2 Sheets--Sheet 1.

C. C. GLOVER.

Carbonic-Acid Gas-Generator.

No. 164,163. Patented June 8, 1875.

Fig: 1

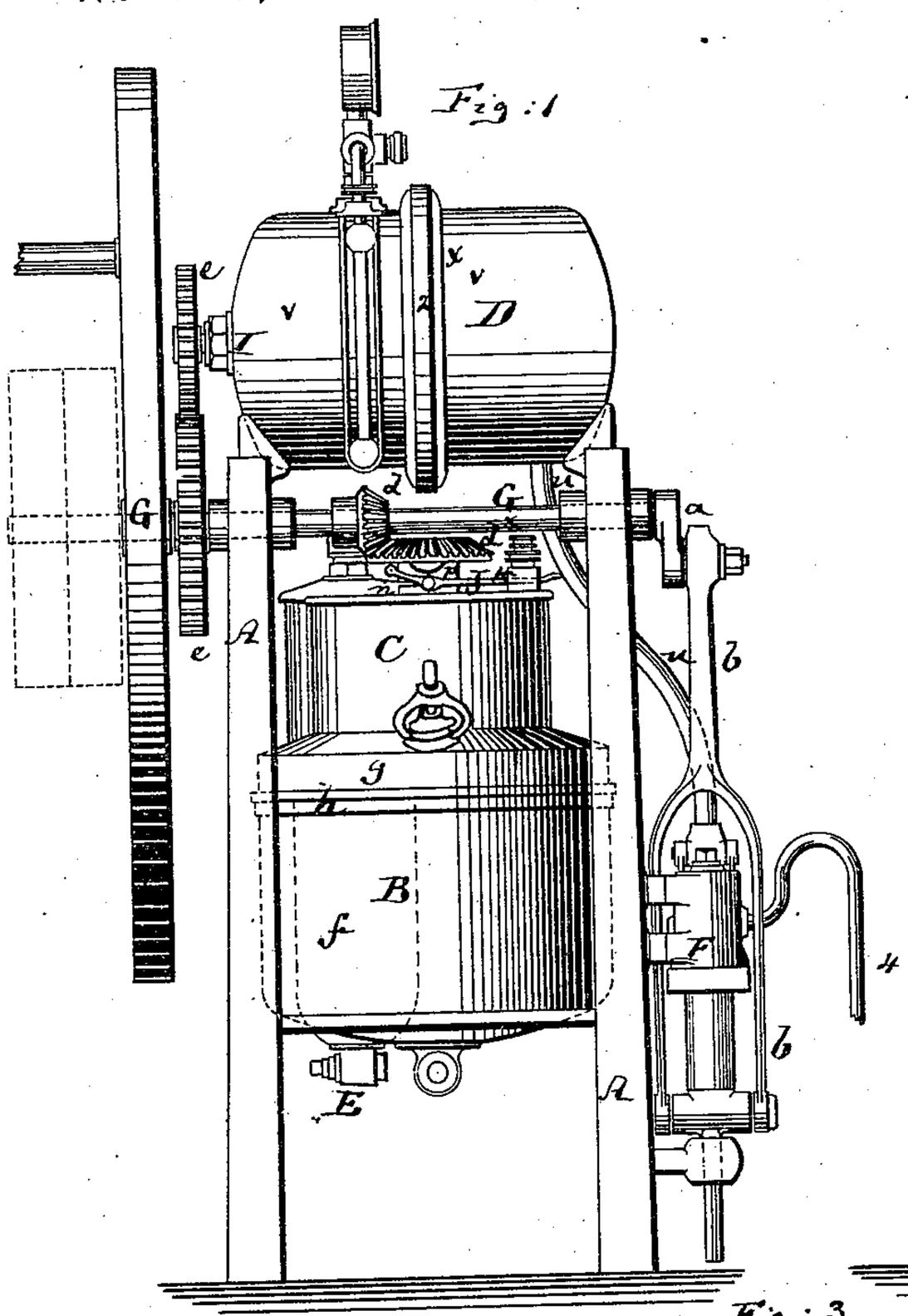


Fig: 2

