

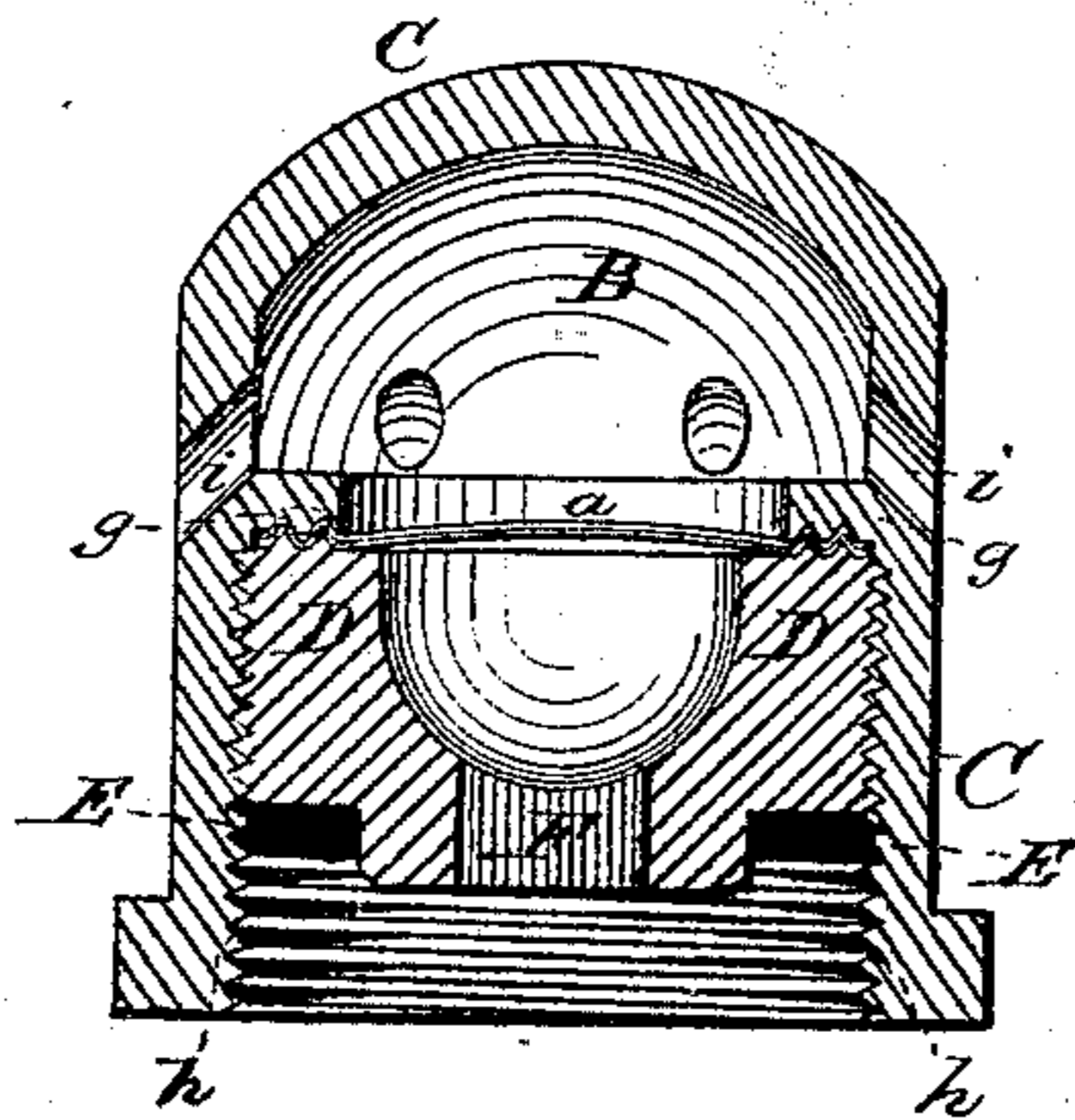
**J. MATTHEWS.**

# Caps to Prevent the Bursting of Carbonic Acid and other Vessels.

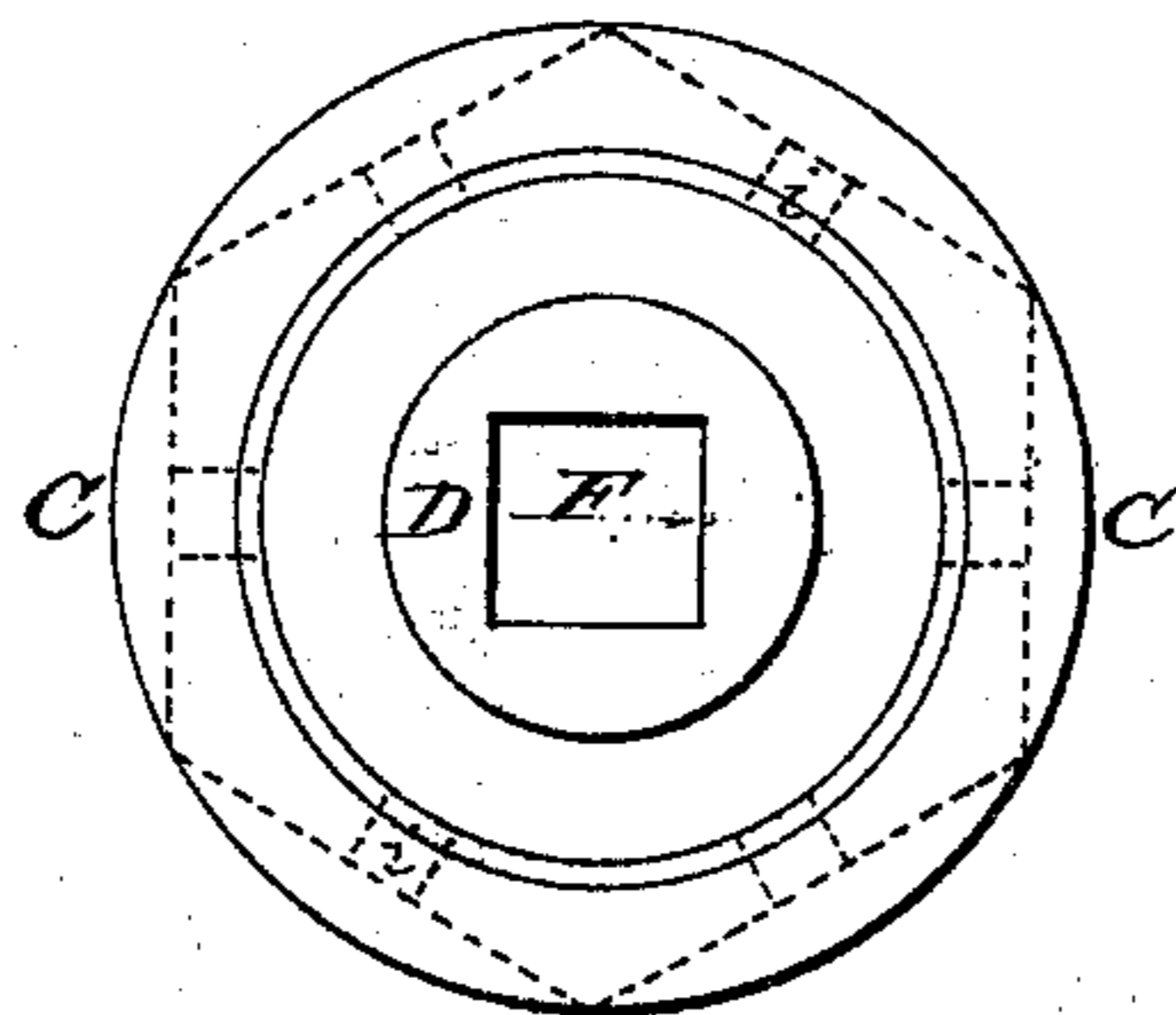
No. 138,171.

Patented April 22, 1873.

Fig. 1



*Fig. 2.*



Witnesses:

G. H. Sloan.

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John Matthews

# UNITED STATES PATENT OFFICE.

JOHN MATTHEWS, OF NEW YORK, N. Y.

## IMPROVEMENT IN CAPS TO PREVENT THE BURSTING OF CARBONIC-ACID AND OTHER VESSELS.

Specification forming part of Letters Patent No. 138,171, dated April 22, 1873; application filed April 18, 1873.

*To all whom it may concern:*

Be it known that I, JOHN MATTHEWS, of the city, county, and State of New York, have invented a new and useful Improvement in Closing-Caps for the Orifices of Vessels Containing Liquids under Pressure, the same being especially applicable to vessels in which carbonic acid is generated, and which may be applied to many other vessels containing liquids or gases, or liquids charged with gases, in which both the temperature and the pressure vary. It may therefore be applied to stills, steam-generators, chemical apparatus, and such other like apparatus, when it is required to prevent the rupture of the vessel by undue pressure, by providing a weaker part, which will give way at a nearly constant and uniform pressure under varying degrees of temperature. The invention, therefore, consists of a cap possessing the double function of closing the charging bung or orifice of carbonic-acid generators or other vessels containing compressed elastic fluids, and of a metallic disk so constructed as to rupture at a uniform pressure under varying degrees of temperature, and thereby to act as a safety-valve in case of undue pressure. The invention also consists of a novel method of constructing the case in which the disk is secured; also, in a novel method of discharging the contents of such vessel when the disk is ruptured; also, of a novel method of constructing the disks to resist the corrosive action of the materials used in generating carbonic acid and other gases produced by the action of corrosive chemicals; and it further consists in an improved method of constructing the disks so as to insure the rupture at a uniform pressure at varying temperatures.

