

No. 830,996.

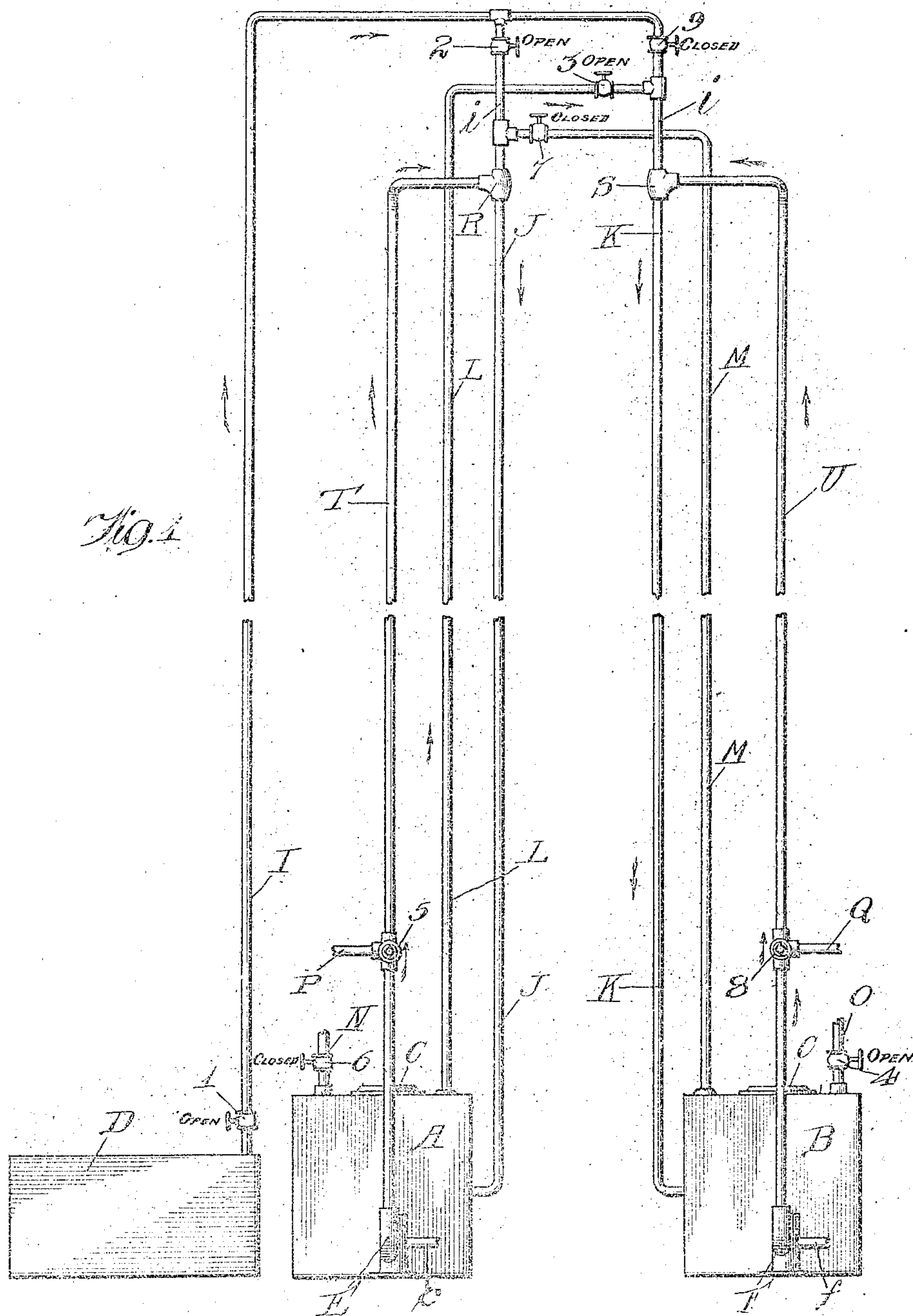
PATENTED SEPT. 11, 1906.

N. HEATH.

PROCESS OF MAKING BISULFITE LIQUOR.

APPLICATION FILED OCT. 19, 1905.

