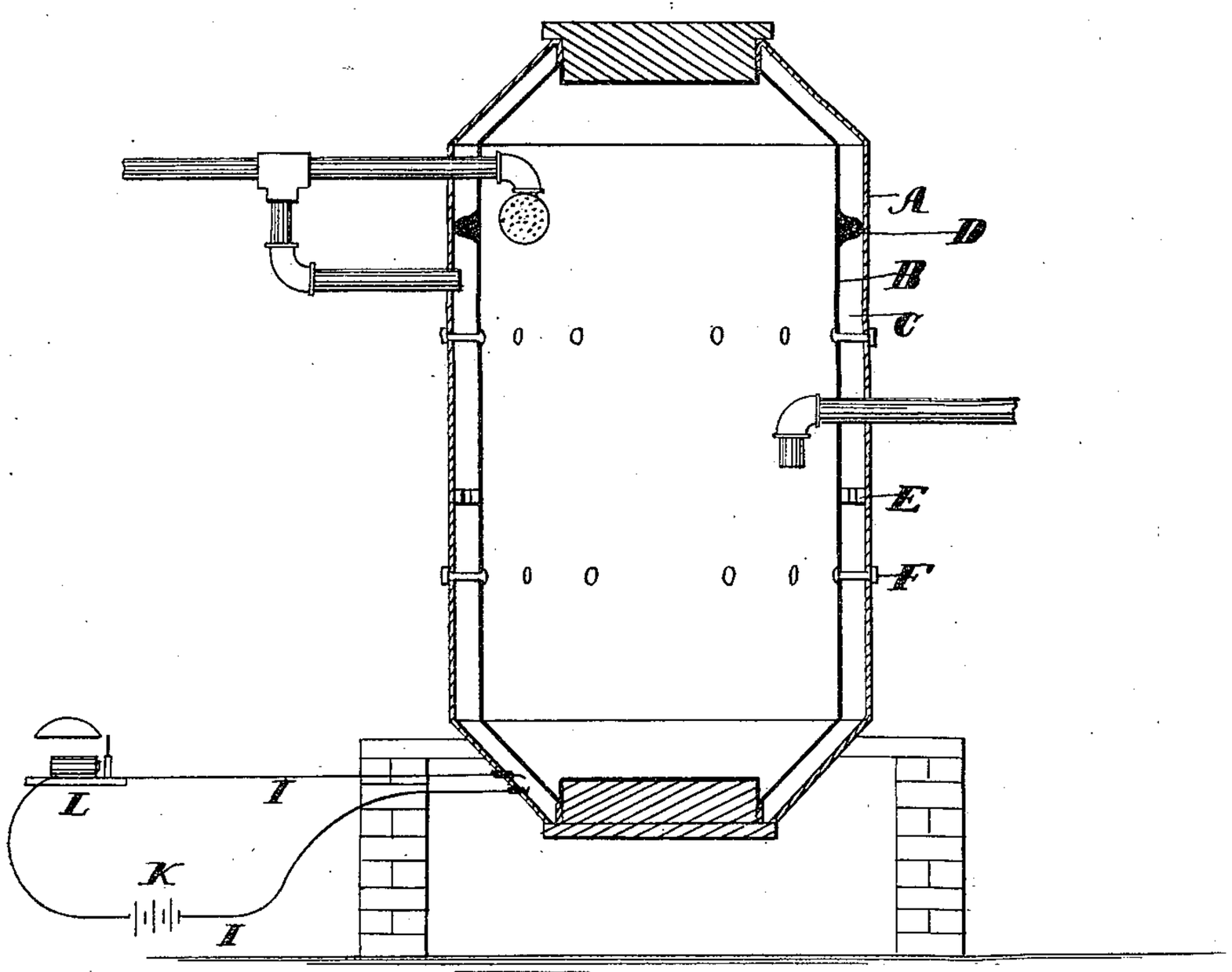

Fig 1

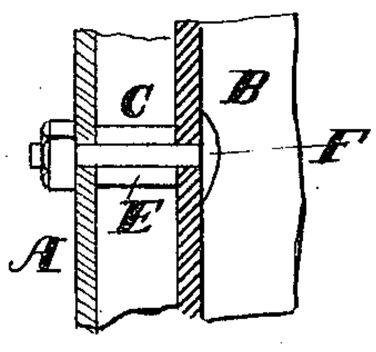

Fig. 2

Witnesses
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UNITED STATES PATENT OFFICE.

CHARLES E. BALL, OF NEW YORK, N. Y.

DIGESTER FOR PAPER-PULP.

SPECIFICATION forming part of Letters Patent No. 336,078, dated February 16, 1886.

Application filed May 14, 1885. Serial No. 165,465. (No model.)

To all whom it may concern:

Be it known that I, CHARLES E. BALL, a citizen of the United States, and a resident of New York, in the county and State of New York, have invented a new and useful Improvement in Digesters for Paper-Pulp, of which the following is a specification.

