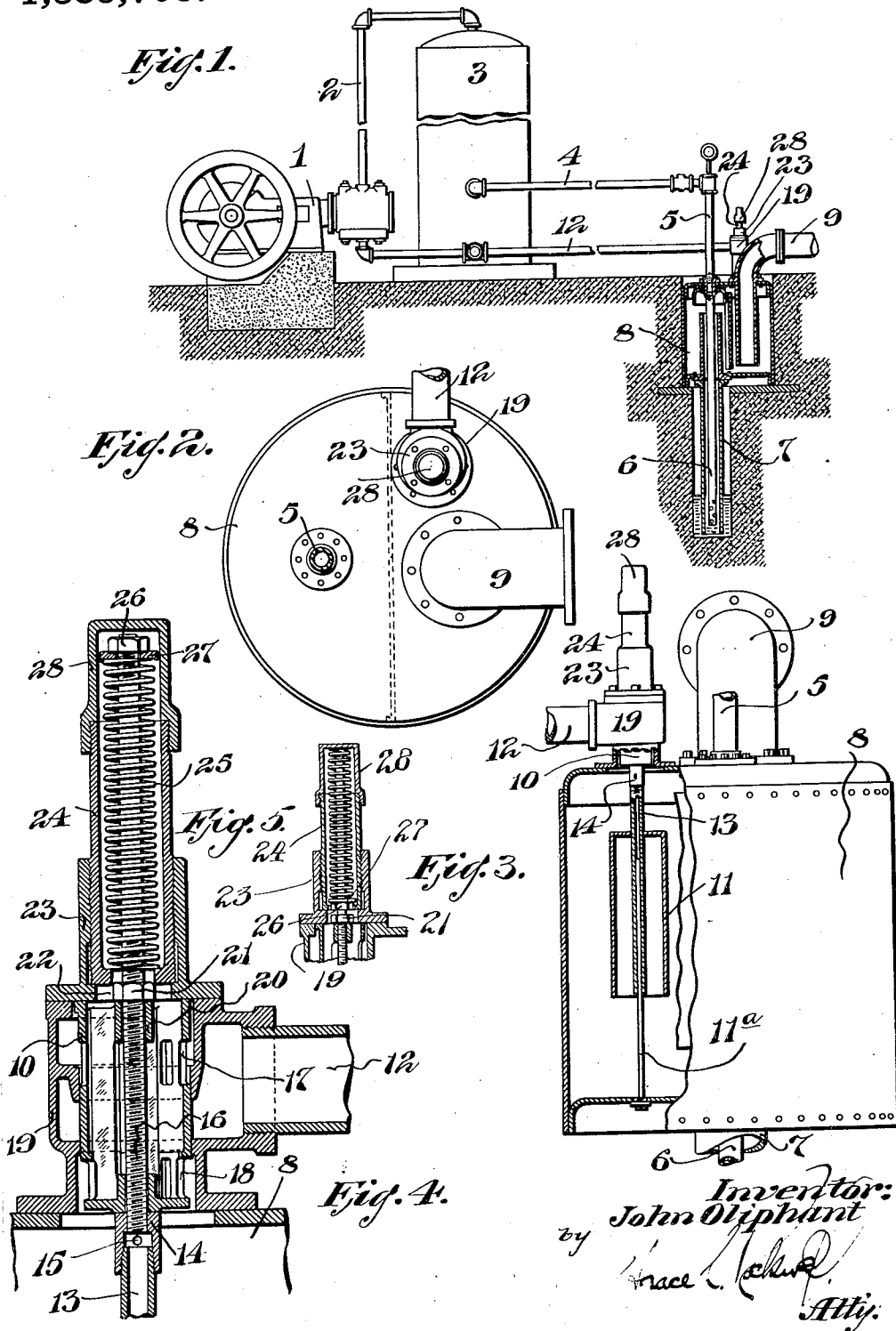


J. OLIPHANT.
AIR LIFT BOOSTER.
APPLICATION FILED DEC. 6, 1916.

1,385,708.

Patented July 26, 1921.



UNITED STATES PATENT OFFICE.

JOHN OLIPHANT, OF CHICAGO, ILLINOIS, ASSIGNOR TO SULLIVAN MACHINERY COMPANY, A CORPORATION OF MASSACHUSETTS.

AIR-LIFT BOOSTER.

1,385,708.

Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, JOHN OLIPHANT, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Air-Lift Boosters, of which the following is a full, clear, and exact specification.

My invention relates to air lift boosters. It has for its object to provide improved means whereby the buoyancy of the float within an air lift booster may be adjusted. A more specific object of my invention is to provide improved means whereby the valve controlling float within the booster tank or casing may be adjusted or balanced from the exterior of the booster tank in such a manner as to enable the buoyancy thereof effectively to operate the regulating valve, these means preferably being reversible and of such a character that a wide range of adjustment is obtained. These and other objects of my improved construction will, however, hereinafter more fully appear.

In the accompanying drawings, I have shown, for purposes of illustration, one embodiment which my invention may assume in practice.

