

(No Model.)

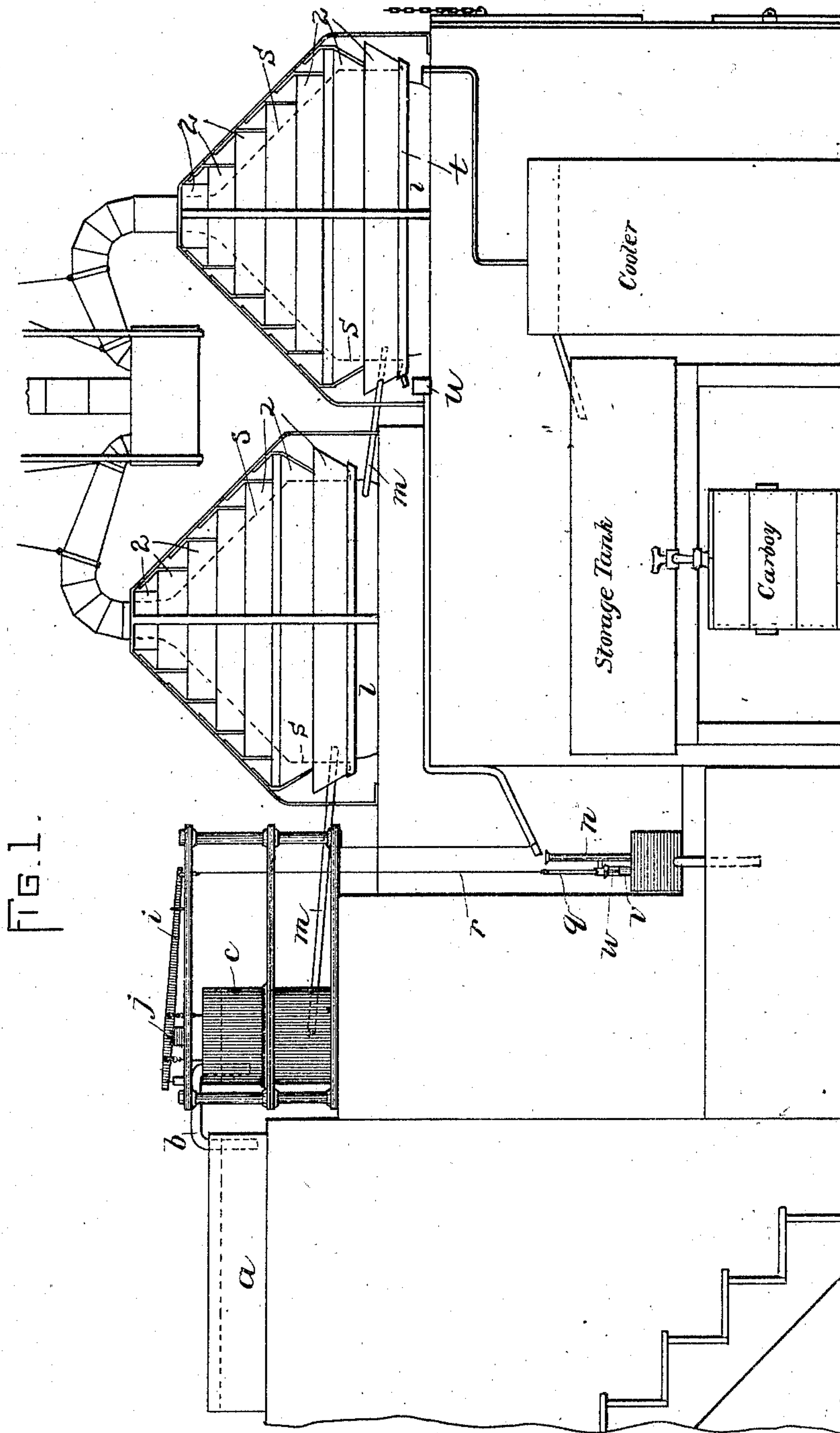
3 Sheets—Sheet 1.

H. HOWARD.

METHOD OF AND APPARATUS FOR CONCENTRATING SULPHURIC ACID.

No. 509,664.

Patented Nov. 28, 1893.



WITNESSES:

H. A. Hall.  
H. M. Whipple

INVENTOR:

by Henry Howard.  
Wm. Brown Crossley.  
Attor.

(No Model.)

