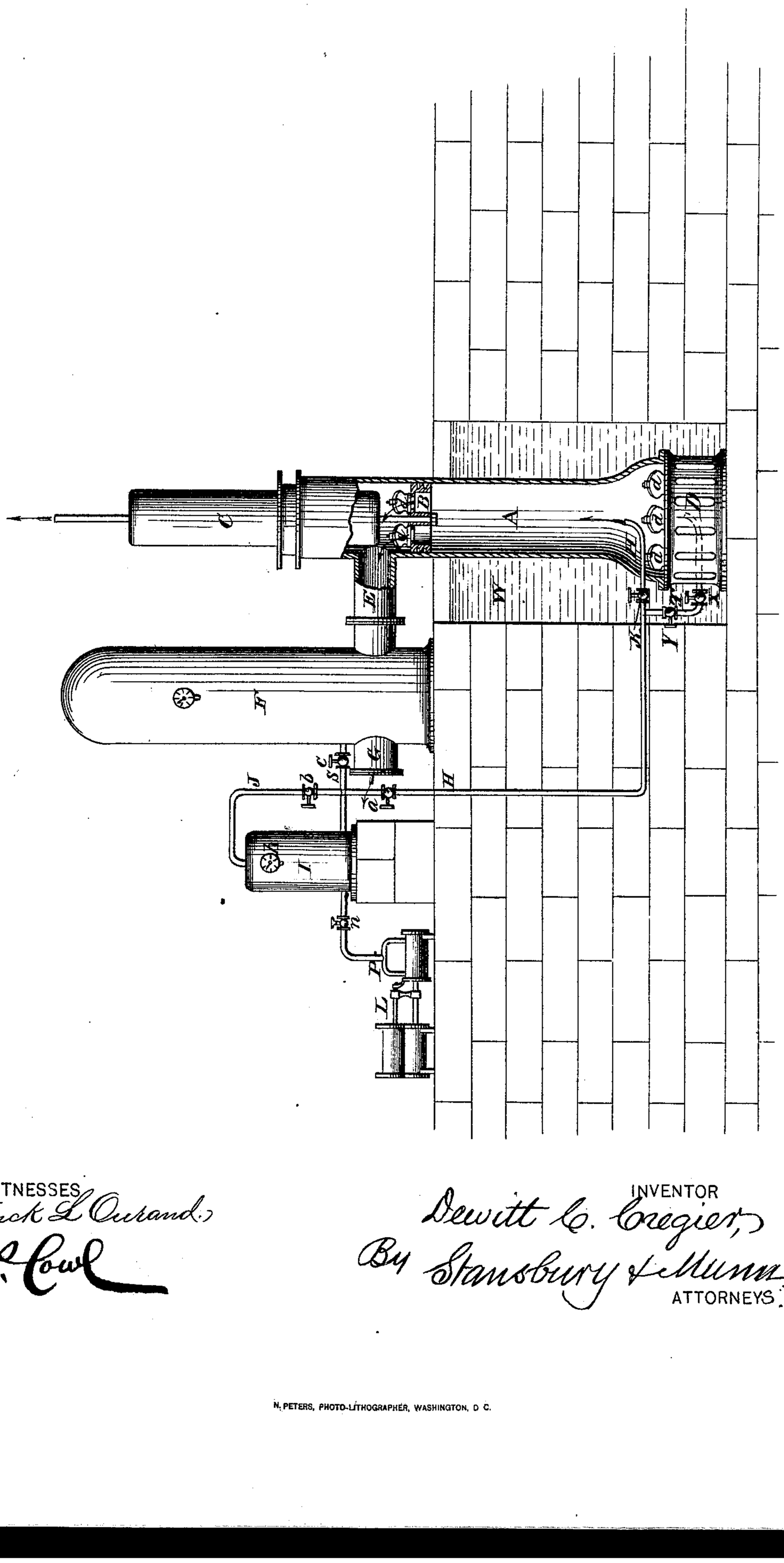
D. C. CREGIER.

COMPRESSED-AIR WATER-ELEVATORS.

No. 195,800. Patented Oct. 2, 1877



WITNESSES

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DEWITT C. CREGIER, OF CHICAGO, ILLINOIS, ASSIGNOR TO WILLIAM McALPINE CREGIER, OF SAME PLACE.

IMPROVEMENT IN COMPRESSED-AIR WATER-ELEVATORS.

Specification forming part of Letters Patent No. **195,800**, dated October 2, 1877; application filed August 10, 1877.

To all whom it may concern:

Be it known that I, DEWITT C. CREGIER, of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Pumping-Engines; and I do hereby declare that the following is a full, clear, and exact description thereof, which will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawing, and to the letters of reference marked thereon, which form a part of this specification.

Said drawing is a side elevation, partly in section, of a pumping-engine having my improvements.

In raising water under a head by means of any of the ordinary pumps, there is usually produced a concussion or shock, of more or less severity, to the machinery to which said pumps are attached. This shock is mainly due to the opening and closing of the valves at the moment of the reversal of the motion of the pump piston, bucket, or plunger, as well as of the two last named combined. Said pistons, buckets, or plungers, upon their descent, impinge upon a solid body of water or other non-elastic fluid, producing a shock which not only creates a disagreeable noise, but is apt to jar the entire structure, and transmit a violent momentary strain to the various connections, bearings, and other parts of the pumping-engine, thus producing undue friction and damaging wear, and increasing the liability of the parts to fracture.

In the operation of a steam-piston this shock is guarded against by the retention or admission of steam to act as a cushion.

