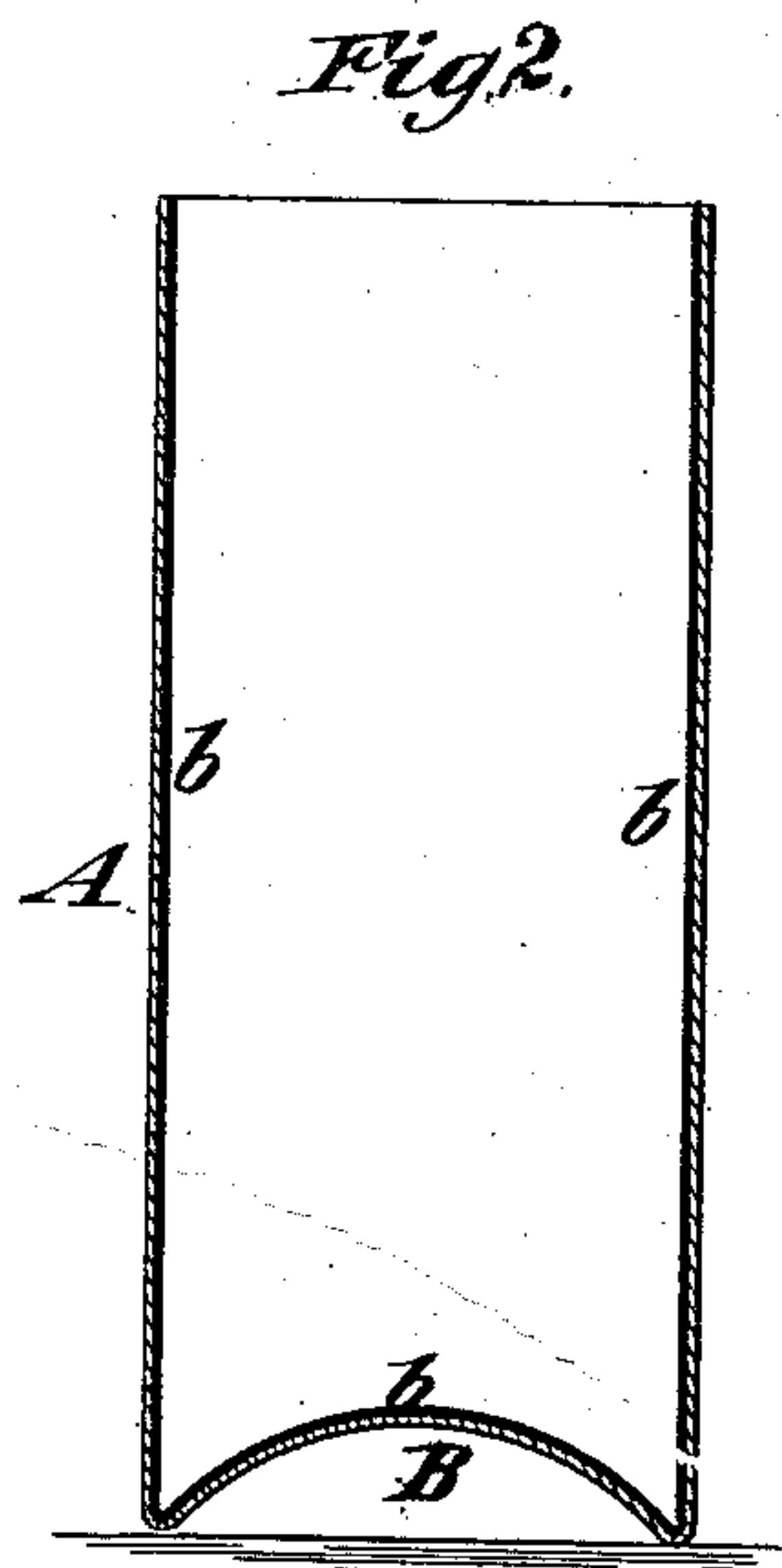
