

3 Sheets—Sheet 1.

APPARATUS FOR TREATING LIQUIDS WITH GASES.

Patented June 22, 1886.

Fig. 1.

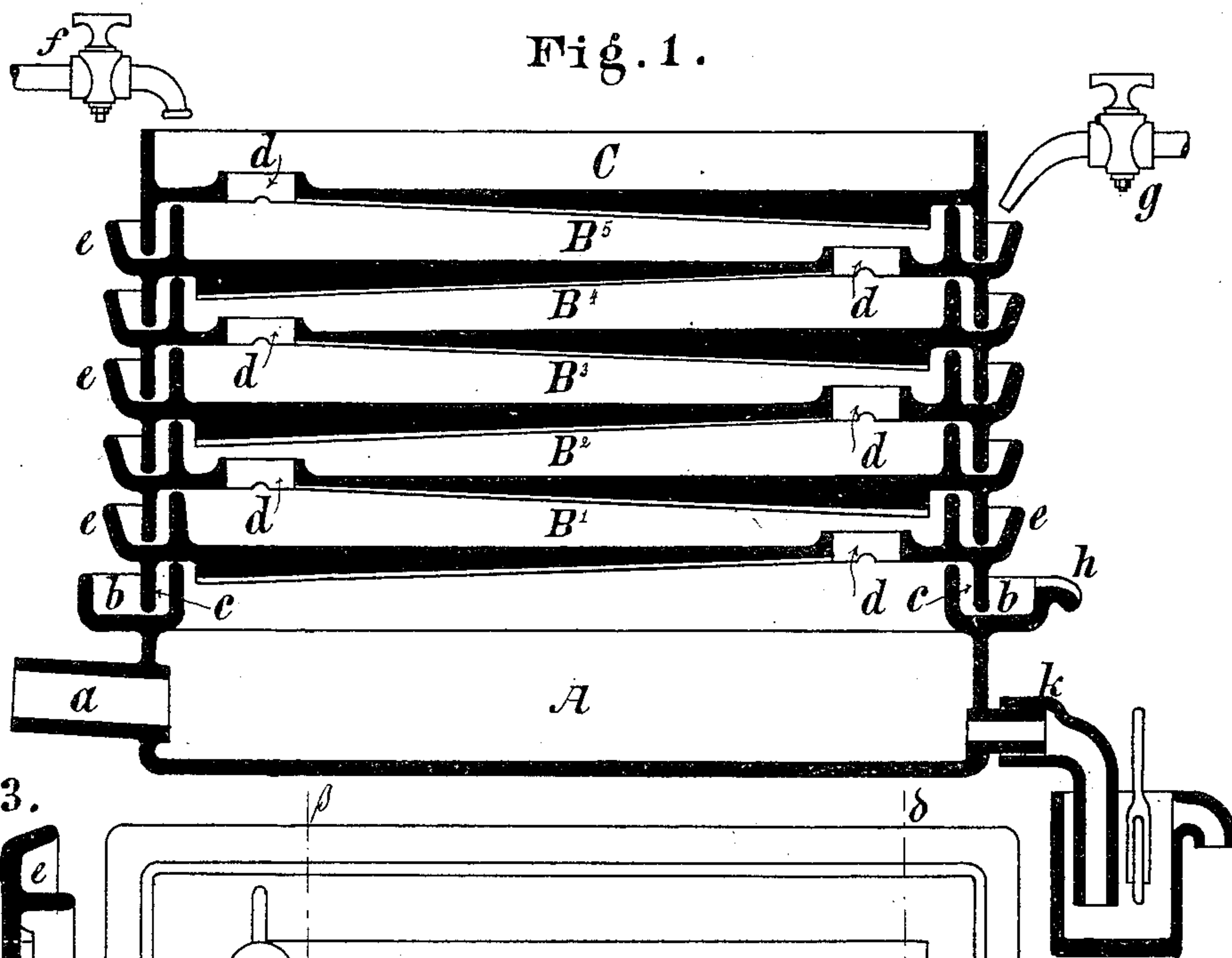


Fig. 2.

Fig. 3.

