(No Model.) 2 Sheets—Sheet 1.

S. HANFORD.

HYDRAULIC AIR COMPRESSOR.

No. 474,296. Patented May 3, 1892.

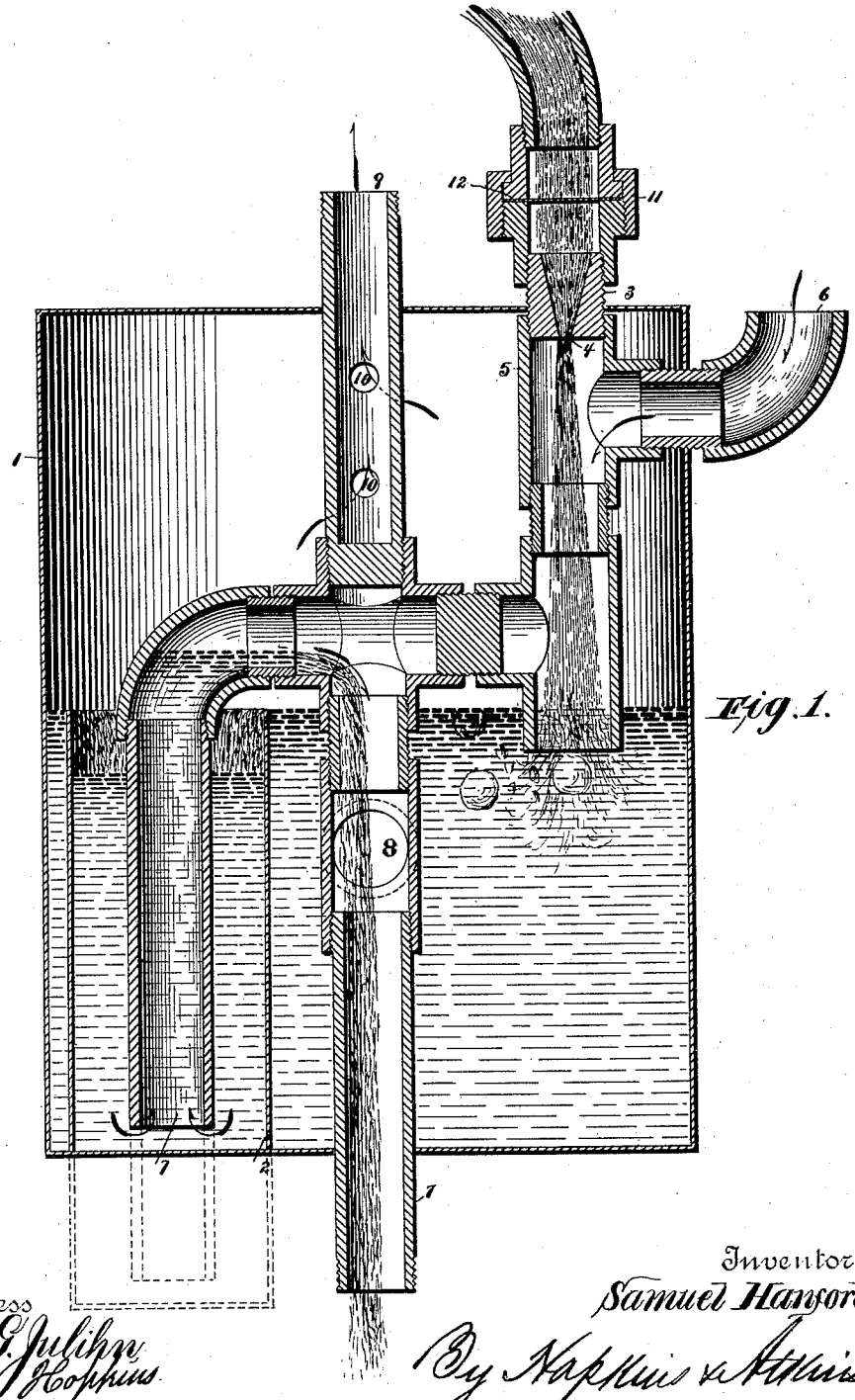

Fig. 1.

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(No Model.) 2 Sheets—Sheet 2.