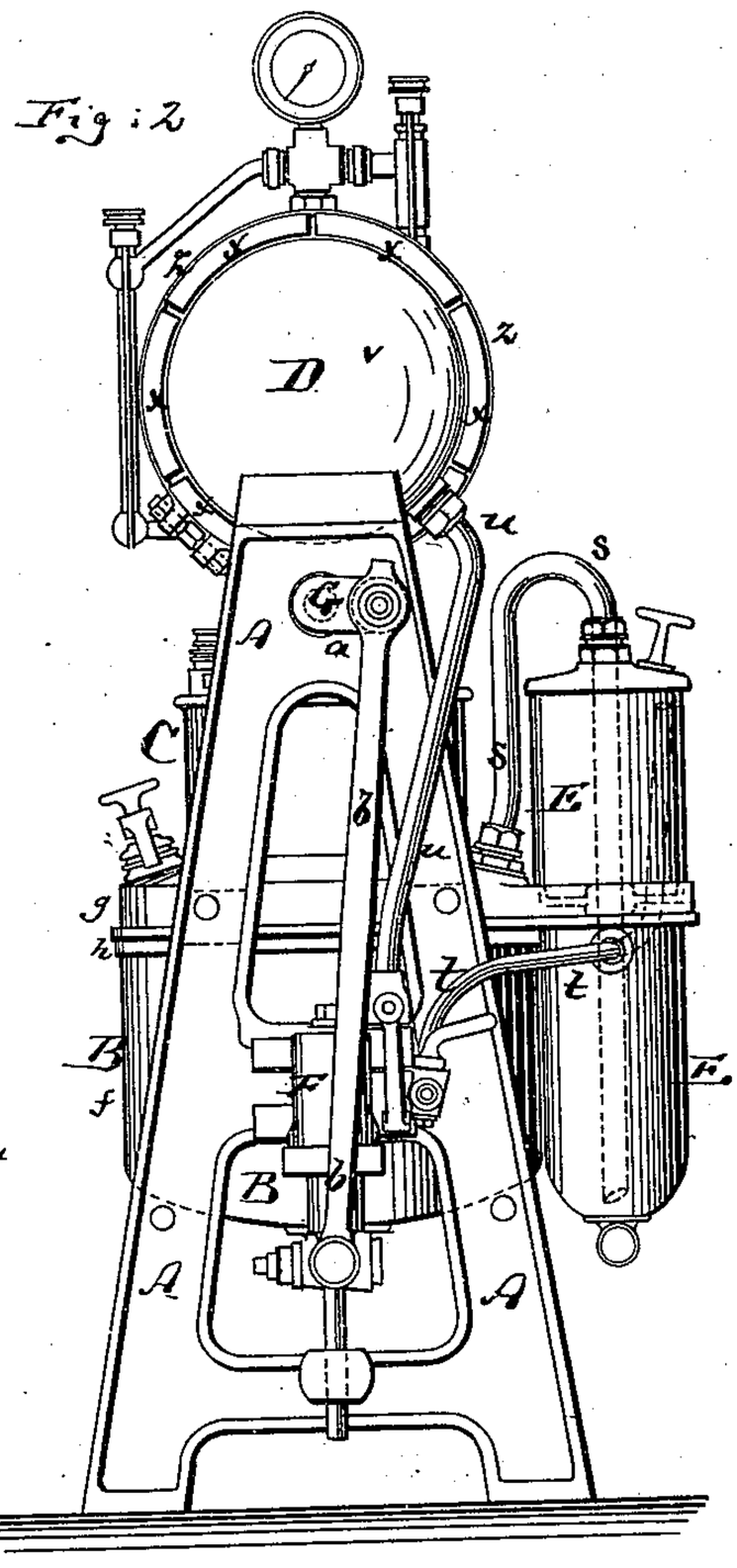


Fig: 4

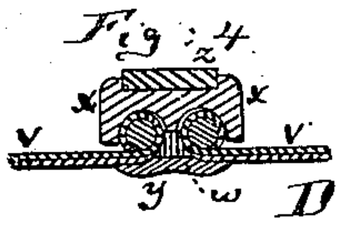


Fig: 3

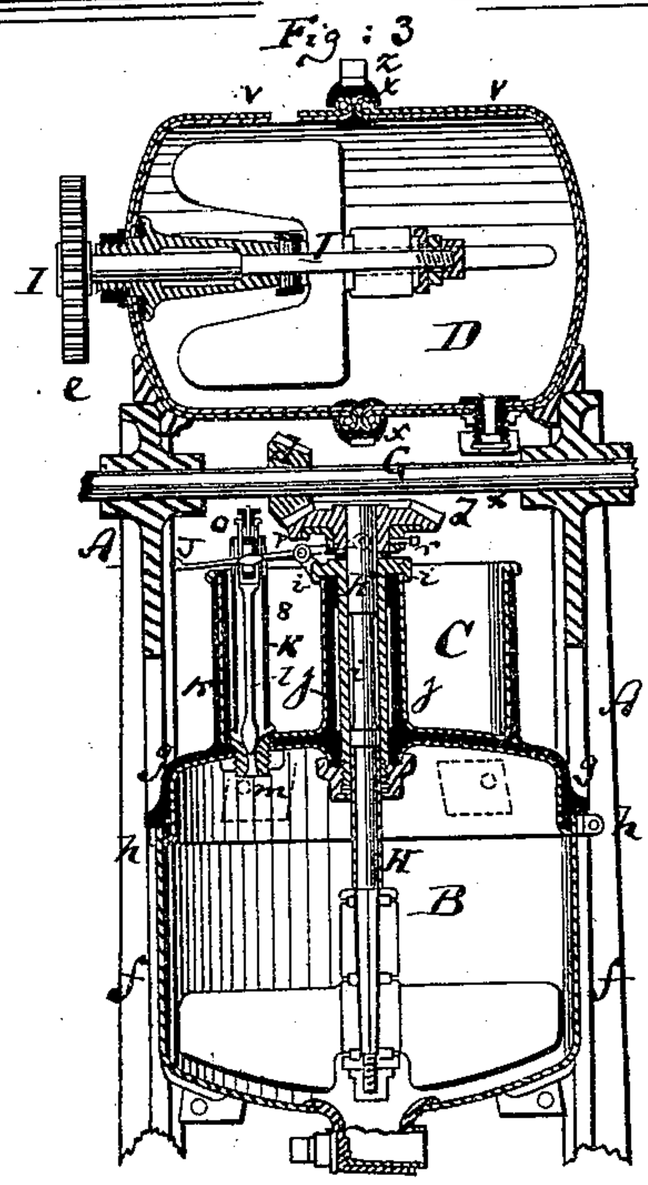
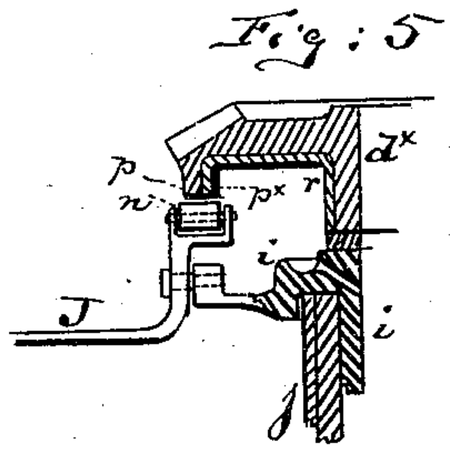


Fig: 5



Witnesses:

A. Moraga.

E. C. Abbot

Inventor:

Chas. C. Glover

by his attorney

A. V. Briesen

THE GRAPHIC CO. PHOTO-LITH. 39 & 41 PARK PLACE, N.Y.

