No. 779,743. PATENTED JAN. 10, 1905.

D. L. SHAFFER.

PUMP.

APPLICATION FILED MAR. 19, 1904.

2 SHEETS—SHEET 1.

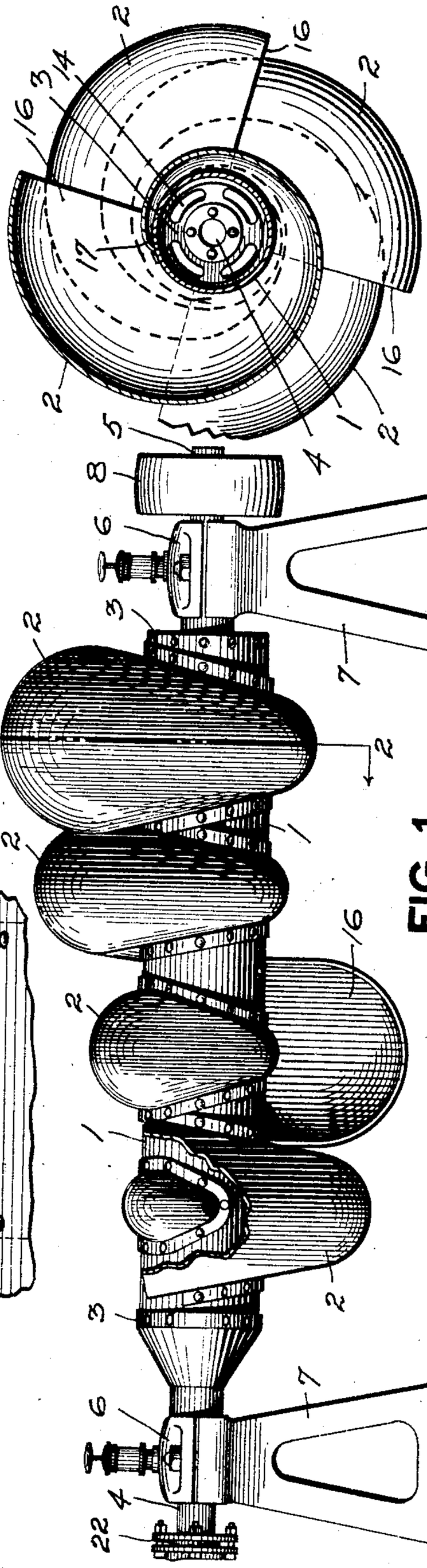

FIG. 2

FIG. 5

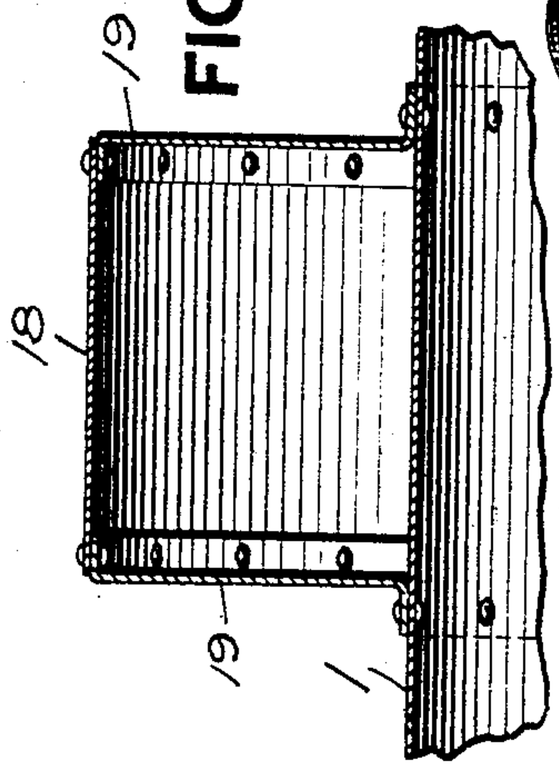

FIG. 1

WITNESSES.

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2 SHEETS—SHEET 2.