3 Sheets—Sheet 2

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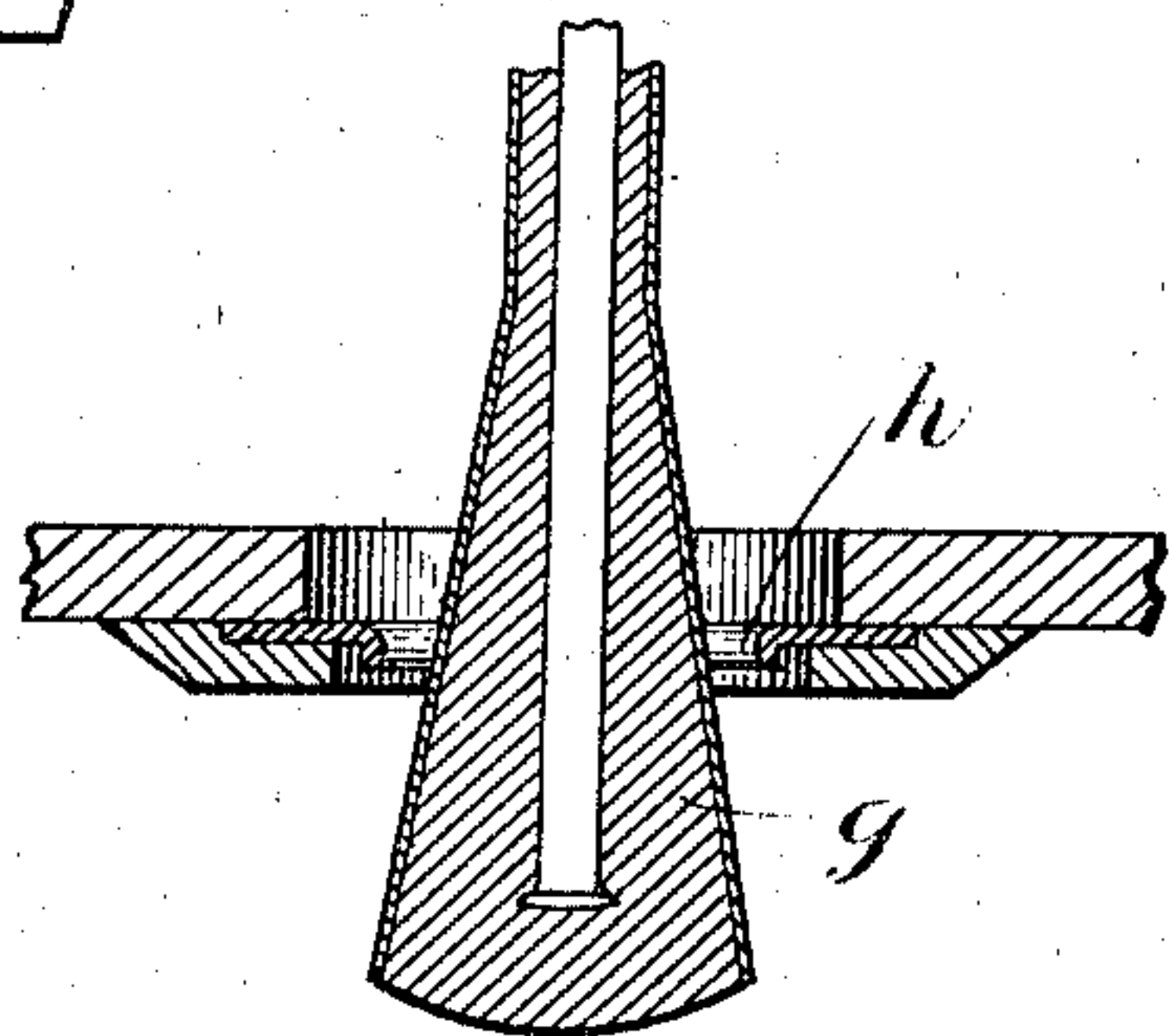
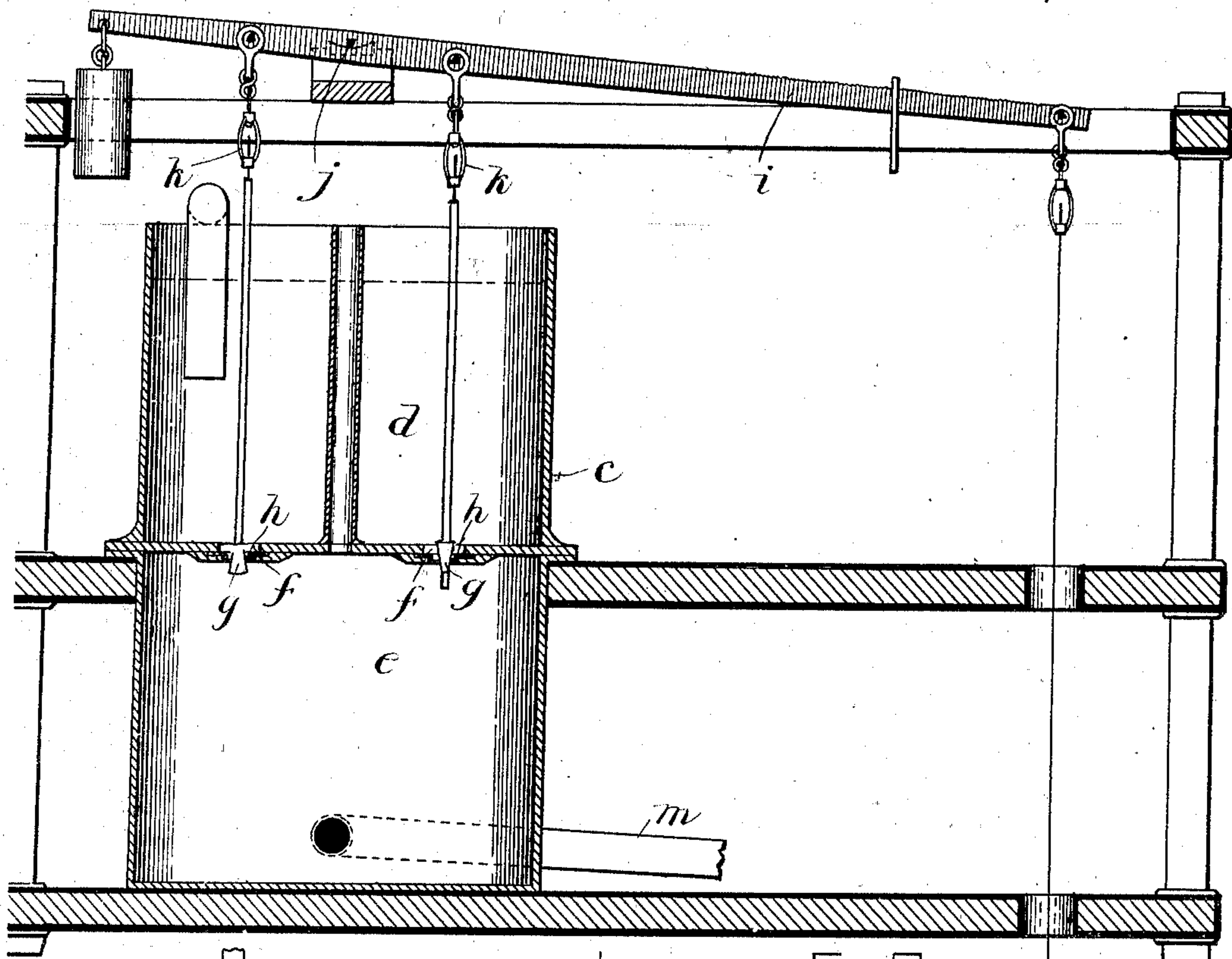


