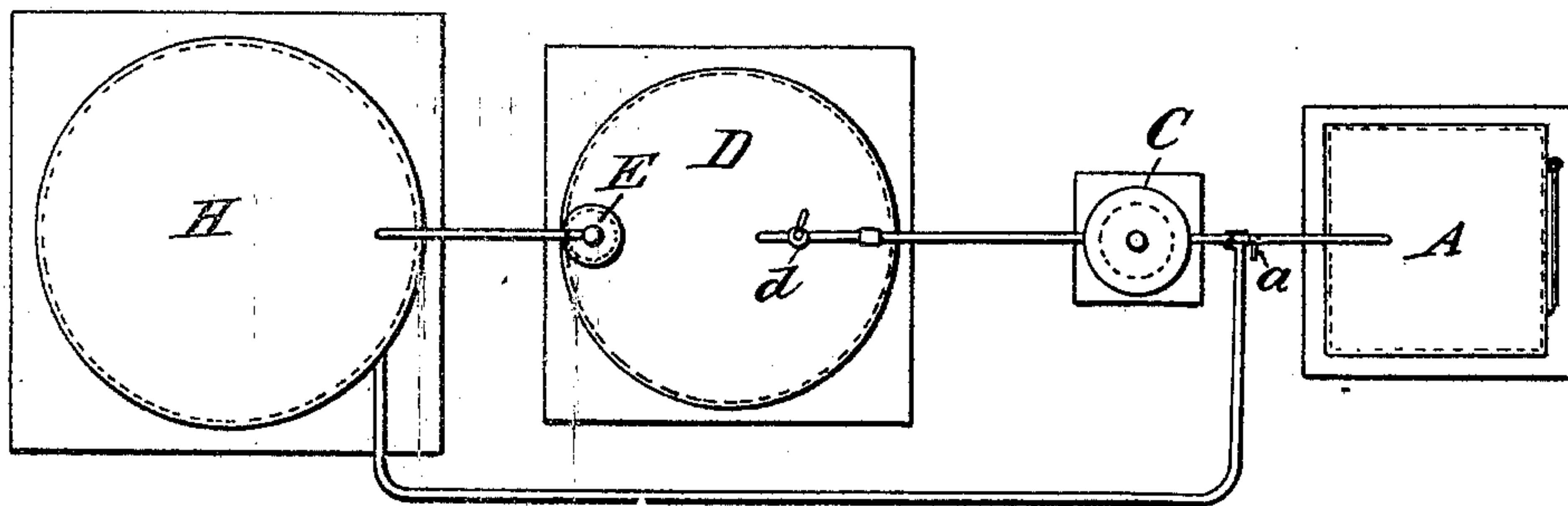
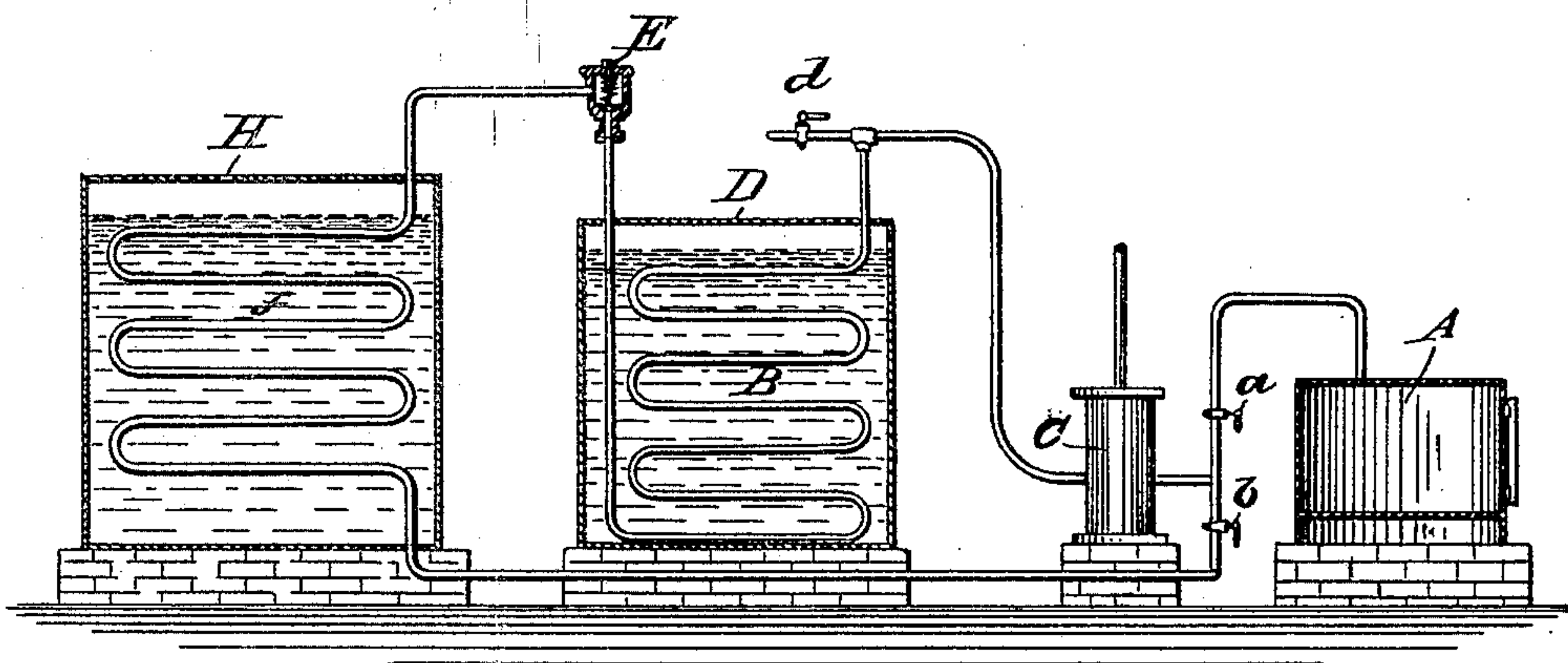