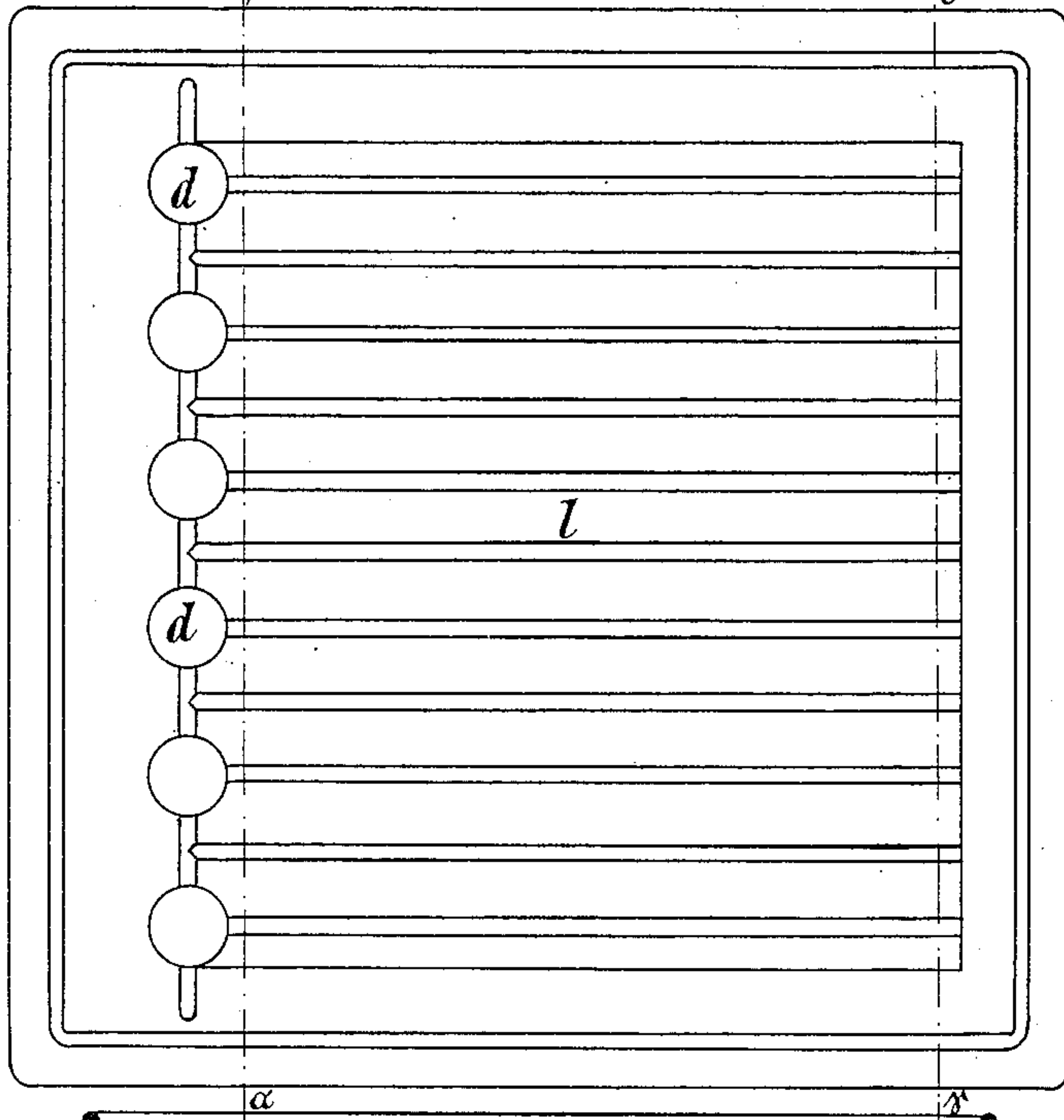
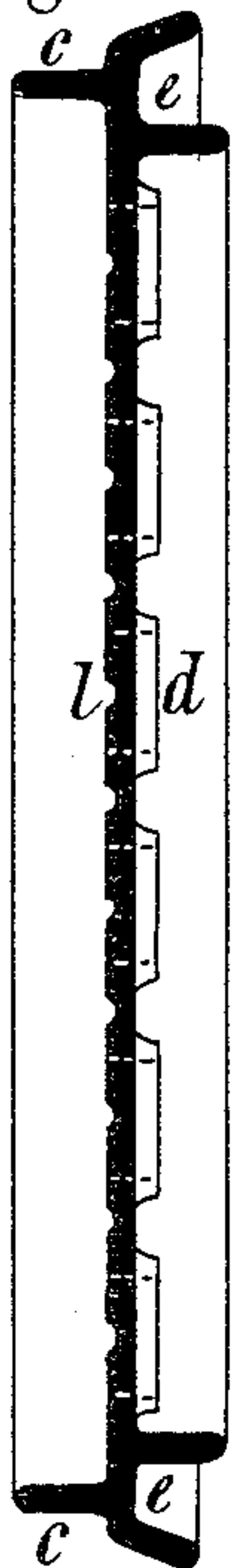


Fig. 4.