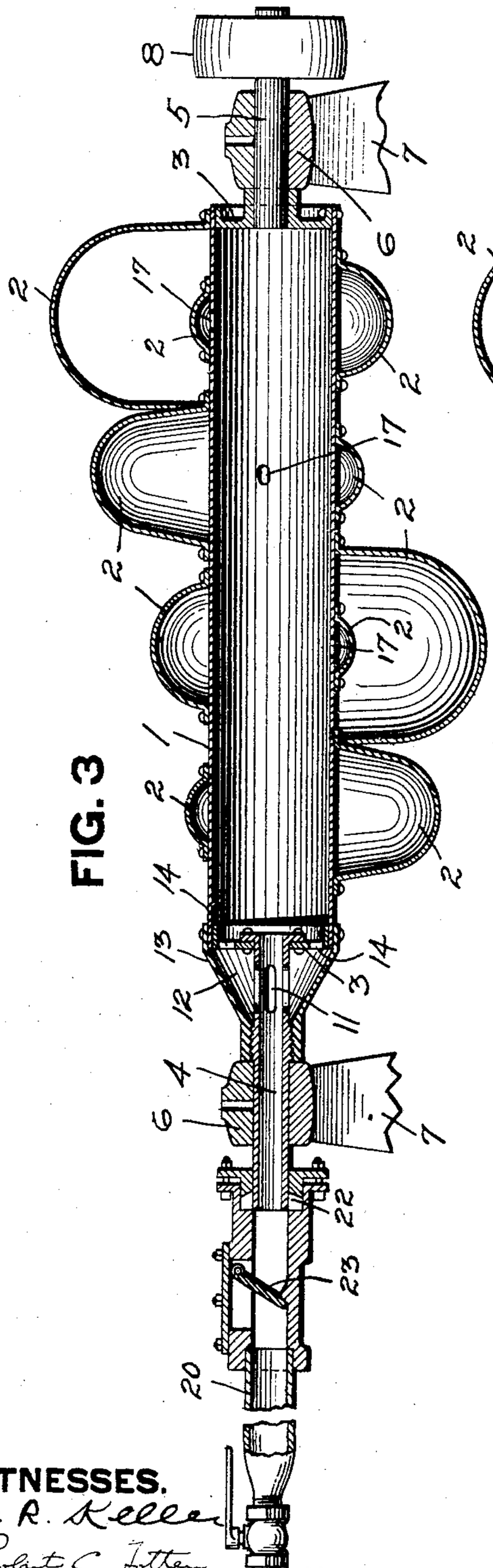

FIG. 3

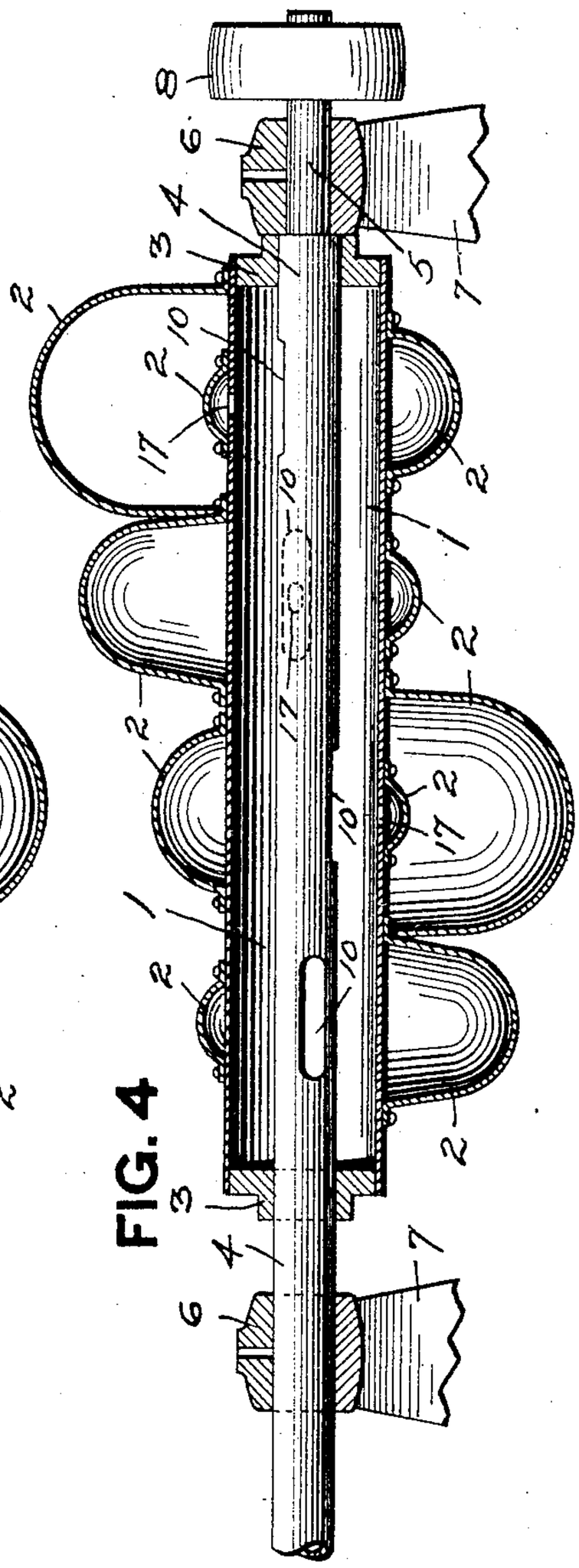

FIG. 4

WITNESSES.

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UNITED STATES PATENT OFFICE.

DAVID L. SHAFFER, OF PITTSBURG, PENNSYLVANIA.

PUMP.

SPECIFICATION forming part of Letters Patent No. 779,743, dated January 10, 1905.

Application filed March 19, 1904. Serial No. 198,913.

To all whom it may concern:

Be it known that I, DAVID L. SHAFFER, a resident of Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Pumps; and I do hereby delare the following to be a full, clear, and exact description thereof.

My invention relates to rotary pumps, and more especially those adapted for compressing air, although it may also be used for lifting or conveying water.

The object of my invention is to provide a pump which is simple of construction, which contains no valves, and which practically cannot get out of order.

In the accompanying drawings, Figure 1 is a side view of my pump, a portion being broken away. Fig. 2 is a transverse section thereof on the line 2 2, Fig. 1. Fig. 3 is a longitudinal vertical section through the same. Fig. 4 is a similar view showing a modification, and Fig. 5 is a detail sectional view showing a modified form of spiral.

The essential feature of my pump consists of a rotary cylinder 1, having thereon one or more spirals 2, four such spirals being shown in the drawings; but obviously any number may be used. The cylinder 1 is provided with heads 3 and has projecting into the same a pipe 4, which has openings communicating with the cylinder-chamber 1. The cylinder 1 is provided with suitable axial journals on which it revolves, and one of these journals is formed by the pipe 4, while the journal 5 on the opposite end of the cylinder is solid. These journals are mounted in suitable bearings 6 in