

(No Model.)

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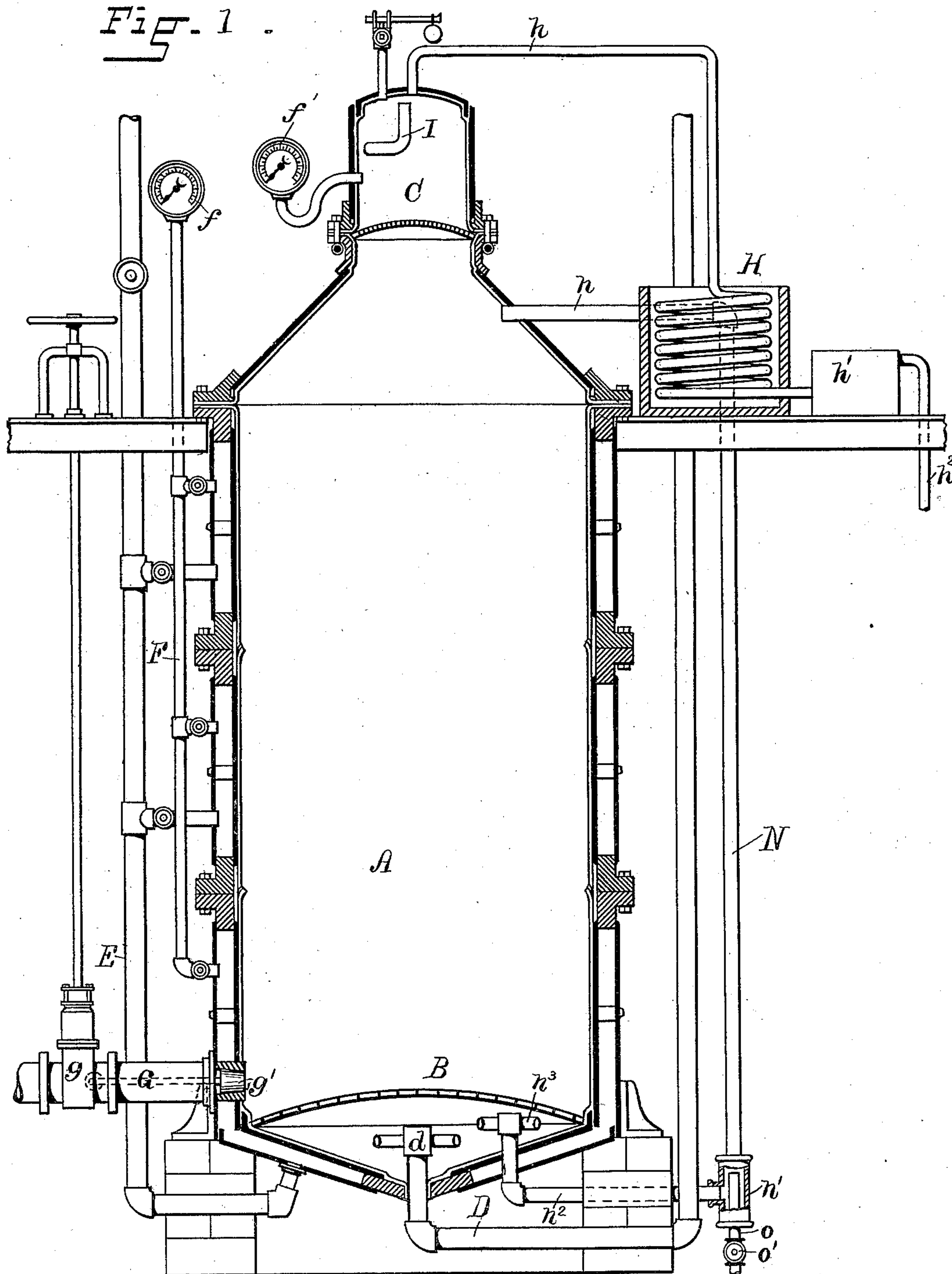
C. S. WHEELWRIGHT & G. E. MARSHALL.

APPARATUS FOR TREATING WOOD FOR PAPER PULP.

No. 307,609.

Patented Nov. 4, 1884.

Fig. 1.



WITNESSES:

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Jos. L. Condon

INVENTOR:

Charles S. Wheelwright
George E. Marshall
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Attys

(No Model.)