Witnesses
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Robt H. Roy.

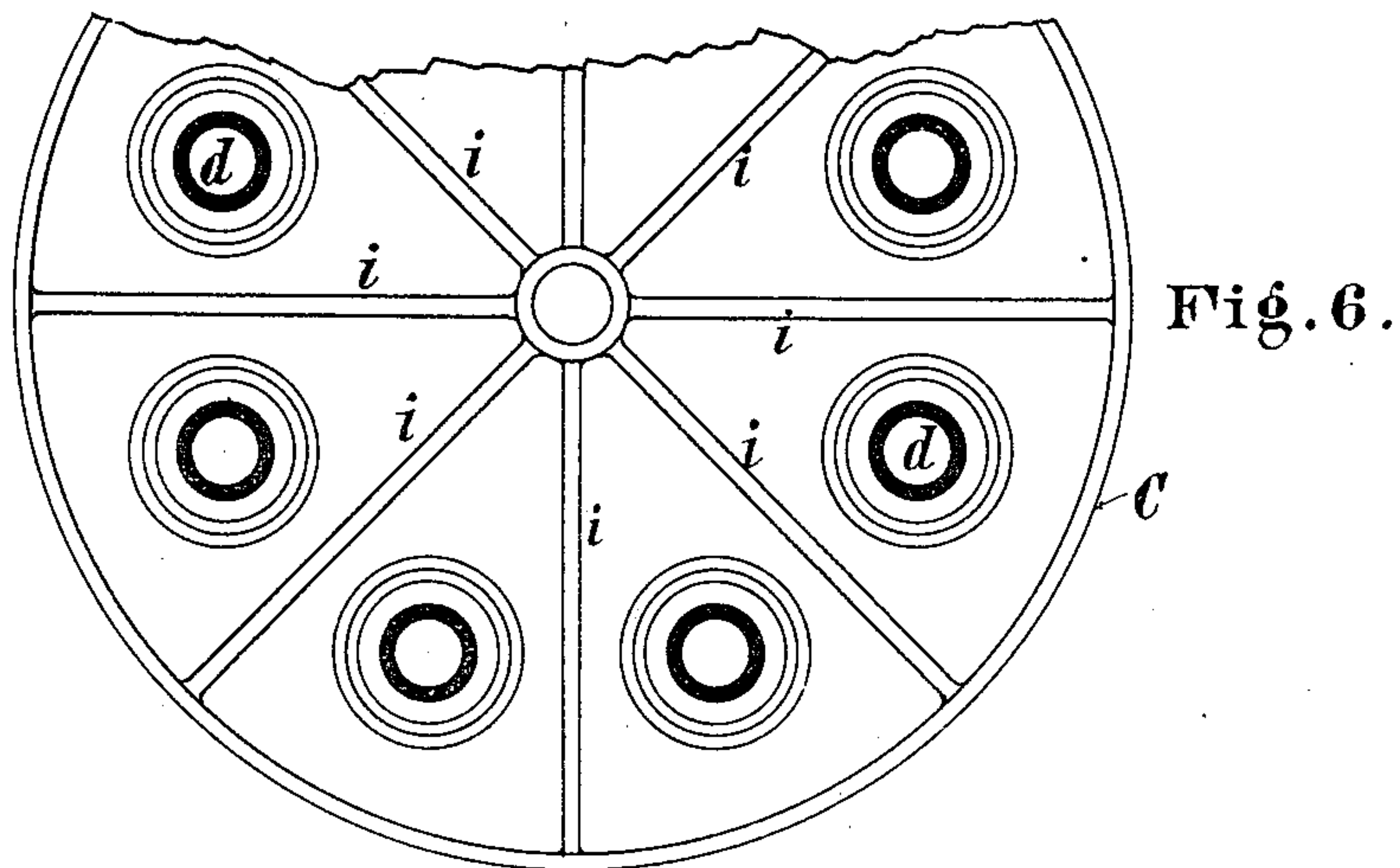
