

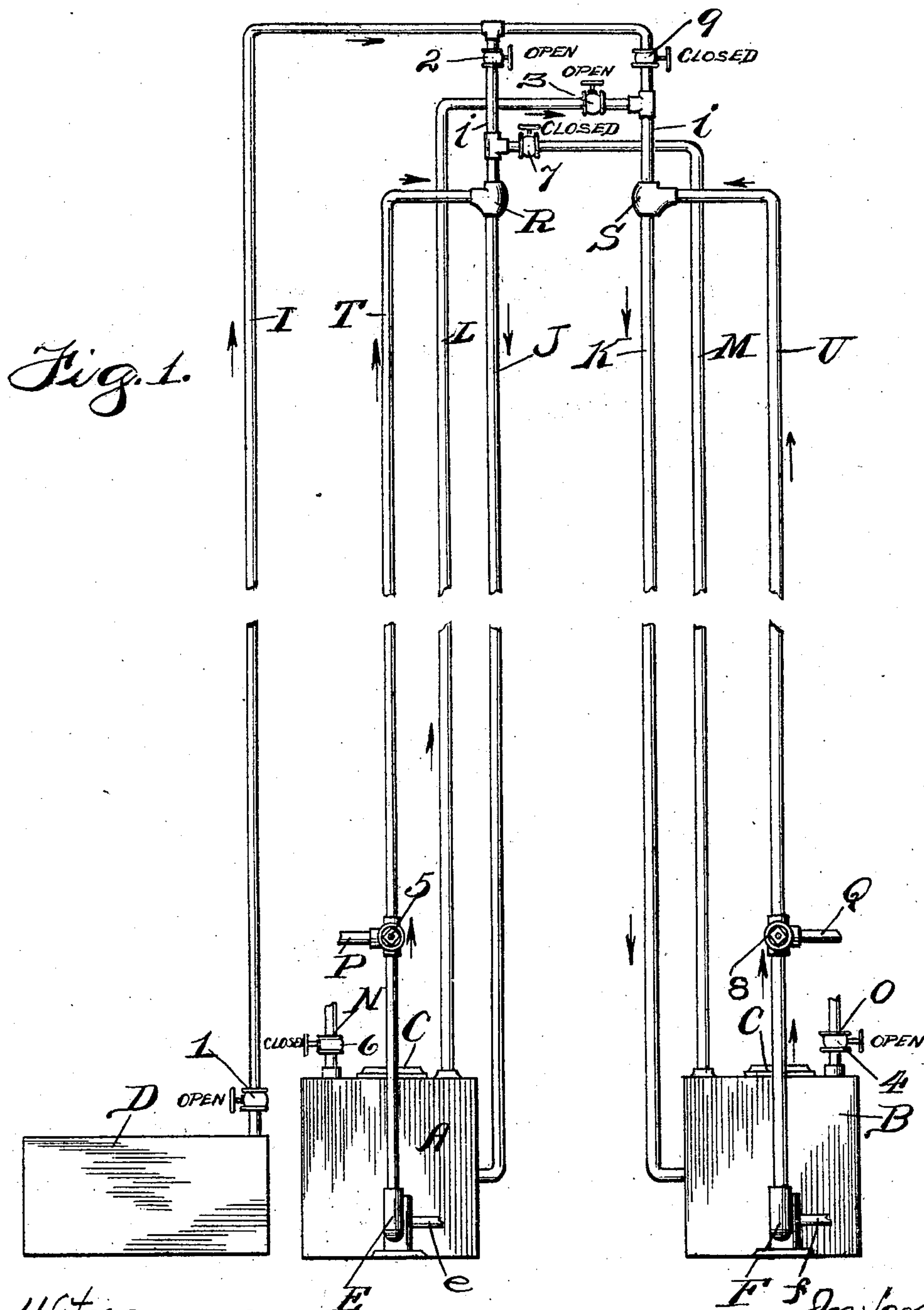
No. 856,195.

PATENTED JUNE 4, 1907.

N. HEATH.
APPARATUS FOR MAKING BISULFITE LIQUOR.

APPLICATION FILED JULY 2, 1906.