A. H. TAIT.  
Cooling Liquids.

No. 94,450.

Patented Aug. 31, 1869.



Witnesses:  
Ernest F. Haslenhuber  
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# UNITED STATES PATENT OFFICE.

A. H. TAIT, OF NEW YORK, N. Y.

## IMPROVED MODE OF COOLING AND FREEZING LIQUIDS AND OTHER SUBSTANCES.

Specification forming part of Letters Patent No. **94,450**, dated August 31, 1869; antedated August 21, 1869.

*To all whom it may concern:*

Be it known that I, A. H. TAIT, of the city, county, and State of New York, have invented a new and useful Improvement in Cooling Liquids and other Matters; and I do hereby declare the following to be a full, clear, and exact description thereof, which will enable those skilled in the art to make and use the same, reference being had to the accompanying drawings, forming part of this specification, in which drawings—

Figure 1 represents a longitudinal vertical section of the apparatus which may be used in carrying out this invention. Fig. 2 is a plan or top view thereof.

Similar letters indicate corresponding parts.

This invention is based on the property of sulphurous acid, which condenses and becomes liquid under a pressure of forty-five pounds to the square inch at a temperature of about 50° Fahrenheit, and reassumes its gaseous state as soon as the pressure is removed. In this respect sulphurous acid is similar to carbonic acid, which has been employed for cooling purposes; but the great advantage of the sulphurous acid over the carbonic acid is due to the fact that the former condenses under the moderate pressure of forty-five pounds to the square inch, while a pressure of five hundred and twenty pounds to the square inch is requisite to condense carbonic-acid gas at a temperature of 50°. On account of this dangerous pressure the process of cooling by means of carbonic-acid gas has proved to be impracticable, and after manifold experiments with other gases I have succeeded in producing a very good cooling effect by the action of sulphurous acid.

In carrying out my invention I use an apparatus such as shown in the drawings, which consists of a furnace A, in which the sulphurous-acid gas is produced by the combustion of sulphur or of pyrites. The sulphurous-acid gas evolved in the furnace A is forced by means of a pump C into a receiver B, composed of a serpentine pipe capable of sustaining a pressure of fifty pounds to the square inch and inclosed in a vessel D, which is supplied with a constant stream of cold water, so that by the combined action of the pressure and of the cold water surrounding the receiver the sulphurous-acid gas will be

condensed at a pressure of forty-five pounds or less to the square inch. Said receiver is furnished with a safety-valve E, which is so adjusted that it offers a resistance of about forty-five pounds per square inch against the escape of the sulphurous-acid gas, at which point of pressure the gas becomes liquid at the ordinary temperature. When the receiver B becomes filled with the liquid sulphurous acid, the safety-valve is raised at each stroke of the pump and the liquid sulphurous acid escapes into a serpentine pipe F, which is inclosed in a tank H, filled with liquid or other matter to be cooled. On passing into the pipe F the sulphurous acid, being relieved of the pressure, reassumes its gaseous state, and in doing so it absorbs an enormous quantity of latent heat, which heat is abstracted from the liquid or other matter surrounding the pipe F, and consequently said liquor or other matter is cooled down rapidly to a comparatively low temperature.

The sulphurous-acid gas escaping from the serpentine pipe F is returned by the action of the pump into the receiver, and on being condensed it parts with its latent heat, which is absorbed and carried off by the cold water surrounding said receiver.

While the pump C is working gas from the furnace A a large quantity of nitrogen gas (about four-fifths of the volume of air consumed in the furnace) is forced by said pump into the receiver B and must be expelled by means of the cock *d*, which is carefully opened from time to time, as the lifting of the valve E shows that the pipes B are filled up to the required pressure with gas and fluid, and the nitrogen being uppermost in a gaseous state is allowed to escape gently.

When the pipes B are filled with liquid sulphurous acid, which is known by the liquid appearing at the cock *d*, the cock *a* is closed and the cock *b* opened, so as to allow the pump to keep up a regular circulation, compressing, cooling, and expanding until the liquid or other matter surrounding the pipes H is cooled to the point required, the furnace A being thrown out of action and serving merely to renew the gas in the apparatus as the same is diminished from leakage or other similar defects.

I do not claim, broadly, as my invention pro-



ducing a cooling effect by the alternate compression and expansion of a condensable gas, but

What I claim as new, and desire to secure by Letters Patent, is—

The within-described process of cooling by the action of sulphurous acid, which is successively compressed into a liquid state,

cooled, and then allowed to expand into a gaseous state, substantially in the manner set forth.

A. H. TAIT.

Witnesses:

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