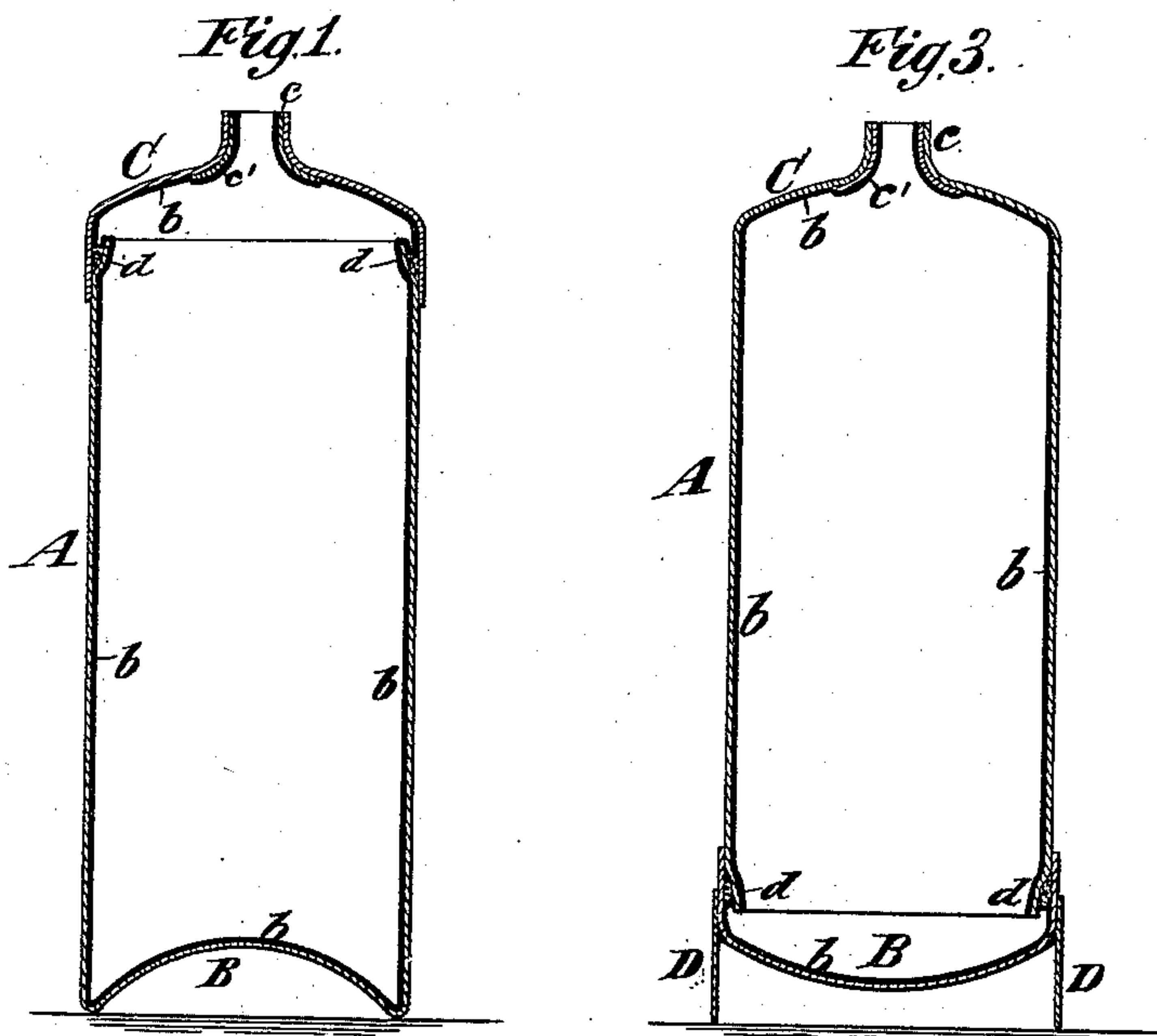