My present invention has relation to boilers or digesters to be used in the manufacture of paper-pulp. As sulphurous acid, acid solutions, sulphites or bisulphites are commonly employed in the digesting process, and as such process is carried on under considerable steam-pressure, it is the usual custom to construct these boilers or digesters of iron and to line them with lead. This lead lining has been applied to the boilers and affixed therein in various ways, none of which, however, has proved entirely satisfactory. The sudden changes of temperature to which these boilers are subjected during the digesting process and the difference in expansion and contraction between the iron casing and the lead lining have the effect of causing the lead to warp and curl up at various points, while it is strained and spread at other points, and eventually the lining becomes cracked or broken, and the liquid or vaporous acid in the interior, escaping through the fissures in the lead, attacks the iron casing. The usual manner of detecting the leakage of any acid through the lead lining is by scenting the sulphureted hydrogen which may escape at some of the joints of the iron casing. The life of these boilers of digesters is usually not more than two or three weeks, the replacement of the lead lining being then necessary.

My invention has for its object the provision for preventing as far as possible any distortion, warping, or breaking and consequent leakage of the lead lining in boilers or digesters used in the manufacture of paper-pulp.

My invention has for its further object the provision of means for immediately indicating by a sonorous signal the escape of any acid through the lead lining, whether such acid be in a liquid or vaporous form.

My invention consists, first, in constructing the boiler or digester in such manner as to leave a space between the lead lining and the iron casing, and maintaining an equal pressure on both sides of the lead lining while the boiler or digester is in operation; secondly, in the provision of an electric signal adapted to be automatically operated upon the escape of any of the acid contents of the boiler through the lead lining.

Referring to the accompanying drawings, wherein Figure 1 is a vertical central section of a vertical stationary boiler embodying my improvement, and Fig. 2 a detail—

A designates the exterior iron casing of the boiler, which is of the usual form and construction, and need not therefore be particularly described. B designates the lead lining. This lead lining is separated from the interior of the iron casing A by a space, C, and maintained at that distance by means either of rings of lead D, which are formed integral with the lining B or attached thereto in any suitable manner, or by means of rings of iron E, which are formed integral with or attached to the casing A.

In Fig. 2 I have shown a means for securing the iron casing and lead lining together, and at the same time sustaining the rings D or E in position, such means consisting of bolts F, passing through the casing, the lining, and the rings. The rings D or E, whichever may be employed, can be made continuous all around the lining, in which case they should be provided with holes for the passage of steam or water; or they may be replaced by a number of lugs or projections arranged at proper intervals.

It is my design to maintain constantly an equal pressure upon the outside and inside of the lead casing, and in order to do so I attach a branch pipe to the steam-pipe which conveys steam to the interior of the boiler, which branch pipe I lead into the space C, between the lead lining B and the casing A. This space may be kept full of steam alone, the pressure being the same as that upon the inside of the lead lining, or a quantity of water may be kept in the space, and the pressure of the steam upon the top of the water within and without the lead lining will maintain an equilibrium. If water is kept in the space, it should be pure, and the water of condensation of the steam will probably be found sufficient for the purpose after the boiler has been in operation for some little time. Suitable pipes

should be provided for the ingress and the egress of the solutions used, and the boiler is of course provided with the usual means for introducing and discharging the material to be acted upon in the boiler. At or near the bottom of the boiler are fixed two wires, I I, which pass through the exterior casing, A, and are insulated therefrom. The inner ends of these wires are brought close together without contact, and their outer ends are connected to the terminals of an electric circuit in which are included a battery, K, and an electric signaling apparatus, L.

Operation: The apparatus being constructed and arranged as described, the material to be digested and the desired acid solution introduced into the boiler, steam is turned on and enters the interior of the boiler and also the space C. An equilibrium of pressure is thereupon established between the interior and exterior surfaces of the lead lining, which is maintained during the time the contents of the boiler are under pressure. The lead lining and the iron casing of course expand and contract as the temperature increases or diminishes; but being separated from one another by the space C, wherein the steam-pressure is maintained, as before mentioned, there will be comparatively no bulging or warping of the said lining, and hence but little tendency on the part of the same to crack or leak at any of its joints or seams. Should any leakage occur, the water of condensation, into which the wires I I project, becomes acidulated and establishes a circuit between the two, thereby causing the alarm L to be sounded and immediately notifying the operative in charge of the boiler of such leakage.

Having described my invention, I claim—

1. In a boiler for digesting materials by the action of acids, the combination, with an exterior casing and an interior lining separated from said casing by a space, of steam-pipes leading into the interior of the boiler and into the space between the lining and the casing, whereby an equable steam-pressure may be maintained on each side of said lining, substantially as described.

2. In a boiler for digesting by the action of an acid solution or vapor, the combination, with an exterior casing and a lining separated from said casing by a space, of an electric signaling apparatus whose circuit-terminals project into said space, substantially as described.

3. In a boiler for digesting materials by the action of acids, the combination, with the exterior casing and an interior lining, of an electric signaling apparatus adapted to be automatically operated upon the escape of acid through the lining, substantially as set forth.

In testimony that I claim the foregoing as my invention I have signed my name, in presence of two witnesses, this 9th day of May, 1885.

CHAS. E. BALL.

Witnesses:

GEORGE F. ESCHBACH,

GEORGE THORNE.