

No. 658,724.

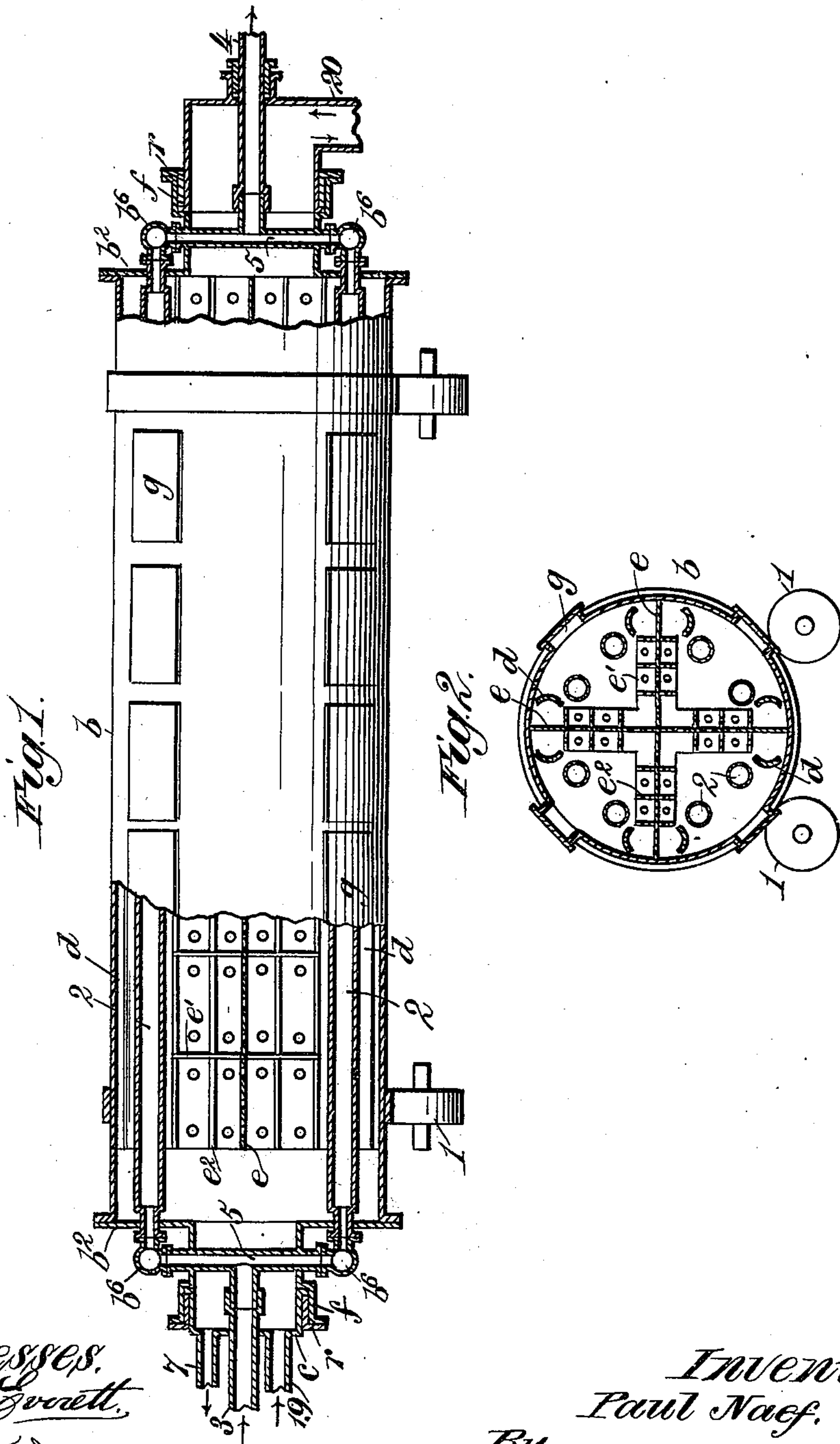
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P. NAEF.

APPARATUS FOR TREATING LIQUIDS WITH GASES.

