L. S. MATHEUS & C. LEINDECKER.

COMPRESSED AIR APPARATUS FOR ELEVATING LIQUIDS.

APPLICATION FILED AUG. 19, 1909.

976,818.

Patented Nov. 22, 1910.

2 SHEETS—SHEET 1

Fig. 1.

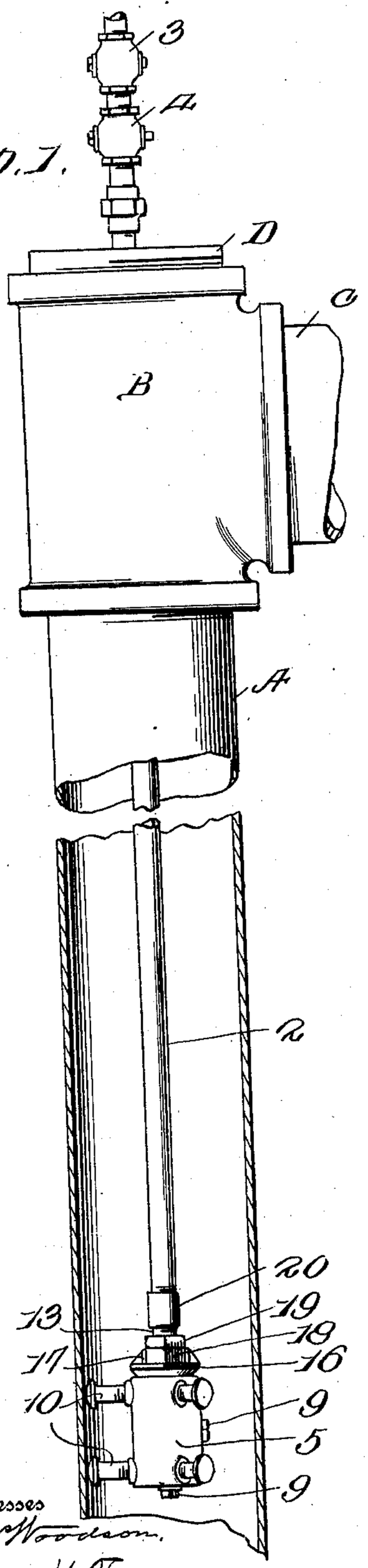
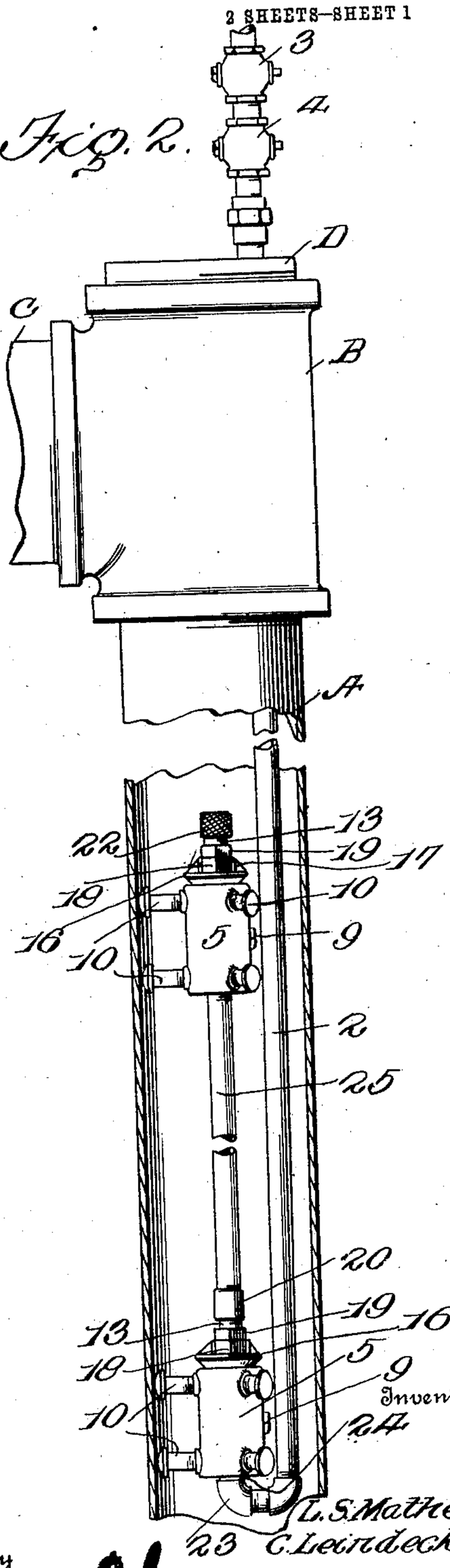