2 SHEETS—SHEET 1.



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2 SHEETS—SHEET 2.

Fig. 2.

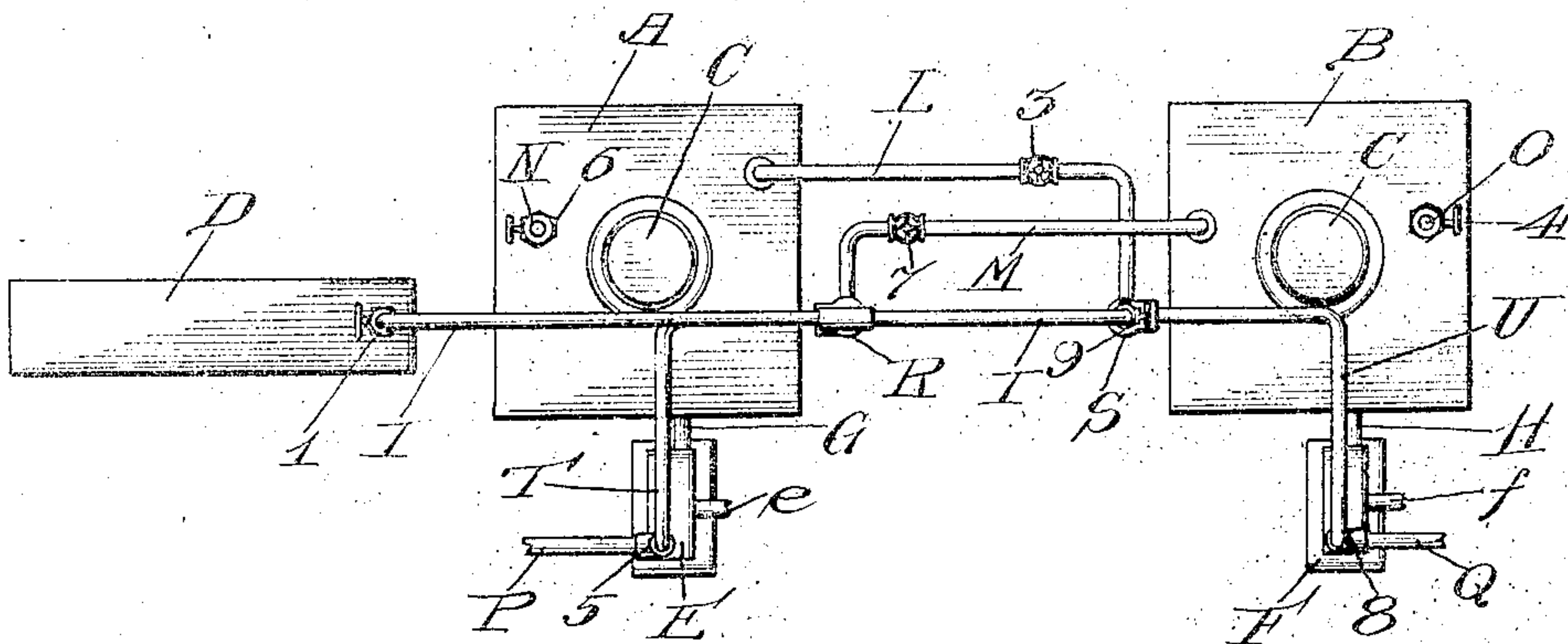


Fig. 3.