(Application filed Mar. 28, 1900.)

(No Model.)



Witnesses.
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UNITED STATES PATENT OFFICE.

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APPARATUS FOR TREATING LIQUIDS WITH GASES.

SPECIFICATION forming part of Letters Patent No. 658,724, dated September 25, 1900.

Application filed March 28, 1900. Serial No. 10,507. (No model.)

To all whom it may concern:

Be it known that I, PAUL NAEF, a citizen of the Republic of Switzerland, residing at New York city, in the county of New York and State of New York, have invented new and useful Improvements in Apparatus for Treating Liquids with Gases, of which the following is a specification.

This invention relates to apparatus for treating liquids with gases for various purposes—such, for instance, as described in my application, Serial No. 3,998, filed February 5, 1900—though the said apparatus is adapted also to many other purposes which require treatment of various materials with gases.

The invention consists in features of construction and combinations of parts in a cylinder for treating liquids and other materials with gases, as hereinafter set forth.

Referring to the drawings, Figure 1 is a longitudinal section of the apparatus. Fig. 2 is a cross-section of the same.

In the drawings the reference-letter *b* designates the shell or casing of the cylinder, which is preferably supported on rollers 1 1, so that the said cylinder may revolve thereon when actuated by any suitable means.

The numeral 2 designates the cooling-pipes, which may be extended through said cylinder.

$b^2 b^2$ are the end plates of the cylinder. The pipes 2 pass through the end plates b^2 , and the ends of said pipes communicate outside said end plates, respectively, with annular pipes $b^6 b^6$. At one end of the cylinder there is an inlet 3 for cooling fluid, and at the other end of said cylinder there is an outlet 4 for the cooling fluid. The inlet-pipe 3 and the outlet-pipe 4 communicate, respectively, through pipes or passages 5, which connect with the annular pipes $b^6 b^6$. The pipes 3 and 4 are supported in stationary end plates or covers *c*, so as to remain fixed while the cylinder *b* is revolved. These covers or end plates *c* fit within annular flanges *f* on the cylinder ends. A suitable packing may be placed between the flanges *f* and the rims of the end plates or covers *c*, and this packing is held in place by rings *r* or otherwise.

The liquor to be treated enters the cylinder through a pipe 19 at one end and leaves through a pipe 20 at the other end. The gas

enters the cylinder through this pipe 20 and leaves through a pipe 7 at the other end of the cylinder. This arrangement is of special advantage if the liquor passes through several cylinders successively, as the pipe 20 thus serves both for conveying the liquor from the upper to the lower cylinder and for conveying the gas from the lower to the upper cylinder. In the interior of the cylinder there is a space at the charging end, while radial partitions *e e* are arranged to extend through the rest of the cylinder. These radial partitions *e e* meet on the axis of the cylinder and are provided with longitudinally-extended ribs *e' e'*. The partitions *e* and their ribs *e'* may be cast together and are both perforated. These partitions may be made either of wood or any other suitable material, such as wire-gauze. The ribs *e'* act as distributors of the liquor and prevent the same from running off the partitions *e* too quickly. It is often of advantage to employ corrugated wire-gauze for the partitions *e*, said corrugations being so formed as to effect a result similar to that effected by the ribs *e'*. To still further prevent the liquor from running through the partitions *e* too quickly, there may be provided cross-ribs e^2 on said partitions, and these cross-ribs may be perforated. The ribs *e'* and e^2 are only shown in part of the cylinder. They may be omitted near the discharge end. It is usually of advantage to run the radial partitions *e* up to the discharge end of the cylinder, as they assist in discharging the solid material. For the purpose of raising the liquid during the revolution of the cylinder and showering it upon the partitions and any solid material thereon there are provided lifters *d*, which are suitably spaced apart and may be attached either to the cylinder or to the partitions therein. These lifters may be perforated, as shown.