(No Model.)

W. H. BROWN.  
METHOD OF MAKING METALLIC RECEIVERS FOR FLUIDS.  
UNDER PRESSURE.

No. 360,993.

Patented Apr. 12, 1887.



Witnesses.

O. Sundgren  
Emil Herter

Inventor:

Wm. Henry Brown  
by his attys  
Brown & Hall

# UNITED STATES PATENT OFFICE.

WILLIAM HENRY BROWN, OF NEW YORK, N. Y.

METHOD OF MAKING METALLIC RECEIVERS FOR FLUIDS UNDER PRESSURE.

SPECIFICATION forming part of Letters Patent No. 360,993, dated April 12, 1887.

Application filed August 12, 1886. Serial No. 210,711. (No model.)

*To all whom it may concern:*

Be it known that I, WILLIAM HENRY BROWN, of the city and county of New York, in the State of New York, have invented a new and useful Improvement in the Method of Making Metallic Receivers for Fluids Under Pressure, of which the following is a specification.

My invention relates to closed vessels which are constructed to contain liquids or gases under great pressures, and it is applicable with particular advantage to vessels for containing volatile liquids, such as ammonia, under a very heavy pressure.

In the manufacture of receivers for the purposes above described, I employ steel or other metal of great strength and ductility to form the body and heads of the receiver or vessel, and I line the receiver or vessel with tin or other metal which is usually softer than the metal of which the receiver itself is composed.

My improvement in the method of making metallic receivers, which constitutes my invention, consists in first producing by drawing operations from steel or other strong metal, these several parts (two or more) to form the body and heads of the receiver; in then covering the interior surfaces with a lining metal, such as tin, and subjecting the parts to further drawing operations, whereby the lining metal is condensed and incorporated into the pores of the steel or other stronger metal; in then contracting one or more of the parts at the end, so that they will enter one within another, and in electroplating the lining surfaces produced by drawing, and in finally fitting the parts together one into another and uniting them by soldered joints, as more fully hereinafter described.

In the accompanying drawings, Figure 1 represents a vertical section of a cylindric vessel or receiver made according to my invention, and which has a concave base and body formed in one piece of metal and an upper head formed from another piece of metal. Fig. 2 represents a seamless drawn shell which is intended to form the lower head or bottom and body of the receiver shown in Fig. 1; and Fig. 3 is a vertical section of a receiver also embodying my invention, and which comprises an upper head and body formed of one piece of metal and a lower convex head or bottom

united thereto and provided with a base-ring, on which it may stand.

Similar letters of reference designate corresponding parts in the several figures.

In the vessel shown in Fig. 1, the body A and the lower head or bottom, B, are formed of a seamless shell made from one piece of metal without seam or joint, and the upper head, C, is formed by itself from another single piece of metal without seam or joint, and has at the center a neck, c, to receive a bung or other device for closing the vessel, and which is reinforced by a flange or piece of metal, C', secured therein by solder, as will be hereinafter described.

As here represented, the seamless shell A B, forming the body and bottom, is made of cylindric form, and the bottom is concaved, so that it will readily stand upon the floor or other support and will serve to resist a very considerable internal pressure—for example, a pressure of three hundred pounds to the square inch or thereabout. This seamless shell A B, I produce from a flat circular disk of plate metal, such as steel, by folding and drawing operations with mandrels and dies, as described in my United States Letters Patent No. 316,600, dated April 28, 1885; and the first folding operations by mandrels and dies, whereby the metal is changed from a flat disk to a cylindric shell, are preferably performed while the metal is in a hot state, and the later drawing operations, whereby the shell is elongated to bring it to the desired length and reduced in thickness, so as to condense, consolidate, temper, and harden the metal, are preferably performed while the metal is in a cold state, as is fully described in my said patent.