Fig. 2.



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2 SHEETS—SHEET 2.

Fig. 3.

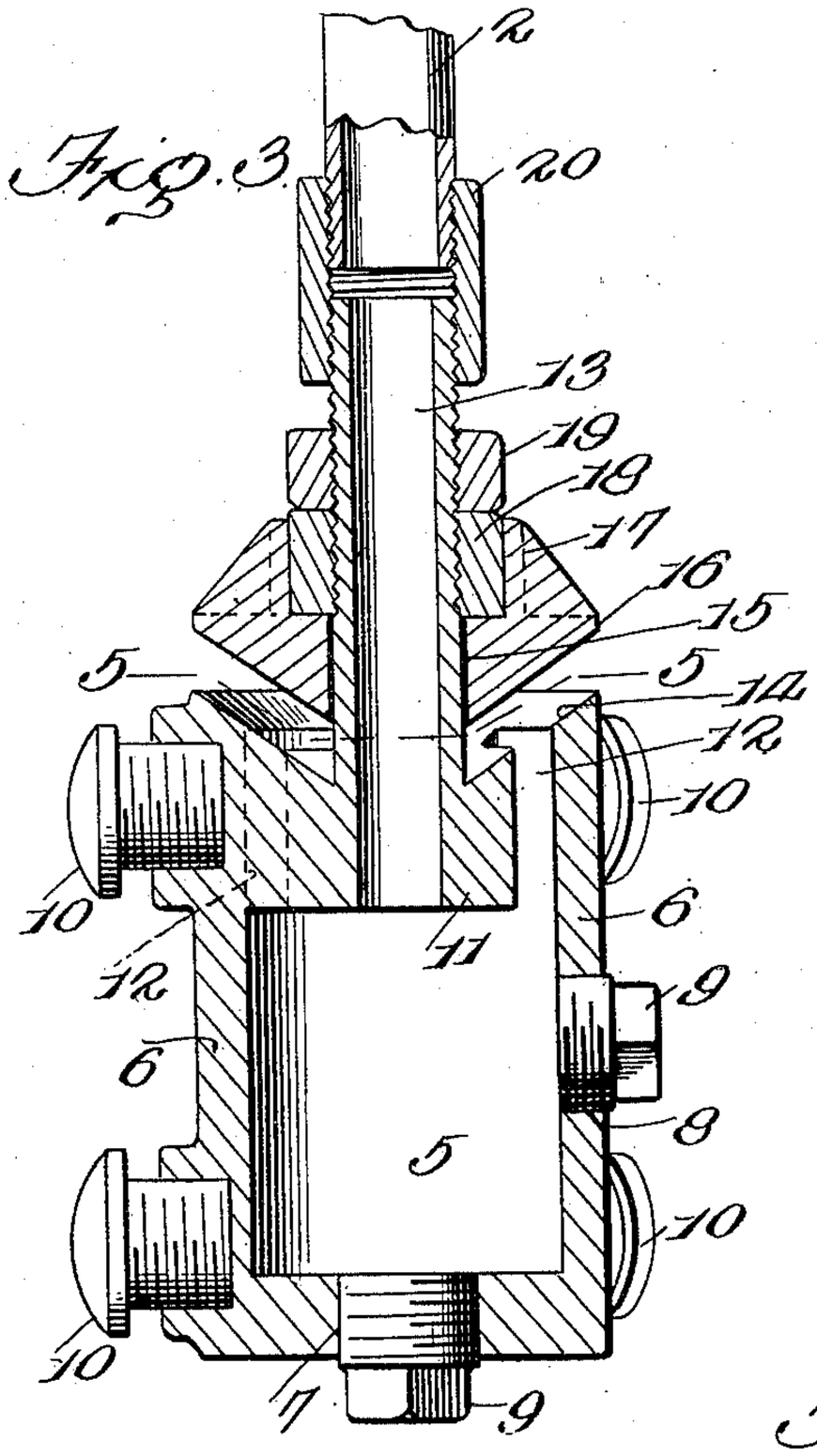