2 Sheets—Sheet 2.

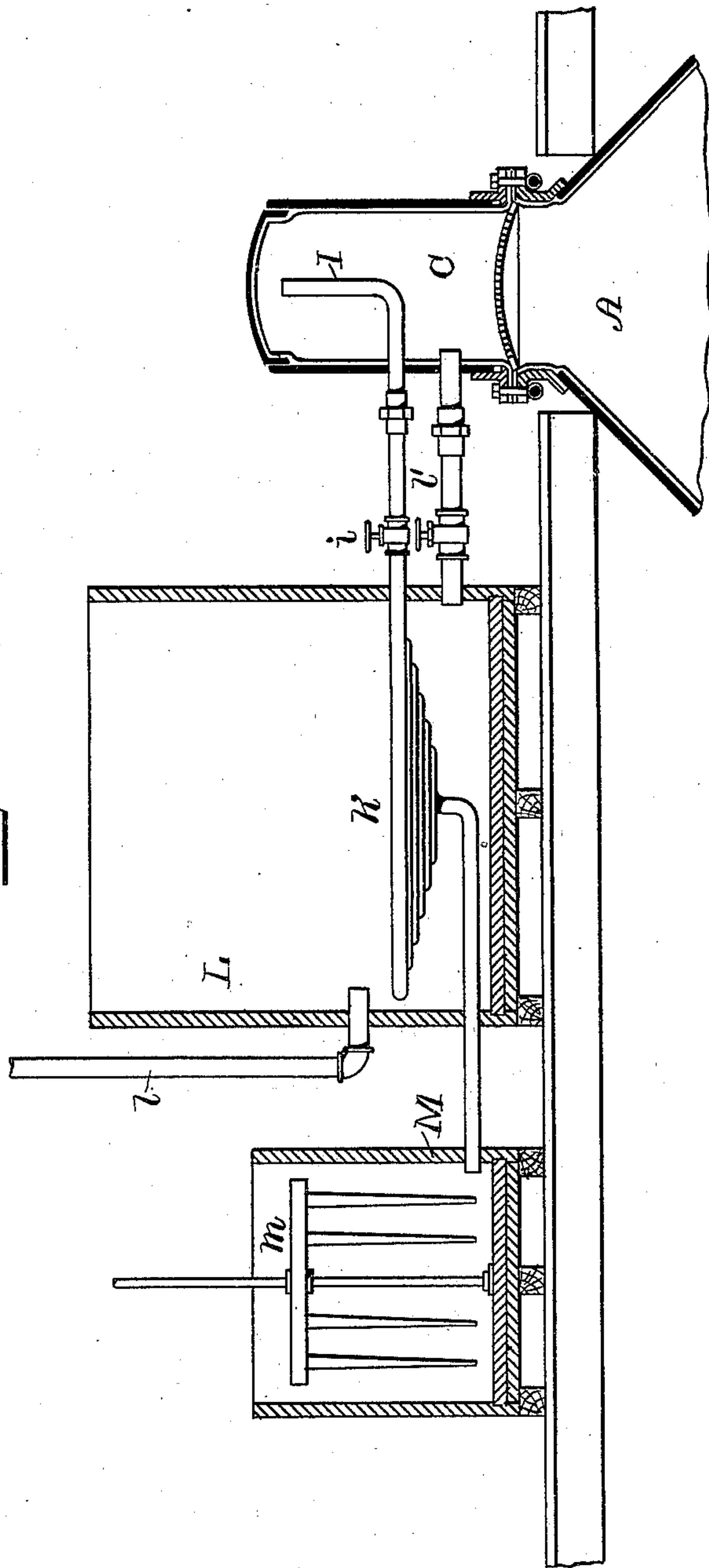
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Fig - 2 -



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C. H. Luther Jr
Geo. L. Condon

INVENTOR:

Charles S. Wheelwright
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UNITED STATES PATENT OFFICE.

CHARLES S. WHEELWRIGHT, OF PROVIDENCE, RHODE ISLAND, AND GEORGE
E. MARSHALL, OF TURNER'S FALLS, MASSACHUSETTS.

APPARATUS FOR TREATING WOOD FOR PAPER-PULP.

SPECIFICATION forming part of Letters Patent No. 307,609, dated November 4, 1884.

Application filed May 10, 1884. (No model.)