the standards 7, and to one thereof will be connected suitable means for driving the same, such as the belt-pulley 8. Obviously, however, a gear or any other well-known mechanism might be used instead. The driving mechanism will be such as to impart a very high rotary speed to the drum.

The pipe 4 will project into the cylinder 1, either passing entirely through the same, as shown in Fig. 4, and provided with a series of opening 10, whereby the air can enter the pipe from the cylinder-chamber, or said pipe will project only through one of the heads 3 of the cylinder, as shown in Fig. 3. In this case the inner end of the pipe is open to the cylinder, and the pipe is also provided with openings 11, which communicate with a small chamber 12, inclosed by the conical cylinder end 13, and which in turn communicates with the cylinder-chamber 1 by means of openings 14 in the head 3.

The spirals 2 are wrapped around or encircle the drum, the drawings showing them encircling the same once; but obviously said spirals need extend only partially around the drum, or, if desired, they may be wrapped around the drum two or more times. These spirals are provided at their outer ends with very large mouths 16, disposed practically radially with reference to the drum, and said spirals thence gradually diminish in cross-sectional area and have small or restricted inner ends, which communicate with the drum through suitable openings 17. These openings relatively are very small compared to the outer ends or mouths of the spirals, and as the walls of the spirals gradually converge from the mouth to the restricted orifice no obstruction exists to the gradual flow of the air inward, and as a consequence the large volume of air entering the mouth 16 becomes gradually compressed and forced into the cylinder 17 under comparatively high pressure.