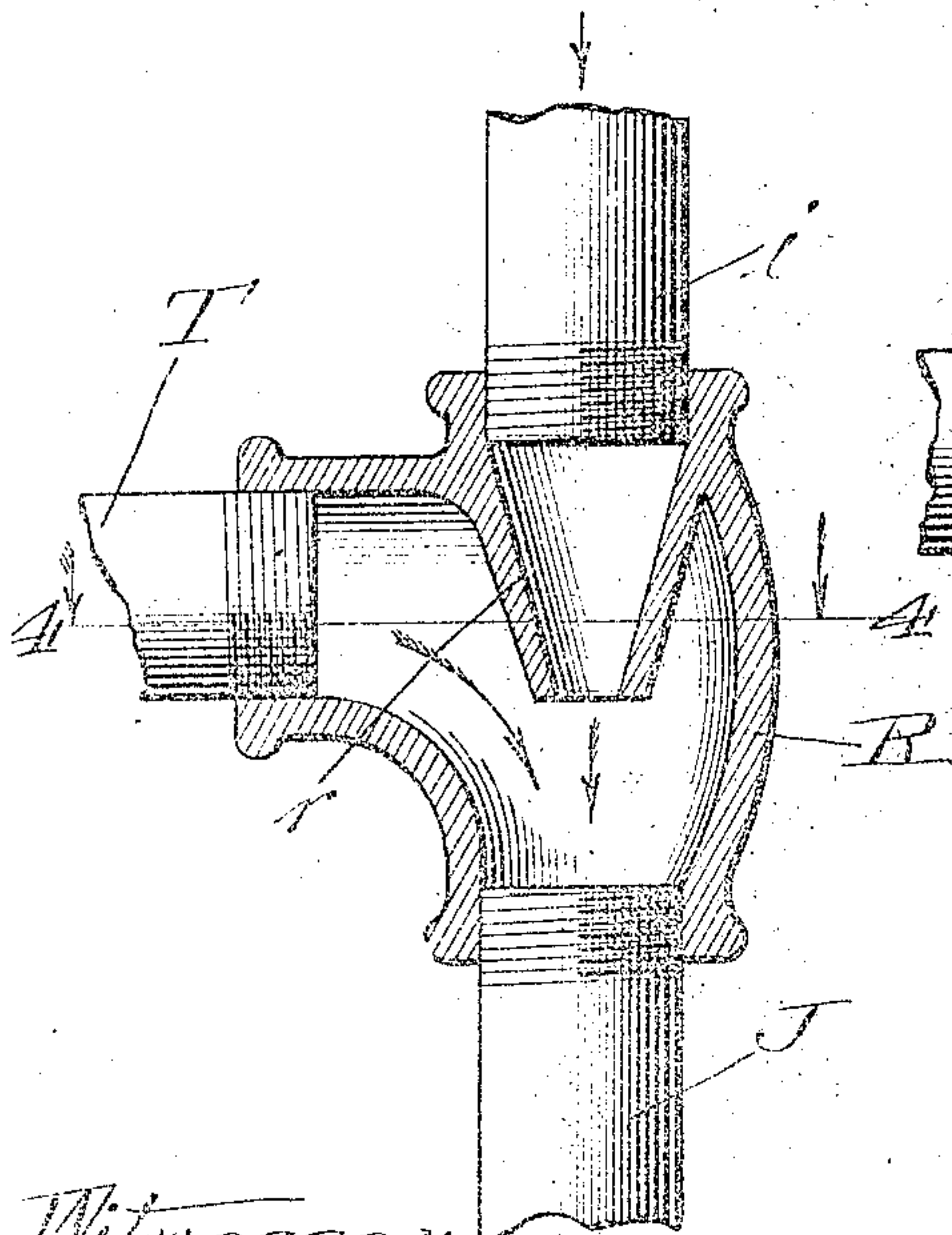
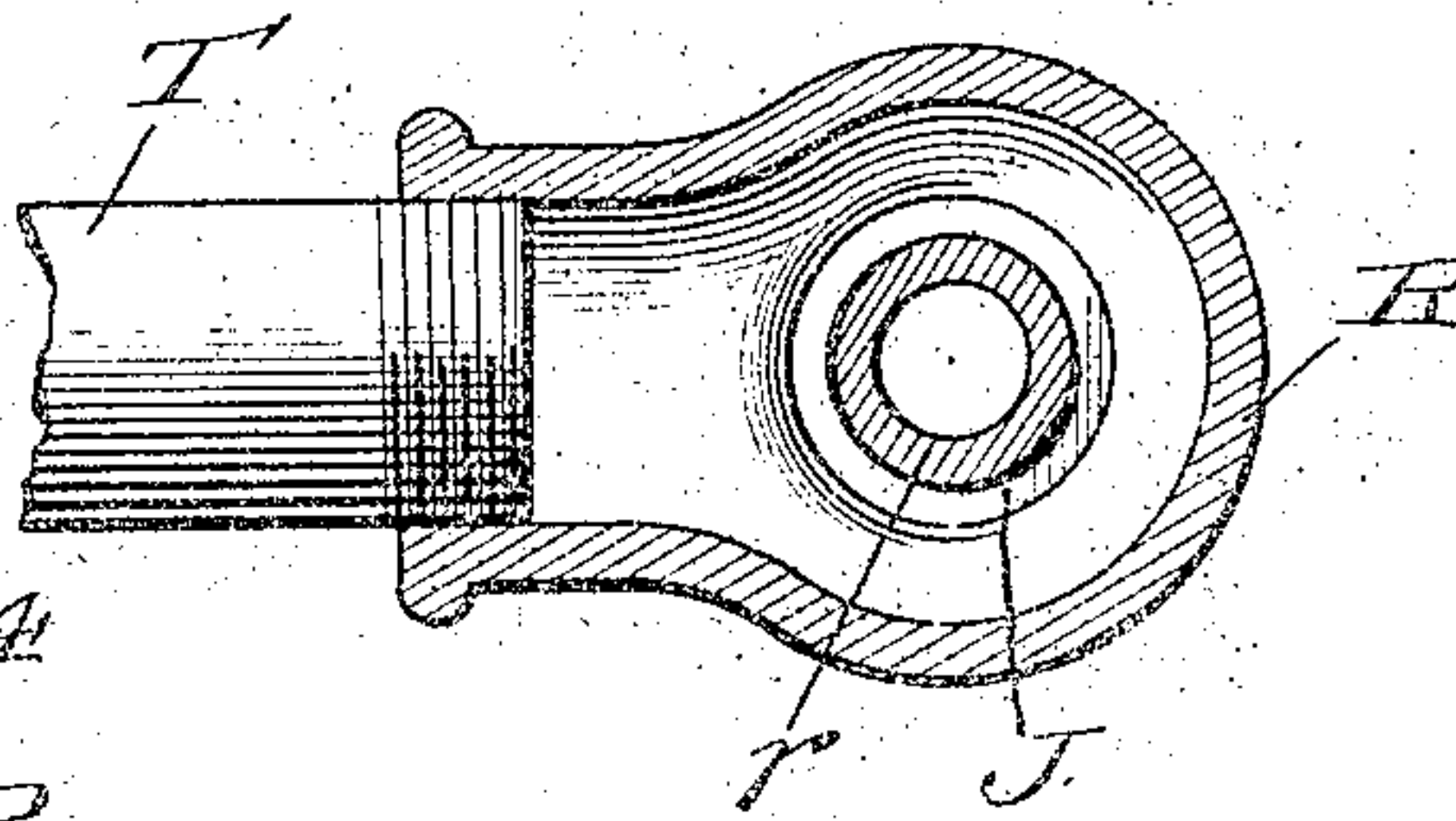