To all whom it may concern:

Be it known that we, CHARLES S. WHEEL-
WRIGHT, of Providence, in the county of
Providence and State of Rhode Island, and
5 GEORGE E. MARSHALL, of Turner's Falls, in
the county of Franklin and State of Massa-
chusetts, have invented a new and useful Im-
provement in the Method and Apparatus for
Treating Wood for Paper-Pulp; and we here-
10 by declare that the following is a full, clear,
and exact description of the same, reference
being had to the accompanying drawings,
forming part of this specification.

The object of our invention is to produce
15 fiber from wood suitable for paper-making by
boiling the wood under pressure at a reduced
cost and with more facility than has been done
heretofore. Another object of our invention
is to regain the acids and chemicals used in
20 the boiling process to a large extent, and there-
by reduce the expense; and another object of
our invention is to simplify the work by mak-
ing the process more automatic than was here-
tofore possible and always producing uniform
25 results.

The invention consists in the peculiar and
novel construction of the digester and the im-
proved method by which the gases are with-
drawn from the digester automatically, as will
30 be more fully set forth hereinafter. In the
various processes now in use for disintegrat-
ing the fiber of wood or other substances by
boiling the same under pressure, sulphurous
acid is used to dissolve the resinous, albumi-
35 nous, or other matter by which the fibers are
inclosed and held together. The liquid in
which the fiber is boiled consists of water con-
taining from one to four or more per cent. of
acid—preferably sulphurous—to which mag-
40 nesia or lime is added in varying propor-
tions. In this liquid the fiber is submerged,
and is heated by steam in a jacketed non-cor-
rosive metal-lined boiler, sufficient room be-
ing left in the upper part of the boiler or di-
45 gester to form a steam-space. During the
process of boiling, gases are formed in consid-
erable quantity, which, by the absorption of
oxygen from the steam, the water, and the
fibrous material, form sulphuric acid, which

is liable to injure the wood or other fiber by 50
blackening the same. It has therefore hereto-
fore been necessary to blow off the steam and
gases from time to time. It required consid-
erable time and attention to do this at the
proper time, and the gases so blown off were 55
lost. Another difficulty consisted in the sud-
den expansion of these gases, by which the
pressure in the digester was increased on the
top of the wood or other fiber under treat-
ment and the free circulation of heat through 60
the liquid prevented. To avoid all these dif-
ficulties and prevent the loss of the chemicals,
we connect the steam-space of the digester
with a worm or condenser surrounded with
cold water, and controlled either by a valve, 65
which can be more or less opened, or, as is
shown in the drawings, with any one of the
well-known forms of steam-traps, by which
the condensed liquid is automatically with-
drawn without the diminution of pressure in 70
the digester. When the process of boiling the
fiber is completed, the steam and gases are
blown off, and to utilize the chemicals con-
tained therein we provide a separate condenser
consisting of a worm placed into a large tank 75
of water, and connect this tank with the di-
gester, so that the water heated by the escap-
ing steam and gas can be readily used for
washing the digester. The condensed acid is
conducted to a stirrer, by which the condensed 80
liquid is incorporated with any base required.
In place of thus incorporating the sulphurous
liquid, it may be drawn into any suitable re-
ceptacle for further use.

Figure 1 is a sectional view of the digester, 85
showing the same connected with the steam-
dome. Fig. 2 is a sectional view of the steam-
dome of the digester, showing the blow-off
pipe connected with a separate condenser.

In the drawings, A is the digester or verti- 90
cal jacketed and non-corrosive metal-lined
boiler.

B is a perforated false bottom.

C is the steam-dome.

D is a steam-pipe, by which the interior of 95
the digester is supplied with steam. This pipe
enters the bottom of the digester, the joint
being made by a suitable flange. The end of

the steam-pipe D is provided with a suitable head, by which the steam is distributed laterally and equally in all directions.

E is the steam-pipe, by which steam is supplied to the sections of the steam-jacket surrounding the digester.

F is a pipe connecting the various sections of the steam-jacket with the steam-gage *f*.

f' is the steam or pressure gage connected with the interior of the digester.

G is the discharge-pipe, by which the contents of the digester are blown out. This discharge is controlled by the gate-valve *g*.

To prevent the fiber from entering the pipe G during the process of boiling, the plug-valve *g'* is placed into the discharge-pipe, resting against a suitable seat, so as to close the same and prevent any raw fiber or other substances from entering the blow-off pipe.

