(No Model.) 2 Sheets—Sheet 1.

H. BRÜNGGER.

PROCESS OF LINING DIGESTERS.

No. 483,827. Patented Oct. 4, 1892.

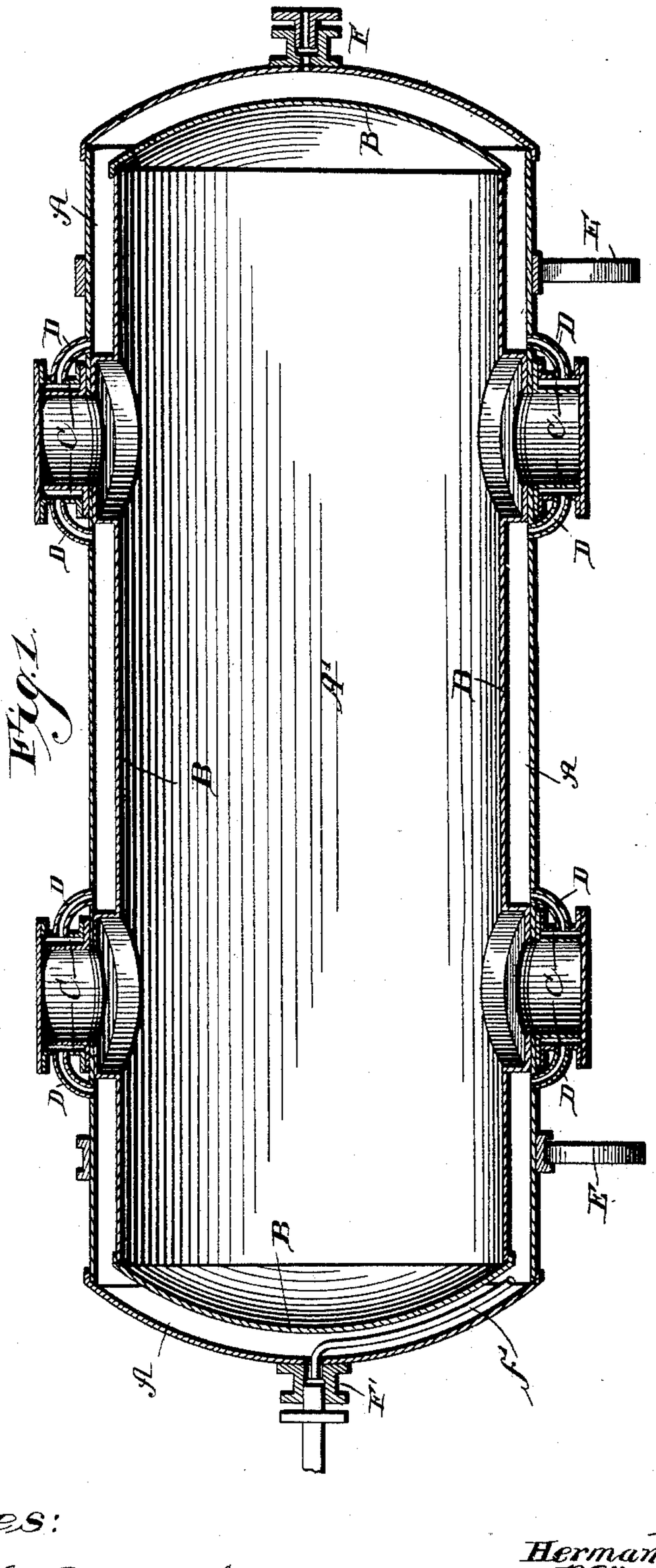

Fig. 2.

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Henry Orth
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(No Model.) 2 Sheets—Sheet 2.