2 Sheets--Sheet 2.

C. C. GLOVER.

Carbonic-Acid Gas-Generator.

No. 164,163. Patented June 8, 1875.

Fig: 8

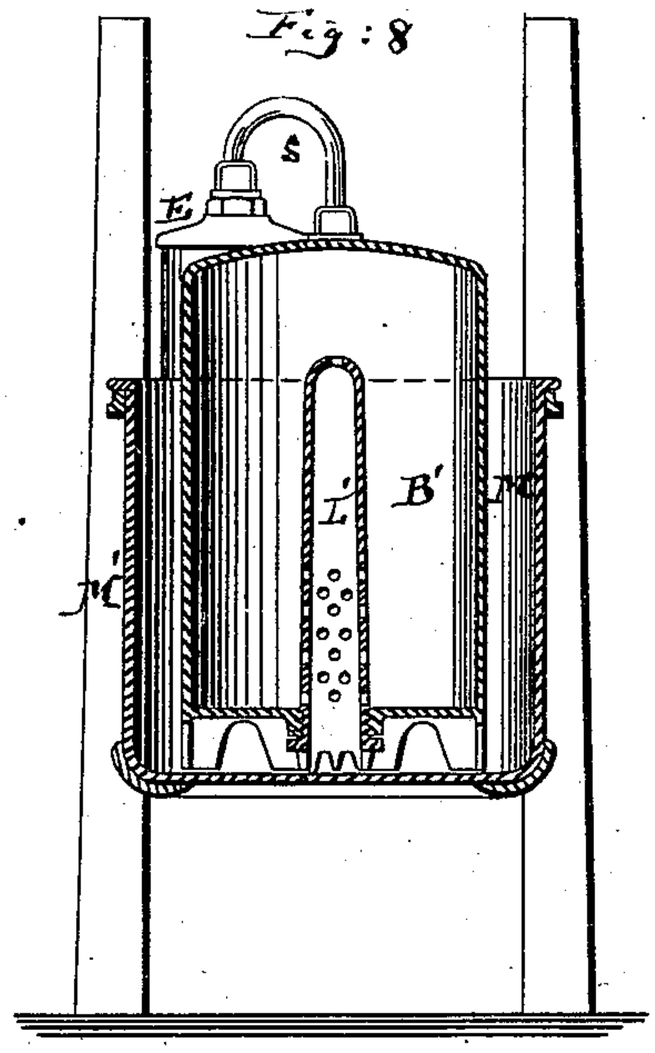


Fig: 7

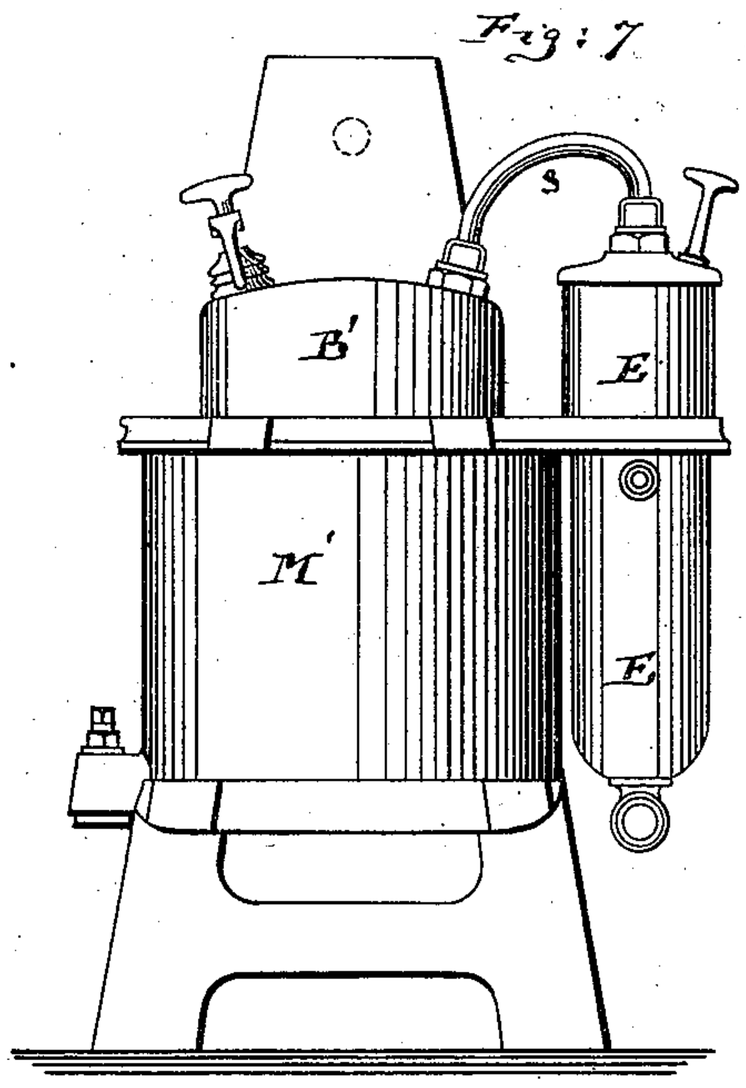


Fig: 6

Witnesses:

A. Moraga.

E. L. Wolf

Inventor:

Chas. C. Glover

by his attorney

A. V. Briesen

UNITED STATES PATENT OFFICE.

CHARLES C. GLOVER, OF NEW YORK, N. Y.

IMPROVEMENT IN CARBONIC-ACID-GAS GENERATORS.

Specification forming part of Letters Patent No. **164,163**, dated June 8, 1875; application filed April 19, 1875.

To all whom it may concern:

Be it known that I, CHARLES C. GLOVER, of the city, county, and State of New York, have invented a new and Improved Apparatus for Automatically Generating Carbonic-Acid Gas, and Charging Liquids and other Substances with the same, of which the following is a specification:

Figure 1 is a side elevation of my improved apparatus; Fig. 2, an end elevation of the same; Fig. 3, a vertical transverse section thereof; Fig. 4, a detail vertical section through the joint of the receiving-vessel; Fig. 5, a detail sectional view of my adjustable cam mechanism for regulating the escape of the acid. Fig. 6 is a perspective view of the apparatus; Fig. 7, a side view of a modification of the generating-vessel, and Fig. 8 a vertical central section of said modification.

Similar letters of reference indicate corresponding parts in all the figures.

The object of this invention is to produce a compact, inexpensive, and safe apparatus for producing carbonic-acid gas, and charging soda-water, sparkling wines, and other liquids, or even semi-liquids, with the same.

The devices heretofore in use for the same purpose are mostly cumbersome, being usually made in three or more distinct parts, all more or less independent of each other, and requiring a large quantity of connecting-pipe, many valves, cocks, and other devices that are liable to get out of order. Yet these devices are more or less unsafe, many lives being annually lost or put in jeopardy in the United States by the explosion of such gas-generators. The principal cause of explosion is the accumulation of gas in the generator, which I in my new apparatus entirely avoid by so arranging the parts that the gas in the generator will only be created when there is a vacuum in the same vessel—that is to say, I interpose the pump between the generator and the receiver, so it will act by suction on the generator, and by force on the receiver; whereas, in the old apparatus, the receiver was usually placed between the generator and the pump, which would prevent the latter from directly affecting the contents of the generator.

My invention, aside from the general arrangement of parts above alluded to, also consists in the novel mechanism for automatically regulating the discharge of sulphuric acid into the generator, such mechanism being arranged to not only regulate the quantity of acid discharged in conformity with the chemical properties of the carbonate in the generator, but also to absolutely prevent any acid from reaching the generator, if, from any cause, the pressure of gas in the latter should exceed a certain prescribed degree.