Fig. 5.

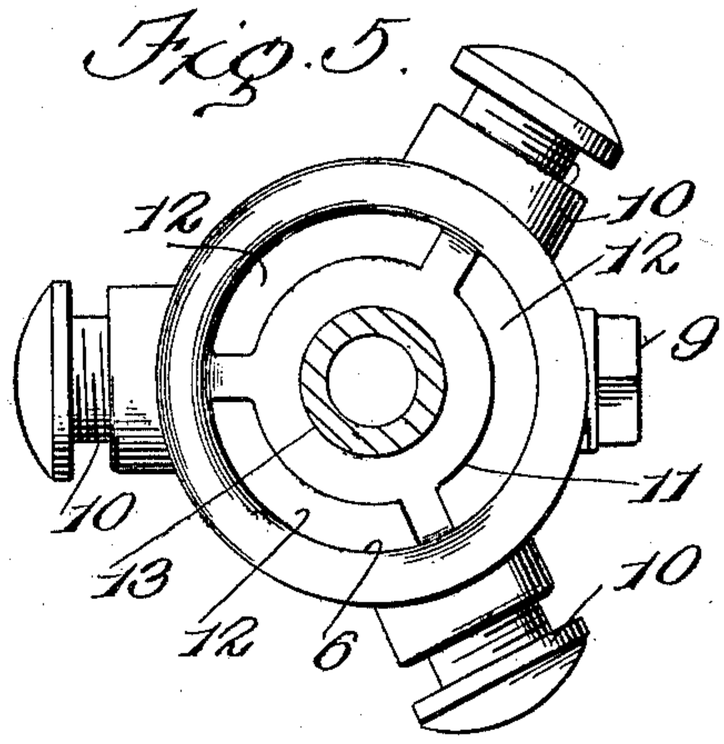


Fig. 6.

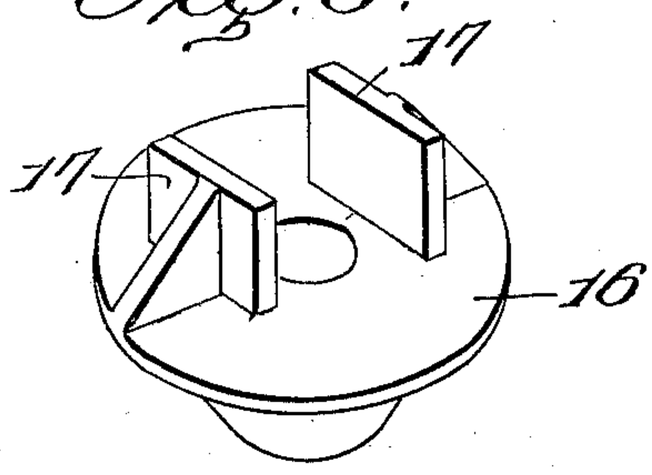


Fig. 7.