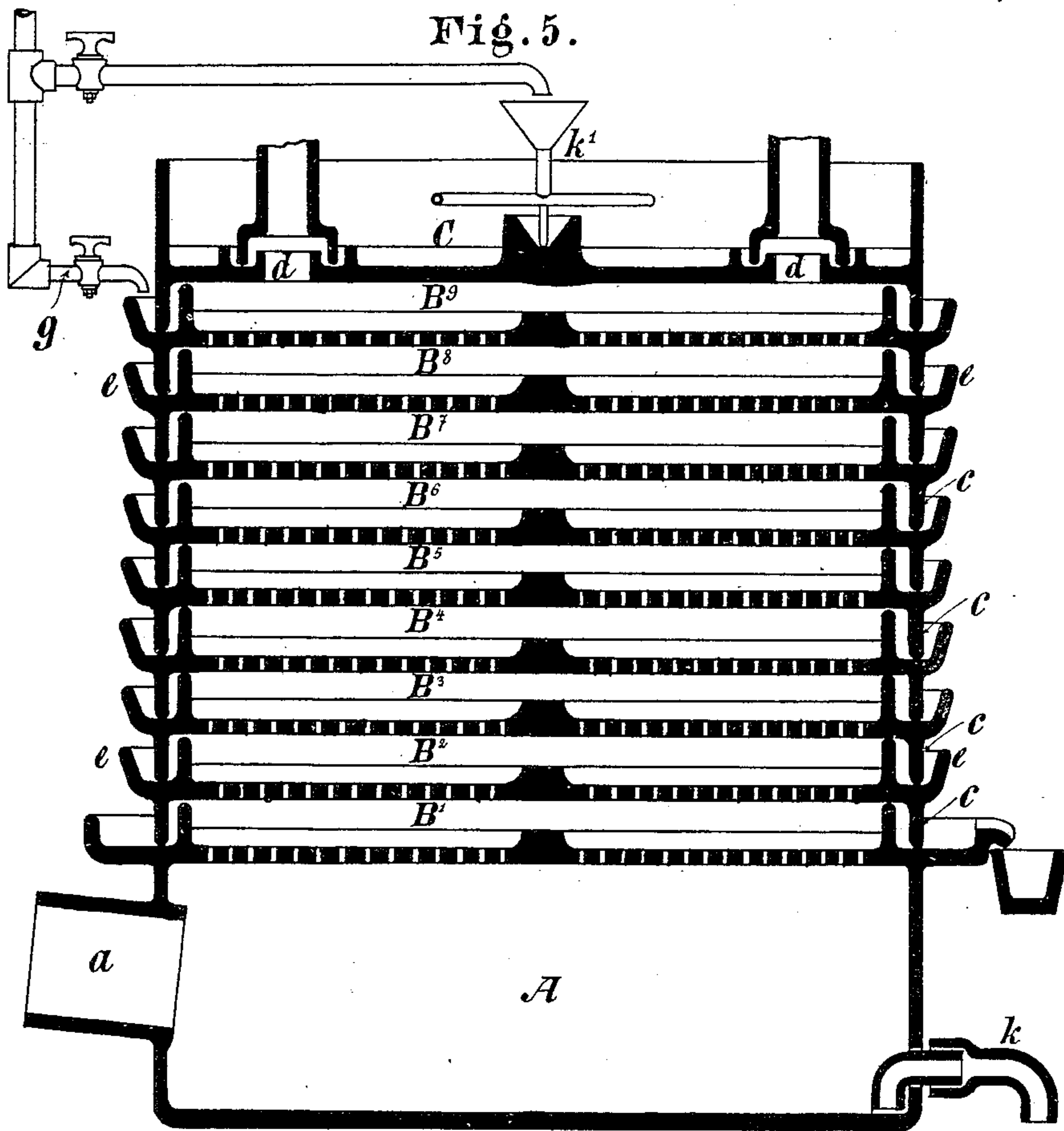
Inventor:-
George Lunge
by his attorney
Roeder & Bienen