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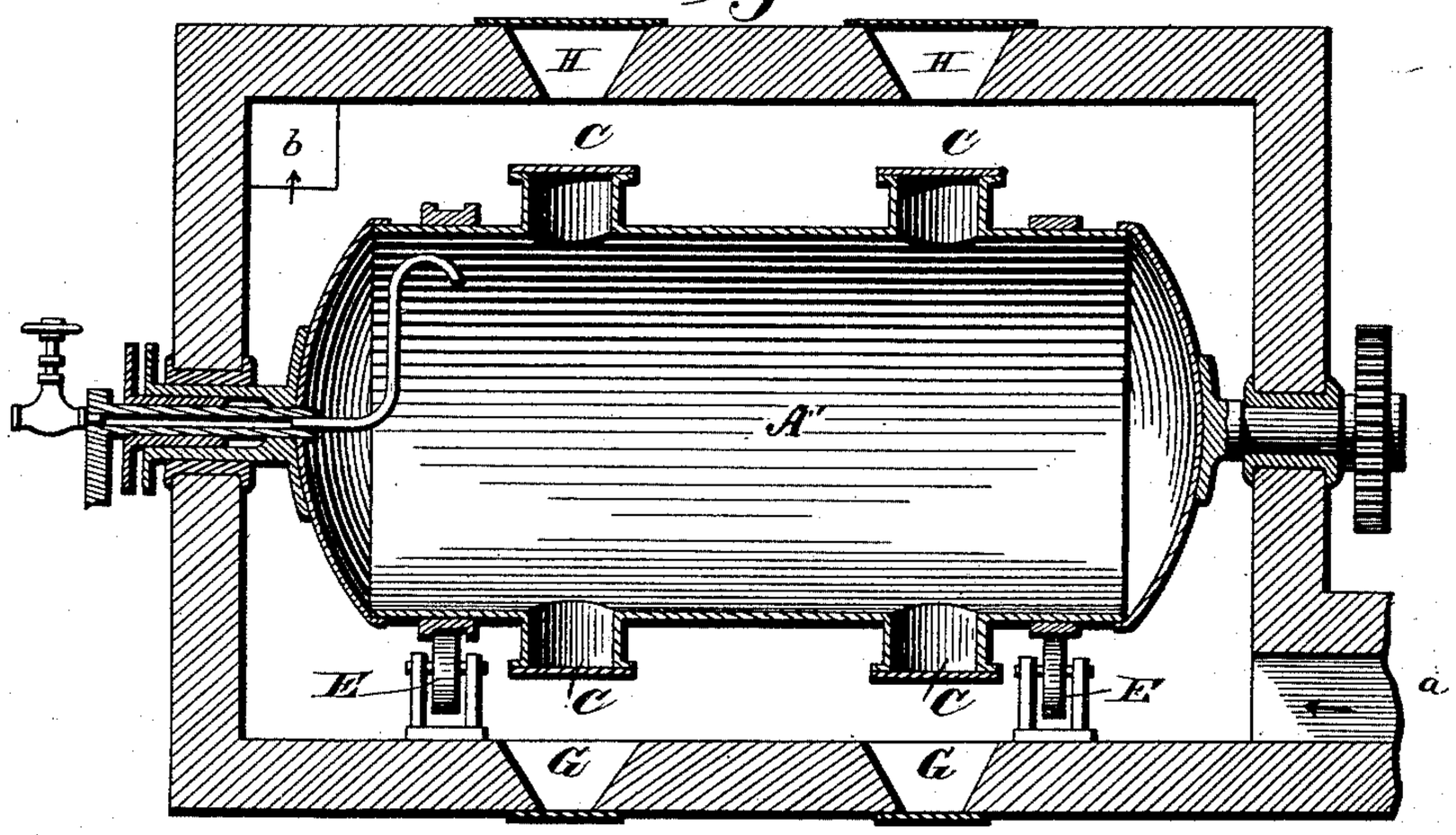
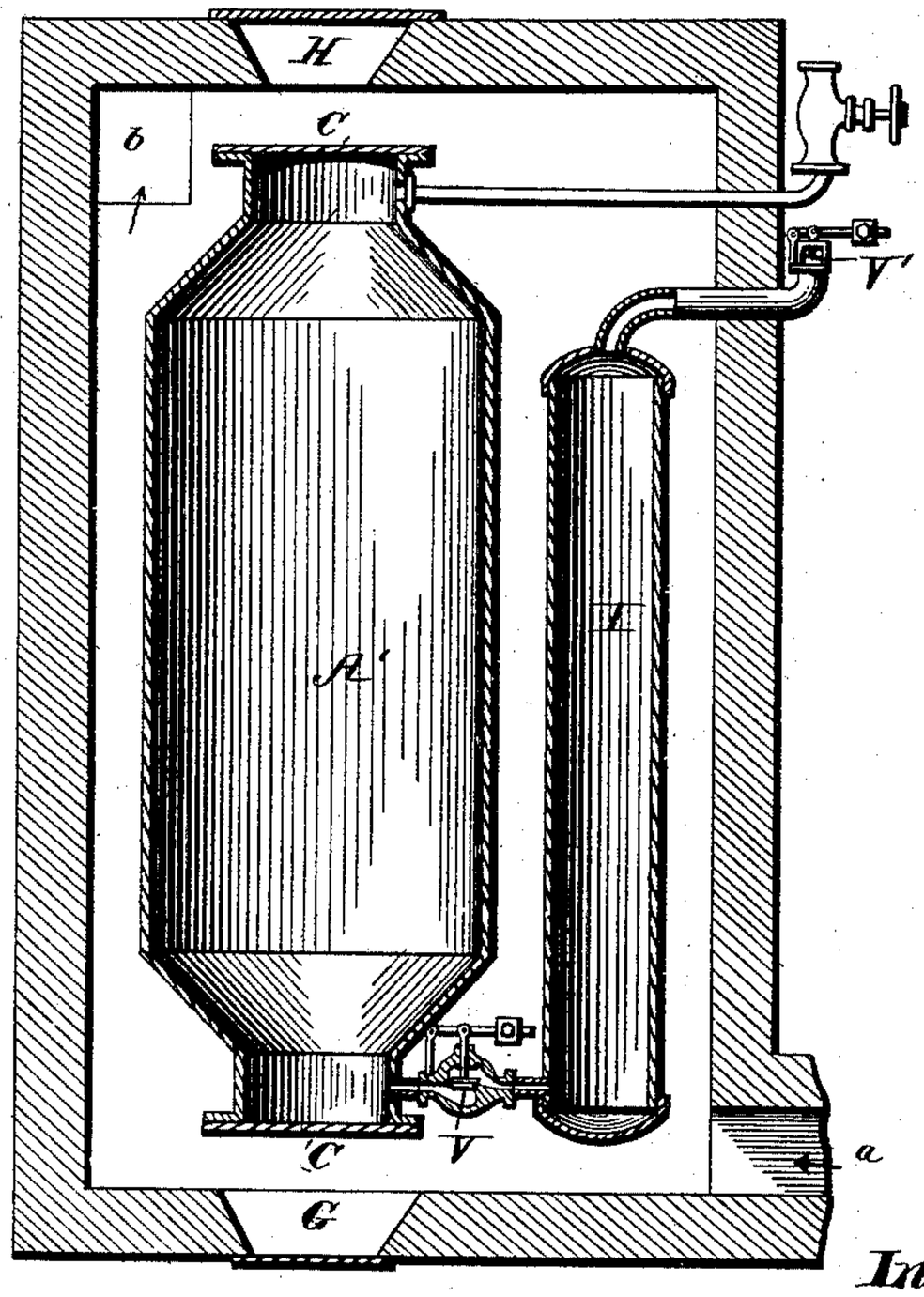