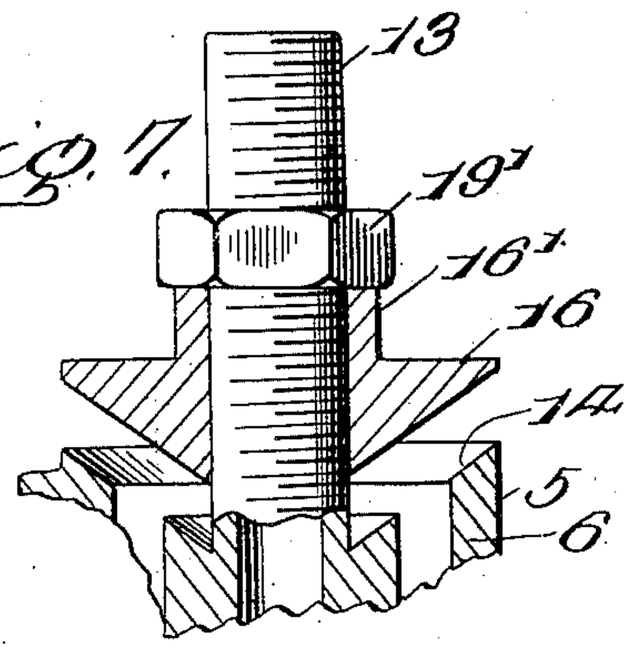
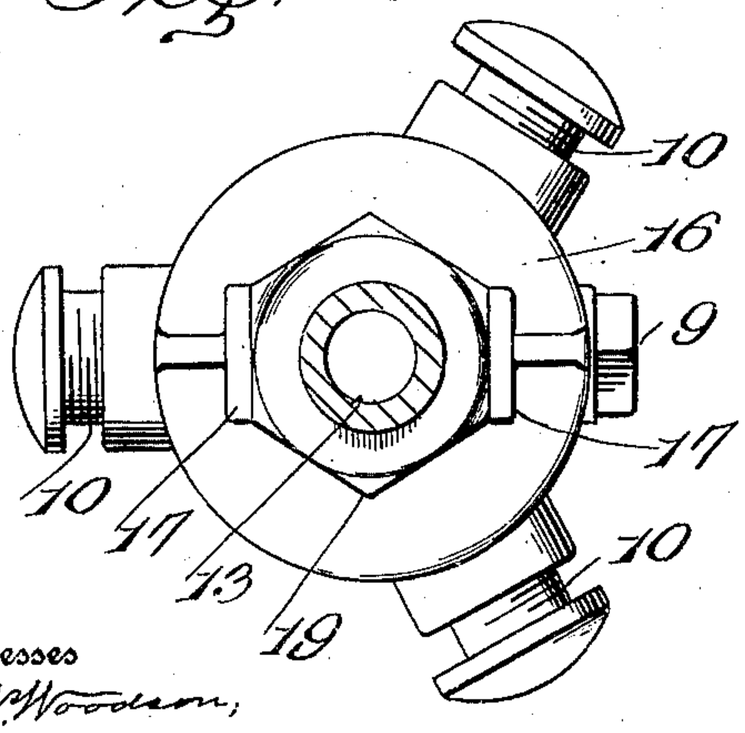


Fig. 4.



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UNITED STATES PATENT OFFICE.

LOUIS S. MATHEUS AND CHARLES LEINDECKER, OF LAWRENCEBURG, INDIANA.

COMPRESSED-AIR APPARATUS FOR ELEVATING LIQUIDS.

976,818. Specification of Letters Patent. **Patented Nov. 22, 1910.**

Application filed August 19, 1909. Serial No. 513,639.

To all whom it may concern:

Be it known that we, LOUIS S. MATHEUS and CHARLES LEINDECKER, citizens of the United States, both residing at Lawrenceburg, in the county of Dearborn and State of Indiana, have invented certain new and useful Improvements in Compressed-Air Apparatus for Elevating Liquids, of which the following is a specification.

