

(No Model.)

2 Sheets—Sheet 1.

E. T. TURNEY.

PROCESS OF AND APPARATUS FOR GENERATING GAS.

No. 556,115.

Patented Mar. 10, 1896.

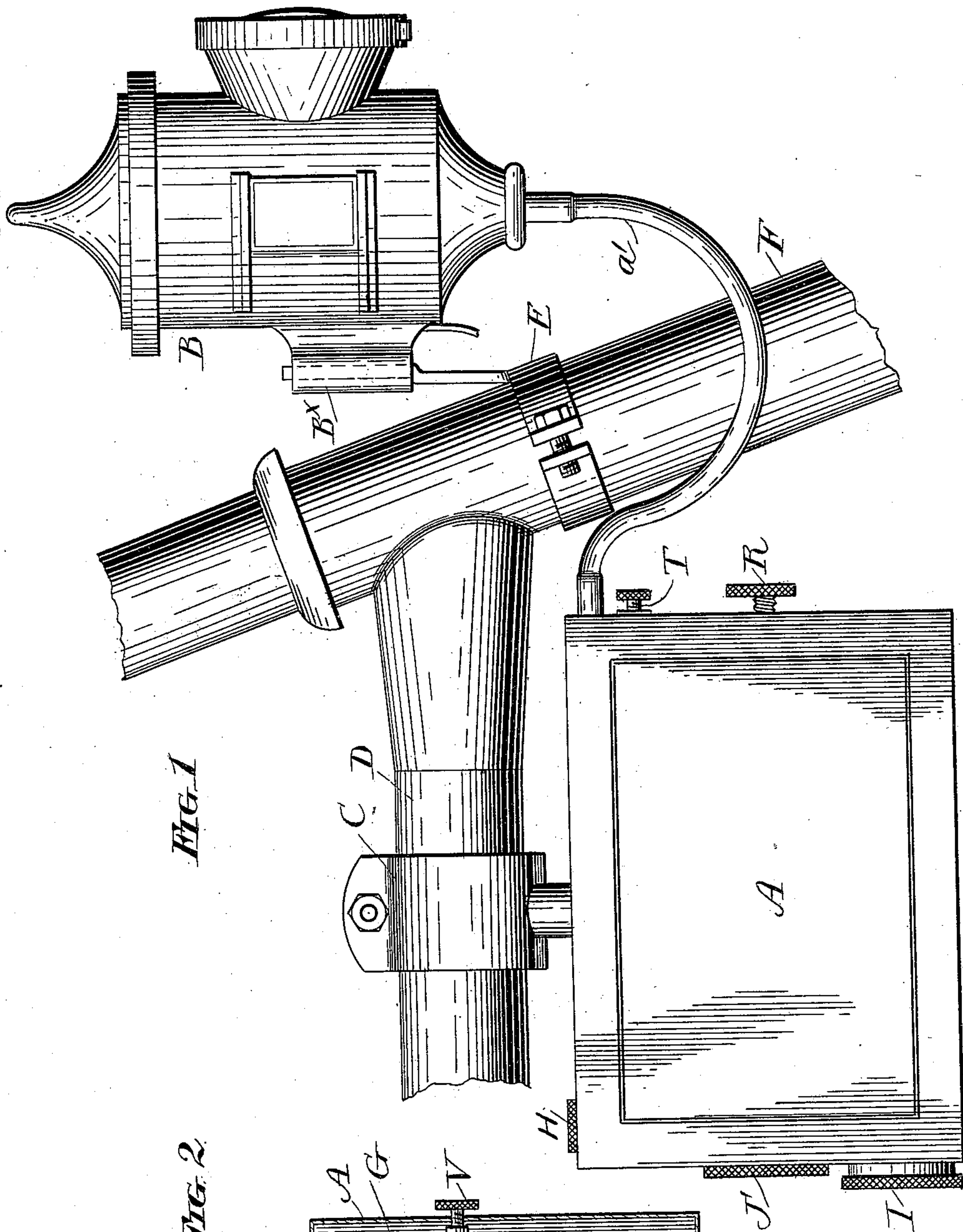


FIG. 1

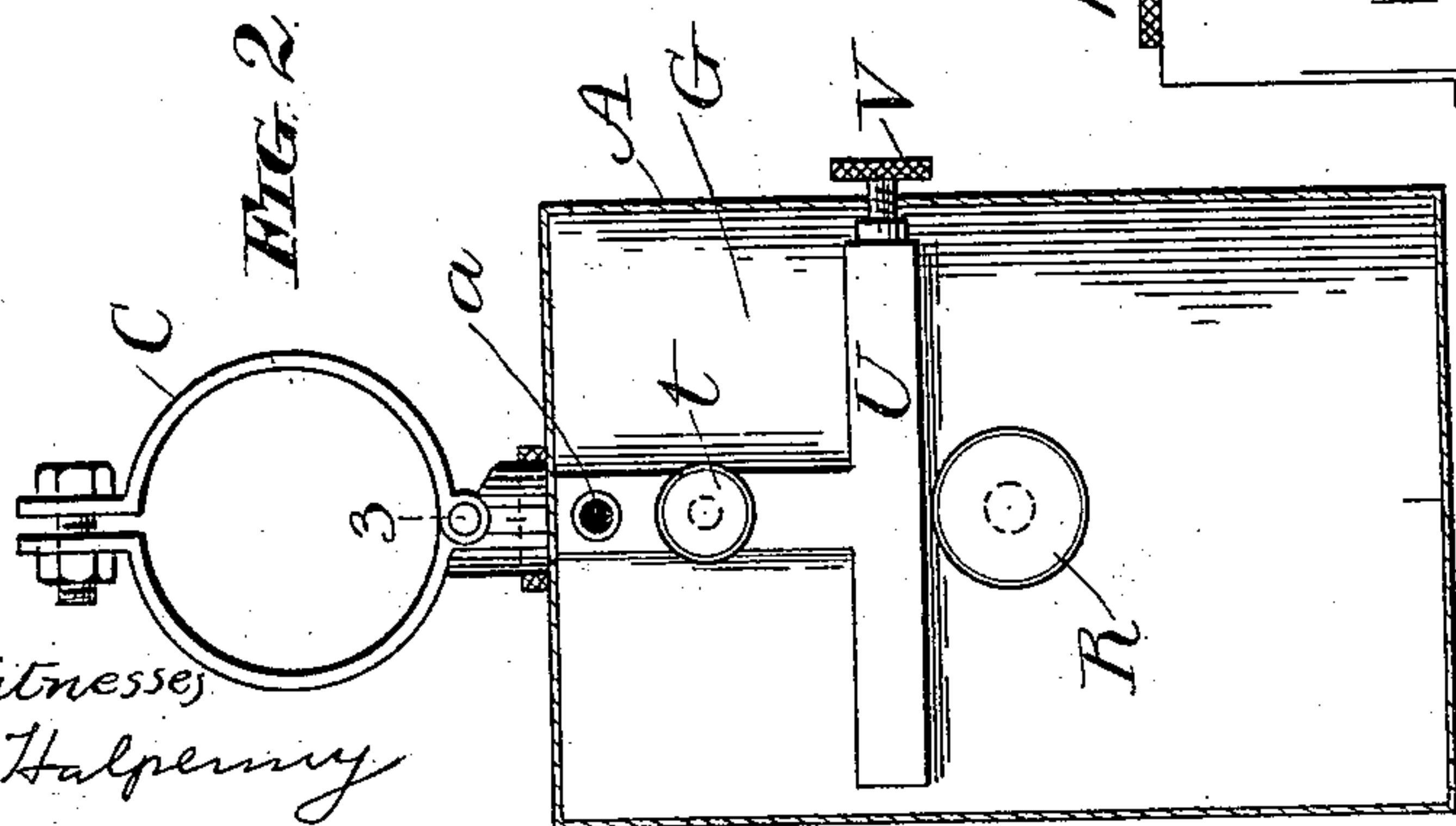


FIG. 2

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By his attorneys,  
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(No Model.)

2 Sheets—Sheet 2.

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FIG. 5.