It will be observed that by revolving the cylinder its contents will be thoroughly agitated by reason of the partitions arranged therein and by the showering of the liquor upon said partitions from the perforated lifters *d*. The passage of the liquor and of the gas through the cylinder in reverse directions secures an intimate contact of the liquor and gas, so that the treatment of the liquor with

said gas for the purposes required will be thorough and complete. The fluid that is passed through the pipes 2 in the cylinder *b* may obviously be either heated or cooled, according to the purposes to which the apparatus is applied, and also the gas that is introduced into the cylinder to come into contact with the liquor flowing through the apparatus may have been previously heated or cooled, according to the required treatment of said liquor. It will be understood that several of these cylinders may be connected in series and be so arranged and connected that the liquor and the gas may flow continuously through a succession of cylinders and in reverse directions.

Each cylinder may be provided at suitable points with doors or manholes *g* to facilitate cleaning the apparatus.

In some cases it is found of advantage to operate the apparatus intermittently, the liquor being treated in the apparatus until the reaction is completed and afterward being run off through suitable openings, which may, for instance, be arranged in the periphery. In a similar way the apparatus can with advantage be used for the lixiviation of ores, and a suitable gas is with advantage passed through the apparatus during the operation. If the apparatus is fitted with a continuous ore-feed, the lixiviation is effected in a continuous manner.

Having described my invention, what I claim is—

1. The herein-described revolving cylinder provided at its opposite ends with inlets and outlets for liquor and gas to flow through said cylinder in opposite directions and in contact with each other, in combination with perforated partitions arranged longitudinally in said cylinder and provided with ribs.

2. The herein-described revolving cylinder having a series of pipes extended through the same, inlet and outlet pipes communicating with the said pipes which are extended through the cylinder, inlets and outlets at opposite ends of said cylinder for the passage of liquor and gas through the cylinder in opposite directions, and partitions arranged longitudinally in said cylinder and provided with longitudinal ribs *e* and cross-ribs *e*².

3. The herein-described revolving cylinder having end plates *b*², pipes 2 extended through said cylinder and its end plates, an inlet-pipe 3 communicating with said pipes 2 at one end of the cylinder, an outlet-pipe 4 communicating with said pipes 2 at the other end of said cylinder, a liquor-inlet pipe 19 and a gas-exit pipe 7 communicating with one end of said cylinder, and a pipe 20 communicating with

the other end of said cylinder for the outlet of liquor and inlet of gas.

4. The herein-described revolving cylinder provided at its opposite ends with inlets and outlets for liquor and gas to flow through said cylinder in opposite directions and in contact with each other, in combination with perforated partitions arranged longitudinally in said cylinder and provided with ribs, and devices for lifting the liquor and showering it upon said partitions as the cylinder revolves.

5. The herein-described revolving cylinder provided at its opposite ends with inlets and outlets for liquor and gas to flow through said cylinder in opposite directions and in contact with each other, said cylinder being divided into sections provided with manholes, in combination with perforated partitions arranged longitudinally and vertically in said cylinder and provided with ribs, and lifters for raising the liquid and showering it upon the partitions.

6. The combination with a revolving cylinder provided with means for passing liquor and gas therethrough in opposite directions and in contact with each other, of perforated partitions arranged longitudinally in said cylinder and provided with series of perforated ribs, and perforated lifting devices extended longitudinally in said cylinder near its periphery to discharge liquor onto the said partitions during the whole revolution of the cylinder.

7. The combination with a rotating apparatus, and means for passing liquor and gas therethrough, of perforated partitions located in said apparatus, and numerous perforated ribs carried by said partitions and extended in parallel rows longitudinally and transversely and at right angles to each other.

8. The combination with a rotating apparatus for treating liquor, of longitudinally-arranged perforated partitions located in said apparatus, and perforated lifting devices carried by said partitions to discharge liquor during the whole revolution onto said partitions as the cylinder revolves.

9. The combination of a revolving cylinder, pipes extending therethrough, annular pipes at each end in communication with the pipes that are extended through said cylinder, and a centrally-located pipe in communication with each of said annular pipes.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

PAUL NAEF.

Witnesses:

C. E. LANGDON,
GERRIT SMITH.