

G. Sinclair,

Flux Digestor.

No. 110,873.

Patented Jan. 10, 1871.

Fig. 1.

Witnesses.

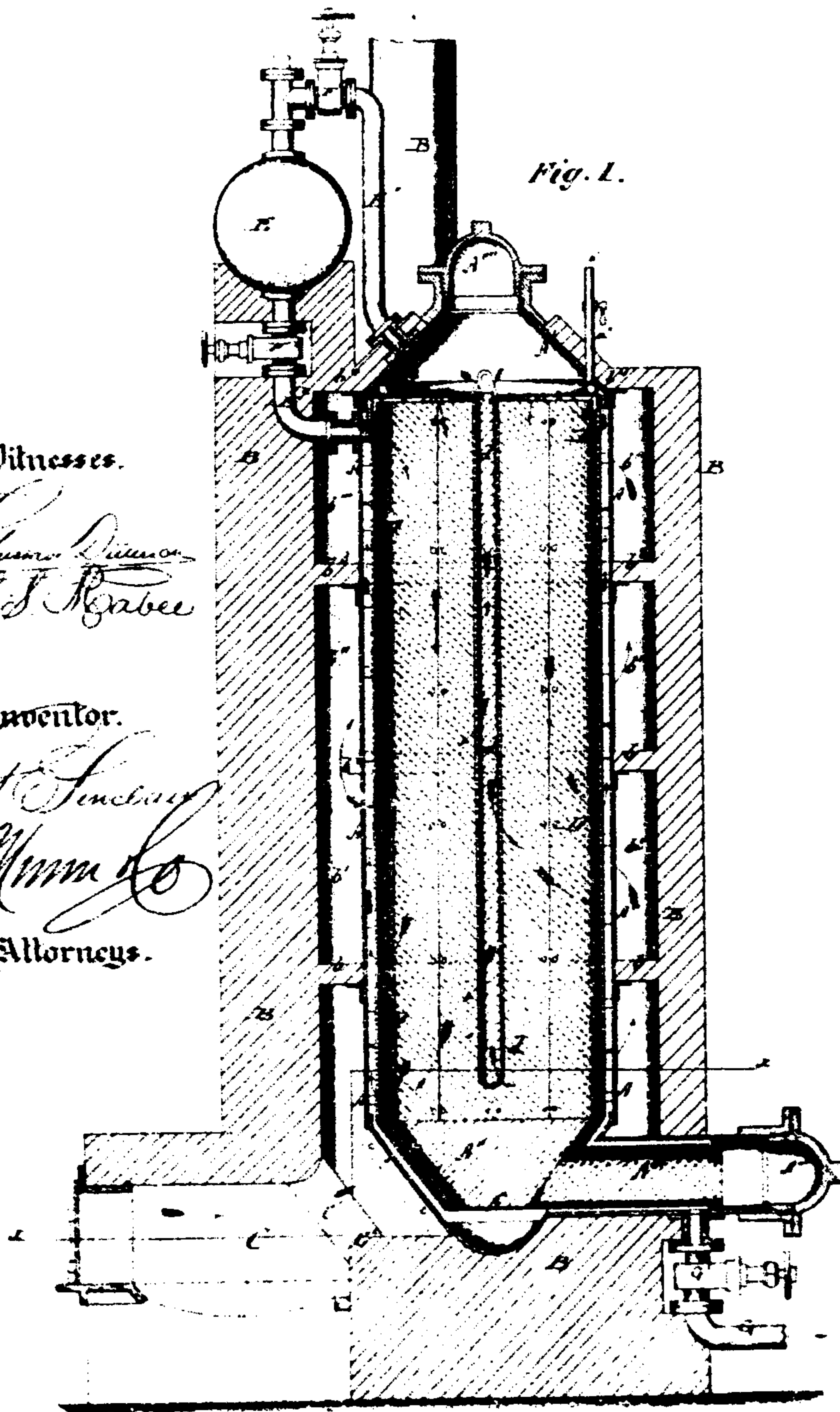