G. LUNGE.

APPARATUS FOR TREATING LIQUIDS WITH GASES.

No. 344,322.

Patented June 22, 1886.



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(No Model.)

3 Sheets—Sheet 3.

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APPARATUS FOR TREATING LIQUIDS WITH GASES.

No. 344,322.

Patented June 22, 1886.

Fig. 7.

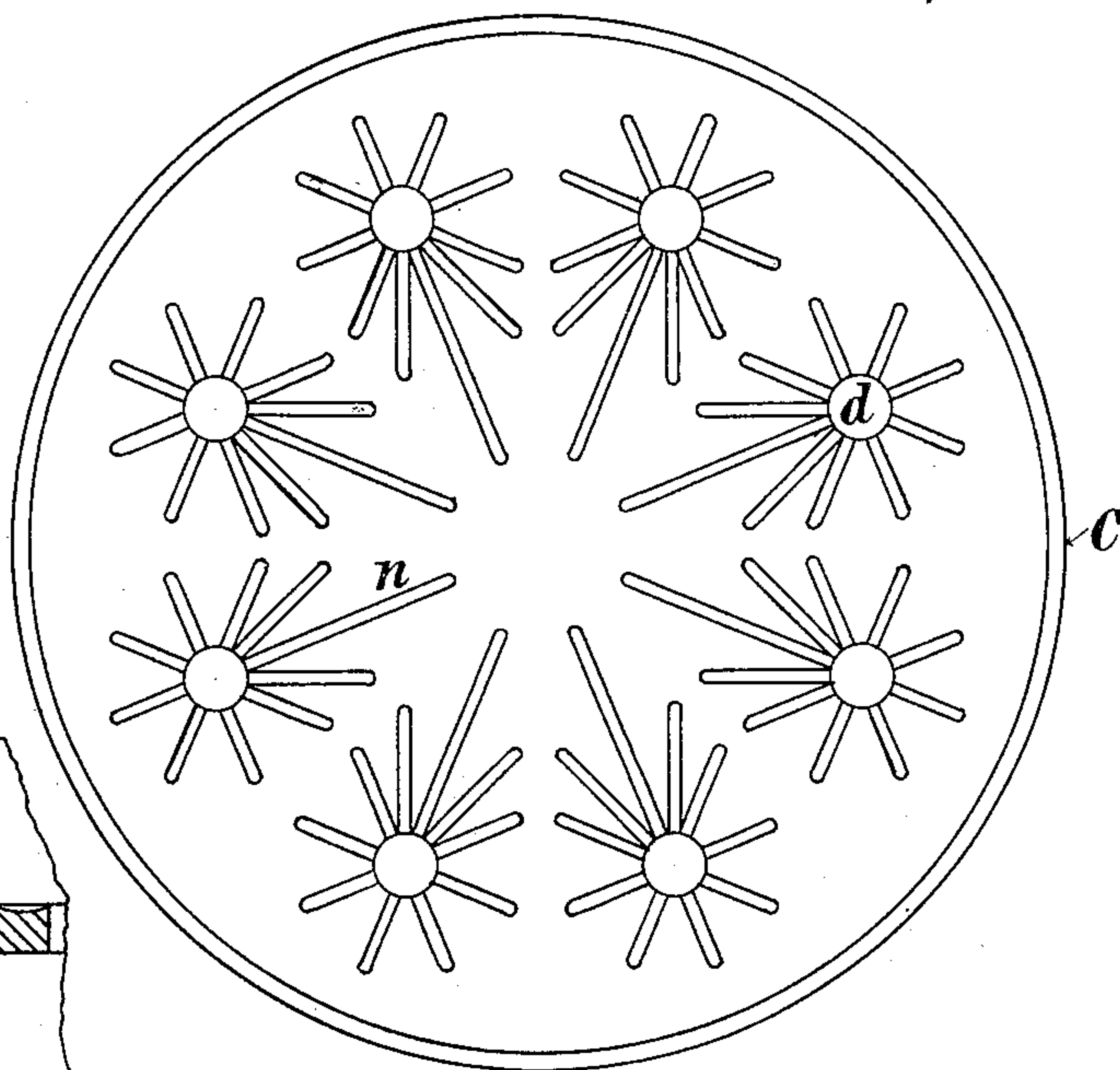


Fig. 9.