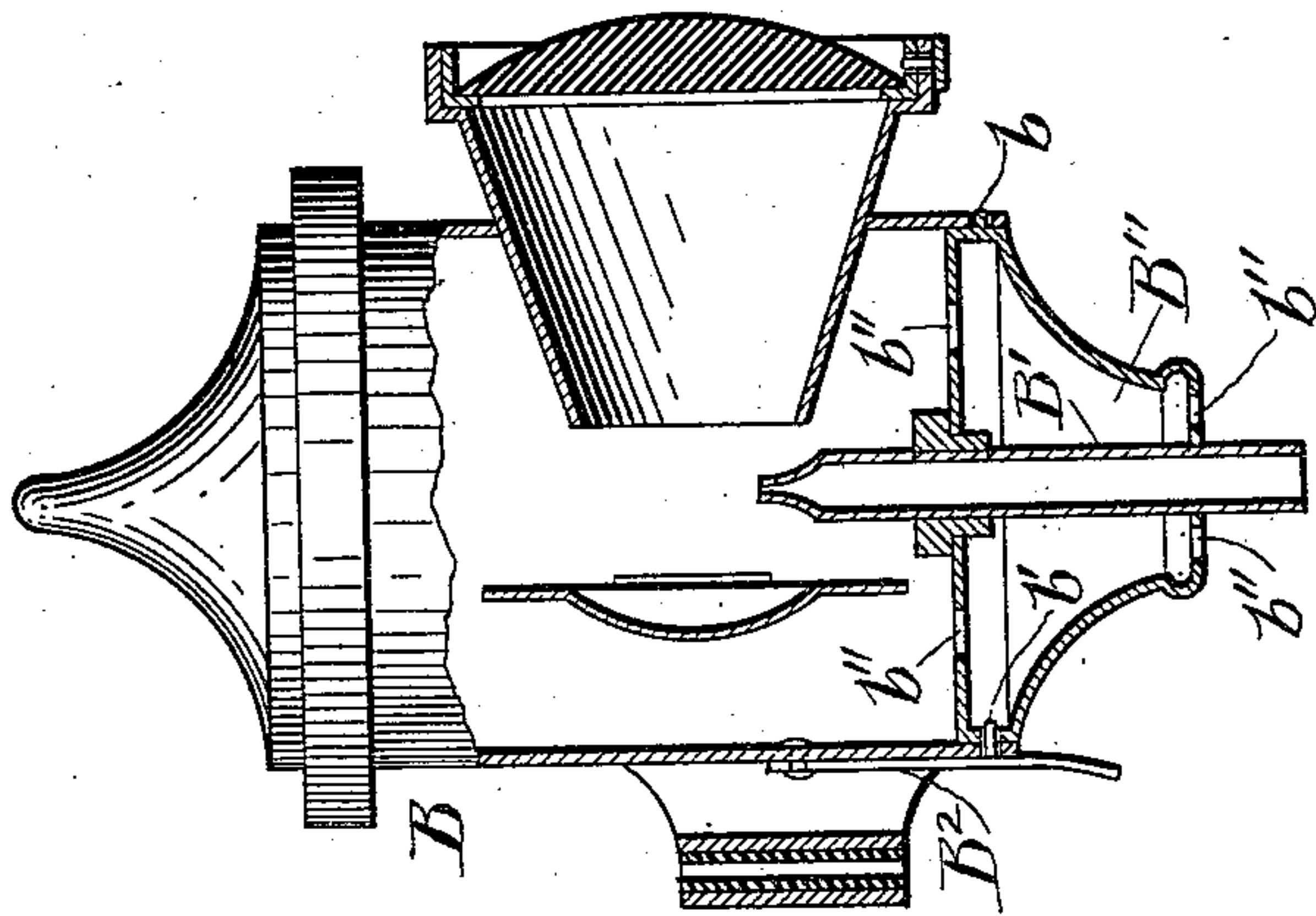


FIG. 3.