In generators for evolving carbonic acid the temperature of the apparatus is constantly raised by the union of the acid and carbonate of lime or other carbonates used to produce carbonic acid. It is therefore necessary to employ a pressure-disk so constructed as to compensate for the different temperatures of the apparatus, which varies in ordinary use from 50° to 200° of Fahrenheit. Copper, by an increase of temperature, is so much weakened that, in practice, disks made of it are not efficient, as they would rupture at high tempera-

tures at too low a pressure. Iron or steel, on the other hand, is so much strengthened by an increase of temperature above the ordinary atmospheric range that disks made of that metal will not rupture or burst at a safe pressure when the temperature is raised. There are other metals which are well known to be affected in a similar manner by variations of temperature. I therefore construct my disks of two or more metals which compensate each other for this variability or inequality of strength at different temperatures. I have found that a disk composed of Siemens' metal, or fine iron and copper, the relative thickness of which varies somewhat with the qualities of the metals used, answers the purpose perfectly well. I have found that, with the commercial metals of such quality as I have been able to obtain, the disks may be of nearly equal thickness, and that they will rupture or explode at nearly a constant pressure at the temperatures usually obtained in the ordinary case of carbonic-acid generators. I have succeeded very well in coating the iron on both sides with a cyanite solution of copper, and then depositing a smooth deposit of copper on the same in an acid solution, and then passing the sheet through rollers to insure equality of surface; or sheet-iron may be first stamped of the right size, and afterward plated with copper, testing the thickness of the disks by carefully weighing or gaging. After being coated with copper the disks may be annealed, which is found to improve them. I have also soldered the copper to the fine iron, and then rolled the sheets in the same manner as metals are frequently plated. The sheets may then be annealed. The disks are then cut out and carefully assorted by weighing or gaging, and tested and marked before being packed for use.

In generators used for chemical purposes, or for evolving acid gases or vapors, I have found that some coating was necessary to protect the disks against the corrosive action of the vapors. This may be secured by boiling them in paraffine, or by plating them with a metal not affected by the corrosive vapors, or by attaching to the disks a thin foil of a non-corrodible metal.

To insure uniformity of resistance in the

disks, a number taken indiscriminately from a lot are tested, up to the pressure at which they burst, in a suitable cap. The remainder are then tested up to within a small difference of the bursting pressure.

When thus tested the disks are somewhat concave on the side protected by foil or other coating. They are then wrapped in paper marked with the pressure which they can resist, with proper directions for use, and then placed in boxes in proper quantity for the market. The seats and vents between which the disks are to be placed are to be accurately grooved so as to fit the different disks so that each disk will fit exactly the seat for which it is intended.

The following description taken in connection with the accompanying sheet of drawing, which forms a part of this specification, will enable any one skilled in the art to make and use this invention.

Figure 1 is a vertical sectional elevation, and Fig. 2 a plan view.

The form shown is that adapted for closing the orifices of carbonic-acid generators, but may be varied to suit the various uses to which this invention is applicable.

The device is composed of a cap, C, having a screw-thread, *h*, which fits the screw on the charging-bung. *g g* is an annular seat having grooves turned in it, as shown in Fig. 1. *a* is the safety-disk resting on the seat, and secured by the internal nut D D having grooves fitting into the grooves in the seat *g g*. F is a square opening, serving the double purpose of inserting the key or wrench to screw up the nut upon the disk, and also for the passage of the gases from the vessel in case the disk is ruptured. E is a washer, preferably of lead or lead alloy, which is soldered to the nut D by sweating. B is the explosion-chamber, which serves to secure the ruptured disk and to communicate with the passages *i i*, which are inclined downward and opening on the exterior of the cap.

The following is the mode of operation: The disk *a*, as above described, made of such strength as to be ruptured by an approximately-known pressure somewhat less than

the pressure the generator is capable of sustaining with safety, is inserted in the cap C, resting on the seat *g g*. The nut D is then screwed down tightly upon the disk, as shown in the drawing. The cap is then screwed on the charging-bung of the generator, which fits the screw *h*, and tightens upon the packing E. As soon as the pressure in the generator, which also impinges upon the disk, exceeds the point of safety the disk is ruptured and the pressure is relieved by the escape into the explosion-chamber, and passes out through the canals in a downward direction, thus avoiding the scattering of the contents of the generator over the operator or neighboring objects. Upon removing the cap and unscrewing the internal nut another prepared disk can be inserted and the cap is again ready for use.

Having thus described my invention, what I claim, and desire to secure by Letters Patent of the United States, is—

1. The improved device herein described, for preventing the bursting of carbonic-acid generators and other vessels, provided with a disk composed of two or more metals so as to compensate for varying temperature, as and for the purpose set forth.

2. The combination of the cap C, nut D, and packing E, substantially as described.

3. The cap C provided with chamber B and downwardly-projecting orifices *i*.

4. The corrugated annular disk-seat formed of the hollow nut D and corrugated base *g*, as described.

5. The combination of the cap C, disk *a*, nut D, and packing E, all so as to operate substantially as set forth.

6. Compound disk made by uniting copper and iron or other metals similarly effected by heat so as to secure a uniform strength under varying degrees of temperature.

7. The disk *a*, made of iron and copper or equivalent metals, and coated so as to resist corrosive liquids and gases, as set forth.

JOHN MATTHEWS.

Witnesses:

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WILLIAM T. GOLDEN.