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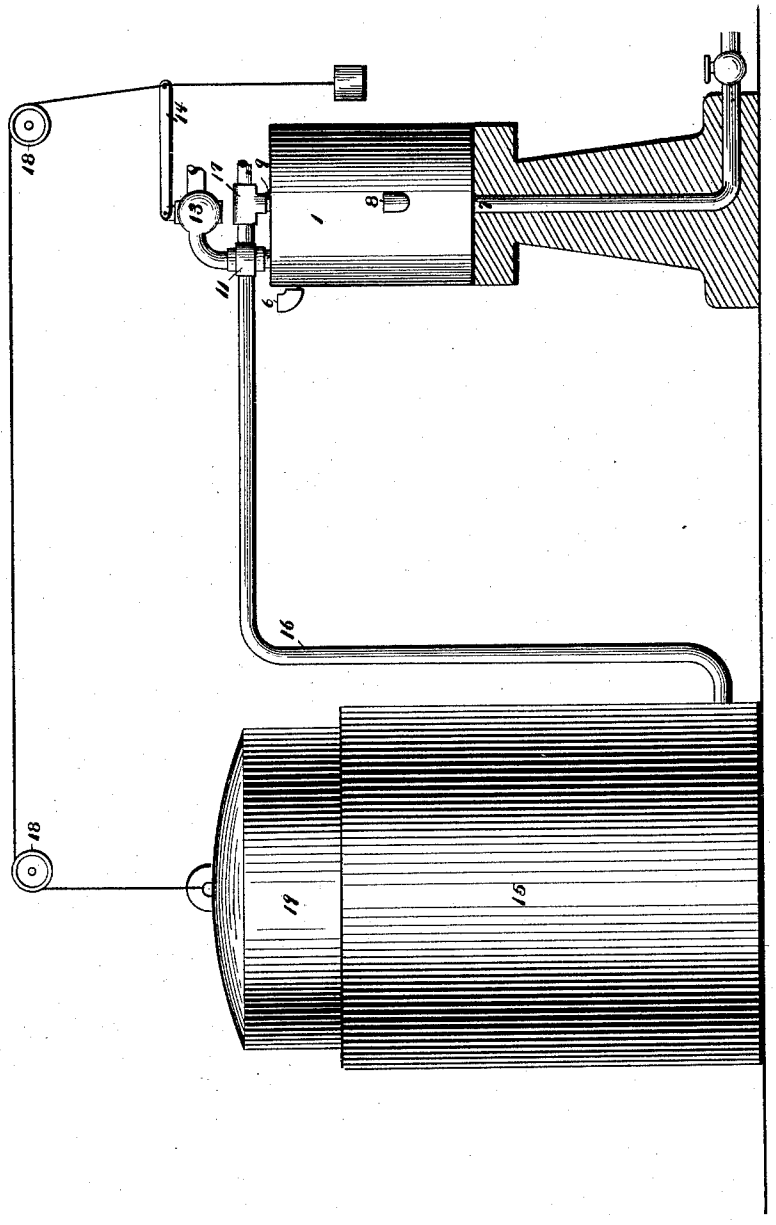

Fig. 2.

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UNITED STATES PATENT OFFICE.

SAMUEL HANFORD, OF BINGHAMTON, NEW YORK.

HYDRAULIC AIR-COMPRESSOR.

SPECIFICATION forming part of Letters Patent No. 474,296, dated May 3, 1892.

Application filed October 28, 1891. Serial No. 410,088. (No model.)

To all whom it may concern:

Be it known that I, SAMUEL HANFORD, of Binghamton, county of Broome, and State of New York, have invented certain new and useful Improvements in Hydraulic Air-Compressors, of which the following is a specification, reference being had to the accompanying drawings.

The object of my invention is to produce an improved compressor for supplying a continuous and steady blast of air. It may be used in many different ways—for instance, in sounding an organ, in supplying air to a gas apparatus or to a blow-pipe or a blast for a furnace, in driving light machinery, and the like.

In the accompanying drawings, Figure 1 is a vertical central section of my apparatus. Fig. 2 is a side elevation of the compressor with one portion partly in section.

Referring to the figures on the drawings, 1 indicates an air-tight shell or drum, and 2 a well, preferably fastened to the interior of one end of it and extending a little more than half way up its side.

3 indicates a water-supply pipe or nozzle, with a screw-threaded upper end that pierces the top of the drum and which may be fastened to a hydrant or other source of water-supply adapted to deliver water under pressure. It is pierced at its lower end by a small opening 4 and is screwed into the top of a pipe 5, which forms a continuation of it and terminates below the top of the well 2.

6 indicates an air-supply pipe entering one side of the pipe 5 and projecting outwardly, preferably through the side of the shell.

7 indicates a vent or discharge pipe, which extends from near the bottom of the well upwardly over the top of the well and thence preferably downwardly through the bottom of the shell. That part of it that extends downwardly outside of the well is preferably provided with an air-pipe 8. While the pipe 7 may be made in any suitable manner, a convenient form is illustrated in the drawings, in which the two parts of the pipe are shown as united by an ordinary cross or four-way fitting. One of the lateral branches of this fitting serves to support the pipe 5, (but there is no communication between these parts,) while the upper part supports an air-discharge pipe 9, that is closed by an air-tight joint at its lower end. Above this fitting, within the air-space of the drum, the pipe 9 is provided with a number of suitable openings 10 in its sides. The upper end of the pipe 9 projects through the top of the drum.