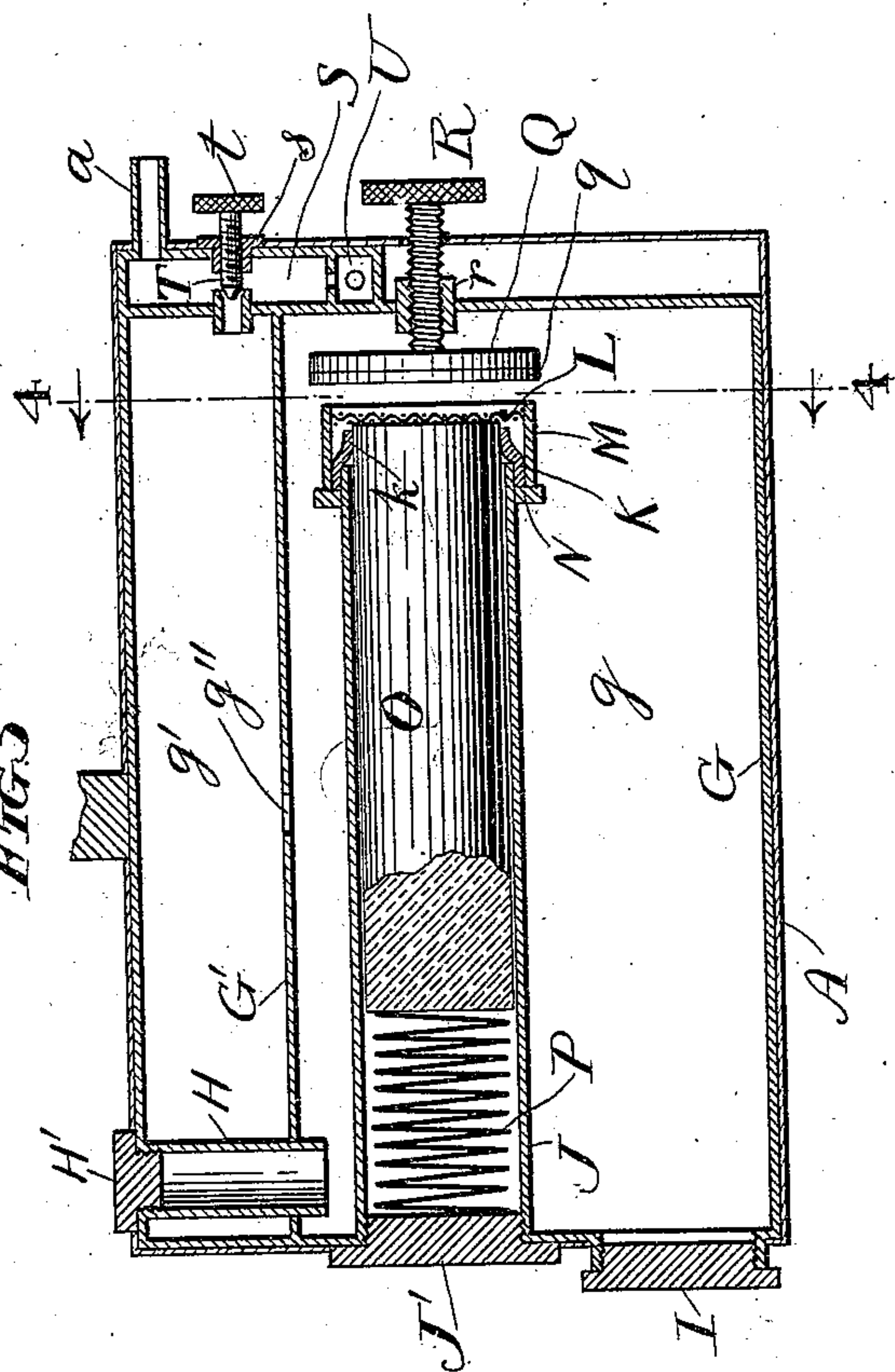
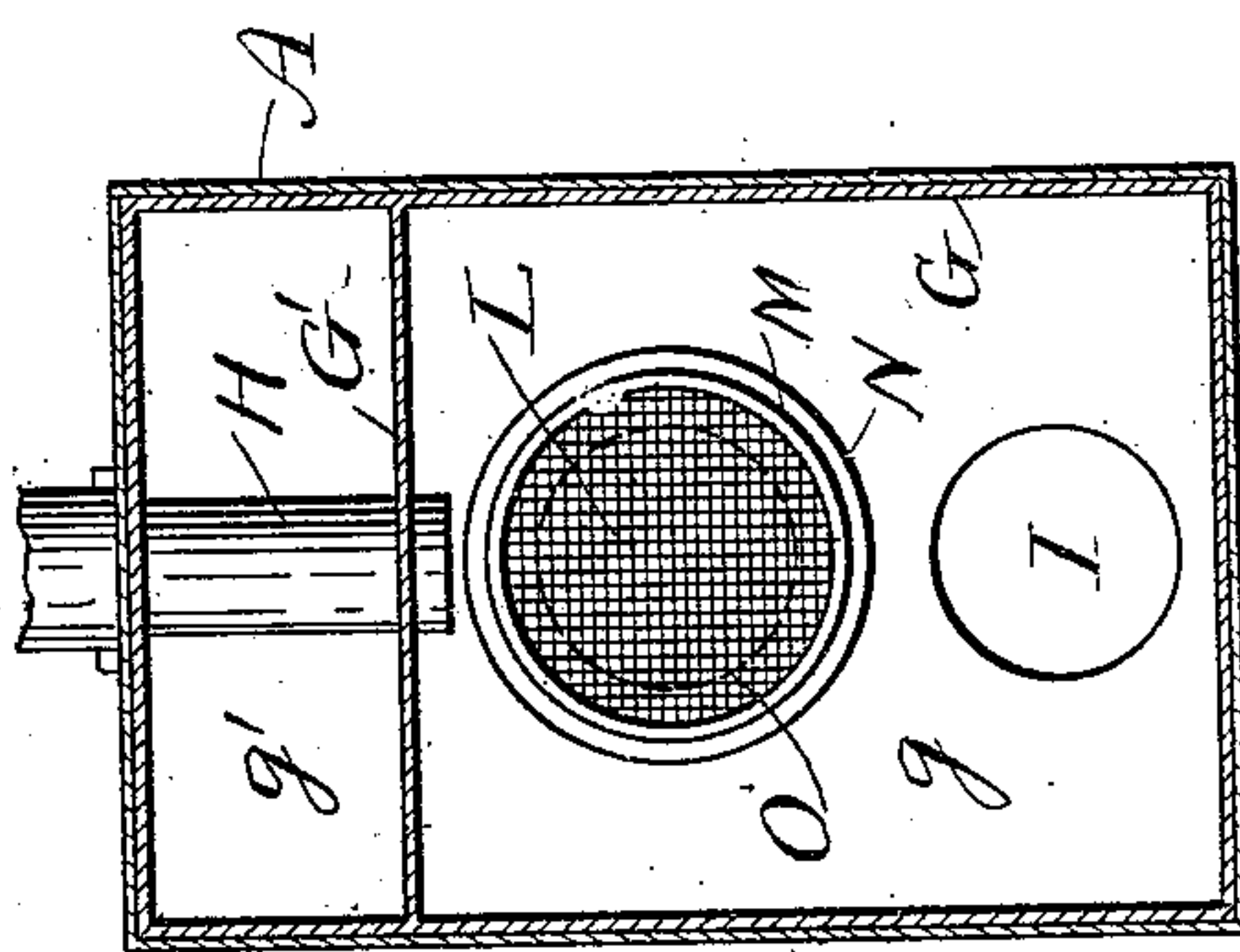