My invention also consists in other details of mechanism and combination of parts, as hereinafter more fully described.

In the accompanying drawings, the letter A represents the frame of my improved generator, carrying, as the principal vessel, the generating-cylinder B, upon which the acid-receptacle C is mounted, as shown. The frame also supports the receiver or impregnator D, the purifier and washer E, and the pump F. But any one or more of these parts B, C, D, E, and F, or either of them, may be supported separately if desired, though for compactness their application to the same frame A in the manner indicated in the drawing renders the apparatus far superior to a more expanded system.

G is a horizontal driving-shaft, hung in the frame A, and connected by a crank, *a*, at one end with the pump-rod *b*, so that the rotation of the shaft G, imparted to the same by suitable means, will cause the pump to be operated. By means of bevel-gear wheels *d d** the shaft G also imparts rotary motion to a vertical shaft, H, which extends through the vessel C into the generator B, for purposes hereinafter more fully specified. By cog-wheels *e e* the shaft G also imparts rotary motion to a stirrer-shaft, I, hung in the receiver D.

The generator B is made, by preference, in two parts, as indicated in Fig. 3, the lower part *f*, which is the main vessel, being made of lead or other suitable material, while the upper part *g* is made of cast-iron or other proper material, lined on the inner side with lead, enamel, or other substance. A ring, *h*, is placed around the upper part of the portion *f*, where the same overlaps the lower portion of *g*, and is tightened by means of a screw or

bolt to produce a tight joint, all as indicated in Fig. 3. Upon the generator B is supported, and by preference made in one piece with the same, a cylindrical or other shaped upright receptacle, C, which is intended to contain the sulphuric acid used in the production of the gas. This vessel C is also, on the inner side, lined with lead, or other proper substance capable of withstanding the attacks of the acid. The shaft H has secured to its upper end the bevel-wheel *d**, which supports it on a flanged bushing, *i*, that rests on a central tubular extension, *j*, of the upper part *g* of the gas-generator, said extension *j* reaching through the center of the acid-receptacle C, as clearly shown in Fig. 3. The bushing *i* laps around the top of the tubular extension *j*, and is properly closed by a nut at the lower end around the shaft H, as shown, and a washer is interposed between the upper end of the bushing *i* and the lower supporting-surface of the wheel *d**. In the upper edge of the bushing is formed an oil-channel, with proper openings toward the shaft H, so that proper lubrication can be obtained. By this manner of supporting, or rather suspending, the shaft H, I dispense with the necessity of using a step at the lower end thereof, and with the friction which would thereby be created in the generator. As heretofore made, the stirrer-shafts in gas-generators invariably enter some step or bearing in that part of the vessel which is filled, or partly filled, with the marble-dust or other carbonate, and such dust, entering such step or bearing, will soon seriously interfere with the operation of the parts. By my arrangement I dispense with a lower support of the shaft, suspending it entirely from the top, and there will, consequently, be no danger of marble-dust interfering in any way with the operation of such shaft and stirrers. Suitable projecting stirrer-blades are attached to the lower part of the shaft H within the generator B, as clearly indicated in Fig. 3. A tube, K, projects from the top of the generator B upward through the said receptacle C, and contains within it a rod, *l*, which, at its lower end, is formed into a valve or stopple for closing an orifice, *m*, that leads from the generator into the tube K. The sulphuric acid which is contained in the receptacle C will find its way into the tube K through small holes in the lower part of said tube, but will be prevented from entering the generator by the valve or rod *l* closing the orifice *m*. As soon, however, as the rod *l* is elevated, the acid can escape from C into B. This elevation of the rod *l* I produce by automatic process and regulating apparatus, and thereby dispense with the special handling of the valve controlling such discharge, which handling has heretofore always been necessary. Said regulating apparatus consists of a lever, J, which is pivoted to a bracket projecting from the bushing *i*, or to any other stationary part of the apparatus, and it has a friction-roller, *n*, on its inner end, while its outer part passes through the slotted or forked upper part of the rod *l*, and through a slotted yoke or pin, *o*, that is connected by a screw with the upper part of the rod *l*. The lower face of the bevel-wheel *d** is formed into a cam, *p*, which, during the rotation of the bevel-wheel, depresses the friction-roller *n*, and thereby vibrates the lever J on its pivot, and raises the rod *l*. Thus, once during every rotation of the shaft H, or more, if necessary, the lever J is vibrated and the rod *l* raised to allow the escape of acid into the generator.

