

March 19, 1935.

P. W. WAGENSELLER

1,994,934

CONDENSER

Filed Nov. 6, 1929

Fig. 1.

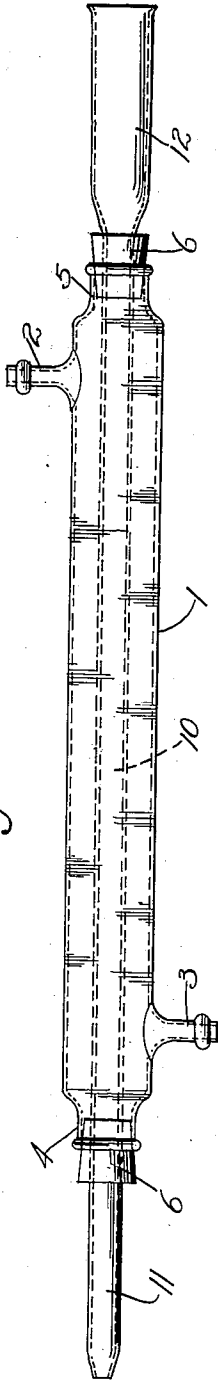


Fig. 2.

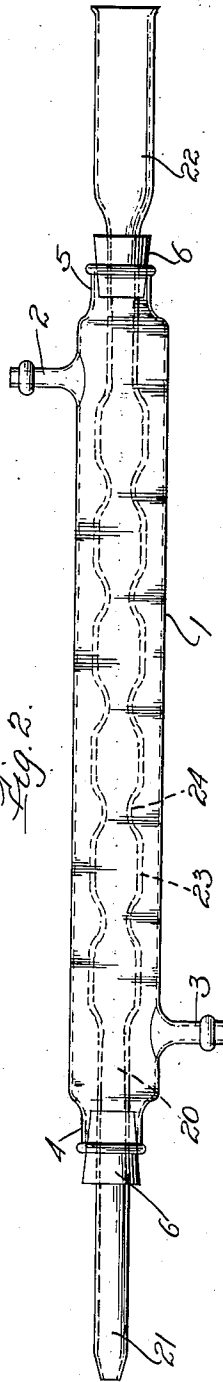


Fig. 3.

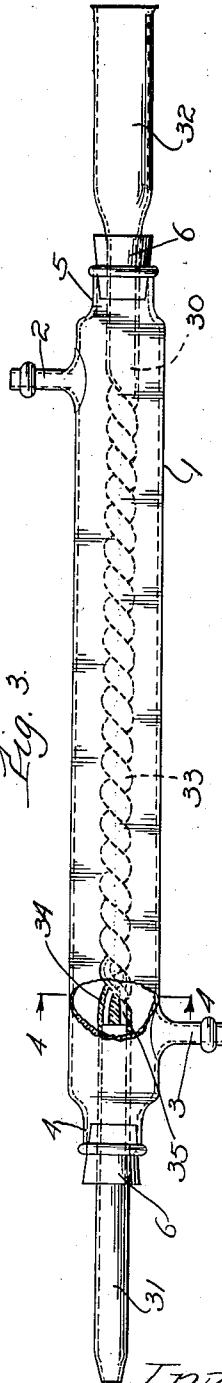


Fig. 4.

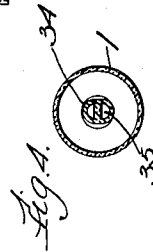
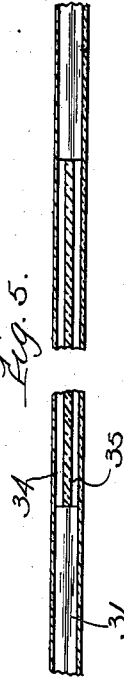


Fig. 5.



Witness
H. F. McKnight.

Inventor
Paul W. Wagenseller
by *Bulfin & Bulfin*
his Attorneys

UNITED STATES PATENT OFFICE

1,994,934

CONDENSER

Paul Weldon Wagenseller, Chicago, Ill.