FIG. 4.



Witnesses:

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By his attorneys  
Eugene T. Turney



# UNITED STATES PATENT OFFICE.

EUGENE T. TURNEY, OF CHICAGO, ILLINOIS, ASSIGNOR TO CHARLES E. RAND, OF SAME PLACE.

## PROCESS OF AND APPARATUS FOR GENERATING GAS.

SPECIFICATION forming part of Letters Patent No. 556,115, dated March 10, 1896.

Application filed February 1, 1896. Serial No. 577,713. (No model.)

*To all whom it may concern:*

Be it known that I, EUGENE T. TURNEY, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in the Process of Generating and Using Gas and the Apparatus Used Therefor, of which the following is a specification.

10 The present invention relates in part to a process of generating gas, in part to a process of both generating and burning gas, in part to an apparatus for generating gas, and in part to an apparatus for both generating and  
15 burning it.

So far as the process is concerned, the invention relates to only that class of processes in which the gas is generated by the chemical combination of suitable ingredients—such, for example, as the process by which acetylene gas is generated when calcium carbide or other metallic carbide and water are introduced to each other.

One of the objects of the present invention is to generate gas in only the limited quantity needed for immediate consumption and to keep the quantity generated practically constant throughout the process of generation, and another object of the invention is to burn or otherwise use the gas thus generated directly after it is generated and at substantially the pressure at which it was generated. One of these objects I accomplish by exposing a portion of the surface of a cartridge containing a solid ingredient of the gas-generating compound in the form of a compact body of uniform sectional area to a liquid ingredient and protecting the remainder of said surface therefrom, so that the area of the exposed  
35 portion and consequently the quantity of gas generated are kept practically constant, and the other object I accomplish by burning or otherwise using the gas thus generated directly after it is generated and at substantially the pressure at which it was generated.

So far as the apparatus is concerned, the invention relates in part to that class of apparatuses that may be used in carrying out my improved process of generating gas and in  
50 part to that class of apparatus that may be

used in carrying out my improved process of both generating and burning gas.

So far as the invention relates to the apparatus, for the purpose of this application I have illustrated it as being embodied in a portable apparatus that is designed especially and is particularly adapted for use as a lamp for bicycles and similar vehicles, and while I shall in this application claim those novel features of the apparatus to which its adaptability for this particular purpose is due, still I desire to have it understood that the invention is not so restricted and that I reserve to myself the exclusive right to embody any or all of its several novel features in apparatuses, either portable or stationary, that are intended or adapted for use in other connections—such, for example, as table-lamps, chandeliers, head-lamps, street-lamps, car-lamps, &c.

