No. 609,088. Patented Aug. 16, 1898.

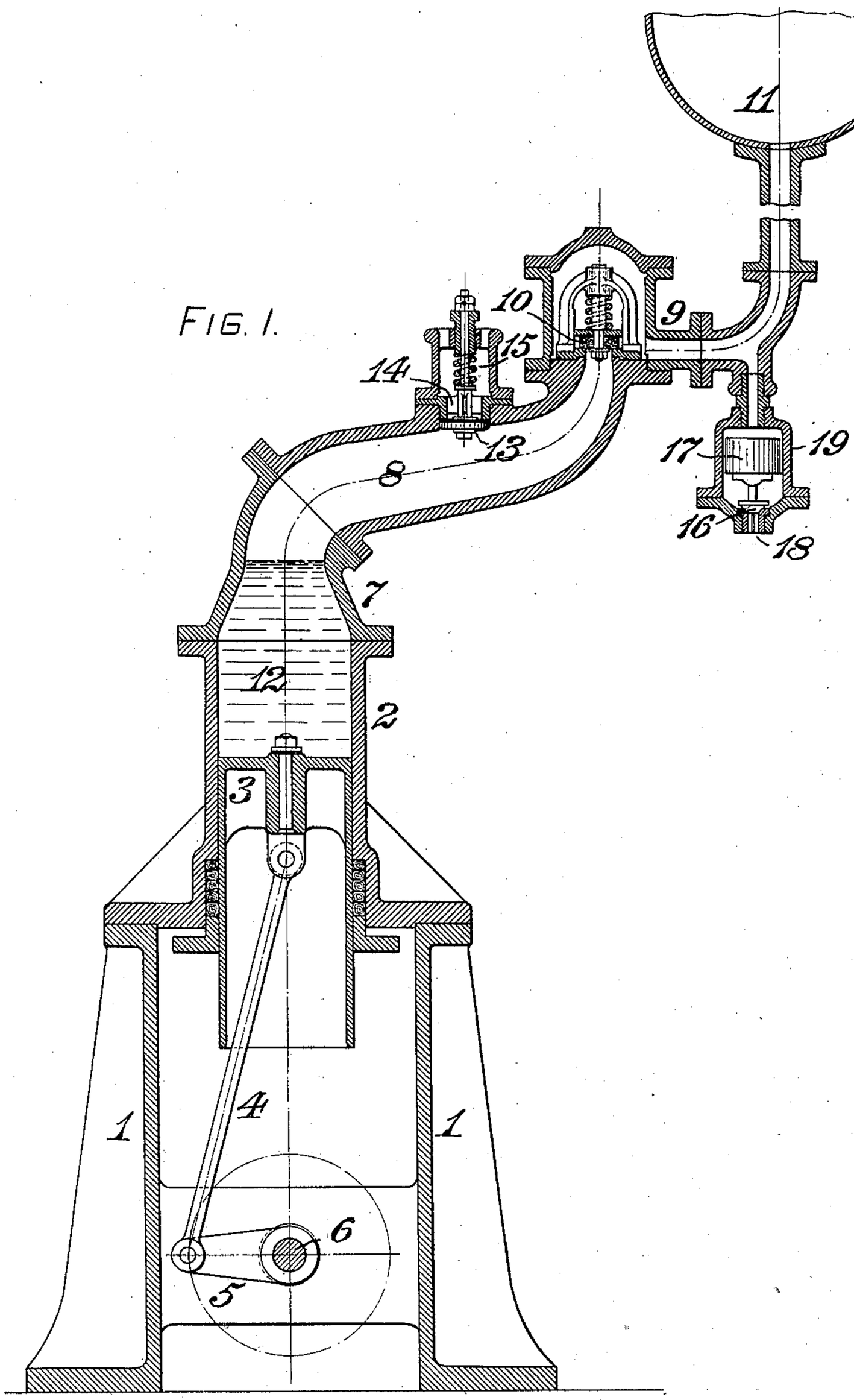
C. N. DUTTON.

AIR COMPRESSOR.

(Application filed Sept. 30, 1897.)

(No Model.) 2 Sheets—Sheet 1.

FIG. 1.



WITNESSES:

Jules F. Metzger

T. J. Hogan.

INVENTOR

Chauncey N. Dutton,

by Howson & Howson

atty.