FIG. 4.

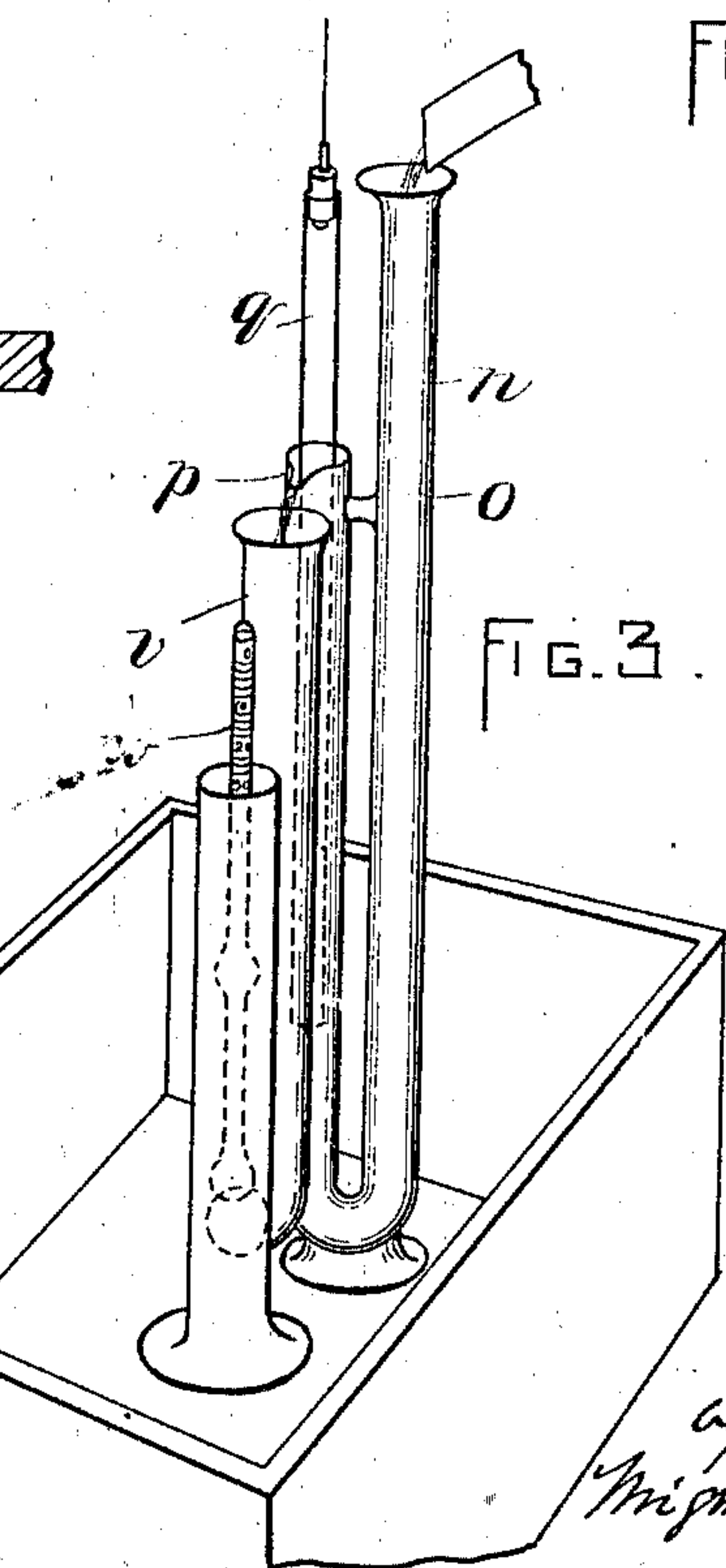
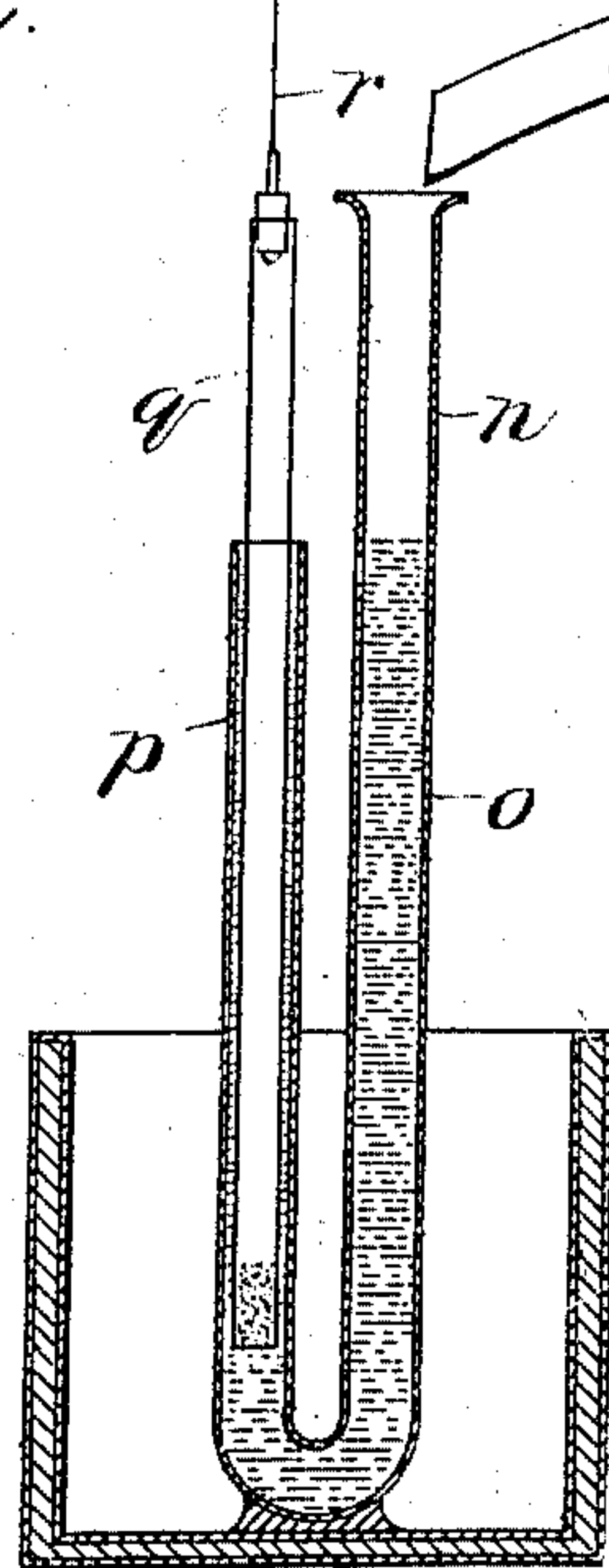


