(No Model.)

W. A JOHNSTON & A. W. BROWNE.

METALLIC VESSEL FOR COMPRESSED GASES.

No. 457,158. Patented Aug. 4, 1891.

Fig. 1.

Fig. 2.

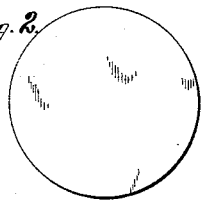


Fig. 3.

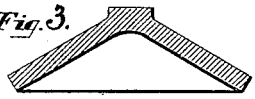


Fig. 4.

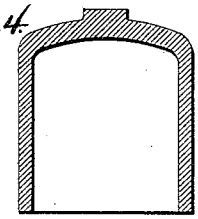


Fig. 8.

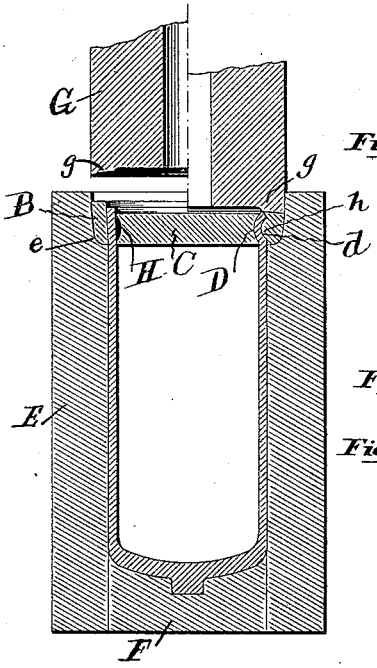


Fig. 5.

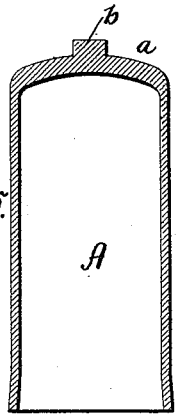


Fig. 6.

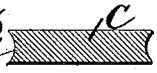


Fig. 7.

Fig. 9.

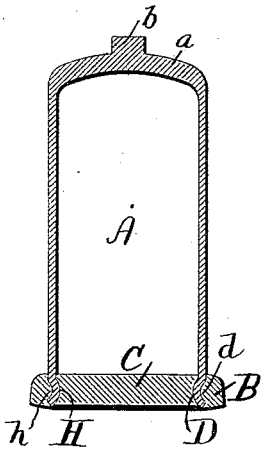


Fig. 11.

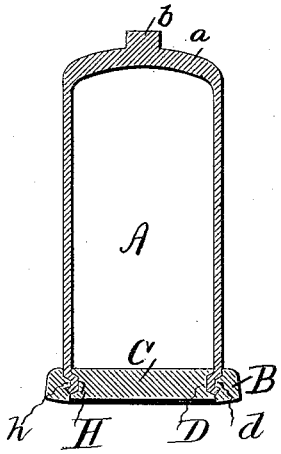
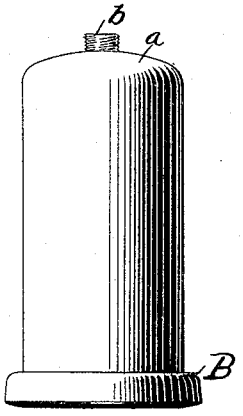


Fig. 10.



Witnesses:

Edw. F. Simpson, Jr.

Arthur C. Clarke.

Inventors.

Wm. A. Johnston,

Arthur W. Browne,

by Atty

UNITED STATES PATENT OFFICE.

WILLIAM A. JOHNSTON AND ARTHUR W. BROWNE, OF PRINCE'S BAY, NEW YORK, ASSIGNORS TO THE S. S. WHITE DENTAL MANUFACTURING COMPANY, OF PHILADELPHIA, PENNSYLVANIA.

METALLIC VESSEL FOR COMPRESSED GASES.

SPECIFICATION forming part of Letters Patent No. 457,158, dated August 4, 1891.

Application filed July 5, 1889. Serial No. 316,508. (No model.)

To all whom it may concern:

Be it known that we, WILLIAM A. JOHNSTON and ARTHUR W. BROWNE, both of Prince's Bay, in the county of Richmond and State of New York, have invented certain new and useful Improvements in Metallic Vessels for Compressed Gases, of which the following is a specification.

Our invention relates to improvements in metallic vessels especially adapted for use in the storing and shipping of highly-compressed gases, such as nitrous oxide. In United States Letters Patent No. 213,576, dated March 25, 1879, a vessel of this class is shown, the said vessel comprising a body having one end or head welded therein and with the other screwed thereto, the vessel-body and its welded head being cleaned by pickling and then lined with a coating metal preparatory to receiving the screw-attached head, which is also coated and is applied to the body while sufficiently heated to insure complete filling by the coating metal of the joints of the screw-threaded connection between the parts.