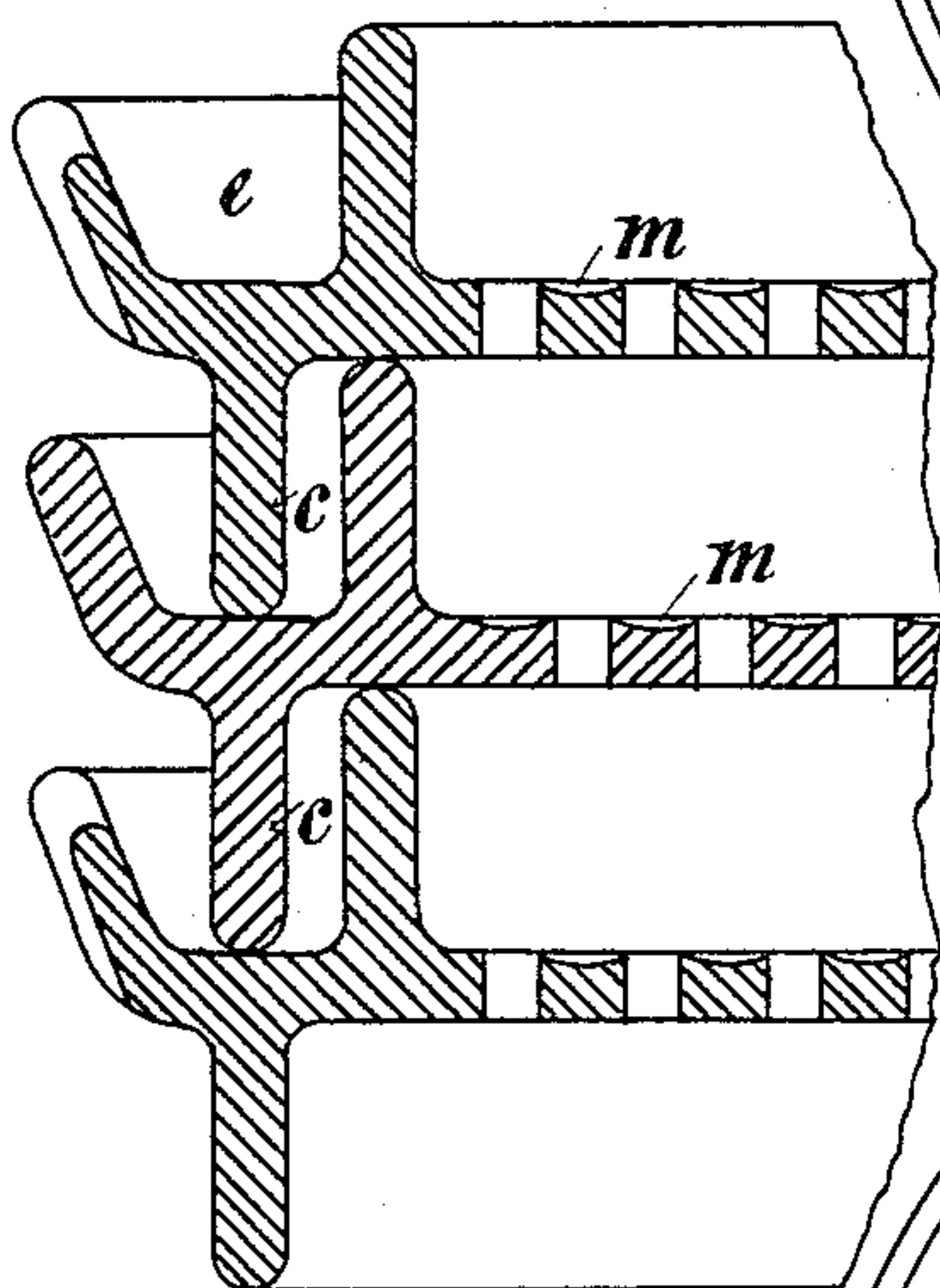
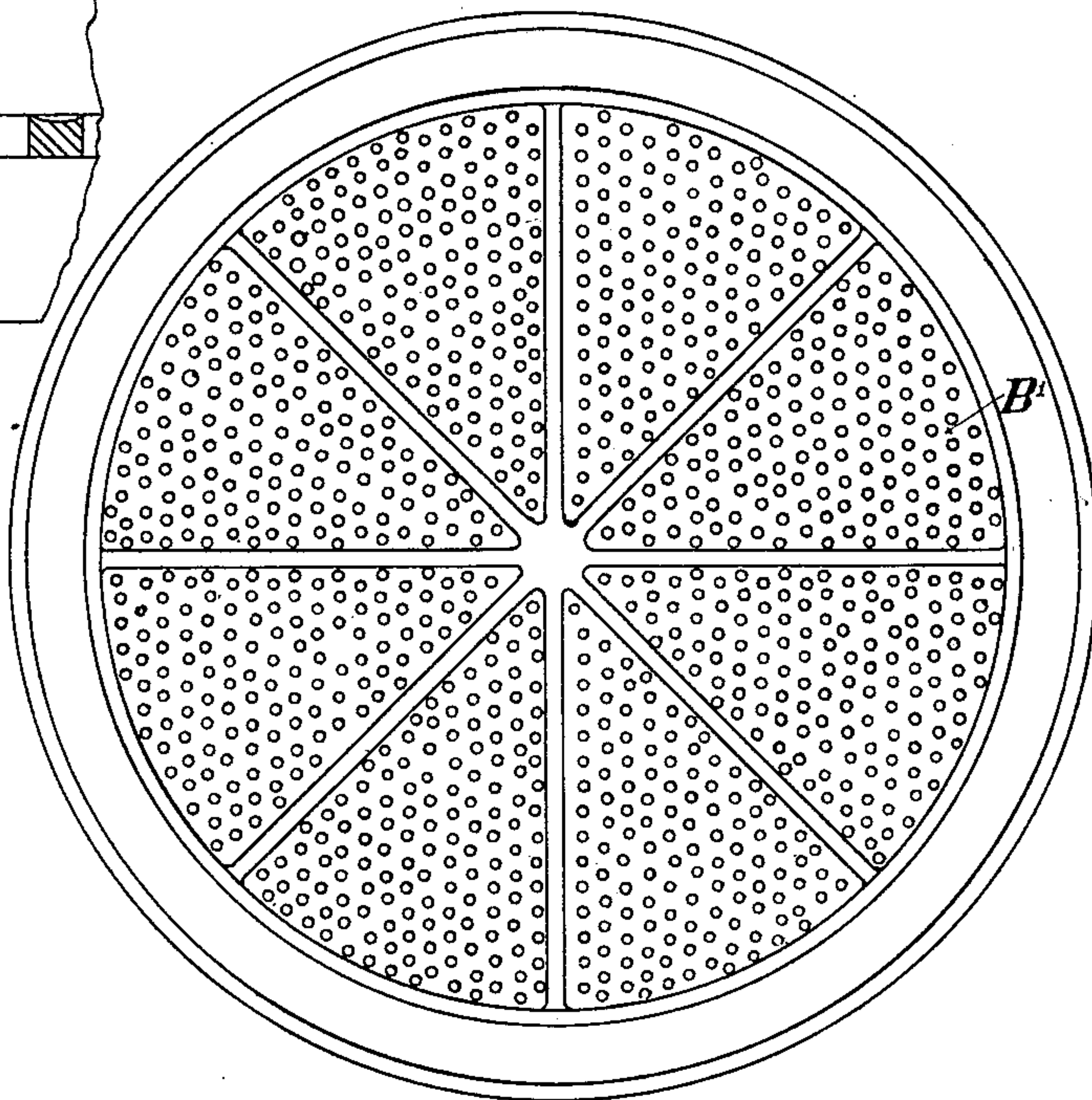