FIG. 3.



INVENTOR:

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T. M. Whipple

by Henry Howard  
Mighty Power Company.  
Atty.

(No Model.)

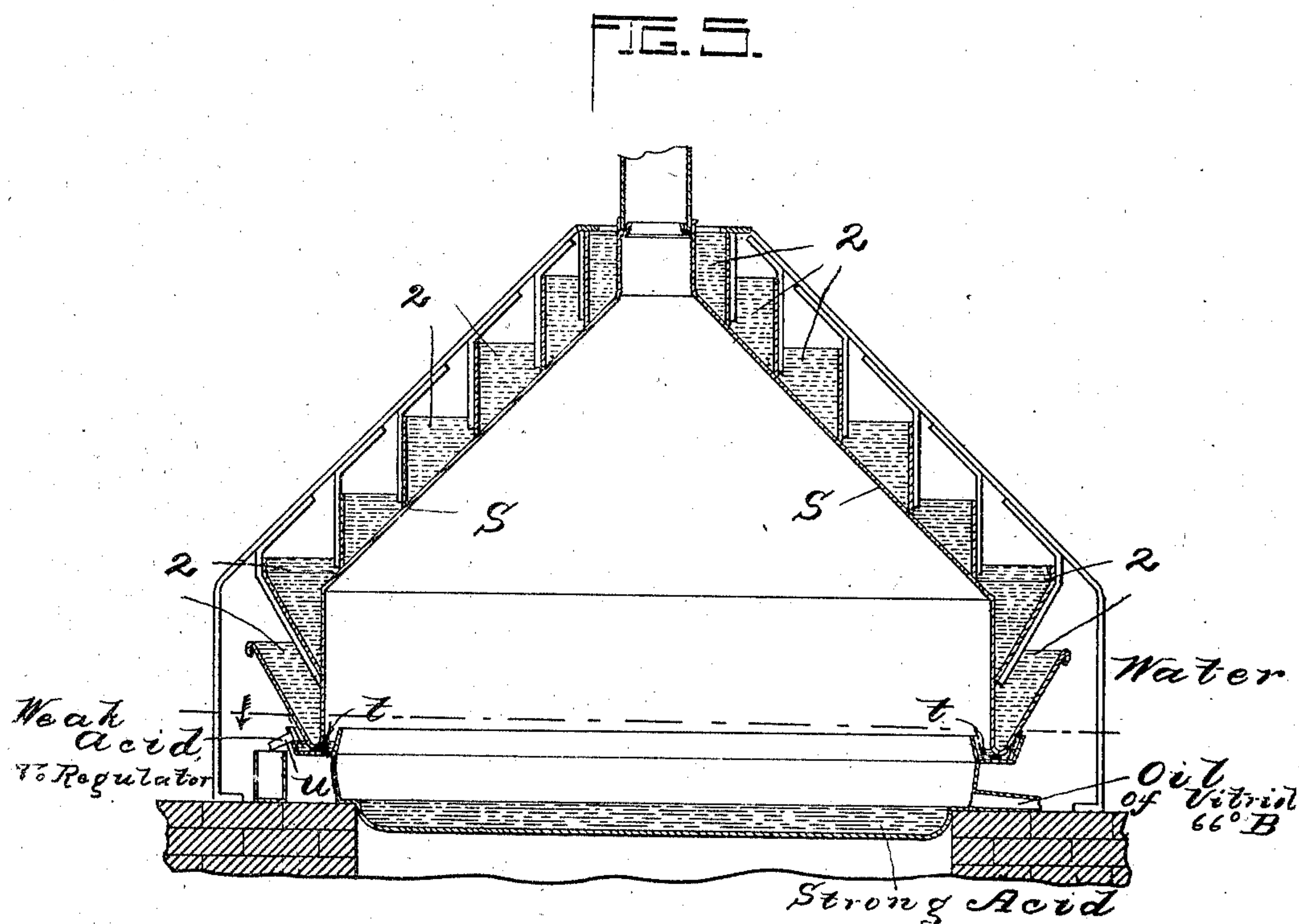
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H. A. Hall.  
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INVENTOR.