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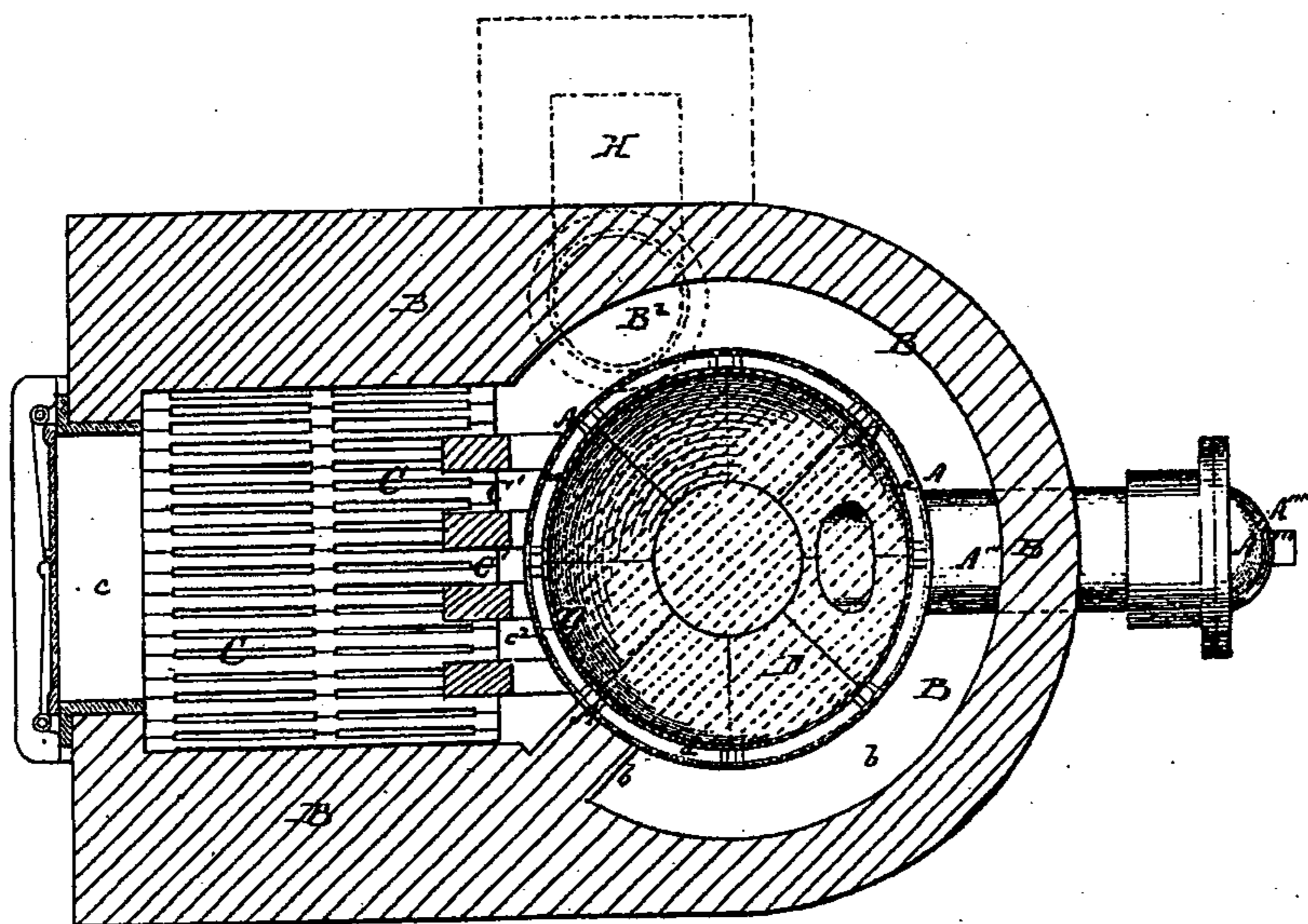
2 Sheets, Sheet 2.