Fig. 8.



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UNITED STATES PATENT OFFICE.

GEORGE LUNGE, OF ZURICH, SWITZERLAND.

APPARATUS FOR TREATING LIQUIDS WITH GASES.

SPECIFICATION forming part of Letters Patent No. 344,322, dated June 22, 1886.

Application filed September 28, 1885. Serial No. 178,489. (No model.)

To all whom it may concern:

Be it known that I, GEORGE LUNGE, a citizen of the United Kingdom of Great Britain and Ireland, residing in Zurich, Switzerland, have invented certain new and useful Improvements in Apparatus for the Action of Gases upon Liquids or Solids, of which the following is a specification.

The object of this my present invention is an apparatus for bringing gases in intimate contact with liquid or solid bodies, whereby, in conformity to the well-known requirement of many operations of industrial chemistry, the action of the gases upon the liquids or solids takes place as perfectly as possible.

In the accompanying drawings, Figure 1 is a vertical section of my apparatus. Fig. 2 is a bottom view of an essential part of the apparatus; Fig. 3, a vertical transverse section, taken in the plane of the line, $\alpha\beta$ Fig. 2, and Fig. 4 a vertical transverse section taken in the plane of the line $\delta\gamma$, Fig. 2, of the same part.

The vessel A, forming the base of the apparatus, is provided with the inlet-pipe a for the gases, and the outlet-pipe k for the liquid, and is surrounded by a trough, b , into which fits the downward-projecting socket c of the plate B' , in order to constitute a so-called "hydraulic" or "water" lute. The plate B' is likewise surrounded by a trough e , in which is placed the downward-projecting socket c of a following plate, B^2 . Upon this plate B^2 there is placed another plate, B^3 , of similar construction, and thus any number of plates, B^1 , B^2 , B^3 , of similar construction, may be successively superposed over one another, always forming hydraulic lutes between the trough e of each one plate and the socket c of each following plate. In these plates B^1 , B^2 , B^3 rows of holes d are disposed in such a way that these rows of holes are situated alternately on the right and on the left side of the plates. The upper ends of the holes d are surrounded by low collars, but the remainder of the upper surfaces of the plates are plain and horizontal. The lower surfaces of the plates are preferably as shown by Fig. 1 of the drawings, inclined in such manner that they descend from the holes d to the opposite side of the plate. Furrows l , Figs. 2, 4, departing from the holes d , the purpose of which is

hereinafter specified, may be advantageously disposed upon the inclined lower surfaces.