Two provisions have, however, yet to be made for adjusting the mechanism which is described, the first being to adapt the automatic motion of the valve *l* to the varying qualities of the carbonate which is put into the vessel B. For, in some cases, it requires more, in other cases less, sulphuric acid to produce the gas which the substance within the generator is capable of yielding, and therefore in some cases the valve *l* must be raised for a longer period to discharge more of the acid into the generator, while, in other cases, it should be raised for a shorter period to discharge a less quantity of the acid. And again, at times, it may be desirable to raise the valve *l* twice during each rotation of the shaft H, at other times to raise it but once, &c., all of which can be done by the use of an adjustable sleeve, *r*, which is put around the hub of the bevel-wheel *d**, that is mounted upon the shaft H′, and which sleeve *r* carries, directly along the inner face of the cam *p*, a similar cam, *p**, as is more clearly indicated in Fig. 5. The friction-roller *n* on the lever J is long enough to extend beneath both cam-edges *p* and *p**; and it is clear, therefore, that, by turning the sleeve *r* on the wheel *d**, so as to bring the cam *p** directly against the inner face of the cam *p*, the rod *l* will be raised for a shorter period than if the cam *p** is set to virtually continue the cam-edge of the apparatus. In fact, the sleeve *r* may be turned on *d** to give to the cam-edge the greatest possible length, or even to produce two cams on opposite sides of the shaft H. In whatever position it is desired to have the sleeve *r*, the same may be locked to the hub of the wheel *d** by a suitable set-screw. By a little screw, which supports the yoke *o* in the upper part of the rod *l*, the stroke of the rod *l* can be regulated, whereby, also, the quantity of acid discharged into the generator is controlled.

The second point of protection to be provided is to guard against the accumulation of too much gas within the generator. This is done by preventing any sulphuric acid from entering the generator as long as a surplus-age of pressure of gas is in the latter—that is to say, whenever the valve *l* is raised, and there is at the same time a pressure of gas in the generator, such gas will enter the tube K through the orifice *m*, and will, by its ascent, crowd the sulphuric acid back into its receptacle C, the gas itself entering the tube K

and escaping through apertures 8, which are formed in the upper part of the tube K. The gas thus prevents the acid from entering the generator during the time the valve *l* is elevated. Not until the pressure within the generator has decreased can acid again enter the same to affect the carbonate therein and cause the production of more gas, and so on.

The generator is, of course, provided with a suitable man-hole, through which it can be charged, and has at its lower part an opening, closed by well-fitting valves, through which it can be emptied and cleaned.

A pipe, *s*, connects the generator B with the purifying and washing vessel E, which is partly filled with water or other liquid, and which, at or near its middle, has a perforated diaphragm, as indicated by dotted lines in Fig. 2. The pipe *s* enters the upper part of the purifying-vessel, but reaches down nearly to the bottom of the same, so that all the gas which passes through said pipe from the generator must enter the water contained in the vessel E, and finally bubbles up through the water into the upper part of the said vessel. The vessel E connects by a pipe, *t*, with the pump F, which pump, by its operation, draws the gas as quick as it is created in the generator out of the same, and forces it, together with the liquid to be aerated, through a pipe, *u*, into the receiver D. By thus interposing the pump between the generator B and the receiver D, I cause the same to create, or at least attempt, a vacuum in the generator, and thereby facilitate the entry of the sulphuric acid, the production of gas, and also the safety of the entire process and apparatus.