Application November 6, 1929, Serial No. 405,104

Renewed June 15, 1934

2 Claims. (Cl. 23-292)

This invention relates to condensers of the type intended primarily for laboratory use, and its object is to provide a construction which shall be more simple and economical to manufacture than that now in use, and which shall also be less liable to breakage. Another object is to provide a construction permitting the use of interchangeable condenser tubes within a single type of jacket. And a further object is to provide a condenser tube of increased efficiency. The invention comprises certain features and elements of construction as herein shown and described and as indicated by the claims.

In the drawing:—

Figure 1 is a side elevation of a glass condenser embodying this invention, showing a condenser tube of straight uniform bore.

Figure 2 is a similar side elevation of a modified form of the invention including a condenser tube having a series of bulbous portions connected by constrictions.

Figure 3 is also a side elevation showing another modification in which the condenser tube is provided with a plurality of bores helically intertwined.

Figure 4 is a transverse section taken as indicated at line 4—4 on Figure 3.

Figure 5 is an axial section of a piece of double-bore tubing of the type employed in the structure of Figure 3.

In the device shown in Figure 1 the outer jacket is shown as a tube, 1, formed with lateral openings adjacent its ends at opposite sides, and with laterally projecting branches, 2 and 3, at said openings for connection with rubber tubing through which the cooling liquid, such as water, is supplied to the jacket. The ends of the tube, 1, are somewhat reduced at 4 and 5 to form necks of equal size into which rubber corks, 6, 6, are fitted. The condenser tube proper is shown at 10 as a tube of uniform size, extending through the axial bores in the corks, 6, 6, and supported thereby. The condenser tube has terminal portions, 11 and 12, the latter being of enlarged diameter, as is usual in devices of this character. It will be understood that the vapor introduced into the tube, 10, is reduced in temperature by conduction of heat through the walls of the tube to the cooling liquid circulating through the jacket, 1, and is thus condensed into liquid form.

Heretofore, when it was desired to construct a condenser of this type entirely of glass, it was common practice to fuse the condenser tube, 10, in place by heating the neck portions, 4 and 5, of the jacket so as to melt them sufficiently for

such fusion. As a result, however, a condenser constructed in this manner is under constant internal stress set up upon cooling of the glass, and is therefore relatively frangible when finished, even if it is successfully completed without breakage. In some cases a rubber cork has been used at one end of the jacket to support the condenser tube so that the fusion of the glass is effected only at the opposite end; but even with this arrangement it is difficult to secure the cork in place without overstraining the fused joint. The use of rubber corks at both ends of the jacket eliminates all such strains in the glass and makes a satisfactorily sealed joint between the jacket and the condenser tube. The openings in the necks, 4 and 5, are made exactly alike and the stub branches, 2 and 3, are symmetrically located so that either end of the jacket may serve as the upper end in use, and the condenser tube may be inserted either way around therein.

The beaded formation of the neck portions, 4 and 5, is typical of the "tooling" process by which the bores of these neck portions are made accurately round. In this process the glass is softened by heating and the shaping members of the forming tool are pressed against its outer surface while its accurately round plug is held in the bore. The glass tubing is then rotated with the forming tool held against rotation, which results in shaping the bead and at the same time forming the bore accurately. This avoids any thinning of the glass wall; in fact, by the compressing action of the tool it is more likely to be thickened in the process, hence, there is no weakening of the glass structure at the tooled necks, 4 and 5, and the bead which is incidentally formed by this method serves to strengthen the outer edge of each opening. This ensures that the tapered rubber plugs, 6, will fit properly in the accurately round bores and satisfactorily seal the ends of the jacket, 1, without danger of cracking or bursting it.

