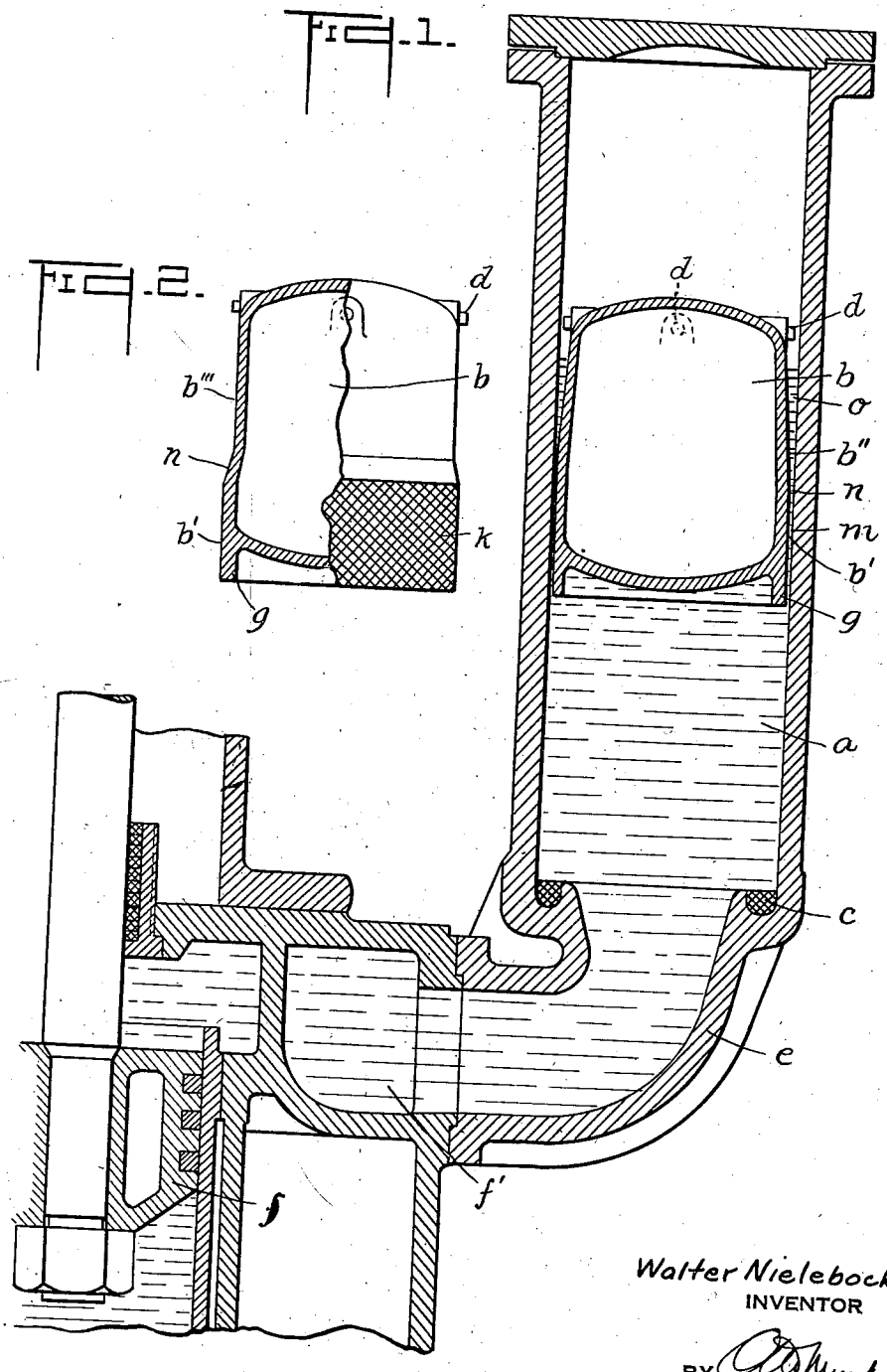
April 27, 1943. W. NIELEBOCK 2,317,796

BLAST TANK FOR LIQUID PUMPS

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FIG. 1.

FIG. 2.



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BLAST TANK FOR LIQUID PUMPS

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6 Claims. (Cl. 138—31)

This invention relates to blast tanks or air vessels, more particularly, for liquid pumps, of the type comprising a float which is intended to prevent gradual absorption of the air in the tank owing to spray water and whirls and to automatically shut off the tank from the pressure pipe during non-operation of the pump, so as to prevent the air in the tank from escaping into the pressure line.

It is an important object of the present invention to provide a float in blast tanks of the type referred to which is very reliable and efficient in operation, and of simple and robust construction.