In a lamp for use on bicycles and other vehicles a gas-flame is preferred because of its tenacity. In a lamp constructed in accordance with my invention the gas is generated only so fast as it is needed for consumption, and the quantity generated is kept practically constant during the process of generation, and the gas is burned directly after it is generated and at substantially the pressure at which it is generated. This regulated constancy of supply can only be maintained by similarly regulating and maintaining constant the supply of the ingredients of the gas-generating compound. Maintaining practical constancy in these respects is a necessary condition in an apparatus that meets the requirements already set forth, and this condition may be brought about by gradually introducing the ingredients to each other in just such quantities as will result in the generation of the proper quantity of gas. The ingredients that I prefer to use are a solution of methyl alcohol (one part) and water, (nine parts,) to which calcium carbide or other metallic carbide is gradually added in just sufficient quantity to produce the quantity of gas needed for immediate use. The calcium liberates hydrogen from the water, and this hydrogen combines with the carbon and forms acetylene gas. Without the alcohol this chemical



combination would be very rapid, and it is simply to retard it that the alcohol is used. If such quantities of these ingredients as will when mixed in this way generate sufficient  
 5 gas to supply the lamp with a proper quantity for a given length of time were all mixed together at one time, the result would be the immediate generation of an excessive quantity of gas, so that at first the burner would  
 10 have an excessive supply and the supply would rapidly decrease until it became insufficient.

The present invention is concerned especially with the structural characteristics of  
 15 the solid ingredient of the gas-generating compound and with the means for exposing a portion of the surface of this solid ingredient to the liquid ingredient and protecting the remainder therefrom. In form the solid  
 20 ingredient is compact—that is to say, its particles are firmly united or bound together in a solid mass—the word “compact” being herein used to point out this characteristic and distinguish from a body whose particles  
 25 are readily displaceable. In shape it is of practically-uniform cross-sectional area from end to end, and, preferably, it presents a substantially-rectangular outline in any plane cutting it longitudinally. It is called a “cartridge,” for the reason that it contains a charge  
 30 for the generator, and is to this extent analogous to other cartridges. It contains (either alone or mixed with some other substance) an ingredient of the gas-generating compound; but the invention is not limited to the use therein of any particular ingredient. With a cartridge having these characteristics by protecting a portion of its surface and exposing a portion of its surface, as hereinafter  
 40 fully described, whether the liquid be at rest or in motion, and however much it may swash about, under any and all conditions, the liquid can have contact with only a predetermined proportion of the surface of the cartridge.  
 45 The area of this exposed surface will be kept practically constant throughout the process of generation.

The invention consists in the features of novelty that are particularly pointed out in  
 50 the claims hereinafter, and in order that it may be fully understood I will describe it with reference to the accompanying drawings, which are made a part of this specification, and in which—

55 Figure 1 is a side elevation of an apparatus for generating and burning gas embodying the invention so far as it relates to the apparatus and adapted to carry out the invention so far as it relates to the process, said  
 60 apparatus being of a portable type that is particularly adapted for use as a lamp for bicycles and other vehicles, a portion of the frame of a bicycle being shown in side elevation. Fig. 2 is an end elevation of the apparatus for generating the gas. Fig. 3 is a vertical section thereof on the line 3 3, Fig. 2.

Fig. 4 is a vertical section thereof on the line 4 4, Fig. 3, looking in the direction of the arrow. Fig. 5 is a vertical central section of the lamp.

A represents the gas-generator, and B the lamp, each of which, when the apparatus is of a portable type that is intended for use on bicycles and other vehicles, is provided with means for securing it to the most suitable  
 75 part of the vehicle.

In Fig. 1 the apparatus is shown as being secured to a part of a bicycle, for which purpose the generator is provided with a clip C, that embraces the horizontal top bar D of the frame, and the lamp is provided with a clip  
 80 having a loop B<sup>x</sup> for receiving an arm projecting from the clip E, that embraces the steering-head F of the frame; but the present invention is not limited to any particular  
 85 means for securing the apparatus in place, as said means will necessarily vary more or less, according to the shape of the frame to which it is to be secured.

From the generator projects a short tube  
 90 a, onto which is slipped one end of an elastic tube a', the other end of which is slipped onto the lower end of the burner B', said tube forming a direct connection between the generator and the burner.

The lamp has a hollow base B'', which is removably held in place in the lower end of the cylindrical body of the lamp by means of a spur b, carried by the base and occupying a  
 100 perforation near the bottom of said body, and a spring B<sup>2</sup>, which is secured to the body and is provided with a spur b', that enters a perforation formed in the removable base at a point diametrically opposite the spur b. This is a familiar means for securing two parts of  
 105 a lamp together and forms no part of the present invention.

G is the shell or casing of the generator, the interior of which is divided by a diaphragm G' into two chambers g and g', that communicate through a small opening g'', formed through the diaphragm, preferably at mid-length. The chamber g is that in which the generation of the gas takes place. The top of the shell G and the diaphragm G' are provided with openings in which is permanently  
 110 secured a tube H, the outer end of which is closed by a screw-cap H', and the inner end of which is in open communication with the chamber g. When the cap H' is removed, the  
 115 ingredients that are to be used in the chamber g for generating gas may be introduced through the tube H, and when introduced the chamber may again be hermetically closed by replacing the screw-cap. The casing is  
 120 also preferably provided near the bottom with an opening, through which access may be had to the interior of the chamber g for cleaning it, a screw-cap I being provided for hermetically closing said opening. Through the casing G is also an opening in which a tube J fits and is permanently secured. The outer  
 125  
 130



end of this tube is closed by a screw-cap J', and its inner end is in open communication with the interior of the chamber *g*.