H is a worm-condenser consisting of a coil of pipe placed into a tank in which cold water is always kept to condense the vapor or gases.

h is a pipe connecting the condenser with the dome of the digester. A valve may be placed into the pipe *h* to control the flow of the vapor to the condenser.

h' is a trap, which may be of any one of the various forms of steam-traps, by which the condensed liquid is withdrawn without allowing the steam to escape.

I is the blow-off pipe, by which the steam and gases are blown off.

Referring now to Fig. 2, it will be seen that the blow-off pipe I is connected with the coil of pipe K, placed within the tank L, which is supplied with water by the pipe *l* and connected with the digester by the pipe *l'*, so that the water from the tank L can be readily run into the digester. When the steam and sulphurous vapor are to be blown off from the digester, the valve *i* is opened and the steam and vapor pass through the coil K, where they are condensed into liquid, which liquid flows into the receiver M, in which any suitable base, preferably magnesia, is stirred by the stirrer *m*, to facilitate the combination of the sulphurous acid with the base. The water from the tank L will be heated by vapor and gases passing through the coil K, and is used for washing the digester. By this improvement in the process and apparatus the wood or other fiber is subjected to the steam heat in the usual manner, the steam-pressure being gradually raised; but the accumulation of the gas-pressure is avoided, the circulation is more rapid, and all parts of the fiber in the digester are more evenly subjected to the action of the heat and the liquor. The formation of sulphuric acid is also avoided by the condensation of the gas and vapor, and the burning or blackening of the material prevented. All the chemicals not taken up by the resinous and fibrous matter are regained, the time required to boil the fibrous material diminished, and the care, attention, labor, and skill required to operate the boiling materially re-

duced, while the product is more uniform and superior in quality.

In order to subject the wood fiber to a more thorough treatment with the chemicals, we establish a constant circulation of the chemicals from the bottom of the digester out of the same, and then into the same through its top, from whence the chemicals pass downward again through the wood. The chemicals, after leaving the bottom of the digester and before entering its top, are brought into contact and mixed with steam, whereby they are heated and injected into the upper part of the digester. The arrangement whereby this result is accomplished is shown in Fig. 1, in which N designates a pipe which extends vertically outside of and parallel with the digester. At its upper end this pipe has a branch, *n*, which enters the top or steam-space of the digester, while at its lower end the pipe N is provided with a cylindrical chamber, *n'*, from which a branch, *n''*, extends laterally and vertically into the digester through its bottom, and terminates in a T-head, *n'''*, which lies just below the perforated bottom B of the digester.

o designates a steam-pipe, the upper end of which enters the bottom of the chamber *n'*, and which is provided with a valve, *o'*. Now, when the valve *o'* is opened, the steam flowing up through the chamber *n'* will act as an injector, drawing the chemicals out of the bottom of the digester, through the branch *n''*, into the chamber *n'*, and up through the pipe N, where they are heated by the steam, and thence into the top of the digester through the branch *n*, from whence they again descend through the wood.

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

1. The improved process for treating wood and similar fiber suitable for paper-making, the same consisting in boiling the material, under pressure, in a solution containing sulphurous acid in a digester, the upper portion of which is connected with a condenser, by which the gases expelled are condensed, so as to prevent their accumulation or change, as described.

2. The process herein described for regaining the chemicals used in the boiling of wood or other fibers, the same consisting in passing the gases through a condenser or condensers connected with the digester, as described.

3. The combination, with the digester A, of the condenser H, constructed to condense the gases during the process of boiling, as described.

4. The combination, with a digester, of a condenser connected with the steam-space of the digester, and constructed to condense the gases during the process of boiling, as described.

5. The combination, with the digester and the blow-off pipe I, of the tank L and condenser K, constructed to condense the gases

and heat the water, as and for the purpose described.

6. The combination, with the digester A, of the blow-off pipe I, the valve *i*, the coil K, and the tank L, connected with the digester by the pipe *l'*, as described.

7. The combination, with the digester, constructed and arranged substantially as set forth, of the pipe N, having the branch *n*, the chamber *n'*, having the T-headed branch *n*³,

and the valved steam-pipe *o*, substantially as described.

In witness whereof we have hereunto set our hands.

CHAS. S. WHEELWRIGHT.
GEORGE E. MARSHALL.

Witnesses:

J. A. MILLER, Jr.,
M. F. BLIGH.