In accordance with our improvements, instead of first producing the vessel-body and then applying the separately-formed complete head thereto, as set forth in said Patent No. 213,576, we, in manner to be hereinafter described, form the body, together with one end or head, from a single metallic blank, and afterward close or complete the other end of the body by applying thereto a separately-formed head.

The subject-matter deemed novel will hereinafter be designated specifically by the claim, after first in detail describing our improvements by the aid of the accompanying drawings.

Figures 1 and 2 show an edge and a plan view of the metallic blank from which to form a vessel-body and its integral end. Figs. 3 and 4 are sectional views representing conditions to which the blank is brought by successive treatments. Figs. 5, 6, and 7 are sectional views representing the body as formed integral with one head and parts for forming the other head. Fig. 8 is a vertical central section showing a way in which the applied head may be secured to the vessel-body by the employment of a die and its punch or hammer, the hammer, for convenience of illustration, being represented as divided, with one part elevated and the other part in the position assumed when the blow is struck by descent of the hammer to secure the head, consisting of an outer and an inner part, which are secured in place by interlocking connection between them and the body without necessitating resort to riveting, screwing, welding, or soldering. Figs. 9 and 10 are a section and an elevation of the vessel. Fig. 11 is a section of a vessel representing a modification.

The vessel-body or hollow cylinder A is composed of some suitable metal of high tensile strength, and is formed integral with one head or end *a*, which may either be entirely closed or left with a small central opening. The other end of the cylinder may be formed in various ways. It may consist of two parts B C, as shown in Figs. 6, 7, and 9, or as represented in Fig. 11.

In producing a vessel such as shown in Fig. 9, in accordance with the method practiced by us we proceed as follows: A blank, Figs. 1 and 2, of suitable metal, cut, preferably, from a bar of sheet or soft steel, is by successive drawing operations, such as are well understood, brought to the form of the vessel shell or body A, with the integral end or head *a*, as shown in Fig. 5. The body and head are then cleaned and coated with tin or any suitable equivalent coating metal or alloy, as heretofore. The body is then placed upright, with its head *a* down, in a suitably-supported die E, having the annular shoulder *e* at its mouth or upper end and the removable bottom F. To provide for most effectually sealing any opening or space which might otherwise be left at the joint between the body and the head applied thereto, a small piece of tin, solder, or the like is dropped into the body. The outer and inner parts B C of the applied head are next placed in position, the former resting on the die-shoulder around the open end of the body and the latter support-

ed in place within the open end of the body, which, as plainly shown, is formed to taper or flare outwardly slightly to maintain the part C in position. Previously to placing them in position the parts B C, having been cleaned, are separately coated with tin or its equivalent. The die punch or hammer G of the swaging apparatus is provided with an annular shoulder or projection *g* and has a longitudinal opening to provide for escape of air and prevent compression thereof upon descent of the hammer. The hammer, being brought down with great force upon the applied head and end of the vessel-body, firmly and tightly swages the parts together, the end of the body being forced into the peripheral groove of the part C and the part B being at the same time firmly embedded in the exterior groove thus formed in the body end. As will be understood, the power applied in compressing the parts together is such as to cause a close and strong interlocking connection between the body and the disk C and collar B by means of the engagement of the annular rib or projection D and groove *d* of the body with the respectively-corresponding groove H of the disk and rib or projection *h* of the collar. In this way resort to welding, soldering, or riveting is rendered wholly unnecessary to secure the parts together, and the work may thus be quickly and economically done. By removing the bottom of the die access may be had to the vessel for ejecting it. The vessel is next heated sufficiently to completely seal any space in the joint between the applied head and the body with tin or solder by the well-known flowing or "sweating" process. The projection *b* of the integral head *a* is next drilled through and is threaded externally for the application of the valve-seat cap, thus completing the vessel. Obviously it is not necessary to provide the projection *b* in the formation of the vessel-body and its integral head, as the valve-seat cap may be applied in other suitable way.

In Fig. 11 is shown a modification of the interlocking connection between the vessel-body and its applied head, the shape of the peripheral groove in the part C resulting in this formation of the interlocking connection between the parts when swaged together.

Instead of providing the external screw-thread, as shown, for applying a valve-seat plug, an internal screw-thread may be formed in the vessel for this purpose. We, however, prefer to apply the valve-seat plug externally, instead of to an internal thread, thus lessening the liability of leakage by rendering escape of gas from the vessel impossible except by way of the valve-stem seat.

From the above description it will be seen that we provide economically and expeditiously a wrought-metal vessel of great strength, capable of confining, without possibility of leakage, gases under a pressure of seventy-five atmospheres or more.

We claim as our invention—

A vessel having the wrought-metal body, with the separate disk within one end thereof and the separate collar without said end, said disk and collar being both secured to the body by interlocking grooves and projections, substantially in the manner and for the purpose set forth.

In testimony whereof we have hereunto subscribed our names.

WILLIAM A. JOHNSTON.
A. W. BROWNE.

Witnesses:
G. S. BARNES,
THOS. C. TOTTEN.