Surrounding the inner end of the tube is an elastic ring or collar K, the diameter of which when not stretched is less than the diameter of the tube, so that when arranged thereon, as shown in the drawings, with a portion projecting beyond the end of the tube, this projecting portion will form an elastic lip *k*, which has a constant tendency to contract. Beyond this elastic lip and opposite the end of the tube is a reticulated diaphragm L, which is preferably supported by means of a sleeve M, that surrounds the elastic ring K and is secured to a ring N, which latter is in turn secured to the outside of the tube.

Within the chamber G is placed a liquid ingredient of the gas-generating compound, (preferably methyl alcohol and water in the proportions already stated,) and within the tube J is placed a cartridge O, having the characteristics already described, which cartridge is of less diameter than the interior of the tube, but of greater diameter than the elastic lip *k* when the latter is not under tension. The tube and lip form an insoluble envelope for inclosing the cartridge, and the joint between the envelope and cartridge is liquid-tight. Within the tube J is also arranged a coiled spring P, one end of which bears against the screw-cap J', by which the outer end of the tube is closed, and the other end of which bears against one end of the cartridge O, whereby its other end is held in contact with the reticulated diaphragm L, the diaphragm being located a sufficient distance beyond the elastic lip *k* to leave a very short portion of the cartridge projecting beyond the lip. This arrangement leaves this projecting portion of the cartridge exposed to the liquid in the chamber *g*, and so long as it is so exposed the generation of the gas will go on. As the chemical action proceeds the cartridge is fed up to the diaphragm by means of the spring P, and in this way (the cartridge being of uniform cross-sectional area from end to end) calcium carbide in exactly the proper quantity is gradually added, the ratio of its addition being the same as the ratio of its consumption, and as the consumption proceeds the quantity of calcium carbide added does not vary materially. The elastic lip *k* fits the cartridge O sufficiently tight to positively prevent any liquid from passing the lip and coming in contact with that portion of the cartridge which is within the tube; but it does not fit it sufficiently tight to prevent the spring P from feeding the cartridge up to the reticulated diaphragm in the manner described.

Located within the chamber *g*, opposite the end of the tube I, is a disk Q, provided on its face with an elastic pad *q*, preferably of rubber, and secured at its back to a thumb-screw R, which passes out through a threaded sleeve *r*, secured in an opening in the casing G. By

turning this thumb-screw in one direction the disk Q may be brought to bear against the end of the sleeve M and in this way prevent the liquid in the receptacle from coming in contact with the cartridge O, and when this is done the generation of gas will of course cease.

Arranged upon one end of the casing G is a chamber S, which communicates with the chamber *g'* through a small opening surrounded by a valve-seat, and with which the tube *a* communicates. The cross-sectional area of this chamber S is greater than the area of the openings into and out of it, and consequently the flow of gas through it will not be so swift as it is through said openings. This retarding of the gas within the chamber S allows the precipitation of any excess of moisture which it may carry from the chamber *g'*. The supply of gas to the burner is controlled by a valve T, whose screw-threaded stem extends through a threaded bushing *s*, secured in an opening in the wall of the settling-chamber S, and is provided at its outer end with a milled head *t*, whereby it may be turned.

U is a chamber located below the settling-chamber S and communicating with it through a small opening, and V is a screw-plug, by which an opening in one end of the chamber U is closed. This chamber is for the purpose of collecting the liquid that is precipitated in the settling-chamber S and holding it until such time as is convenient to empty it, which may be done by removing the plug V.

Preferably the casing G is inclosed within an outer ornamental casing, so that the only parts shown in Fig. 3 that are visible are the screw-caps and thumb-screws.