Fig. 4.



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# UNITED STATES PATENT OFFICE.

NOBLE HEATH, OF ANTIOCH, CALIFORNIA, ASSIGNOR OF ONE-FOURTH TO WALTER S. WRIGHT AND ONE-FOURTH TO JAMES W. STEWART, OF CHICAGO, ILLINOIS, AND ONE-FOURTH TO JOHN H. WINSLOW, OF GLENCOE, ILLINOIS.

## PROCESS OF MAKING BISULFITE LIQUOR.

No. 830,996.

Specification of Letters Patent.

Patented Sept. 11, 1906.

Application filed October 19, 1905. Serial No. 283,486.

*To all whom it may concern:*

Be it known that I, NOBLE HEATH, a citizen of the United States, residing at Antioch, in the county of Contra Costa and State of California, have invented certain new and useful Improvements in Processes of Making Bisulfite Liquor, of which the following is a specification.

My invention relates to improvements in processes for the manufacture of wood-pulp.

The object of my invention is to provide an improved and efficient process for preparing bisulfite liquor for digesting wood-pulp for the manufacture of paper, which process may be operated continuously, rapidly, and economically to produce a high-grade product, and which shall more completely utilize the sulfur-fumes or like element, and which shall be compact and economical of installation and operation. These and such other objects as may hereinafter appear are attained by my invention, a convenient embodiment of which is shown in the accompanying drawings, in which—

Figure 1 shows an elevation of a complete plant. Fig. 2 is a plan view, and Figs. 3 and 4 are enlarged details.