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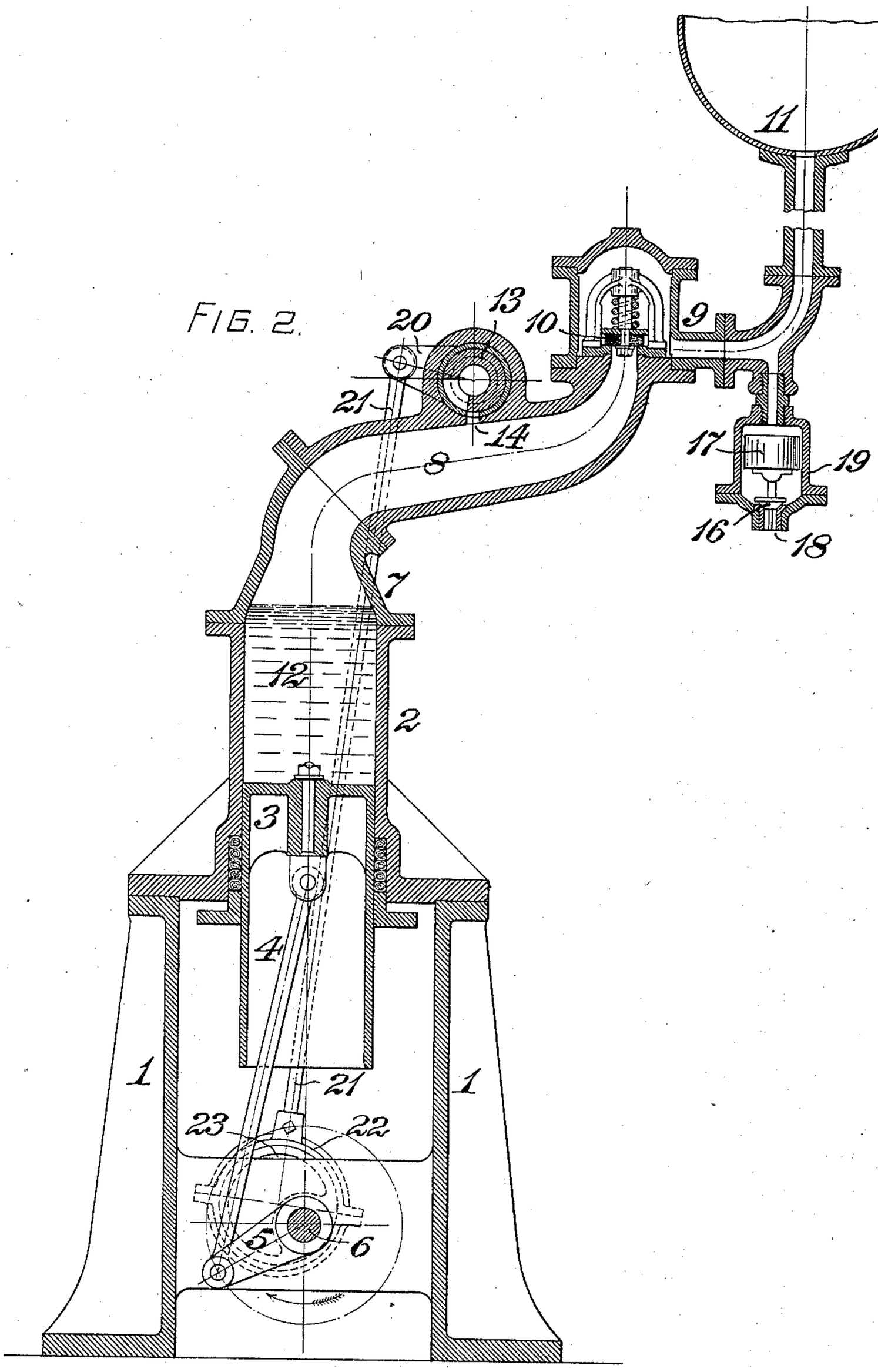
FIG. 2.



WITNESSES:

Jules F. Metzger

T. J. Hogan.

INVENTOR

Chauncey N. Dutton,

by Johnson Dell,

atty.

UNITED STATES PATENT OFFICE.

CHAUNCEY N. DUTTON, OF NEW YORK, N. Y.

AIR-COMPRESSOR.

SPECIFICATION forming part of Letters Patent No. 609,088, dated August 16, 1898.