2 SHEETS—SHEET 1.



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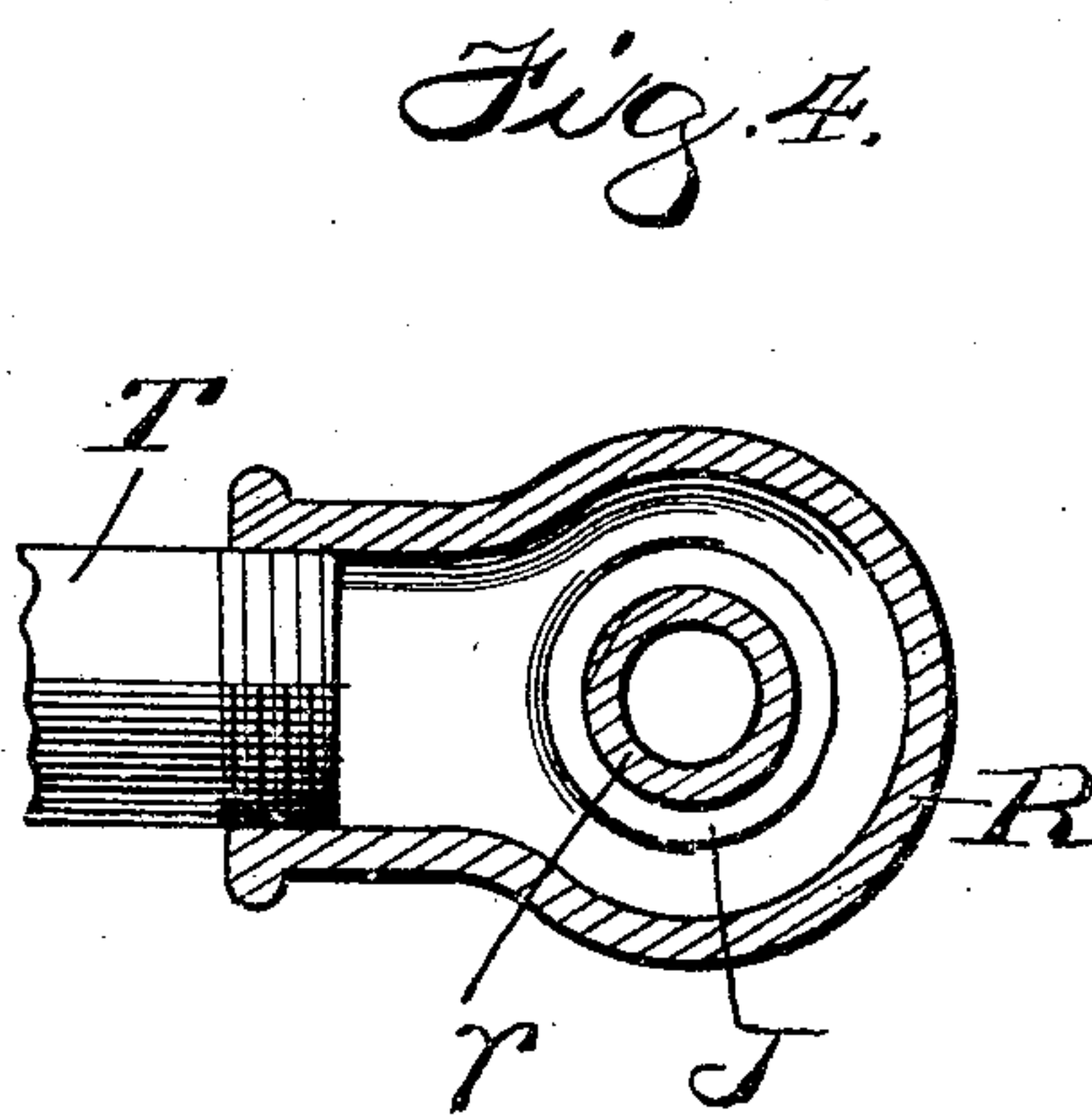
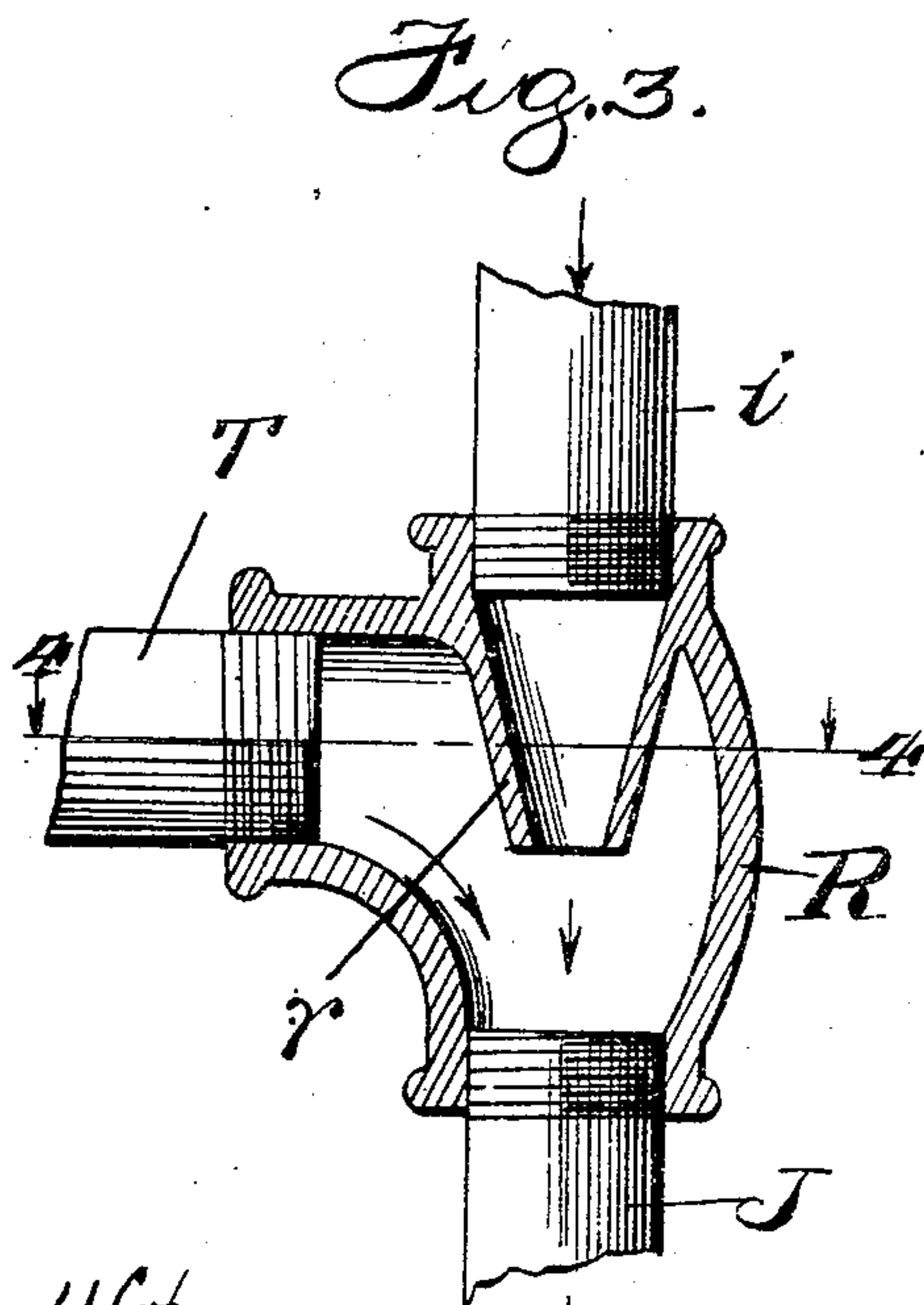