Our invention relates to that class of liquid-elevating mechanism wherein compressed air is forced down into a well or other like situation, the air being distributed through the water, and the escape of the compressed air forcing up the water in the elevator casing.

The invention has for its object the improvement of the head or chamber by which the air is distributed to the water in the well, whereby the compressed air can be introduced into the air chamber or head at the top, side or bottom of the latter, as is deemed most convenient, or as required by the necessities of any particular case, and whereby a more uniform or even pressure at the point of distribution of the air is secured.

A further object is so to form the outlet end of the distributing head or chamber that the air when leaving the chamber is forced out and up into the well in an evenly distributed stream, thus raising the water and forcing it out of the top of the well.

A still further object is to so construct the head that one or more of these heads or chambers may be placed one above the other and connected to the same air introduction pipe so as to distribute compressed air at different heights in the well, all of these heads or chambers being operated by one air line. The use of a plurality of lifting chambers better enables the apparatus to raise water from shallow wells.

The invention consists in the arrangement of parts and the peculiar details of construction set forth in the accompanying specification and more specifically stated in the claims appended.

For a full understanding of the invention and the merits thereof, and to acquire a knowledge of the details of construction, reference is to be had to the following description and accompanying drawings, in which:

Figure 1 is a section of a well or the water-elevating stand pipe therefor, said stand pipe being broken away to show the air-introducing means; Fig. 2 is a fragmentary section of a stand pipe of the kind shown in Fig. 1, but provided with a plurality of lifting chambers or heads; Fig. 3 is a longitudinal diametrical section of the head shown in Fig. 1; Fig. 4 is a top view thereof; Fig. 5 is a section on the line 5—5 of Fig. 3; Fig. 6 is a perspective view of the valve or disk which rests upon the upper end of the head; and, Fig. 7 is a fragmentary vertical section of the upper end of the head or chamber with another form of valve thereon.

Corresponding and like parts are referred to in the following description and indicated in all the views of the drawings by the same reference characters.

Referring now to Fig. 1, A designates a stand pipe which may extend down into a well of any character, or into a reservoir from which water is to be lifted, the lower end of the pipe being of course open for the admission of water into the pipe. The upper end of the pipe is provided with the union B of any suitable character from which an outlet pipe C leads. The upper end of the union is formed with a head D which supports and through which passes the compressed air inlet pipe. The construction described is common to pumps of this class and requires no further description. Passing downward in the stand pipe A is the compressed air inlet pipe 2 which at its upper end is connected to any suitable source of compressed air, and is provided above the union B with a stop cock 3, whereby the passage of air may be entirely closed off, and a regulating cock or valve 4. The lower end of the air inlet pipe 2 is connected to a head or chamber 5 shown in section in Fig. 3.

The head or chamber 5 is preferably cast in one piece, and consists of the walls 6, these walls being formed at the bottom and at the side with openings 7 and 8 which may be closed by the screw plugs 9. These openings are screw threaded for the attachment of the air inlet pipe to the bottom or side of the chamber 5, as desired. When not connected to the air inlet pipe, however, they are blanked or plugged by means of the screw plugs 9. The head 5 is also provided with the screw studs 10, whereby the head or chamber as a whole may be centered in the pipe A. The upper end wall 11 of the

chamber 5 is formed with the segmental slots 12, these slots being located in line with the inner face of the wall 6. A nipple 13 extends upwardly from the center of the wall 11 and is preferably formed in one piece with this wall, this nipple being tubular of course and screw-threaded on its exterior. The upper face of the end 11, surrounding the nipple 13 is upwardly and outwardly inclined as at 14, and the slots or passages 12 open upon this inclined face.