The drum may be made of suitable sheet metal and be secured to the parts which pierce it on the sides and ends to form air-tight joints by soldering or in any other suitable way, or, if desired, it might be cast. I do not confine myself to any particular method of manufacture. Pipes connected with ordinary fittings, as illustrated in the drawings, may be employed in making the necessary passages within the drum, or castings may be made for the several parts and joined together by screwing or in any suitable way.

11 indicates a union provided with a strainer 12, that is preferably interposed between the nozzle 3 and the source of water-supply to prevent access of any obstruction to the orifice in the bottom of the nozzle.

The operation of my device is as follows: Suppose water to be admitted through the nozzle 3 and pipe 5 into the interior of the drum until it rises over the top of the well and fills it, when its further rise will be prevented by its escape through the vent or discharge pipe 7. At the time the water begins to flow out at the vent it will have risen above the lower end of the pipe 5 so as to completely seal it. As the water issues forcibly from the small opening in the end of the pipe 3, it will draw a current of air from the outside through the pipe 6 into pipe 5 down into the water, from which it will rise into the space in the upper part of the shell practically free from moisture, which would render it unfit for many uses. This operation will continue so long as the flow of water continues. From the air-space in the top of the shell the air may pass out through the opening in the air-discharge pipe 9. If, owing to excessive pressure, the air cannot pass out rapidly enough through the discharge-pipe, it will seek another exit. The only one provided for it—the lower end of the pipe 5 being sealed—is through the well and the pipe 7. In order for the air to escape by this way, it must depress the column of water in the well to the bottom of the well and raise it to the top of the vent-pipe 7.

By this means a certain maximum pressure may be obtained with certainty, because the length of the column of water to be removed may be increased, as by making the well deeper, as illustrated by dotted lines in Fig. 1 of the drawings, without enlarging the shell.

If the outside branch of the vent-pipe were longer than the inside branch, there would be a tendency to siphon the water out of the well and prevent the operation of the machine. To obviate this difficulty, the air-pipe 8 is introduced into the descending portion of the vent-pipe.

By having the end of the supply-pipe—*i. e.*, pipe 5—sealed I can produce a constant blast without making the flow of water continuous or by partially shutting it off, which is a material advantage where the supply of water is intermittent or insufficient or where it is obtained through a meter and its economical use is a desideratum.

In Fig. 2 of the drawings I have illustrated an automatic device, which may be used, when desirable, for regulating the flow of water to my compressor according to the requirements of the work it has to do. In that figure 13 indicates a cock provided with a weighted lever 14 for operating it, the weight tending to keep it closed against the passage of a current of water through it into the pipes 3 and 5 of my compressor.

15 indicates an air-reservoir of ordinary and well-known construction, whose air-chamber is connected with the air-chamber of my compressor by the pipe 16. It may be joined to the pipe 9 by a T-fitting 17, whose open end may be joined to an air-service pipe for use.

18 indicates pulleys, over which passes a flexible band attached at one end to the lever 14 and at the other to the top of the movable chamber 19 of the air-reservoir. The length of the band may be adjusted so that the raising by pressure of air in the aerometer of the movable chamber 19 will allow the lever 14 to close the cock 13 and shut off the supply of water. The air remaining in the air-reservoir will issue from it in a continuous blast. When the chamber 19 descends sufficiently to open the cock 13, the water will again begin to flow and the compressor will operate, as before, to replenish the store of air in the air-reservoir. Where there is continuous exhaustion of air from the air-reservoir, the above-described mechanism will adjust itself so as to allow enough water to pass through the compressor to keep up a constant and steady blast of air neither more nor less than is required.

There are various formal modifications respecting the construction and relations of the parts of my apparatus which may be made without departing from the substance of my invention.

What I claim is—

1. In a hydraulic air-compressor, the combination, with a shell and a well therein, of a connected water-supply pipe and air-supply pipe opening within the shell, a vent or discharge pipe extending from near the bottom of the well upwardly and outwardly through the shell, and an air-discharge pipe, substantially as set forth.

2. In a hydraulic air-compressor, the combination of an air-tight shell containing a well, an air and water inlet terminating below the top and outside of the well, and an air-outlet and a water-outlet connected with the well, substantially as set forth.

3. In a hydraulic air-compressor, the combination, with the shell and a well, and air and water inlet, of a vent-pipe extending upwardly from near the bottom of the well over the top and outwardly through the shell, substantially as set forth.

4. The combination of an air-tight shell containing a well, an air and water inlet terminating below the top and outside of the well, a water-outlet connected with the well, and an air-reservoir and an air-outlet communicating between the shell and the air-reservoir, substantially as set forth.

In testimony of all which I have hereunto subscribed my name.

SAMUEL HANFORD.

Witnesses:
JOSEPH L. ATKINS,
HOLMES E. OFFLEY.