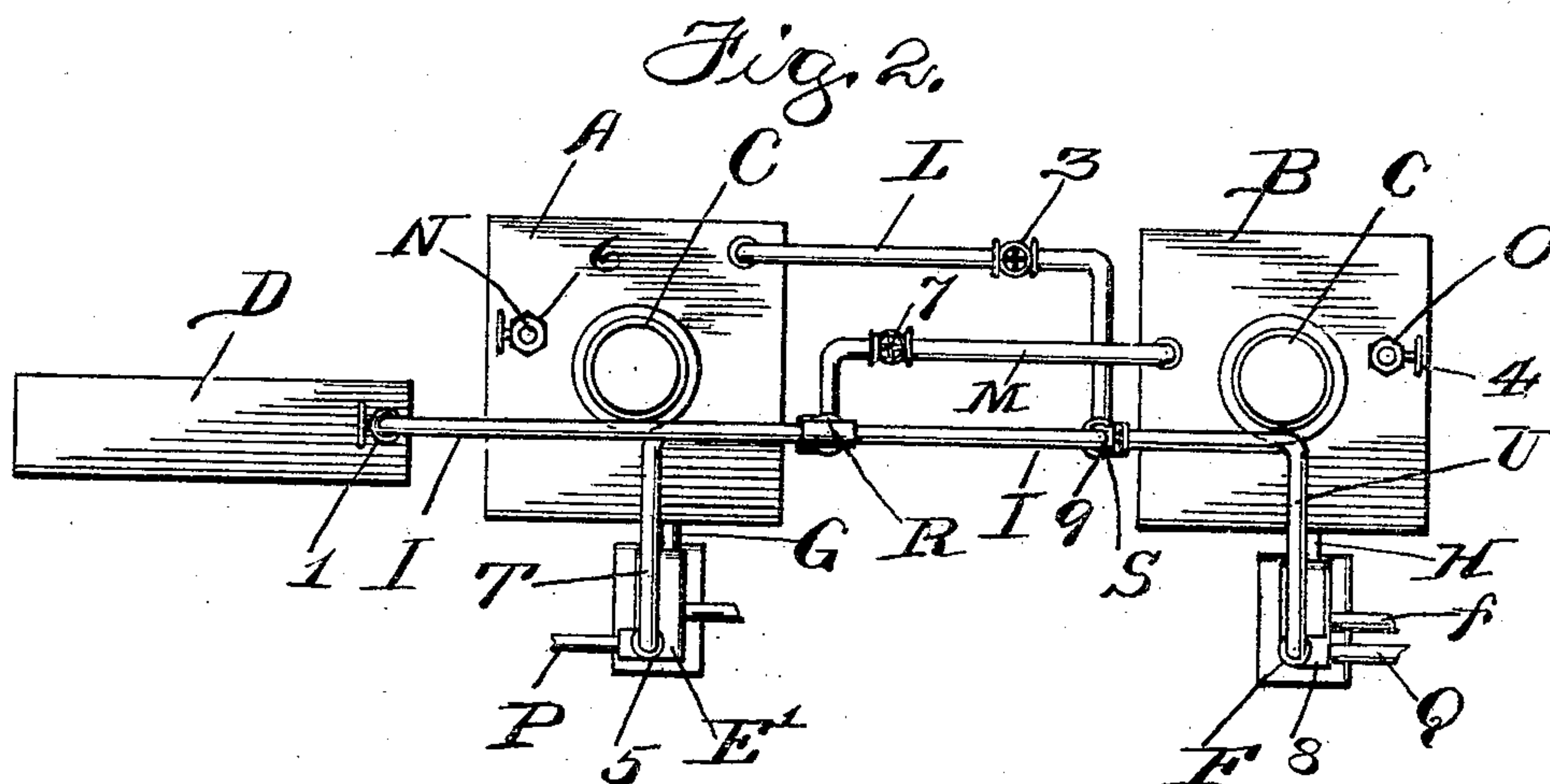
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UNITED STATES PATENT OFFICE.