Fig. 3.



Witnesses:
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J. Thomson Crosse

Inventor:
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Attorney

UNITED STATES PATENT OFFICE.

HERMANN BRÜNGGER, OF CUNNERSDORF, ASSIGNOR TO FERDINAND SALOMON, OF BERLIN, GERMANY.

PROCESS OF LINING DIGESTERS.

SPECIFICATION forming part of Letters Patent No. 483,827, dated October 4, 1892.

Application filed April 26, 1890. Serial No. 349,622. (No specimens) Patented in England September 17, 1888, No. 13,396, and December 10, 1888, No. 18,003; in Norway September 17, 1888, No. 1,087; in France October 19, 1888, No. 193,637; in Belgium November 5, 1888, No. 83,841, and December 1, 1888, No. 84,140; in Germany November 7, 1888, No. 50,789, and in Switzerland February 5, 1889, No. 398.

To all whom it may concern:

Be it known that I, HERMANN BRÜNGGER, a citizen of Switzerland, residing at Cunnersdorf, in the district of Liegnitz, German Empire, have invented a certain new and useful Process of Lining Digesters, (for which I have obtained a patent in Switzerland, dated February 5, 1889, No. 398, and for which I have obtained patents in conjunction with Ferdinand Salomon, LL. D. and manufacturer, a subject of the King of Prussia, residing at 59 Mohrenstrasse, Berlin, who is interested in said invention with me in the following countries, to wit: Great Britain, September 17, 1888, No. 13,396, and December 10, 1888, No. 18,003; Norway, September 17, 1888, No. 1,087; France, October 19, 1888, No. 193,637; Germany, November 7, 1888, No. 50,789, and in Belgium, November 5, 1888, No. 83,841, and December 1, 1888, No. 84,140;) and I do hereby 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 being had to the accompanying drawings, and to letters of reference marked thereon, which form a part of this specification.

