To all whom it may concern:

Be it known that I, Reinhold Burger, a subject of the German Emperor, residing at Berlin, Germany, have invented a certain new and useful Improvement in Making Double-Walled Vacuum Vessels, of which the following is a specification.

The invention relates to the manufacture of double walled glass vacuum vessels, such as bottles, and consists broadly in the process hereinafter described and comprising the steps more particularly pointed out in the claims.

In the accompanying drawings which are all longitudinal sectional views—Figure 1 shows separately the glass cylinder which ultimately forms the outer wall of the bottle. Figure 2 shows separately the glass cylinder which ultimately forms the inner wall of the bottle. Figure 3 shows the cylinder of Figure 2 placed within the cylinder of Figure 1, and the supporting plugs in place between the walls. Figure 4 shows the two cylinders connected only at the end of the neck or mouth of the now double walled vessel. Figure 5 shows the same with one of the tubular projections closed. Figure 6 shows the completed vessel with both tubular projections closed after exhaustion of the space between the double walls.

Similar letters of reference indicate like parts.

I carry my process into effect in the following manner: The glass cylinder A, which is to form the outer wall of the vacuum vessel, is usually received from the glass blowers in the shape illustrated in Figure 1, in which case, the upper portion B is cut off on the line a, a, in order to produce a cylinder of the desired shape having an open end at C, and a rounded bottom end at D. The glass cylinder E, which is of less diameter than cylinder A and is to form the inner wall of the vacuum vessel, is usually received from the glass blowers in the shape illustrated in Figure 2, that is, with a long body portion F and an open neck G. Upon the rounded bottom C of the outer cylinder A, I form two small projecting tubes H, I. I then place the cylinder E within the cylinder A, as shown in Figure 3, and in any suitable way introduce into the space between said cylinders, bodies or plugs J, preferably made of asbestos paper or other yielding heat insulating material. Said plugs may be attached to the surface of the inner cylinder E in any suitable manner, such as, in the way set forth in U.S. Letters Patent No. 888,783, granted to me May 26, 1908, before the said cylinder E is inserted into the cylinder A, or by adhesion; or they may be inserted into the space between the cylinders after said cylinders are put together and then retained in place by engagement with the walls. For convenience in handling and spacing, they may be connected by a ring K of wire or cord. A lip L may also be formed at the open end of the neck of cylinder E, if desired. The two cylinders are next fused together at their mouths, as shown in Figure 4, and suitably molded to shape, thus producing a double walled vessel. In order to fill the pores of the glass, a silvering solution or other suitable coating may be introduced through one of said projections into the space between the walls, and a coating of silver or other material thus applied. One of the projections, as I, is then sealed, Figure 5, and substantially a vacuum is produced in the said space by any suitable device applied to the remaining projection H. The last named projection is then sealed, thus completing the vessel, as shown in Figure 6.

I claim:

1. The process of making glass vacuum vessels which consists in, first, placing within a glass cylinder closed at one end and open at the opposite end and having an opening in said closed end, a second cylinder of less diameter open at one end and closed at the other end, so that a space will be formed between said cylinders and introducing supporting bodies into said space: second, fusing said cylinders together at their open ends: third, producing substantially a vacuum in said intermediate space, and fourth, sealing the opening in said outer cylinder.

2. The process of making glass vacuum vessels which consists in, first, forming on the closed end of a glass cylinder, open at the opposite end, a tubular projection: second, inserting in said cylinder a second cylinder of less diameter open at one end and closed at the other end, so that a space will be formed between said cylinders: third, inserting supporting bodies in said space: fourth, fusing said cylinders together at their open ends: fifth, producing substantially a vacuum in said intermediate space, and sixth, sealing said tubular projection.

3. The process of making glass vacuum vessels which consists in, first, forming on the closed end of a glass cylinder, open at the op-
posite end, two tubular projections: second, inserting in said cylinder a second cylinder of less diameter open at one end and closed at the other, so that a space will be formed between said cylinders: third, inserting supporting bodies in said space: fourth, fusing said cylinders together at their open ends: fifth, introducing a coating solution into said space: sixth, closing one of said tubular projections: seventh, producing substantially a vacuum in said space, and eighth, closing said remaining tubular projection.

In testimony whereof I have affixed my signature in presence of two witnesses.

Witnesses:

WOLDEMAR HAUPF,
HENRY HASPER.

REINHOLD BURGER.