J. Gregg,

Hydropneumatic Machine,

No. 2,433, Patented Jan. 24, 1842.

Fig. 1.

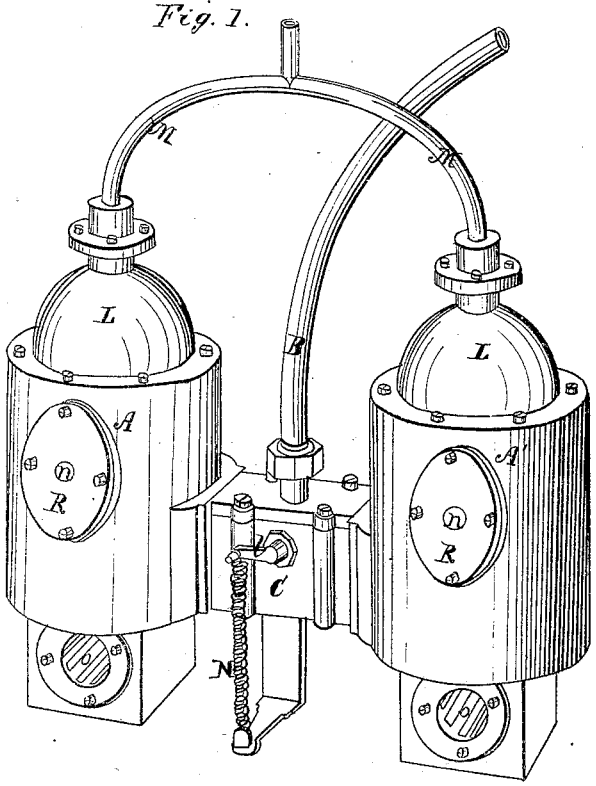


Fig. 2.

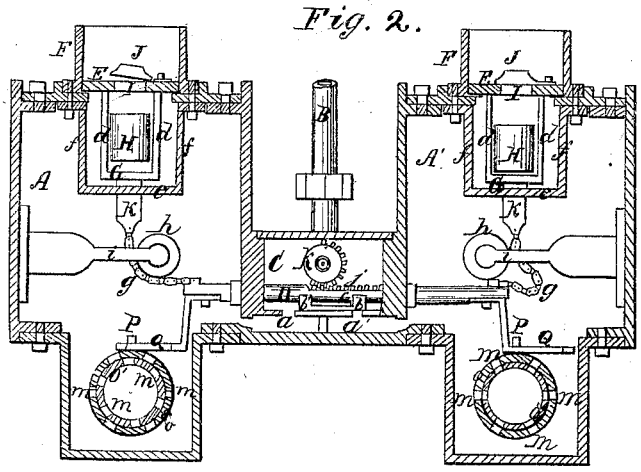


Fig. 4.

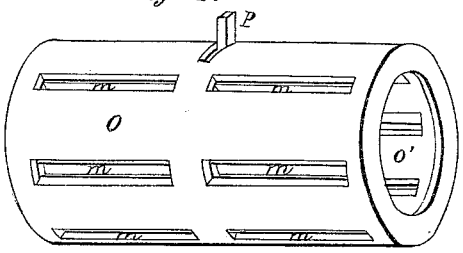


Fig. 3.

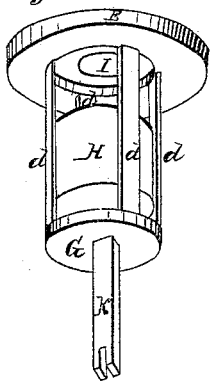
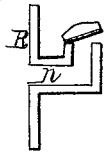


Fig. 5.



UNITED STATES PATENT OFFICE.

JOHN GREGG, OF ROCHESTER, NEW YORK.

IMPROVEMENT IN THE CONSTRUCTION OF APPARATUS FOR CONDENSING AIR TO BE APPLIED AS A MOTIVE POWER, DENOMINATED THE "HYDROPNEUMATIC APPARATUS."