It is stated herein that the generator and burner or other means for using the gas are directly connected; but this is not to be construed as meaning that there is no intervening part. In fact, as shown in the drawings, the tube intervenes, and it is immaterial, so far as the essence of the invention is concerned, what the length of the tube is. By "directly connected" is meant so connected that the gas may flow directly from the generator to the burner or other device for using it, so that throughout the entire apparatus and at the burner or other device the gas will be under substantially the pressure at which it was generated. This is intended to differentiate the apparatus from one in which the gas flows from the generator to a receiver or other device or is stored in the generating-chamber itself, whereby it is put under more or less pressure, necessitating the use of strong containing vessels and of means for reducing its pressure before it reaches the burner.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. The process of generating gas which consists in exposing a portion of the surface of a cartridge containing a solid ingredient of the gas-generating compound to a liquid ingredient and protecting the remainder of said sur-



face therefrom by an insoluble envelope, said cartridge consisting of a compact body of uniform sectional area in planes parallel with its exposed surface, whereby the area of the exposed surface and consequently the quantity of gas generated are kept practically constant, the products of the reaction being removed to present new surfaces throughout the process of generation, substantially as set forth.

2. The process of generating and using gas which consists in first generating gas by exposing a portion of the surface of a cartridge containing a solid ingredient of the gas-generating compound to a liquid ingredient and protecting the remainder of the surface therefrom, said cartridge consisting of a compact body of uniform sectional area in planes parallel with its exposed surface, whereby the area of the exposed surface and consequently the quantity of gas generated are kept practically constant throughout the process, and then using the gas directly after it is generated and at substantially the pressure at which it was generated, substantially as set forth.

3. In an apparatus for generating gas, the combination of a chamber adapted to contain a liquid ingredient of the gas-generating compound, a cartridge containing a solid ingredient of the gas-generating compound, an insoluble envelope for protecting a portion of the surface of said cartridge from the liquid and exposing the remainder of the surface thereto, said cartridge consisting of a compact body of uniform sectional area in planes parallel with its exposed surface, the joint between the envelope and cartridge being liquid-tight, whereby the area of the exposed surface and the quantity of gas generated are kept practically constant throughout the process of generation, substantially as set forth.

4. In an apparatus for generating and using gas, the combination of a chamber adapted to contain a liquid ingredient of the gas-generating compound, a cartridge containing a solid ingredient of the gas-generating compound, means for protecting a portion of the surface of said cartridge from the liquid and exposing the remainder thereto, said cartridge consisting of a compact body, of uniform sectional area in planes parallel with its exposed surface, whereby the area of the exposed surface and consequently the quantity of gas generated are kept practically constant throughout the process, and means directly connected with the generator by which the gas is used directly after it is generated and at substantially the pressure at which it was generated, substantially as set forth.

5. In an apparatus for generating gas, the combination of a chamber adapted to contain a liquid ingredient of a gas-generating compound, a cartridge containing a solid ingredient of the gas-generating compound, means for protecting a portion of the surface of said cartridge from the liquid and exposing the remainder of said surface thereto, said car-

tridge consisting of a compact body of uniform sectional area in planes parallel with its exposed surface, whereby the area of the exposed surface and consequently the quantity of gas generated are kept practically constant throughout the process, and means under the control of the operator for separating the cartridge and the liquid and thereby stopping the generation of the gas, substantially as set forth.

6. In an apparatus for generating gas, the combination with a chamber adapted to contain a liquid ingredient of the gas-generating compound, of a tube communicating therewith, a cartridge containing a solid ingredient of the gas-generating compound arranged in the tube, said cartridge consisting of a compact body of uniform sectional area, and a packing located at the opening through which the tube and chamber communicate and fitting the cartridge, substantially as set forth.

7. In an apparatus for generating gas, the combination with a chamber adapted to contain a liquid ingredient of the gas-generating compound, of a tube communicating therewith, a cartridge containing a solid ingredient of the gas-generating compound arranged in the tube, said cartridge consisting of a compact body, and an elastic lip located at the opening through which the tube and chamber communicate and fitting the cartridge, substantially as set forth.

8. In an apparatus for generating gas, the combination of a chamber adapted to contain a liquid ingredient of the gas-generating compound, a tube communicating therewith, a cartridge containing a solid ingredient of the gas-generating compound arranged in the tube, a spring engaging the cartridge and tending to expel it, and means for resisting its expulsion, substantially as set forth.

9. In an apparatus for generating gas, the combination of a chamber adapted to contain a liquid ingredient of the gas-generating compound, a tube communicating therewith, a cartridge containing a solid ingredient of the gas-generating compound arranged in the tube, a spring engaging the cartridge and tending to expel it, and means surrounding the cartridge and preventing the liquid from entering its containing tube, substantially as set forth.

10. In an apparatus for generating gas, the combination of a chamber adapted to contain a liquid ingredient of the gas-generating compound, a tube communicating therewith, a cartridge containing a solid ingredient of the gas-generating compound arranged in the tube, a spring engaging the cartridge and tending to expel it, and a reticulated diaphragm against which the end of the cartridge bears, substantially as set forth.

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Witnesses:

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