by Henry Howard,  
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Attys.



# UNITED STATES PATENT OFFICE.

HENRY HOWARD, OF BROOKLINE, MASSACHUSETTS.

METHOD OF AND APPARATUS FOR CONCENTRATING SULPHURIC ACID.

SPECIFICATION forming part of Letters Patent No. 509,664, dated November 28, 1893.

Application filed December 2, 1892. Serial No. 453,863. (No model.)

*To all whom it may concern:*

Be it known that I, HENRY HOWARD, of Longwood, Brookline, in the county of Norfolk and State of Massachusetts, have invented certain new and useful Improvements in Methods of and Apparatus for Concentrating Sulphuric Acid, of which the following is a specification.

It is the object of this invention to provide a method or process and means whereby a product of absolutely uniform strength in the concentration of sulfuric acid may be secured.

In carrying out my invention I make use of the varying density of the distillate or condensed vapor, or such portion thereof as can readily be collected and employed from the finishing still, to regulate the flow of acid from the lead pans or other vessels to the finishing stills.

The invention consists in the art of automatically regulating the flow of sulfuric acid through the concentrating apparatus, by the employment of the varying density of the condensed vapor or distillate, or a portion thereof, produced by the acid or other fluid in the process of concentration, whereby a product of absolutely uniform strength is obtained.

The invention also consists of an automatic regulator, for use in the concentration of sulfuric acid to oil of vitriol, comprising in its construction a supply vessel provided with a valve-controlled port through which the finishing stills or retorts are supplied, a distillate-receiving vessel provided with a conduit communicating with the finishing still through which the latter vessel may be supplied with the distillate or condensed vapor coming from the finishing still, and a float in the said distillate-receiving vessel connected with the valve in the supply vessel, whereby the varying density or specific gravity of the distillate collected in the distillate-receiving vessel may operate to vary the degree to which the ports are opened in the supply vessel, and so regulate the supply of acid to the finishing retort, all as I will now proceed to describe and claim.

Reference is to be had to the annexed drawings and to the letters and figures marked thereon forming a part of this specification, the same letters and figures designating the

same parts or features, as the case may be, wherever they occur.

Figure 1, is a side view of an apparatus 55 which may be employed in connection with, and in the carrying out of my improvements. Fig. 2, is a sectional view through the supply and distillate-receiving vessels and their adjuncts. Fig. 3, is a perspective view of the 60 distillate-receiving vessel and a gaging or registering vessel connected therewith. Fig. 4, is a sectional view, on an enlarged scale, of one of the ports and valves in the supply vessel. Fig. 5 is a vertical sectional view of the 65 body of the finishing still shown in Fig. 1, drawn to an enlarged scale.

In the drawings, *a* designates a lead pan or other vessel, from which the acid may be conducted by means of a siphon *b* to the supply 70 vessel *c*, divided by a horizontal partition into two chambers *d* and *e*, communication between which is had through ports *f f* controlled by frusto-conical valves *g g*, reversely arranged as shown. The said valves may be 75 made of lead or of any suitable substance, and may or may not be covered with platinum, or other substance, as shown.

*h h* are the valve seats, which may also be of platinum or equivalent material, which 80 valve-seats are suitably supported in the ports *f*.