Specification forming part of Letters Patent No. 2,433, dated January 24, 1842.

To all whom it may concern:

Be it known that I, JOHN GREGG, of the city of Rochester, in the county of Monroe and State of New York, have invented a new and useful machine or apparatus for obtaining power as a first mover by the employment of hydrostatic pressure to operate through the intermedium of atmospheric air, which apparatus I denominate the "Hydropneumatic Engine;" and I do hereby declare that the following is a full and exact description thereof.

There are many situations in which the power of water can be obtained under a very considerable head, which, from local causes, cannot be rendered available by means of water-wheels without an expenditure of money greater than could be made with prudence. It is principally in such situations that it is intended to employ the machinery invented by me. To effect this object I employ two cylindrical or other formed water-receivers, into which receivers water is alternately admitted under any desired head, and is made by its pressure to condense atmospheric air, which air so condensed is to be conveyed by tubes to a cylinder furnished with a piston, valves, and other appurtenances similar to those usually employed in a steam-cylinder, the air being in fact substituted for steam in such manner as that an ordinary steam-cylinder will not require any alteration to adapt it to use by means of condensed air.

In the accompanying drawings, Figure 1 is a perspective view of my apparatus in one of its forms, and Fig. 2 is a vertical section thereof through its center. Figs. 3 and 4 are enlarged views of certain parts thereof, to be presently described.

A A′ are the two water-receivers, which may be made of boiler-iron, or of any other material having sufficient strength to sustain the pressure of the head of water from which the power is to be obtained. These receivers must be made perfectly water-tight.

B is a pipe which is to receive the water from the head, and to convey it into the receivers A A′.

C is a trunk or valve-chest, through which the water is to pass into the receivers A A′ alternately, the pipe B entering this chest at its upper side. At the lower side of the valve-seat, within this chest, there are two apertures, *a a′*, which are governed by a slide-valve, *b b′*. The aperture *a′* leads into the receiver A′, and the aperture *a* into the receiver A. The slide-valve *b b′* is moved by the shaft D, which passes through stuffing-boxes at the ends of the chest C. The slide-valve is not attached to this shaft, but only embraces it, so that they can slide freely upon each other. On the under side of the shaft there is a pin, as at *c*, by which the slide-valve is moved. As shown in the figure, the valve closes the aperture *a′*, and were the shaft D made to slide for the purpose of closing the aperture *a* it would traverse the distance between the projecting pieces *b* and *b′* before it would begin to move said valve.

As represented in Fig. 2 in the drawings, the receiver A′ may be considered as filled with air, and A as in the act of being filled with water.

I will now describe the manner in which the shaft D, and consequently the slide-valve, is carried back and forth.

E E are pistons, one of which is shown on an enlarged scale at Fig. 3. These pistons are fitted to cylindrical chambers F F, on the upper ends of the water-receivers. *d d* are rods or bars descending from the pistons E, and attached to the circular piece G, so as to form a cage to receive a floating valve or stopper, H. Through the pistons E there are openings I, for the passage of the air as the water passes into the receivers, and these openings are closed by valves J J, opening upward.

K are rods descending from the bottom G of the cage *d* G, and sliding in an opening in a guide-piece, *e*, attached to the upper part of the receiver by the bars *f f*. The lower ends of the rods K K are attached to chains *g g*, made fast at their opposite ends to the sliding shaft D. The chains *g g* pass around pulleys *h h* on the ends of stanchions *i i*. The domes L L, Fig. 1, have tubes M M rising from them, and these are to convey the condensed air to the cylinder in which it is to operate. These domes may be omitted, and the tubes M be allowed to rise from the caps placed directly upon the cylinders F F.