Like characters of reference indicate the same parts in the several figures of the drawings.

Referring by characters to the accompanying drawings, A and B indicate tanks which are filled, preferably, about two-thirds full of lime-water or lime-water and magnesia or like mixture through supply-openings which are tightly closed by the covers C.

D is a furnace, such as a sulfur-furnace, where sulfur is burned either separately or in combination with other chemicals, as may be desired.

E and F are cylindrical pumps operated from shafts *ef*, respectively, said pumps connecting with the tanks A and B through pipes G and H, Fig. 2.

I is a fumes-pipe for conducting fumes from the furnace D and connecting with mixing-pipes J and K, said mixing-pipes leading into the tanks A and B below the fluid-level therein.

L is an exhaust-fumes pipe rising from the tank A and connecting with the mixing-pipe

K, while M is a like exhaust-fumes pipe leading from the tank B to the mixing-pipe J.

N and O are vents from the tanks A and B, respectively, while P and Q are discharge-pipes from the tanks A and B, respectively.

1, 2, 3, 4, 5, 6, 7, 8, and 9 are control-valves, 5 and 8 being preferably three-way valves.

R is a union between the fluid-pipe T, which leads from the pump E to the mixing-pipe J, and S is a like union between the corresponding pipe U and the mixing-pipe K. These unions are locked at a considerable height above the fluid-level in the tanks A and B to create an induced or forced draft through the fumes-pipe I in a manner hereinafter explained and may be conveniently constructed as shown in Fig. 3, the branch fumes-pipes *i* and *i'* leading into a nozzle, such as *r*, in the interior of the unions R and S, so that the falling column of water in the mixing-pipes J and K will induce a forced draft of fumes through the fumes-pipe I and branch fumes-pipe *i* or *i'*, as the case may be, into the mixing-pipes J and K, respectively.

With the apparatus set as shown in Fig. 1, in which valves 1, 2, 3, and 4 are shown as open, 5 and 8 are shown as closed against the outlets P and Q, and 6, 7, and 9 are shown as closed, the operation is as follows: The pumps E and F being in operation and sulfur being burned in the furnace D, the pump E will elevate the fluid mixed in the tank A to the union R, whence the fluid will fall through the mixing-pipe J a considerable distance, preferably from twenty to twenty-five feet, thereby not only allowing, but causing, the fluid to be broken into fine particles and to create a strong exhaust from the fumes-pipe I and branch fumes-pipe *i*, so serving the double purpose of drawing the sulfur-fumes into the mixing-pipe J and of mixing such fumes with the finely-divided fluid, thereby exposing a maximum fluid surface to the sulfur-fumes, and so facilitating in the best manner the absorption by the fluid of the elements contained in the sulfur-fumes, and thus transforming the lime-water or lime-water and magnesia into a bisulfite of lime or of lime and magnesia. While the continued operation of the pump E causes the contents



of the tank A to continuously pass the circuit of the fluid-pipe T and the mixing-pipe J and to be continuously intermingled in the mixing-pipe J with the sulfurous fumes until the fluid mixture in the tank A has attained the desired strength, the unabsorbed fumes which escape from the fluid after it returns to the tank A are free to rise through the exhaust-fumes pipe L. Meanwhile the pump F, being in continuous operation elevates, the contents of the tank B through the fluid-pipe U and union S into the mixing-pipe K, thereby inducing an active flow of the exhaust-fumes through the exhaust-fumes pipe L and union S into the mixing-pipe K, where the unabsorbed elements of said fumes are further absorbed by the fluid from the tank B, and as such mixture of fumes and fluid returns to the tank B through the mixing-pipe K any remaining fumes which have not been absorbed are free to escape through the vent O. When the contents of the tank A have attained the desired strength, which of course will be long before the contents of the secondary tank B have reached that same strength, the valves 2 and 3 will be closed, the valves 6 and 9 will be opened, and valve 5 will be set so as to close communication between the fluid-pipe T and the union R and to open communication between the fluid-pipe T and the outlet P, whereupon as the pump E continues to operate the contents of the tank A will be discharged to any suitable vat, digester, or other receiving device, and meanwhile, the pump F continuing in operation, the contents of the tank B will be circulated through the fluid-pipes U and K and the exhaust-fumes will continue to discharge through the vent O. As soon as the tank A has been emptied the valve 5 is set to close the outlet P and to reconnect the fluid-pipe T with the union R, the tank A is recharged with fresh solution, the valve 7 is opened, and the valve 4 closed, whereupon the tank B becomes the primary tank, the exhaust-fumes from the tank B are conducted through the exhaust-fumes pipe M and branch fumes-pipe i to the union R and finally escape through the vent N, and in due time by a like manipulation of the valves as before the contents of the tank B are pumped out, the tank A running independently meanwhile.