After the drawing operations whereby the shell A B is produced have been nearly completed and the shell has been brought to nearly the thickness and length desired, I apply to the interior surface of the shell, by sweat, solder, or otherwise, a lining or covering which is represented in Fig. 2 by the letter b, and it may be of tin or other metal, preferably softer than the steel or other strong metal of which the shell is made. This lining metal may also be of such character as will resist the acids or other fluids or gases which the receiver is to contain and which will not be acted upon



chemically by such compounds. After so applying the lining metal *b* to the interior surface of the shell A B, I subject the shell to the later drawing operations with mandrels and dies, so as to compress and condense the lining metal *b* and incorporate it directly into the pores of the steel or other metal of the shell A B, and by such later drawing operations the lining metal is made to form on the inner surface of the shell a hardened and condensed glass-like surface of tin or other metal adapted for the purpose to which the receiver is intended.

The head C is prepared in the same way as the shell A B, and also has a lining of comparatively soft metal, *b*, such as tin, applied in the same way as the lining of the shell A B, and condensed and finished by means of a mandrel and die. The neck or projection *c* of the head C may be formed by suitable dies, and a flanged re-enforcement, *c'*, which is also struck up by suitable dies, may be soldered within the neck or projection *c*.

After the shell A B is otherwise completed I contract the end thereof, as shown at *d*, so that it will enter within the head C, and I then deposit upon the hardened glass-like interior surface of the parts, by electricity, tin or other metal suitable for the purpose intended and to any desired thickness. After the parts of the vessel or receiver have been thus constructed, prepared, and finished by a covering of tin or other lining metal on their interior surfaces, I insert the shell A B into the head C and form a strong solder joint between them. This solder joint may advantageously be made in the manner described in United States Letters Patent No. 235,834, granted December 21, 1880, to LeRoy S. White. According to that method of forming a joint a ring of solder is placed outside the contracted end portion *d* of the shell A B. The shell is then inserted within the head C, and heat is applied to melt the solder and cause it to flow downward between the contiguous surfaces of the head and shell.

In the example of my invention shown in Fig. 3 the body A and the head C are made of a seamless shell of metal produced in the manner before described with reference to Figs. 1 and 2, and having an interior covering, *b*, of tin or other lining metal, and the lower head or bottom, B, which is convex, is made of a separate piece prepared in like manner. The body has at the lower end a contraction, *d*,

which receives a ring of solder, as before described, and by heat applied to the joint at the bottom when the receiver is inverted the solder is melted and caused to flow between the contiguous surfaces of the shell A C and the head B, so as to unite them strongly together by a firm solder joint. In this example of my invention, also, the head C is provided with a neck or tubular projection, *c*, having an internal re-enforcing flange soldered thereto; and in order that the receiver, with its convex bottom B, may stand upon a flat surface, I have represented a base-ring, D, as slipped over the bottom portion thereof and made a part of the receiver or not, as is desired. The receiver may simply be set within the base-ring, which is entirely separate therefrom, or the base-ring D may be forced upon the bottom portion of the receiver and there retained by solder or by the tightness with which it hugs the receiver.

By the method above described I am enabled to produce receivers which are very light and serviceable, and which will hold, without leakage, ammonia, gas, and all volatile or other liquids under extraordinary heavy pressures. By my method of manufacture receivers may be made which will withstand an internal pressure of fifteen hundred or two thousand pounds to the square inch.

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

The improvement in the method of making metallic receivers for containing fluids under pressure, consisting in first producing by drawing operations from steel or other strong metal the several parts to form the body and heads of the receiver, in then covering the interior surfaces with a lining metal and subjecting the parts to further drawing operation, whereby the lining metal is condensed and incorporated into the pores of the strong metal, in then contracting one or more of the parts at the end, so that they will enter one within another, and in electroplating the lined surfaces produced by drawing, and in finally fitting the parts together one into another and uniting them by solder joints, substantially as and for the purpose herein described.

WM. HENRY BROWN.

Witnesses:

D. W. MCCREA,  
A. L. LAWRENCE.