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.

APPARATUS FOR MAKING BISULFITE LIQUOR.

No. 856,195.

Specification of Letters Patent.

Patented June 4, 1907.

Original application filed October 19, 1905, Serial No. 283,486, Patent No. 830,996. Divided and this application filed July 2, 1906. Serial No. 324,396.

To all whom it may concern:

Be it known that I, NOBLE HEATH, of Antioch, California, have invented certain Improvements in an Apparatus for the Manufacture of Bisulfite Liquor, of which the following is a specification.

This is a division of my application No. 283,486, filed October 19th, 1905.

My invention relates to improvements in apparatus for the production of bisulfite liquor.

The object of my invention is to provide such an apparatus for preparing bisulfite liquor, especially for use in digesting wood pulp for the manufacture of paper, which apparatus may be operated continuously, rapidly and economically to produce a high grade product, and which shall operate to more completely utilize and absorb the sulfur fumes or like element, and which shall be compact and economical of installation and operation.

These and such other objects as may hereafter 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 letters of reference indicate the same parts in the several figures of the drawings.

Referring by letter 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 *e*, *f*, respectively, said pumps connecting with the tanks A and B through pipes G and H (Fig. 2).

I is a fume 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 located at a considerable height above the fluid level in the tanks A and B to create an induced or forced draft of the fumes through the pipe I in a manner hereafter 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 repair, 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.