In these drawings,—

Figure 1 is a side elevation of an air lift system equipped with my improvement, the booster being shown in section.

Fig. 2 is a plan view of the booster casing so equipped.

Fig. 3 is a side elevation, partially in section, of the booster casing showing the float therein.

Fig. 4 is a detail vertical sectional view through the float controlling and adjusting mechanism.

Fig. 5 is a detail vertical sectional view showing a modified arrangement of the controlling and adjusting mechanism.

As is usual in such systems, it will be noted that I have shown in this illustrative construction, a compressor 1, which may be of any suitable design, connected through a discharge pipe 2 with a suitable receiver 3, which is in turn connected through a pipe 4 with a down pipe 5 of a suitable air lift pump 6 disposed within the well. This pump 6 acts in the usual manner to mix the air with the fluid in the well in such

a manner as to cause the mixture to pass up through an outer concentric pipe 7 into the booster casing 8, in which the air is separated from the water, the water being forced out in the usual manner through the discharge line 9 by the back pressure developed in the booster casing, while the excess air passes out through a booster valve 10 controlled by a float 11, to the atmosphere or preferably to a pipe 12 connected to the inlet of the compressor, as shown. These features of such a system are well known, and as they do not *per se* concern my present invention, they need not be more specifically described.

In this illustrative construction, it will be noted that the float 11, with which my present invention is concerned, is shown to be of the diving bell type and carried on a rod 11^a fixed to the bottom of the booster casing. Obviously, however, it may be of any desired type. As shown, the float is also provided with an upstanding sleeve-like extension 13 threaded into a collar 14, which is in turn suitably vented at 15 and threaded on the lower end of a bolt 16. Disposed above this collar 14 and thus operatively connected to the float, is the valve 10 which, as shown, is hollow and provided with a plurality of lateral outlets 17 and 18 adapted to communicate respectively with an outlet formed in the valve casing 19 and with the interior of the tank casing 8. As shown, the valve 10 is also provided with threaded portions 20 threaded to the bolt 16 and preferably disposed both at its upper and its lower ends, the valve being also clamped against the collar 14 by means of an upper nut 21. This nut and bolt, as shown, extend through an enlarged opening 22 in an upper removable sleeved casting 23 suitably fixed to the top of the valve casing and closing the top of that casing. Threaded into this casting is also preferably an upstanding protecting sleeve 24, and in this sleeve and disposed around the bolt 16, is a coiled spring 25 having its tension adjustable by means of a nut 26 and a washer 27 adjustable on the bolt or by rotation of the sleeve 24. In a preferred form, this bolt is also suitably inclosed, as by a removable threaded cap 28, threaded over the end of the sleeve 24.

Obviously, in the operation of my im-

proved device, the tension of the spring 25, and therefore the buoyancy of the float 11, may be adjusted at will by simply adjusting the nut 26, or sleeve 24 so that the tendency of the spring to lift the valve and therefore balance the float, may be increased or decreased, as desired. Thus, it will be noted that a very convenient form of adjustment is provided and one wherein a very delicate adjustment of the buoyancy of the float may be obtained. It will also be evident that by changing the nut 26 from the top to the bottom of the sleeve, so as to engage the lower instead of the upper end of the spring 25 while permitting said upper end to engage the cap 28, the action of the spring 25 may be reversed in such a manner as to retard instead of augment the buoyancy of the float, as is clearly shown in Fig. 5. In either case, the tension of the spring may be adjusted by movement of the sleeve 24, nut 26, or both. These and other advantages of my improved construction will, however, be apparent to those skilled in the art.

While I have in this application specifically described one embodiment which my invention may assume in practice, it is to be understood that the same may be modified and embodied in various other forms without departing from the spirit of the invention, it being my intention to include all such modifications within the scope of the appended claims.

What I claim as new and desire to secure by Letters Patent is:—

1. In an air lift system, in combination, a booster having a pressure regulating means responsive to the effects of pressure variations in the booster, and a resilient means for controlling the operation of said first named means.

2. In an air lift system, in combination, a booster having a pressure regulating means responsive to the effects of pressure variations in the booster, and a resilient means adjustable from the outside of said booster for controlling the operation of said first named means.

3. In an air lift system, in combination, a booster having a pressure regulating means responsive to variations in the liquid level in the booster, and a resilient means for controlling the operation of said first named means.

4. In an air lift system, in combination, a booster having a pressure regulating means responsive to variations in the liquid level in the booster, and a resilient means adjustable from the outside of said booster for controlling the operation of said first named means.

5. In an air lift system, in combination, a booster having mechanism for maintaining a substantially constant liquid level therein

comprising a valve controlling the discharge of air from said booster, a float for operating said valve, and adjustable resilient means for controlling the buoyancy of said float.

6. In combination with an air lift booster, mechanism for the purpose of maintaining substantially constant liquid level in said booster comprising a valve controlling the discharge of air from said booster, a float under the influence of which said valve is actuated, resilient means tending to move said valve in one direction, and means for adjusting the tension of said resilient means.