The spirals 2 in cross-section may be of any desired form, Figs. 1 to 4 showing the same of curved outline, decreasing both in width and height from the mouth to the inner end. Fig. 5 shows a modification wherein the spiral in cross-section is practically rectangular, and in this case such spiral decreases in height from the mouth to the inner end, but not necessarily in width, and would communicate with the drum through a wide or narrow slot. In Figs. 1 to 4 the spirals are made by suitably pressing to shape a plate of metal, whereas in Fig. 5 the spiral is composed of an outer sheet 18 and separate end or head pieces 19, provided with flanges for riveting to the outer sheet 18 and to the drum 1.

The drum 1 is of comparatively large diameter, and the spirals 2 are wrapped around the same, said drum forming the inner walls of the spirals. The inner edges of the spirals

are united for their entire lengths to the drum, and hence a very strong construction is provided to resist the pressure of the air against the spirals. The spirals are arranged along the drum in different planes, so that one spiral does not break the air for another of the spirals, as would be the case if they were all placed in the same transverse plane.

The supply or conveyer pipe is shown at 20, and this is stationary. The outlet-pipe 4 from the drum projects into the conveyer-pipe, and a suitable stuffing-box 22 is provided for preventing leakage at this point. Preferably also a check-valve 23 of any suitable form will be placed in the conveyer-pipe. If desired, a storage tank or reservoir may be placed between the check-valve 23 and conveyer-pipe 20.

The supply-pipe 20, at least at its discharge-nozzle 24, in cross-sectional area will be less than the combined areas of the openings 17 of the several spirals. As a consequence the air which is forced into the drum under high pressure is maintained at such pressure. The pressure obtained depends upon the diameter of the drum, the speed of rotation, and the relative sizes of the mouths and inner ends of the spirals.

In the drawings the pump has been shown as arranged in a horizontal position; but this is not necessary, as it may be arranged vertical or on an incline, if desired. In use the drum will be rotated at a very high rate of speed, and the spiral or spirals thereon will catch the air and force the same toward their inner ends and gradually compress the same, and the latter will be forced through the restricted orifices 17 into the drum under a high pressure. From the drum the air will be taken to the conveyer-pipe as needed. The spirals 2 may, if desired, be carried inwardly and have their inner ends connected directly to the openings 10 of the pipe 4. (Shown in Fig. 4.)

The pump described is very simple of construction and has no valves or other parts which can get out of order. The several spirals on the drum are symmetrically arranged thereon, so that they will balance the drum, as clearly indicated in Fig. 2, thereby rendering the rotation of the drum easy. With a comparatively small power a comparatively high pressure may be obtained and practically without subjecting the apparatus to wear.

This pump may be used for elevating water and also for ventilating purposes, and by slight modification may be used as a suction device for drawing foul air from mines and the like, and may also be used for initially compressing air and supplying the same to the valve-chamber of ordinary air-pumps in order to increase the amount of air which can be compressed by such pumps. When the pump is used as a suction apparatus, it will be rotated backward and will draw the air through the pipe 4 and discharge it through the spirals 2. Various other uses will readily suggest themselves. When used for elevating water for ventilating purposes, the inner ends of the spirals will be of larger relative size than when the pump is to be used for compressing air.

What I claim is—

1. In a pump, the combination of a drum, axial journals therefor one of which is hollow, bearings for said journals, and one or more spirals surrounding said drum and having their inner edges secured to said drum for their entire lengths, said spirals having large open mouths disposed radially with reference to the drum and gradually narrowing from said mouths and having restricted inner ends opening into the drum.

2. In a pump, the combination of a drum, axial journals therefor one of which is hollow, bearings for said journals, and one or more spirals surrounding said drum, said spirals having their inner sides open and their inner edges secured to the drum for their entire lengths, the drum forming the inner walls of said spirals, said spirals having large open mouths disposed radially with reference to the drum and gradually narrowing from said mouths and having restricted inner ends opening into the drum.

3. In a pump, the combination of a drum, axial journals therefor one of which is hollow, bearings for said journals, and a plurality of spirals surrounding said drum and arranged along said drum in different transverse planes, said spirals having their inner sides secured to the drum for their entire lengths and having large open mouths disposed radially with reference to the drum and gradually narrowing from said mouths and having restricted inner ends opening into the drum.

In testimony whereof I, the said DAVID L. SHAFFER, have hereunto set my hand.

DAVID L. SHAFFER.

Witnesses:
ROBERT C. TOTTEN,
G. C. RAYMOND.