It will thus be seen that with my apparatus the fumes are passed successively through solutions varying as to the quantity of fumes previously absorbed, so that the sulfur-fumes are utilized in the best manner, two tanks of material may be simultaneously treated, while, without stopping the mechanism, the treatment will continue with one tank while the same machinery serves to empty the other tank, and by my arrangement of the unions R and S so as to utilize the action of the long falling columns of water I produce an induced current of fumes not dependent

at all upon the speed with which the pumps cause the fluid to pass through the circulating-pipes and I insure an expansion and breaking up of the water column which facilitates the intimate intermixture of the water with the fumes, and since the water absorbs fumes only on its surface I insure the exposure of a large water surface to the intermingled fumes, thus producing a better product more rapidly, and thereby more economically utilizing the sulfur or like chemicals. So, also, where for any reason it is not desirable to run both pumps or where either pump gets out of order or needs repairs either pump and tank may be run independently, and while not as efficiently utilizing the full strength of the sulfur-fumes either tank when run independently will insure the rapid and economical production of a uniform quality of product. It will be further noted that while the embodiment of my invention shown in the drawings is what I consider a preferred construction the basic idea of causing the fluid to fall a relatively great distance into the tanks, whereby the forced draft of the fumes, the breaking up of the water into small particles and consequent intimate intermingling of the fumes and the fluid solution, and the ideas of further utilizing the exhaust-fumes and of using the circulating-pumps as a means to discharge the contents of the tank from the mixing system may be utilized by various other obvious arrangements and connections of the various pipes with each other within the broad process covered by the claims.

While I claim the apparatus here shown as my invention, the claims thereon have been divided out of the present application and will form the subject-matter of a separate application by me.

I claim—

1. The process of manufacturing bisulfite, which comprises supplying sulfurous fumes to a conduit and causing a column of a fluid solution to fall through said conduit from such a height as to induce a flow of said fumes into said conduit and the intermingling of said fumes and said fluid solution.

2. The process described which comprises supplying sulfurous fumes to the upper portion of a conduit, and causing a column containing lime in solution to fall through said conduit from such a height as to produce the attenuation and division of said fluid column and an induced flow of said fumes into said conduit, whereby said fumes and said attenuated fluid column are intimately intermingled.

3. The process of manufacturing bisulfite, which comprises providing a supply of sulfurous fumes, inclosing a column of a fluid solution, causing the fluid of said column to fall from such a height as to cause an induced flow of said sulfurous fumes toward said col-



umn, and the intermingling of said fumes and said fluid solution.

4. The process of manufacturing bisulfite which comprises providing a supply of sulfurous fumes, providing a falling fluid column of a solution of lime, causing the fluid of said column to fall from such a height as to produce the attenuation and division of said fluid column and so as to induce said fumes to flow toward said column and to intimately intermingle with said attenuated and divided fluid column.

5. The process of manufacturing bisulfite which comprises continuously generating a body of sulfurous fumes, providing a falling

column of a fluid solution, inclosing said column of fluid solution, inclosing said body of fumes and directing the flow thereof into said column of fluid solution, and causing the fluid of said falling column to continuously flow from such a height as to cause the fluid of said column to be broken up and finely divided and to cause said body of sulfurous fumes to continuously flow toward and intimately intermingle with said falling and finely-divided column of fluid solution.

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