Figure 2 shows a structure which is similar to that of Figure 1 except for the heat-radiating portion of the condenser tube. This tube is indicated generally at 20 with a small terminal portion, 21, and a larger terminal, 22. The portion of the tube contained within the jacket, 1, consists of a series of chambers, 23, whose diameter is substantially that of the terminal, 22, and which are connected with each other through constricted tubular portions, 24, of substantially the same size as the terminal portion, 21. Condenser tubes having a series of bulbous portions in this general arrangement have been made

heretofore, but they have been constructed by taking a piece of tubing of the size of the constricted portions, 24, and expanding it to form the bulbous chambers. I have found it more satisfactory to start with the larger size tubing and form the constrictions between the chambers by heating and drawing down the tubing so that there is no thinning of the wall and consequent weakening of the structure at any point. As a condenser tube this type is preferable to a plain tube in that it provides chambers in which the vapor will tend to accumulate by reason of the restricted outlets between chambers. This retards the flow of vapor from end to end of the device and also presents larger surfaces at the bulbous portion, 23, for radiation of heat from the vapor in the process of condensation.

Figure 3 illustrates a very efficient form of condenser tube fitted into a jacket, 1, which is in all respects similar to the jackets shown in Figures 1 and 2. The condenser tube of Figure 3 is indicated generally at 30 with a small terminal, 31, and a larger terminal portion, 32. The middle portion which is contained within the jacket, 1, appears externally as a double helix, apparently formed of two cylindrical bores twisted closely together in intertwined relation. I construct this, however, by utilizing for the twisted portion a double-bore tubing which is manufactured originally with an approximately oval cross-section, as indicated in Figure 4, having two bores, 34 and 35, extending parallel within the oval outer wall and separated by a partition. This tubing, when heated, may be twisted uniformly from end to end, so that the bores, 34 and 35, are thus automatically intertwined, providing a relatively long passageway for the vapor between the ends of the jacket, 1; the bores, 34 and 35, being small relatively to the mass of the surrounding glass walls, permit the glass to absorb a large amount of heat from the vapor and to radiate it readily to the cooling fluid in the jacket, 1. The terminal portions of the condenser tube may be constructed of ordinary glass tubing fused to the ends of the double-bore section, as indicated in Figures 3 and 5.

This type of construction, which consists in mounting a glass condenser tube in a glass jacket

by means of the resilient corks, 6, 6, permits the use of a transparent jacket to facilitate observance of the process going on in the condenser tube, and, as already stated, reduces the tendency to breakage, both in manufacture and use, as compared with the fused structure. It also results in some economy of equipment, because the design is such that the various forms of condenser tubes shown in Figures 1, 2 and 3 are perfectly interchangeable in a single jacket. Thus, a condenser equipment of this type may consist of a single jacket and the three different types of condenser tubes which may be interchangeably mounted therein as occasion may require.

I claim:

1. A condenser comprising an outer glass jacket formed with inlet and outlet openings adjacent its opposite ends respectively, and having aligned openings at said ends, a condenser tube of glass comprising tubular end portions and an intermediate heat-radiating portion, said latter portion being constructed from tubing having a plurality of parallel bores within a single outer wall, said bores communicating with the tubular end portions, and said intermediate part being twisted to arrange said bores in inter-twined helical form, together with plugs of resilient material fitted into said aligned openings and bored to fit over the tubular end portions of the condenser tube for supporting the latter in the jacket, said twisted heat-radiating portion of the condenser tube being dimensioned to be entered and removed through one of said aligned openings.

2. A condenser including an outer glass jacket with end portions formed with axially aligned openings and each having a reinforcing bead at its outer edge, said aligned openings being accurately round in cross-section with tapered plugs of resilient material fitted respectively into said openings, and each having an axial bore, and a condenser tube of glass including end portions fitted respectively into the bores of said plugs with an intermediate heat-radiating portion removably supported in the jacket by said plugs, said intermediate portion being dimensioned to pass through one of said aligned openings.

PAUL WELDON WAGENSELLER.