In the form of our device shown in Fig. 3, the lower end of the nipple 13 is smooth as at 15, and surrounding this smooth lower end and movable thereon is the disk 16, the lower face of this disk being beveled from the center thereof outward and upward. The disk is annular and surrounds the nipple 13, and is capable of movement thereon. The upper face of the disk is provided with the opposed upwardly projecting studs 17 shown in Fig. 6, these studs being flat on the inner faces to engage with the flat faces of a nut 18 which is screwed upon the nipple 13. By adjusting this nut 18 to any desired position upon the screw-threaded portion of the nipple 13, the disk 16 may be limited in its upward movement so that it cannot open more than a certain distance away from the face 14 of the upper end of the chamber 5. In order to prevent any movement of the nut 18, we also provide the set nut 19 which thus locks the nut 18 in place when once adjusted, and prevents any shifting. The object of making the disk 16 so that it is movable up and down upon the lower end of the nipple 13, is to provide means whereby the upper face of the head may be protected when the device is not in use, and prevent the deposition of sand or other matter upon the upper end of the head. Of course when compressed air is escaping from the chamber 5 by means of the slots 12, the disk 16 will be raised to the position shown in Fig. 3.

In Fig. 3, the upper end of the nipple 13 is connected to a coupling 20 which in turn is connected to the air-conducting pipe 2. If, however, the air conducting pipe 2 enters the side or bottom of the chamber 5, the open end of the nipple 13 is closed by a plug 22, as shown in Fig. 2. Of course, in order to attach the air inlet pipe 2 to the side or bottom of the head 5, it is necessary to provide the pipe 2 with elbows 23 and nipples 24 which have screw-threaded engagement with the openings 7 or 8.

While preferably the disk 16 is movable so that upon the cessation of compressed air entering the chamber 5 the disk 16 will close against the upper end of the chamber, yet we may form the disk 16 so that it has screw-threaded engagement with the nipple 13, as shown in Fig. 7. In this figure, the disk 16 is formed with an upwardly projecting hub 16′, the inner face of the disk and hub being screw-threaded for engagement with the screw threads of the nipple. Thus, the disk is formed like a nut and may be turned up or down upon the nipple, it being held locked in place by means of the lock nut 19′. Both these constructions, however, permit the disk 16 to be adjusted nearer to or farther from the beveled end of the head 5. It will be seen from the drawings that the bevel of the face of the disk 16 has the same angle as the beveled face 14 of the head.

While the construction which we have described permits the air inlet pipe to be secured either to the bottom, side or top of the head 5, our construction also permits a plurality of heads to be used, as shown in Fig. 2, the heads, however, are of precisely the same construction as heretofore described. Where a plurality of heads are used, however, the air inlet pipe 2 enters either the bottom or the side of the lowermost head, and a connecting pipe 25 is used, which is engaged with the nipple 13 of one head, and leads into the screw-threaded opening 7 in the bottom of the head next above it. Thus, our construction permits of a plurality of heads being used, as well as the use of one head, and thus our device is adapted to many different conditions.

In order to illustrate our construction clearly, the proportions of the diameter to the length in the head 5 have been varied. As a matter of fact, where the stand pipe A is six inches in diameter, the head 5 should be three inches in diameter and about fifteen inches long. It will of course be obvious, however, that these proportions might be changed in any manner to best fit the heads for their work, without departing from the invention.

The operation of this liquid-elevating apparatus is as follows: The tube A being filled with water above the level of the lowermost head 5, compressed air is forced into the tube 2, passes downward into the head or heads 5, and issues from the annular space between the face 14 and the beveled face of the disk 16. The issuing air, by reason of the peculiar form of the disk 16 and the face 14 of the head, has the form of what may be termed an annular jet or sheet, and the air when issuing therefrom, is forced out and up into the well, and evenly distributed therein, thus raising the water and forcing it out of the top of the well. The even distribution of compressed air in the water is one of the important elements of this class of devices, and we have found in practice that the peculiar form given to the upper end of the head and to the valve, is peculiarly efficacious in so distributing the compressed air through the water as to secure an easy lifting of the water and a maximum of suction.