7. In an air lift system, in combination, a booster and means for maintaining a substantially constant liquid level in said booster comprising a valve controlling the discharge of air therefrom, means for controlling said valve in accordance with the liquid level in said booster and including a float movable downwardly to open said valve and upwardly to close the same, and adjustable resilient means for controlling the buoyancy of said float.

8. In an air lift booster, in combination, a valve controlling the discharge of air therefrom, a float movable with said valve, and resilient means normally tending to move said valve in one direction, said parts having provision whereby the normal tendency of said resilient means may be reversed.

9. In an air lift system, in combination, a booster having a pressure regulating means responsive to variations in the liquid level in the booster, a resilient means for controlling the operation of said first named means, and an adjusting means for said resilient means including an adjustable protecting casing.

10. In an air lift system, in combination, a booster having a pressure regulating means responsive to variations in the liquid level in the booster, a resilient means for controlling the operation of said first named means, an adjusting means for said resilient means, and a second adjusting means for said resilient means comprising an adjustable protecting casing having a cap which is removable to permit adjustment of the first named adjusting means.

11. In an air lift booster, in combination, a valve controlling the discharge of air therefrom, a float connected to said valve for operating the same, resilient means normally projecting said valve in the same direction as the lifting action of said float, and a plurality of means for adjusting said last mentioned means.

12. In an air lift booster, in combination, a valve controlling the discharge of air therefrom, a float connected to said valve for operating the same, resilient means normally projecting said valve in the same direction

as the lifting action of said float, and means including a nut and a sleeve for adjusting said last mentioned means.

13. In an air lift booster, in combination, a valve controlling the discharge of air therefrom, a float connected to said valve for operating the same, resilient means normally projecting said valve in the same direction as the lifting action of said float, and means including an adjusting nut and a protecting sleeve for adjusting said last mentioned means.

14. In an air lift booster, in combination, a valve controlling the discharge of air therefrom, a float for operating said valve, and resilient means for operating said valve, said resilient means being reversible to cause the same to oppose or augment the action of said float.

15. In an air lift booster, in combination, a valve controlling the discharge of air from the booster, a float connected to the valve for operating the same, a rod connected to the valve, and resilient means normally tending to project the valve and rod in one direction, said valve and float constituting means for maintaining a substantially constant liquid level in said booster.

16. In combination, an air lift booster and means for maintaining a substantially constant liquid level therein comprising a valve controlling the discharge of air therefrom, a float connected to said valve for operating the same, resilient means normally projecting said valve in the same direction as the lifting action of said float, and means for adjusting said last mentioned means.

17. In an air lift booster, in combination, a booster casing, a valve controlling the discharge of air therefrom, a float connected to said valve for operating the same, a rod connected to said valve, and resilient means adjustable from the exterior of said casing normally tending to project said valve and rod in one direction.

18. In an air lift booster, in combination, a valve controlling the discharge of air therefrom, a float connected to said valve and movable therewith, and resilient means normally projecting said valve in the same direction as the lifting action of said float, said parts having provision whereby the effect of said last mentioned means may be reversed.

19. In an air lift booster, in combination, a valve controlling the discharge of air therefrom, a rod connected to said valve, a float carried by said rod, a spring coiled about said rod, a pair of oppositely disposed

fixed abutments alternatively engageable by opposite ends of said spring respectively, and an abutment carried by said rod and movable into positions for engagement by either end of said spring.

20. In combination, an air lift booster and means for maintaining a substantially constant liquid level in said booster comprising a valve controlling the discharge of air from said booster, a valve casing, a float connected to the valve for operating the same, a rod extending through the float and valve, and means including a spring coiled around said rod normally tending to project the rod and valve in one direction.

21. In combination, an air lift booster comprising a booster casing and means for maintaining a substantially constant liquid level in said booster, comprising a valve controlling the discharge of air therefrom, a valve casing, a float connected to said valve for operating the same, a rod connected to said valve and extending out of said booster casing, resilient means including a spring coiled around said rod normally tending to project said valve and rod in one direction, means for adjusting the tension of said spring, and removable means inclosing said adjusting means.

22. In combination, an air lift booster comprising a booster casing and means for maintaining a substantially constant liquid level in said booster, comprising a valve controlling the discharge of air therefrom, a valve casing, a float connected to said valve for operating the same, a rod connected to said valve and extending out of said booster casing, resilient means including a spring coiled around said rod normally tending to project said valve and rod in one direction, means for adjusting the tension of said spring, means inclosing said rod and spring removably attached to said valve casing, and a removable cap inclosing said adjusting means.

23. In an air lift booster, in combination, a booster casing, a valve controlling the discharge of air therefrom, a valve casing, a float connected to said valve for operating the same, a rod connected to said valve and extending out of said booster casing, resilient means including a spring coiled around said rod normally tending to project said valve and rod in one direction, means for adjusting the tension of said spring, and removable spring adjusting means inclosing said adjusting means.

In testimony whereof I affix my signature.

JOHN OLIPHANT.