G. Sinclair,
Full Digester.

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Fig. 2.



Witnesses.

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United States Patent Office.

GEORGE SINCLAIR, OF LEITH, SCOTLAND.

Letters Patent No. 110,873, dated January 10, 1871.

IMPROVEMENT IN APPARATUS FOR BOILING AND TREATING PAPER-STOCK.

The Schedule referred to in these Letters Patent and making part of the same.

To whom it may concern:

Be it known that I, GEORGE SINCLAIR, of Leith, in the county of Edinburgh, Scotland, have invented a new and improved construction and arrangement of Boiler and Apparatus for the Treating and Boiling of Split-Wood, Wood-shavings, "Esparto," and other Vegetable Fibrous Material, for the Production of Paper-Pulp; and I do hereby declare that the following is a full, clear, and exact description thereof, which will enable others skilled in the art to make and use the same, reference being had to the accompanying drawing forming part of this specification.

This invention consists in improvement in boilers or vessels for containing fibrous wood or other vegetable material, to be treated by direct action or radiation of heat from the flame or gaseous products of combustion from ordinary forms of fuel and furnaces through an outer shell or case; and

The invention consists in the arrangement of a central perforated tube within the boiler, for the purpose of causing a more forcible or free circulation of the liquid currents laterally through the fibrous material, and in the provision of a supply-chamber; and also in the arrangement of obstructing-plates in the annular space between the boiler and the wall of the furnace or combustion-chamber, as hereinafter described.

In the accompanying drawing—

Figure 1 is a vertical section of my new and improved boiler.

Figure 2 is a horizontal section of the same, taken on the line *x x* in fig. 1.

Similar letters of reference indicate corresponding parts.

The main shell *A* of the improved pulp-preparing boiler is of a long, narrow, cylindrical shape, of such a diameter that the contents placed within it would be easily heated through from the outer circumference.

I prefer to construct it with a diameter of from two to four feet, and with a length of from three to six diameters; and to make it of the best malleable-iron boiler-plate.

The ends *A'* *A''* of this boiler are of conical or hollow semi-spherical form, and so strongly made as to stand the great pressure of from two to three hundred pounds, due to the heat required within.

In the top of the boiler is an opening for filling the boiler, while the bottom of the same is connected with a discharging-pipe, *A'''*.

The top opening can be closed by a screw-cap, *A''''*, while a similar cap, *A'''''*, can be used for closing the pipe *A'''*.

These caps can be provided with turned flanges, made fluid-pressure tight by fine grooves and rings

of copper wire, or other equivalent simple joints, or otherwise. The flanges may be tightened by screw-bolts passed through them, or other equivalent suitable fastening.

The main boiler *A* is placed within a confined walled heating-flue or chamber, *B*, of brick-work, having the heated products of combustion from an ordinary furnace, *C*, passed into and up through the chamber *B*, so as to act on the outer surface of the boiler *A*.

Within the boiler *A* is set up an inner casing or vessel, *D*, formed of thin sheet-metal plates, closely perforated with small holes, or of strong wire-cloth; in either case it is secured to the outer shell or vessel *A* by small, short stays or studs, or other equivalent fastenings, to retain the perforated vessel an inch or two from the interior of the outer heating-vessel *A* all round and opposite to where the heat impinges or is imparted to it.

Thus the outer hot shell *A* is prevented from touching, overheating, or burning the fibrous materials, which are all placed and kept within the inner perforated vessel *D*, and so as to heat the liquor or "lyes" within the narrow annular space *a* between the outer and inner vessels *A* *D*, and cause it to circulate freely up the space *a*, over the open top, down the center of the perforated vessel *D*, and through the openings of the same, as indicated by the arrows, all so as to pass vertically and laterally through the body of the fibrous materials being treated, and thus thoroughly boil and reduce them.

The fibrous material is apt to pack so closely as to prevent the free circulation of the liquid through it, and thus the object of the treatment is only partly attained.