Our device is extremely simple, has no internal parts, and therefore cannot readily get out of order. It provides for the attachment of the air inlet pipe in a plurality of places, thus permitting of variations to suit particular circumstances, and it is so constructed as to permit the device to be used in casings varying in internal diameter, the device being centered therein by the studs 10. The device forms a unit which may be multiplied to any extent desired, so as to provide a plurality of lifting heads, and the movable valve or disk 16 permits the issue of air in the form of an annular sheet, but protects the upper surface of the chamber when the apparatus is out of commission. This filling of the air chamber with foreign matter, and the consequent choking up of the air passages, is sometimes extremely inconvenient and detrimental to the proper action of the elevator.

Having thus described the invention, what is claimed as new is:—

1. In an apparatus of the character described, the combination with a stand-pipe, of a compressed air inlet pipe extending into the stand-pipe, a plurality of chambers, pipes connecting said chambers in series, and a connection between the lower end of the compressed air pipe and the lowermost one of said chambers, each of said chambers being provided with an upwardly opening outlet.

2. In apparatus of the class described, the combination with a stand pipe, of a compressed air inlet pipe extending into the stand pipe and then extending upward, said upward extension of the inlet pipe being provided with a plurality of chambers at different levels, each of said chambers being closed at its bottom and having discharge openings at its top, and means for deflecting the air passing from said openings outward and upward.

3. In apparatus of the class described, the combination with a stand pipe, of a compressed air inlet pipe extending downward into the stand pipe and returned upon itself at its lower end and then extending upward, said upwardly extending portion of the inlet pipe being provided with a plurality of chambers at different levels, each of said chambers being closed at the bottom and sides and having discharge openings at their upper ends, and a cover mounted above each chamber, normally resting upon said chamber and covering said openings, said cover being adapted to lift when the air is being forced out of said chambers.

4. In apparatus of the character described, the combination with a stand pipe, of a compressed air inlet pipe extending into the stand pipe, and a plurality of distributing chambers connected in series to each other, each of said chambers having a discharge opening at its upper end, said inlet pipe being connected to the lowermost of said chambers and means for deflecting the air passing from said upper ends of said chambers outward and upward.

5. In an apparatus of the class described, the combination with a compressed air inlet pipe, of an air distributing head therefor, said head being chambered and provided at its side, lower end and upper end with means for the attachment of said compressed air inlet pipe, the head being formed with an air discharge opening in its upper end.

6. In an apparatus of the class described, the combination with a compressed air inlet pipe, of a distributing head therefor, said head being chambered and being provided with means for the attachment of the inlet pipe, the upper end of said head having a downwardly and centrally beveled face, and provided with ports extending from the interior of the chamber to said beveled face, and a beveled disk movably mounted above the beveled end face of the head in contiguity therewith normally resting upon the upper face of the head, but adapted to be raised therefrom by the passage of air through said ports.

7. In an apparatus of the class described, the combination with a compressed air inlet pipe, of an air distributing head therefor, such head being chambered and connected to the air inlet pipe, the upper end of the head being formed with segmental outlet ports extending to the end face of the head, said end face being upwardly and outwardly beveled, a disk movably mounted above the beveled end and normally resting thereon, but adapted to be lifted therefrom by the passage of air through the outlet port, said disk having an upwardly and outwardly beveled lower face, and means for limiting the movement of said disk out of a predetermined contiguity with the beveled end of the head.

8. In an apparatus of the class described, the combination with a compressed air inlet pipe, of an air discharging head therefor, said head being chambered and connected to the air inlet pipe, the outer face of the upper wall of said head being upwardly and outwardly beveled and having segmental ports opening thereon and leading to the interior of the head, an upwardly projecting member extending from the center of the upper wall, and a disk mounted upon the upwardly projecting member in contiguity with the end-face of the head, said disk having an upwardly and outwardly beveled lower face.