The receiving-vessel D receives the liquid or substance to be charged with the gas from the pump, and is made of two half-shells, *v v*, which are formed of sheet metal or other suitable material, lined on the inner side with block-tin, silver, or enamel. These two shells have their edges rolled outward around wires, as indicated in Fig. 4, and between these rolled edges is interposed a ring of rubber, *w*. A sectional metal ring, *x*, double grooved along its inner edge, embraces and clasps the rolled edges of the two shells *v v*, and an inner ring, *y*, is inserted within the receiver D, to close the joint of its two shells from within. The rubber *w* is thus confined between four surfaces—that is to say, between the rolled edges of the shells *v v*, and also between the outer ring *x* and the inner ring *y*. The outer ring *x* is, as I have already stated, made in sections, and the several sections composing it are held in place and clamped together by a band or strap, *z*, which is placed around them, as shown, and which is closed at its ends by a screw or bolt. This band or strap *z* enters a groove in the outer face of the sectional ring *x*.

By means of this joint construction I am enabled to firmly hold the two parts of the vessel D together, and, at the same time, to separate them for cleaning purposes whenever required.

The stirrer-shaft I within the receiver D is also supported only at one end, and properly packed to prevent the escape of the liquid through its bearings. It carries a series of blades within the vessel for agitating the contents, and causing the proper distribution of the gas.

From the vessel D the charged liquid or substance is withdrawn into suitable bottles, casks, fountains or other receptacles.

A modification of the generator B is represented in Figs. 7 and 8, in which the sulphuric-acid tank C and the stirrer H are dispensed with. The receiver B′, in this case, has its lower part inserted in a larger vessel, M′, and contains within its center an upwardly-projecting perforated tube, L′, which tube is open at its lower end, and in communication with the contents of the embracing-vessel M′.

The carbonate is placed into the receiver B′, through a suitable man-hole, so as to surround the tube L′, and, after the receiver has been closed air-tight at the top, the diluted sulphuric acid is poured into the embracing-vessel M′, in such a way that it cannot enter into contact with the carbonate contained within the vessel B′. As soon as the pump commences to operate by exhausting through the pipe *s* the sulphuric acid will be gradually drawn through the perforated tube L′ into the receiver, and into consequent contact with vessel B′, and with the carbonate therein contained, and the gas created as rapidly as the suction of the pump permits.

This modification is desirable in many cases where simplicity of construction and the possibility of dispensing with the agitator are desired; and it is particularly useful to druggists and chemists, as it will serve, even in diminutive test apparatus, to prepare carbonic-acid gas perfectly pure and free from foreign substances.

The pump F draws the liquid to be aerated by a pipe, 4, from a suitable vessel, and forces it with the gas into the receiver.

I claim as my invention—

1. In an apparatus for generating and charging carbonic-acid gas, the pump F, interposed between the generator B and the receiver D, to act by suction on the generator, and by force on the receiver, substantially as specified.

2. The combination of the valve *l* with the actuating-lever J, and with the cam *p* on the wheel *d**, substantially as specified.

3. The adjustable sleeve *r*, carrying the cam *p**, combined with, and applied to, the wheel *p**, which carries the cam *p*, all arranged to permit the lengthening and shortening of the cam *p*, substantially as specified.

4. The combination of the generator B and perforated tube K with the sulphuric-acid vessel C and the valve *l*, all arranged to prevent the discharge of acid into the generator

in case of undue pressure within the latter, substantially as described.

5. The stirrer-shaft H, supported by a cog-wheel, *d**, at its upper end on the flanged bushing *i*, which rests on the tube-extension *j*, so that the said shaft is suspended into the generator without having a step or bearing therein, substantially as set forth.

6. The generator B, pipe *s*, washer E, pipe *t*, pump F, and receiver D, all combined and arranged, with respect to one another, substantially as herein shown and described.

CH. C. GLOVER.

Witnesses:
E. C. WEBB,
A. V. BRIESEN.