This invention relates to the manufacture of cellulose by the sulphite process, and more especially to the protection of the digesters or boilers; and it has for its object to protect such digesters or boilers against the corrosive action of the sulphite solution.

To this end the invention consists in a novel process of forming a protective lining for the digesters or boilers used in the manufacture of cellulose by the sulphite process, which lining may be formed either during the process of disintegration of the fibrous material or independently thereof, as will now be fully described.

In the manufacture of cellulose by the sulphite process the boilers heretofore used were protected against the corrosive or destructive action of the sulphite solution by lining the same with lead or with some other material not affected by the sulphite solution. These linings are very expensive, liable to leakage, and consequently necessitating frequent repairs, while such leakages are in many cases diffcult to detect or cannot be detected until the boiler-wall, brought in contact with the sulphite solution, is so far corroded as to cause a leakage in the boiler-shell itself.

The object of this my invention is to obviate the difficulties referred to by providing such digesters or boilers with a lining that will effectually protect the digester against the action of a sulphite solution, and which lining, should it crack, will reform or repair itself during the process of disintegration of a fibrous substance, or may be readily repaired or reformed independently of such process.

In carrying out my invention and when the sulphite solution is a concentrated one I preferably preheat the digester to such a degree as that a decomposition or partial decomposition of said solution will follow when brought in contact with the heated digester-walls, and I have found that a temperature of from 100° centigrade upward will answer the purposes. When, however, a weak sulphite solution is employed that will not rapidly corrode the metal when brought in contact therewith at a normal temperature, the preheating of the digester is not adsolutely necessary, and the process of forming the lining and of disintegrating the fibrous material may then be carried on simultaneously, thereby effecting an economy in fuel. Hence I may proceed in two ways, according to the degree of saturation of the solution. If the solution is a weak one, so that it will not corrode the digester-walls too rapidly, a digester of iron or steel and devoid of all lining may be charged with the fibrous material to be disintegrated or reduced—as wood, for instance—and with a sulphite solution—as, for instance, a solution of bisulphite of calcium. The digester-walls may then be heated to a temperature ranging from about 100° centigrade upward, when decomposition or partial decomposition of the solution in contact with such heated walls and a separation of the salt therefrom will ensue, which salt will be deposited upon said walls and form an incrustation insoluble in

the bisulphite solution, the temperature referred to being maintained during the process of disintegration, so that the heat necessary to the disintegration of the fibrous material will at the same time assist in the formation of a lining for the digester that will be insoluble in the sulphite solution. If desired, however, the digester may be coated or lined before introducing the fibrous material. When the solution is sufficiently concentrated as to rapidly attach the digester-walls, I prefer to preheat the digester, and when heated to about 100° centigrade and upward the solution is admitted thereto, when decomposition or partial decomposition of the solution by contact with the heated walls and deposition of the salt upon said walls will ensue. The degree of heat referred to is maintained until a lining of sufficient thickness has been formed—say from one and one-half to two millimeters — when the digesters may be charged with the fibrous material and the reduction thereof proceeded with at any desired or required temperature. It is obvious that should the lining crack or fissure from any cause such crack or fissure can be readily repaired, as described, or will repair itself during the operation of reduction of the fibrous material.

To render the deposit more uniform, the digester may be kept in rotation during the process, though this is not absolutely necessary.

An analysis of the lining of one of the digesters shows about the following proportions of components in one hundred parts:

26.775 parts sulphate of calcium, ($CaSO_4$.)
62.232 parts calcium sulphite, ($CaSO_3$ and sulphide CaS_2.)
0.673 parts free lime, (CaO.)
0.11 parts magnesia, (MgO.)
0.27 parts oxide of iron and argillaceous earth.
9.93 parts water and organic matter, of which I found 0.17, or about that, to be cellulose.