Suppose water to be running into the receiver A. When it rises to sufficient height, the float-valve H, being formed of buoyant materials, will be made to close the opening

I, and the valve J will then fall. As the water still presses, its force will now be exerted on the under side of the piston E, which will rise in the chamber F. The rod K will then draw upon the chain *g*, and this upon the shaft D, and cause the latter to slide. The upper side of D is formed into a rack, *j*, which turns a pinion, *k*, carrying a crank-arm, *l*, Fig. 1. To the end of this crank-arm is attached a spiral spring, N, and when the rack *j* has passed far enough to carry the crank-arm *l* over beyond the dead-point the spiral spring N will then complete the motion of the shaft D, and close the aperture *a* by means of the slide-valve. The action of the rack and pinion and of the spiral spring will be the same in either direction. When one of the receivers has been filled with water, and the slide-valve by which it had been admitted is shifted so as to allow the water to flow into the other receiver, the water is discharged from that which has been filled in the following manner: At the lower end of each receiver I place a discharge-valve, *o*, (shown on an enlarged scale in Fig. 4,) which is constructed and operated in the following manner: I take two tubes, which are nearly cylindrical, and which are to be fitted into each other water-tight, and to effect this they are made somewhat conical, which allows of their being ground together. These are shown in section in Fig. 2, and in perspective in Fig. 4, the outer tube being marked O, the inner O′. Through these I make slots *m m*, which will coincide in both tubes, but which, by rotating the inner tube, will be closed. To the inner tube I attach a stud, P, which passes also through a slot or mortise in the sliding arm Q, which is attached to the sliding shaft D, and as this is moved back and forth the tube O′ will be rotated. The slots through the arms Q correspond in length with the play of the shaft D between the projections *b b′* on the slide-valve, so that the said valve and the rotating discharge-valves operate simultaneously. In the receiver A this latter is shown as closed, in the receiver A′ as open. As the water is discharged it is necessary that air should be admitted into the receiver. For this purpose an air tube and valve are attached to each receiver, the valve opening inward. The valves into these tubes are shown at *n n*, Fig. 1, and said tube and valve are represented in section in Fig. 5. Their nature and operation will be apparent without further explanation. R R are plates covering man-holes.

I have thus fully described the manner in which I construct, combine, and arrange the respective parts of my apparatus; but it will be manifest to every competent machinist that this arrangement may be changed in many particulars, while the general construction and operation of my machine would remain the same. Instead, for example, of placing the two water-receivers in a vertical position, they may be placed horizontally with their axes coinciding, the slide-valve and the other parts of the apparatus concerned in the admission and discharge of the water and in the condensation and admission of air being so arranged and combined as to admit of this change of form, while as a whole the instrument would remain substantially the same.

I am fully aware that it has frequently been proposed to use condensed air as a substitute for steam in working a piston within a cylinder constructed like those of a steam-engine.

I am aware, also, that it has been proposed to use the pressure of water from the rising and falling of the tide to effect such condensation—a device which would manifestly be sufficient for the production of any useful practical result, and not proposed to be effected in the manner which I have invented of rendering the pressure of water available in the driving of machinery. I do not claim, therefore, to be the first who has proposed to use condensed air in a steam-cylinder, or in a cylinder analogous thereto; nor do I claim to be the first who has condensed air by the pressure of a column of water acting in a cylinder of water; but

What I do claim as constituting my invention, and desire to secure by Letters Patent, is—

1. The particular manner in which I have combined and arranged the pistons E, the float-valve H, the sliding shaft D, and their appurtenances, so as alternately to co-operate in the admission and discharge of the water and in the condensation of the air.

2. The manner in which I have constructed and arranged the rotating discharge-valve O O′, so as to be operated upon and to operate in the manner described.

I will here remark that, although I consider the within-described apparatus as especially applicable to the attaining of power by the pressure of water from heads of considerable height, I do not intend to limit its use to these, as in situations where the head is not high and the volume of water is considerable it may be applied very advantageously to the working of blowing-cylinders and to many other purposes.

JOHN GREGG.

Witnesses:
THOS. P. JONES,
B. K. MORSELL.