Application filed September 30, 1897. Serial No. 653,576. (No model.)

To all whom it may concern:

Be it known that I, CHAUNCEY N. DUTTON, of the city, county, and State of New York, have invented a certain new and useful Improvement in Air-Compressors, of which improvement the following is a specification.

The object of my invention is to provide a fluid-compressor which shall be capable of compressing air at one stage from atmospheric pressure to as high a degree as may be desired, to which end my invention, generally stated, consists in the combination of a compressor-cylinder, a water-packed piston fitted to reciprocate therein, a compression-chamber communicating directly with the compressor-cylinder, an air-reservoir, a valve-controlled passage connecting the compression-chamber and reservoir, and a release-valve which is open during the initial portion of the compressing stroke of the piston and is closed when the piston has attained its maximum velocity.

The improvement claimed is hereinafter fully set forth.

In the accompanying drawings, Figure 1 is a vertical central section through an air-compressor embodying my invention, an automatic release-valve being employed; and Fig. 2, a similar section showing a mechanically-actuated release-valve.

The provision of the water packing and release-valve hereinafter set forth attains the results of packing the cylinder tightly and absolutely preventing air leakage, eliminating clearance and consequent loss of power, cooling the walls of the compressor-chamber and the compressed air, and allowing the piston and water packing to move freely while the driving-crank is passing the dead-center and is in the slow portion of the stroke, thus distinguishing the apparatus from those on the principle of hydrostatical compression, and after the piston and water packing have acquired velocity and have stored up in them and in the balance-wheel of the apparatus the force or work of the driving mechanism during the first part of the stroke the release-valve closes, and the water packing acts hydraulically and compresses the air to the desired pressure for which the apparatus is proportioned.

Water-packed air-compressors of different constructions were known in the art prior to my invention; but so far as my knowledge and information extend none of them have embodied the feature of a release-valve or possessed the capability of storing up work during the first part of the stroke or acting hydraulically in the compressing operation as in my invention.

Referring first to Fig. 1, a compressor-cylinder 2 is supported upon a suitable frame or bed 1 and fitted with a movable abutment or pressure member, as a piston 3, which is coupled by a connecting-rod 4 to a crank 5, fixed upon a shaft 6, to which rotation is imparted by any suitable prime mover. The pressure end of the compressor-cylinder 2 communicates by a nozzle 7 with a compression-chamber 8, which is connected by a pipe 9, governed by a delivery check-valve 10, with an air-reservoir 11. The aggregate volume of the nozzle 7 and compression-chamber 8 is made such that a water packing 12, which is supplied to and contained in the cylinder on the pressure side of the movable member 3, will completely fill the nozzle and compression-chamber when said movable member is at the limit of its compressing stroke.

A passage 14, leading to the atmosphere, is formed in the compression-chamber 8 or in the nozzle 7, if preferred, and is controlled by an outwardly-seating release-valve 13, which in this instance acts automatically. The release-valve is normally held unseated by a spring 15 or by gravity, or by both, and automatically closes when the velocity of the outgoing air becomes that for which the valve is set.

A drain-valve 16, connected to a float 17 and controlling a discharge-passage 18, is preferably provided and is fitted to work in a chamber 19, connected to the pipe 9, leading to the reservoir 11, in order to automatically discharge entrained water.

The modified form of apparatus illustrated in Fig. 2 differs from that first described only in the particular that a positively-operated release-valve is substituted for the automatically-acting valve of the former construction. The release-valve 13 is in this case of the rocking type and is vibrated over the passage

14 through an arm 20 on one of its ends, which is coupled by a rod 21 to the strap 22 of an eccentric 23, fixed on the driving-shaft 6.

In the instances shown the valve 13 performs the function of an inlet as well as of a release valve, and such construction is the preferable one, particularly in point of simplicity. It will, however, be obvious that under my invention the prime and special function of this valve is that of release and that, if desired, an independent inlet-valve might be employed.