With this and further objects in view, as may become apparent from the within disclosures, the invention consists not only in the structures herein pointed out and illustrated by the drawing, but includes further structures coming within the scope of what hereinafter may be claimed.

The character of the invention, however, may be best understood by reference to certain of its structural forms, as illustrated by the accompanying drawing in which:

Fig. 1 is a vertical section through a blast tank connected to a piston pump and having the invention applied thereto, while

Fig. 2 is an elevation, partly in section, of a modified form of float for use in connection with the blast tank of Fig. 1.

Similar characters of reference denote similar parts in the two figures.

According to an important feature of my invention, the float is so constructed that the outer diameter of its lower portion nearly conforms to the inner diameter of the air vessel, leaving a narrow gap only, while the top portion of the float is tapered or reduced in diameter with respect to said diameter of the lower portion.

According to a further feature of the invention, the float at its bottom is formed with a cylindrical extension of non-reduced diameter which co-operates with a valve seat in the bottom of the blast tank for automatically shutting off the blast tank when the pump stops.

Referring now to the drawing in greater detail, showing further features of the invention, it will be noted, that *a* is an air vessel or blast tank casing of conventional type which through a branch *e* communicates with the outlet or pressure line *f'* of a piston pump *f*. The tubular or cylindrical portion of the tank accommodates a hollow float *b* emerging from the level of the liquid in the blast tank into the space above said liquid level which is filled with more or less compressed air. It will be seen that the diameter of the lower portion *b'* of the float is only very slightly smaller than the inner diameter of the blast tank, thus forming a relatively long and narrow gap *m* between the lower portion of the float and the cylindrical inner wall of the blast tank. From a point designated with *n* the float is tapered towards its top where an annular gap *o* of larger width is thus formed than in the lower region of the float.

Suitable projections in the form of ribs or noses *d* in the top region of the float serve to guide the same for motion in the blast tank.

I have found that by the provision of a blast tank and float of the above described type spray water and water whirls as well as gradual absorption of the air in the blast tank are prevented. The favorable effect of my novel blast tank construction may be explained as follows. With normal and violent motions of the float due to shocks of the pump the lower, narrow annular gap *m* formed between portion *b'* of float *b* and the inner wall of the blast tank *a* acts as a braking path for the water or other liquid. Owing to the relatively great length and narrow width of this gap the liquid passing through it on sudden acceleration by a pump shock meets with a high dynamic resistance, so that the speed difference between the liquid in the gap and the float remains at a low figure, although the float of course constitutes a greater mass than the liquid. On the other hand, in the enlarged annular gap *o* near the top of the float between the tapered portion *b''* thereof and the wall of the blast tank the liquid accelerated in the tank by sudden shocks, e. g. on starting the pump, is greatly retarded, so that the liquid level remains quiet. Again, if the compressed air in the blast tank, due to decreased pump pressure, is expanded to compensate the pressure drop, the upper and lower gaps at *b''* will co-operate to maintain the liquid in the blast tank at a substantially unchanged level with respect to the float. Owing to the smooth shape of the upper portion of the float, eddies tending to cause absorption of the air in the blast tank are prevented. Hence, it will be appreciated that my novel blast tank and float combination while being simple in construction tends to reduce the speed difference as between the float itself and the liquid in the gap *m, o* and to reduce eddies, whereby the absorption of the air above the float is reduced to a minimum. The simple shape of the float offers particular advantages in its manufacture where the same has to be made of sheet steel, such as, in high pressure blast tanks.

It will be observed from Figs. 1 and 2 that the float has a lower cylindrical or tubular projection *g* having the same diameter as the lower body portion *b'* of the float. When the liquid passes out of the tank, the ring portion *g* will engage a valve seat *c* provided, for instance, in the bottom of the blast tank, whereby the blast tank is shut off from the pressure pipe of the pump. The provision on the float of a valve body projection *g* having the same diameter as the

lower portion of the float proper offers the advantage that the narrow braking and damping gap *m* is appreciably extended in length. In other words, the valve portion *g* thus cooperates with the float proper to quiet the liquid in the tank and to prevent loss of air from the blast tank. Furthermore, in consequence of the bell-shaped form of the valve portion *g* the buoyancy current on rising liquid pressure is chiefly directed towards the bottom of the float inside of the valve projection and the float is lifted, before any substantial leading or forerunning current can be produced in the long, narrow gap *m*. Also, the cylindrical valve body *g* tends to damp downwardly directed oscillations of the float by which it is submerged into the liquid, whereby the rising motions of the float are also reduced.