99.990

I am at present not in a position to positively determine the reaction that takes place. I have, however, ascertained that when the sulphite solution is brought in contact with heated iron or steel, or the iron or steel is heated while in contact with the solution, a monosulphite is formed, which by the further action of the heat is decomposed into calcic sulphate and sulphide with evolution of water, sulphurous oxide, and sulphur, some of the monosulphite remaining undecomposed, the reaction and separation taking place as soon as the temperature reaches 100° centigrade.

The degree of saturation of the sulphite solution is immaterial to the process of forming the lining, as such will be formed whatever the strength of the solution may be, so that in the reduction of fibrous materials requiring a weak solution the reduction and formation of the lining may be carried on simultaneously, and this may also be done with materials requiring a strong solution, provided a weak solution is first employed, and as the lining is formed stronger solutions used. The lining so formed is enamel-like, exceedingly hard, and adheres very firmly to the digester-walls.

In the accompanying drawing I have illustrated both horizontal and vertical digesters and means for heating the same.

Figure 1 illustrates by a longitudinal section a revoluble horizontal digester constructed with double walls as a means for heating the same. Fig. 2 is a like view of a digester devoid of double walls; and Fig. 3 is a vertical section of a digester, also devoid of double walls, other means being provided to heat the same.

The digester A′ (shown in Fig. 1) is heated to the required degree by passing a heated fluid—such as steam, for example—through a jacket formed by the outer walls A and the inner walls B. The spaces between the double walls of the manholes C are connected to the spaces between the walls A B by pipes D, the steam being introduced through one F of the hollow trunnions and exhausted by pipe f', connected with the other hollow trunnion F′, the digester or boiler A′ being revoluble on the rollers E.

Digesters devoid of a jacket formed by double walls are, as shown in Figs. 2 and 3, contained in a heating-chamber of masonry which is provided with apertures G H opposite the several manholes C, adapted to be closed by suitable doors. The digester in this latter arrangement is heated by means of hot air or other gas or gases admitted to the chamber at a and exhausted at b.

When the digester is stationary, as shown in Fig. 3, it is necessary to fill it with the sulphite solution, and as the solution expands when subjected to heat I provide the vessel I that is connected with the lower end of the digester A′, and in said connection is a weighted valve V, a like valve V′ being arranged in the feed-pipe of said vessel, the load of the valve V being so adjusted that the pressure in the digester will overcome that exerted by the load to allow the solution to flow back into the vessel I, while the load of the valve V′ will be so adjusted that the pressure exerted thereby will resist the pressure in the digester.

It is obvious that by means of the described process the usual expensive linings for digesters used in the manufacture of cellulose by the sulphite process may be entirely or partially dispensed with, which has heretofore not been possible.

Another advantage than those hereinbefore referred to is derived from my process, in that the operation of disintegration sets in more rapidly.

I do not desire to claim herein a digester or boiler provided with a lining that is insolu-

ble in the solution from which such lining has been obtained, as this is claimed in a separate application for Letters Patent of even date with this, Serial No. 349,623.

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

1. The process of lining digesters, which consists in forming on the interior surface of a boiler or digester a protective coating or lining insoluble in a sulphite solution, such coating or lining being produced by decomposing or partially decomposing by means of heat a sulphite solution while in contact with said surface, as set forth.

2. The process of lining digesters, which consists in forming on the interior surface of a boiler or digester a protective coating or lining insoluble in a sulphite solution, such coating or lining being produced by decomposing or partially decomposing a sulphite solution by bringing the same in contact with said surface previously heated, as set forth.

3. The process of lining digesters, which consists in forming on the interior surface of a boiler or digester a protective coating or lining insoluble in a sulphite solution, such coating or lining being produced by decomposing or partially decomposing by means of heat a sulphite solution and revolving the digester during the operation, as set forth.

4. The process of lining boilers or digesters, which consists in forming on the interior surface of a boiler or digester a protective coating or lining insoluble in a sulphite solution, such coating or lining being produced by charging the boiler or digester with a sulphite solution and with the fibrous material to be reduced and in decomposing or partially decomposing by means of heat said sulphite solution and simultaneously therewith reducing the fibrous material, as set forth.

In testimony whereof I affix my signature in presence of two witnesses.

HERMANN BRÜNGGER.

Witnesses:

J. J. KENNEDY,

THOS. H. SAVERY.