9. In an apparatus of the class described, the combination with a compressed air inlet pipe, of an air distributing head therefor, said head being chambered and connected to the air inlet pipe, the upper end of the head being provided with a centrally disposed

tubular nipple screw threaded for engagement with a pipe, the upper end face of the wall forming the upper end of the head surrounding the nipple being upwardly and outwardly beveled and formed with segmental ports leading to the interior of the head, and an annular disk surrounding the nipple having its lower face upwardly and outwardly beveled.

10. In an apparatus of the class described, the combination with a compressed air inlet pipe, of an air discharging head therefor, said head being chambered, the upper end of the head being provided with a centrally disposed upwardly extending tubular nipple exteriorly screw-threaded for engagement with the pipe, the upper face of the head being outwardly and upwardly beveled and provided with discharge ports extending into the interior of the head, an annular disk surrounding the nipple and shiftable thereon and formed with an upwardly and outwardly beveled lower face, and means for limiting the upward movement of the disk.

11. In an apparatus of the class described, the combination with a compressed air inlet pipe, of an air discharging head therefor, said head being hollow and provided with means for the attachment of the air inlet pipe, the upper end of the head being formed with a central tubular nipple screw-threaded on its exterior, the upper end face of the head being upwardly and outwardly beveled and having ports extending from said face into the interior of the head, an annular disk surrounding the nipple, and a lock nut engaging with the threads of the nipple above the disk.

12. In an apparatus of the class described, the combination with a compressed air inlet pipe, of an air discharging head therefor, said head being chambered and connected to the air inlet pipe, the upper end of the head being provided with a central tubular nipple screw-threaded on its exterior, the upper end face of the head being outwardly and upwardly beveled and formed with discharge ports leading to the interior of the head, an annular disk mounted on the nipple having its lower face upwardly and outwardly beveled, opposed flat-faced lugs on the upper face of the disk, and an adjusting nut engaging with the nipple and with said lugs.

13. An air-discharging head for compressed air water elevators, the end of the head being formed with outward openings, and a disk valve mounted exteriorly to the head and normally resting upon the upper end thereof and closing said openings, but adapted to lift to permit the discharge of air.

14. An air-discharging head for compressed air water elevators, the upper end of the head being provided with a wall formed with a concentrically disposed outlet opening, the upper end face of the wall being outwardly and upwardly beveled, and an annular disk shiftably mounted exterior to the head to normally rest against the beveled face of the head, the inner face of the disk being upwardly and outwardly beveled.

15. An air-discharging head for compressed air water elevators, the upper end face of the head being outwardly and upwardly beveled, the upper end of the head being formed with concentrically disposed outlet ports opening upon said beveled face, and an annular disk having its lower face upwardly and outwardly beveled, said disk being shiftably mounted upon the upper end of the head and normally resting upon said beveled end face and closing said openings, but being adapted to be lifted by the air within the head.

16. An air distributing head for compressed air water elevating apparatus, comprising a closed chamber having a screw-threaded opening on its side and on its bottom, the upper end of the chamber being formed with an upwardly extending tubular nipple opening into the chamber, the chamber also being provided with discharge openings at its upper end surrounding the nipple.

17. An air discharging head for compressed air water elevating apparatus, including a chamber having openings in its sides, and said openings being screw-threaded and adapted to be closed by plugs to be attached to an air inlet pipe, the upper end of the chamber being provided with an upwardly extending screw-threaded tubular nipple, the upper end face of the chamber surrounding the nipple being upwardly and outwardly beveled and formed with ports extending from said face into the interior of the chamber, an annular disk surrounding the nipple and formed with an outwardly and upwardly beveled lower face, and means on the head for centering it with relation to an inclosing casing.

In testimony whereof we affix our signatures in presence of two witnesses.

LOUIS S. MATHEUS. [L. S.]
CHARLES LEINDECKER. [L. S.]

Witnesses:
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