Referring now to the float illustrated in Fig. 2, it will be observed that this modification as to its design and function corresponds substantially to that of Fig. 1, the difference lying merely in the fact that the upper reduced portion *b'''* of the float in this case is also cylindrical, with a short conical intermediate portion *h* between the cylindrical portions *b'* and *b'''*.

I prefer to provide the lower superficies portion *b'* of the float with a roughened surface, as indicated at *k* in Fig. 2, whereby the braking and damping effect of the narrow gap *m* between portion *b'* of float *b* and the inner wall of the tank is further enhanced. To this end, the said surface portion may be knurled on a lathe by means of a so-called knurling tool or wheel having crosswisely extending sharp edges or projections.

It should be noted that the narrow gap *m* between the lower half of the float *b* and the walls of the tank is so dimensioned that it just permits free motion without any friction between the float and the tank. In other words, the diameters D of the tank and D' of the float are made to differ by a certain, wide tolerance only corresponding to a "slack fit" or "loose fit". Practically, gap *m* in most instances is 0,8–1,3 mms. and preferably 1 mm.

The method and apparatus of the present invention have been described in detail with reference to specific embodiments. It is to be understood, however, that the invention is not limited by such specific reference but is broader in scope and capable of other embodiments than those specifically described and illustrated in the drawing. For example, the lower portion *b'* of the float forming the narrow gap *m* with the walls of the tank may occupy a much larger proportion of the total length of the float than illustrated in Figs. 1 and 2.

I claim:

1. In a blast tank for a liquid pump, a substantially cylindrical compressed air vessel having free communication with the pressure pipe of the pump, and a substantially cylindrical hollow closed float disposed within said vessel and adapted to project slightly above the liquid level to prevent splashing of liquid into the air space, said float having a lower cylindrical portion whose outer diameter is only slightly smaller than the inner diameter of said air vessel, and an upper portion whose outer diameter is smaller than that of said lower portion.

2. In a blast tank for a liquid pump, a substantially cylindrical compressed-air vessel having free communication with the pressure pipe of the pump, and a substantially cylindrical hollow closed float disposed within said vessel and adapted to project slightly above the liquid level to prevent splashing of liquid into the air space, said float having a lower cylindrical portion whose outer diameter is only slightly smaller than the inner diameter of said air vessel and being gradually tapered from said lower portion towards its top.

3. In a blast tank for a liquid pump, a substantially cylindrical compressed-air vessel having free communication with the pressure pipe of the pump, and a substantially cylindrical hollow closed float disposed within said vessel and adapted to project slightly above the liquid level to prevent splashing of liquid into the air space, said float having a lower cylindrical portion whose outer diameter nearly equals the inner diameter of said air vessel, an upper cylindrical portion of smaller diameter, and a conical portion between said cylindrical portions.

4. In a blast tank for a liquid pump, a substantially cylindrical compressed-air vessel having free communication with the pressure pipe of the pump, an annular valve seat formed on the bottom of said vessel, and a substantially cylindrical hollow closed float disposed within said vessel and adapted to project slightly above the liquid level to prevent splashing of liquid into the air space, said float having a lower cylindrical portion whose outer diameter nearly equals the inner diameter of said air vessel, an upper portion of smaller diameter, and a cylindrical projection extending downwardly from said lower portion of the float and having the same diameter as the latter, said cylindrical projection being adapted for co-operation with said valve seat to shut off the communication between the air vessel and the pressure pipe of the pump, when the float reaches its lowermost position.

5. In a blast tank for a liquid pump, a substantially cylindrical compressed-air vessel having free communication with the pressure pipe of the pump and a substantially cylindrical hollow closed float disposed within said vessel and adapted to project slightly above the liquid level to prevent splashing of liquid into the air space, said float having a lower portion whose outer diameter is only slightly smaller than the inner diameter of said air vessel, and an upper portion whose outer diameter is smaller than that of said lower portion, said lower float portion being roughened at its surface.

6. In a blast tank for a liquid pump, a substantially cylindrical compressed-air vessel having free communication with the pressure pipe of the pump, an annular valve seat formed on the bottom of said vessel, and a substantially cylindrical hollow closed float disposed within said vessel and adapted to project slightly above the liquid level to prevent splashing of liquid into the air space, said float having a lower cylindrical portion whose outer diameter nearly equals the inner diameter of said air vessel, an upper portion of smaller diameter, and a cylindrical projection extending downwardly from said lower portion of the float and having the same diameter as said lower float portion, said cylindrical projection being adapted for co-operation with said valve seat to shut off the communication between the air vessel and the pressure pipe of the pump when the float reaches its lowermost position, said lower float portion and its downwards extending cylindrical projection being roughened at their surfaces.

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