We will suppose that in the apparatus an action of gases upon a liquid is to take place. The gases in this case enter the vessel t through the pipe a , while the liquid to be treated is flowing through the pipe f upon the top or covering plate C of the tower-like apparatus. This covering-plate C is analogous in construction to the other plates, B^1 , B^2 , B^3 , only, in case the gases which leave the apparatus are still to be conveyed to some other apparatus the holes d of the covering-plate C are provided with hydraulic lutes joining these holes to the pipes which convey the gases to the following apparatus. The gases ascending through the holes d pass the apparatus in a zigzag line, and are thereby brought into most intimate contact with the liquid, which, flowing over the low collars which surround the holes d , descends from plate to plate, and finally flows off in a very concentrated state through the pipe k . The gases do not only come into contact with the thin layer of liquid spread upon the upper surfaces of the plates B^1 , B^2 , B^3 , but also with those layers of liquid which adhere to the inclined lower surfaces of those plates, the liquid flowing down by adhesion from the holes d over the inclined lower surfaces of the plates. By this means there is a very extensive surface of contact afforded between the gases and the liquid.

In order to form the hydraulic lutes, water or any other convenient liquid, as the case may be, is made to run through the cock g into the uppermost trough, e , of the apparatus. The liquid descends by means of overflows situated alternately at opposite sides of the troughs e , passes in this way through all the hydraulic lutes, and finally leaves the trough b , running off at h . This stream of liquid through the hydraulic lutes, which may either be continuous or intermittent, serves in many cases advantageously for cooling the apparatus.

In some cases the apparatus hereabove described may be slightly modified, in the manner represented by Figs. 5 to 9 of the drawings. Fig. 5 is a vertical section of the modified apparatus; Fig. 6, the top view, and Fig. 7 the bottom view, of the covering-plate C. Fig. 8 is the top view of one of the other

plates. Fig. 9 is a part of the vertical section, Fig. 5, on a larger scale.

The plates $B' B^2 B^3$ are in this modified construction of the apparatus provided with very many small holes, the total cross-section of which is greater than that of the gas-inlet pipe a . The lower surface of the plates is plain and horizontal. The upper surface may be slightly hollowed out at m , Fig. 9, between the small holes. These latter are alternated from one plate to the following one, so that the liquid traversing the holes falls upon a solid piece of the following plate, and is thereby scattered about. The ascending gases are thoroughly dispersed and caused to continuously change their course by the manner of arranging the perforations of the plates, and they are thus intimately mixed with the equally dispersed or atomized liquid.

In order that the liquid forming very thin layers upon the plates, and being contained especially in the hollows m , may be spread as uniformly as possible over the plates $B' B^2$, also to provide against the case that the plates are somewhat out of the level, the upper surfaces of the latter are divided by ledges i into a number of entirely separate compartments. The same arrangement is also given to the covering-plate C , Fig. 6, which may have in each compartment one or more larger holes, d , instead of a greater number of small ones. These larger holes d , as already stated in the description of the first apparatus, and represented by Fig. 5, can be easily connected by means of water-lutes with the pipes which convey the gases to some other piece of apparatus.

The liquid may advantageously be spread over the surface of the covering-plate C by means of a reaction-wheel k , Fig. 5.

In order to distribute the liquid uniformly over the following-plate, furrows n , Fig. 7, may depart radially from the holes d on the lower surface of the covering-plate C .

If in such apparatus gases have to act upon

solid bodies, or mixtures of solid and liquid bodies, the plates $B' B^2 B^3$ may be singly filled with the solid, or the mixture of solid and liquid substances, and superposed over one another, and as soon as the operation is ended they may be lifted off and emptied one after the other.

The apparatus shown by Figs. 1 to 4 is more appropriate for treating solid substances in the shape of a powder or a mud, while the apparatus shown by Figs. 5 to 9 is more convenient for treating coarsely-granulated substances.

The apparatus may be constructed of stoneware, earthenware, metal, wood, or any other convenient material. Instead of the square or circular shape of the plates $B' B^2 B^3$, (shown by the drawings,) any other form may be employed.

I claim as my invention—

1. The combination, in a condenser, of vessel A , having pipes a R , with superposed perforated plates $B' B''$, &c., connected by hydraulic lutes, substantially as and for the purpose specified.

2. The combination, in a condenser, of the vessel A , with superposed plates $B' B''$, &c., connected by hydraulic lutes, and having flanged openings and inclined bottoms, substantially as and for the purpose specified.

3. The combination, in a condenser, of the vessel A with superposed perforated plates $B' B''$, connected by hydraulic lutes, and having the cavities m between the perforations, and with ledges i , as and for the purpose set forth.

In witness whereof I have hereunto signed my name in the presence of two subscribing witnesses.

GEORGE LUNGE.

Witnesses:

ROBERT E. SCHMIDTZ,
FRANGOTT SANDMEYER.