In the operation of each of the forms of apparatus described and shown, the piston 3 being supposed to be at the upper end of its traverse—that is to say, the inner limit of its compressing stroke—and downward movement being imparted to it by the rotation of the driving-shaft 6, the valve 10 is closed by the pressure in the reservoir 11, and the valve 13 is opened either automatically, as in Fig. 1, by the external atmospheric pressure, its gravity, and the spring 15, or positively, as in Fig. 2, by its connections with the driving-shaft. Air then enters through the passage 14 and fills the space above the water packing 12 in the cylinder 2, nozzle 7, and compression-chamber 8. In the upward or compressing stroke of the piston the valve 13 is held open either by its gravity and the spring, as in Fig. 1, or by its connections with the driving-shaft, as in Fig. 2, during the initial portion of the compression-stroke of the piston and until the same and its water packing have acquired their maximum velocity and have stored up in them and in the balance-wheel of the apparatus (when a balance-wheel is employed) the force or work of the driving power. During the portion of the compressing stroke in which the valve 19 is open the air escapes freely from the compression-chamber 8 through the passage 14 and opposes no resistance to the movement of the piston, and when the velocity of the outgoing air becomes that for which the valve is set it is closed by the pressure within the compression-chamber or by its connections with the driving-shaft, as the case may be. During the remainder of the stroke of the piston the air in the compression-chamber is compressed by the piston and water packing and lifts the delivery check-valve 10, passing into the reservoir 11 through the port governed by said valve.

It will be observed that the compression-chamber 8 is contracted from its junction with the nozzle 7 to the delivery-valve 10. This is done in order that the advance of the water through the compression-chamber 8 may be at a uniform velocity, the contraction of the chamber 8 being provided to compensate for the reduction in the velocity of the movable abutment 3, so that as the speed of said abutment becomes less the space to be filled by the water becomes correspondingly less, and the velocity of the water at the point where it is in contact with the air to be compressed shall be uniform or as near thereto as may be desirable.

I claim as my invention and desire to secure by Letters Patent—

1. In an air-compressor, the combination, substantially as set forth, of a compressor-cylinder, a water-packed piston fitted to reciprocate therein, a compression-chamber communicating directly with the compressor-cylinder, an air-reservoir, a valve-controlled passage connecting the compression-chamber and reservoir, and a release-valve which is open during the initial portion of the compressing stroke of the piston, and is closed when the piston has attained its maximum velocity.

2. In an air-compressor, the combination, substantially as set forth, of a compressor-cylinder, a water-packed piston fitted to reciprocate therein, a compression-chamber communicating directly with the compressor-cylinder, an air-reservoir, a valve-controlled passage connecting the compression-chamber and reservoir, a passage from the compression-chamber to the atmosphere, an inwardly-opening valve controlling said passage, and means for opening said valve during the initial portion of the compressing stroke of the piston and closing it when the piston has attained its maximum velocity.

3. In an air-compressor, the combination, substantially as set forth, of a compressor-cylinder, a water-packed piston fitted to reciprocate therein, a compression-chamber communicating directly with the compressor-cylinder, an air-reservoir, a valve-controlled passage connecting the compression-chamber and reservoir, a passage from the compression-chamber to the atmosphere, an inwardly-opening valve controlling said passage, and a pressure device, as a spring or weight, which acts upon and imparts opening movement to said valve during the initial portion of the compressing stroke of the piston and permits its closure by internal pressure when the piston has attained its maximum velocity.

4. In an air-compressor, the combination, substantially as set forth, of a compressor-cylinder, a piston fitted to reciprocate therein, a compression-chamber communicating directly with the compressor-cylinder and of a volume sufficient to be substantially filled by water packing contained in the compressor-cylinder at the inner limit of the compressing stroke of the piston, an air-reservoir, a valve-controlled passage connecting the compression-chamber and reservoir, a passage from the compressor-chamber to the atmosphere, a valve controlling said passage, and means for opening said valve during the initial portion of the compressing stroke of the piston and closing it when the piston has attained its maximum velocity.

5. In an air-compressor, the combination, substantially as set forth, of a compressor-cylinder, a piston fitted to reciprocate therein, a compression-chamber communicating directly with the compressor-cylinder and of

volume sufficient to be substantially filled by water packing contained in the compressor-cylinder at the inner limit of the compressing stroke of the piston, said compressing-chamber being graduated in size, so that the advance of the water packing through it may be uniform, an air-reservoir, a valve-controlled passage connecting the compression-chamber and reservoir, a passage from the compression-chamber to the atmosphere, a valve controlling said passage, and means for opening said valve during the initial portion of the compressing stroke of the piston and closing it when the piston has attained its maximum velocity.

CHAUNCEY N. DUTTON.

Witnesses:
F. N. GLEASON,
FRANK A. FLOWER.