The valves *g g* are connected by means of stems and other suitable devices with a lever 85 *i* balanced on a knife-edge or other means as at *j*. Turn buckles *k k* or equivalent devices may be employed for adjustably connecting the valves with the said lever. The acid is siphoned or otherwise conveyed into the upper chamber *d* so as to keep the latter at all 90 times substantially full. The said acid flows thence through the ports *f* to the chamber *e* and is supplied from the latter to the finishing stills or retorts *l l* of common form and construction, through the conduit *m*. 95

*n* is what may be termed a distillate-receiving vessel which may be constructed of any suitable substance and in any suitable form. As herein shown it consists of a U-shaped tube, to one arm or member *o* of which, the 100 distillate or fluid is supplied from the finishing stills, and in the other arm or member *p* of which is arranged a float *q* connected by a suitable wire *r*, with the outer end of the le-



ver *z*. It will now be seen that as the density of the fluid or distillate in the distillate-receiving vessel is increased in density or specific gravity, the float *q* will be raised accordingly, and the valves *g* will be operated through the medium of the lever *i* to open the ports *f* to an extent corresponding to the degree of density of the distillate, and as the density of the said distillate is lowered the said ports will be in like manner, and through the same means, correspondingly closed; and in this way the finishing stills or retorts will be supplied so as to keep the product at a uniform degree of density.

The invention may be employed in connection with any known form of still, but as platinum stills are the more commonly used, I have chosen to represent my invention in connection therewith, and to show the regulator as located between the lead pans *a* (which always have a good supply of acid in them) and the still *z*.

This still in which there is nothing new comprises in its construction a jacket or dome *s* down over the outside of which water is caused to flow to cool the jacket, the water being collected in the uppermost of the annular troughs *2* and overflowing therefrom to the next trough below, being finally led or drawn off from the bottom trough in the usual way.

*t* is a liquid seal arranged below the bottom annular trough *2*, into which the distillate which collects on the interior surface of the dome *s* runs, the said distillate being guided by adhesion down the interior surface of the dome into the lute. In stills of this kind as a matter of convenience, I may make use of that portion only of the distillate which condenses on the water-jacket dome *s* (shown in dotted lines in Fig. 1), and runs down into the liquid seal *t* of the still, from whence it is conducted through the conduit *u* to the arm *o* of the distillate-receiving vessel. In cases where a platinum cover to the still is used the distillate from the condenser may be employed, it being a matter of no importance to my invention from whence the distillate is collected or whether all or a portion only of the same is employed. The distillate in any case is an exceedingly delicate indicator of the strength of the oil of vitriol in the still, since a variation of .01° Baumé in the strength of the acid would at once produce a change of 10° to 15° Baumé in the strength of the distillate. If desired, the

overflow from the distillate-receiving vessel may be received into a vessel *v* provided with an indicator *w* to show the density or specific gravity of the distillate.

I do not confine my invention to use in connection with the process of and means for concentrating sulfuric acid to oil of vitriol, since it is obvious that it may be employed in connection with other concentrating or distilling operations; nor do I confine myself to the form and arrangement of devices shown, since these may be changed to suit circumstances.

Having thus explained the nature of the invention and described a way of constructing and using the same, though without attempting to set forth all of the forms in which it may be made or all of the modes of its use, it is declared that what is claimed is—

1. The art of automatically regulating the flow of sulfuric acid through the concentrating apparatus, consisting in collecting the whole or a portion of the condensed vapor or distillate and conveying the same to a point where it may operate upon the means for controlling the flow of the sulfuric acid or other fluid in process of concentration and causing it to act through variations in its specific gravity upon said means whereby a product of uniform strength is obtained.

2. An automatic regulator for use in the concentration of sulfuric acid, comprising in its construction a valve for governing the supply to the still, controlling devices for actuating the said valve, means for collecting the distillate and conveying the same to a point where it may be adapted to act upon the said valve-controlling devices, as set forth.

3. An automatic regulator for use in the concentration of sulfuric acid, comprising in its construction a supply vessel provided with a valve-controlled port for supplying the concentrating apparatus, a distillate-receiving vessel, a conduit communicating between the latter vessel and the concentrating apparatus, and a float in the distillate-receiving vessel connected with the valve in the supply vessel to regulate and control the said valves.

In testimony whereof I have signed my name to this specification, in the presence of two subscribing witnesses, this 19th day of November, A. D. 1892.

HENRY HOWARD.

Witnesses:

ARTHUR W. CROSSLEY,  
F. M. WHIPPLE.