To obviate this result, or to insure the thorough permeation of the material, I have provided a long perforated tube or pipe, *d*, down the center of the vessel *D* and materials in it, as shown in fig. 1, by preference with a close or perforated lower end, all for the purpose of insuring the passage of the liquid currents down and out laterally through the perforations of said pipe and through the materials being treated, as indicated by the arrows in fig. 1.

The upper end of the boiler is made to project vertically through the brick-work at the top, for the convenience of filling the vessel *D*, while the discharge-pipe *A'''* is placed horizontally through the brick-work at the lower end of the vessel *A*, for the more easy withdrawal of the solid fibrous material from the inner vessel *D*, into other portable or stationary apparatus for subsequent treatment.

A small supply-vessel, *E*, by preference of a spherical, or it may be of a strong cylindrical, form, is placed above the boiler *A* and structure *B*.

The upper parts of both vessels A and B are connected by a small pipe, E¹, while another small pipe, E², leads from the bottom of the supply-vessel E into the side of the boiler A and inner vessel D, both pipes E¹ E² being provided with controlling-valves F¹ F².

The boiler A is built vertically in the heating-chamber B, with an annular fire-heating space all around it, and is set, by its lower strong conical end, on the brick-work.

The flame and gaseous products of combustion are led into the bottom of the heating-furnace through the oblong holes C¹ in the flame-wall O¹. Thence the same pass once around the boiler A and rise through an opening in the first plate b into the space b¹, and thence through the plates and spaces b² b³ and b⁴ b⁵, till they reach the flue B², all as indicated by arrows.

The operation is as follows:

The entrance and charging-cover is screwed off, and the wood-shavings, esparto, or other fibrous material to be treated is put into and retained within the inner perforated or wire-cloth vessel D, with a sufficient charge of caustic soda, or strength of the proper alkaline liquid desired, so as to fill the vessel A to the top with the liquid in the usual proportions.

The cover is then firmly screwed down, and the small vessel E filled with water or alkaline liquid, so as to keep the boiler A D always full of the circulating liquid.

The fire is then lighted in the furnace O and kept burning slowly, the heated products of combustion passing over the flame-bridge O², and round and up the heating-space B, and openings b¹ b² b³ between the outer heating-shell A of the boiler A D and the brick wall, to and out through the chimney or funnel B² into the air.

The products of combustion serve thereby to boil the fibrous materials and alkaline liquors all under the pressure required, and for the time necessary to reduce the materials to the usual and well-known loose fibrous, or pulpy degree or consistency desired; the boiling liquid being in continuous circulation through the fibrous material being treated, as hereinbefore de-

scribed and indicated by the arrows, after which the alkaline liquids are drawn off by the small blow-off pipe G and valve G¹, bolted to the lower part of the discharge-pipe A³.

The lid on the large discharge-duct A⁴ may then be screwed off and the treated fibrous materials withdrawn from the inner perforated vessel D into any other vessel for further treatment. Or otherwise, when desired, both the alkaline liquid and fibrous materials may be withdrawn through the discharge-duct and doors A⁴ A⁵.

A small water-pipe, a¹, with stop-cock, may be connected by a branch or branches to the upper part of the outer shell A of these duplex boilers A D, so as to wash the annular space a between the outer and inner shells A and D occasionally, when desired, after one or more boilings or discharges of the materials.

I am aware that a perforated inner shell for keeping the material from contact with the boiler is not new, and I therefore disclaim it.

Having thus described my invention,

What I claim as new, and desire to secure by Letters Patent, is—

1. The perforated tube d, arranged centrally and longitudinally of the boiler A, and extending from top to bottom, as shown and described, and for the purpose specified.

2. The perforated plates b b² b³, arranged, as shown and described, with reference to the boiler A and furnace-chamber, as shown and described.

3. The arrangement of the vessel B and pipes E¹ and E² with reference to the boiler D and furnace-wall B, as shown and described, for the purpose specified.

The above specification of my invention signed by me this 1st day of August, 1870.

GEORGE SINCLAIR.

Witnesses:

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