The object of my invention is to provide in a pump an agency which shall act in the same manner in the relief of shock that steam does in the cylinder of an engine—a provision especially desirable in the class of large pumping-engines employed for supplying cities and towns with water.

The apparatus which I employ may be used with advantage in pumps of any class, including single or double acting, whether piston, plunger, or bucket, or the two last combined, or whether said pumps are force or lift, set vertical, horizontal, or inclined.

The nature of my invention consists in the combination, with a water-pumping engine, of a condensing air-pump connected with said engine by the necessary pipes, valves, and air chamber or chambers, for the introduction of compressed air into the pump at any desired point in the stroke, for the purpose of supplying an air-cushion to receive the impact of the piston, and thus relieve the shocks to which pumping-engines are ordinarily subjected, all substantially as hereinafter more particularly set forth.

In the drawings, A marks a pump of the bucket and plunger variety, set in a wet well, W, and surrounded by water. The pump is fitted with a bucket, B, plunger C, induction and eduction valves *d d*, and a nozzle, E, connecting with the air-vessel F.

G is a nozzle leading to a reservoir or standpipe, or direct to the distribution-pipes of a city.

D is the base of the pump, provided with suitable openings, through which water or other fluid is drawn.

L is an ordinary compression air-pump, driven in any convenient manner.

P is a pipe leading from the air-pump to a check-valve, *n*, and thence to the bottom of receiver or air-reservoir I.

Pipes J S H H T conduct air from receiver I to air-vessel F, to pump A, and to base D. These pipes are provided with check and stop valves, whereby the volume of air passing to the pump may be controlled at pleasure.

The air-pump should be kept from heating by a small jet of water, and should be so proportioned as to deliver into reservoir I the required volume of air under any pressure above that of the atmosphere. It should, indeed, have a capacity sufficient to supply the necessary quantity of air under a pressure a trifle in excess of that due to the head of water under which the main water-pump is working, or, in other words, slightly in excess of the pressure maintained in air-vessel F.

The object of the receiver is to retain a large surplus volume of air at the required pressure, so that the main pump may be fully supplied at each induction-stroke without exhausting the air, and without the too rapid or irregular action of air-pump L.

The operation is as follows: The air-pump

L being started, air flows into receiver I until the desired pressure (indicated by the gage *h*) is reached. Valves *b* and *a* are opened sufficiently to permit the proper volume of compressed air to pass through check-valve K to main pump A at a point between the induction and eduction valves *d d*. If preferred, a portion of the compressed air may be admitted below the induction-valves through branch pipe T and check-valve X.

I am aware that air-pumps are sometimes used to force air into the main air-vessel of a water-pumping engine for the purpose of keeping it fully supplied therewith. This operation I do not claim except when said main air-vessel is used as a reservoir for the purpose herein indicated as a substitute for receiver I.

I am also aware that air is sometimes admitted to water-pumps when in operation under the force of the partial vacuum which may be formed in said pumps. I have never known highly-compressed air to be forced into pumps while in operation in the manner and for the purpose herein shown and described.

Pumps are sometimes submerged in water. In such cases the induction-valves are located at more or less depth below the surface; or, when pumps are not submerged, their induction-valves may be far below the surface of the water flowing to said pumps. In either case there will be but a partial vacuum formed in the pump, it being vitiated in proportion to the pressure due to the height of the water above the induction-valve, because, at the moment of the opening of the induction-valve the water flows into the pump by force of gravity, and prevents the admission of sufficient air to produce the effect desired.

By my invention the required quantity of air is forced into a pump under a pressure greatly in excess of that produced by any vacuum that can be created, and also in excess of the pressure due to the height of water feeding the pump. Consequently said compressed air enters the pump in advance of the water, following the course of the bucket or plunger on their induction-stroke. On the reversal of motion or return stroke the bucket, piston, or plunger impinges upon a volume of compressed air, forming an elastic cushion, instead of upon a solid non-elastic body of water. This relieves the valves and all parts of the engine from the shock which would occur but for the presence of said air-cushion.

The admission of air under the induction-valves, as shown by pipe T, is sometimes desirable; but the best effect is generally secured by admitting the air above the induction and under the eduction valves.

I am aware that the admission of air into a pump under any pressure during its induction-stroke diminishes its capacity in a slight degree; yet, by the use of my invention, in the manner and for the purpose described, the loss in capacity is more than compensated by the greatly-increased velocity under which a bucket, plunger, or piston may be driven without producing any jar, shock, or concussion.

One air-pump and receiver provided with suitable valves may be made to serve a number of independent pumping-engines if located within reasonable distance of each other.

I claim—

1. The combination, with a water-pumping engine, of an air-pump connected with said engine by the necessary pipes, valves, and air chamber or receiver, for the introduction of compressed air into the pump at any desired point in the stroke, for the purpose of supplying an air-cushion to receive the impact of the piston, and thus relieve the shocks to which the pumping-engine is ordinarily subjected, all substantially as specified.

2. The compression air-pump L, in combination with pipe P P, check-valve *n*, and receiver I, all substantially as and for the purpose described.

3. The receiver I, in combination with pipe J, pipe H H, branch pipe T, stop-valves *b a* Y, and check-valves K and X, all substantially as and for the purpose set forth.

In testimony that I claim the foregoing as my own I hereto affix my signature in presence of two witnesses.

DEWITT C. CREGIER.

Witnesses:

J. D. C. WHITNEY,

B. F. CHASE.