I claim:

1. The combination with a tank provided with a vent at the top thereof to carry off fumes, of a sulfur furnace, a mixing pipe leading into said tank, means for conducting fumes from said furnace to said mixing pipe, a pump arranged to draw fluid from said tank, a riser leading from said pump to said mixing pipe, a discharge pipe communicating with said riser, and control valves for said discharge pipe and said vent.

2. The combination with a sulfur furnace, of two tanks each provided with a vent; mixing pipes leading into said tanks, respectively; a pump connected with each of said tanks; risers or fluid pipes leading from said pumps, respectively, to said mixing pipes; discharge pipes connected with said fluid pipes, respectively; a fumes pipe leading from said furnace; branch fumes pipes leading from said fumes pipe to said mixing pipes, respectively; exhaust fumes pipes connecting each tank with the mixing pipe of the opposite tank; and control valves for said branch fumes pipes, exhaust fumes pipes, discharge pipes and vents.

3. The combination with a fumes generat-

ing furnace, of two tanks, a mixing pipe rising from each of said tanks, respectively, means for conducting fumes from said furnace to said mixing pipes, means for controlling the flow of fumes from said furnace into said mixing pipes, means for conducting exhaust fumes from each tank to the mixing pipe of the other tank, means for controlling the flow of such exhaust fumes, means for conducting a fluid from said tanks into said mixing pipes, valve controlled means connected therewith for conducting the contents of said tanks to a suitable receptacle, and valve controlled vents connected with said tanks.

4. An apparatus of the class described comprising means for generating fumes, and a fumes and fluid circulating system comprising two tanks, a mixing pipe leading into each tank, valve controlled means for conducting fumes from said generator to said mixing pipes, means for conducting a fluid from said tanks to said mixing pipes, valve controlled fumes vents opening from said system, and valve controlled means for conducting the fluid contents of said tanks out of said system.

5. The combination with a fumes generating device, of a fluid tank, a circulatory system connected with the tank and comprising a pump and a mixing pipe, a conduit from the fumes generating device to the mixing pipe whereby the fumes are drawn into the mixing pipe by means of the circulation created by the pump, a valve to cut off the fumes from the circulatory system, and a discharge pipe leading from the circulatory system, whereby the tank may be emptied through the operation of the same pump used to promote the circulation of the fluid during the process of saturating the same with the fumes.

6. The combination with a fumes generating device, of a tank, a circulatory system connected with the tank and comprising a pump and a mixing pipe, a conduit from the fumes generating device to the mixing pipe, whereby the fumes are drawn into the mixing pipe by means of the circulation created by the pump, a second fluid circulatory system, and a fumes exhaust pipe leading from the tank to the second fluid circulatory system, whereby the exhaust fumes from the

first circulatory system are drawn into the second circulatory system.

7. The combination with a fumes generating device, of a fluid tank, a circulatory system connected therewith and comprising a pump and a mixing pipe, a conduit leading from the fumes generating device to the mixing pipe, a second circulatory system comprising a pump, a valve-controlled discharge pipe leading from the first circulatory system and a valve to shut off the fumes from the mixing pipe, whereby the fluid in the first circulatory system may first be saturated with the fumes while the exhaust fumes are conducted to the second system and then pumped out of the tank by the continuous operation of the same pump.

8. The combination of a fumes generating device, with two fluid tanks, a circulatory system connected with each of said tanks and comprising a pump and a mixing pipe, conduits from the fumes generating device to each of the mixing pipes, an exhaust fumes pipe leading from each of said tanks to the mixing pipe of the other system, and valves for shutting off the fumes conduits from the mixing tubes, whereby each of said circulatory systems may be supplied with fumes in alternation directly from the fumes generator and then indirectly through the exhaust fumes pipe of the other circulatory system.

9. The combination of a fumes generating device, with two fluid tanks, a circulatory system connected with each of said tanks and comprising a pump and a mixing pipe, conduits from the fumes generating device to each of the mixing pipes, an exhaust fumes pipe leading from each of said tanks to the mixing pipe of the other system, valves for shutting off the fumes conduits from the mixing tubes, and valve controlled discharge pipes leading from each of the circulatory systems, whereby in alternation the fluid in each circulatory system may receive fumes from the exhaust of the other system, then direct from the fumes generator and then be pumped out from the tank by a continuous operation of said pumps.

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Witnesses:

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