

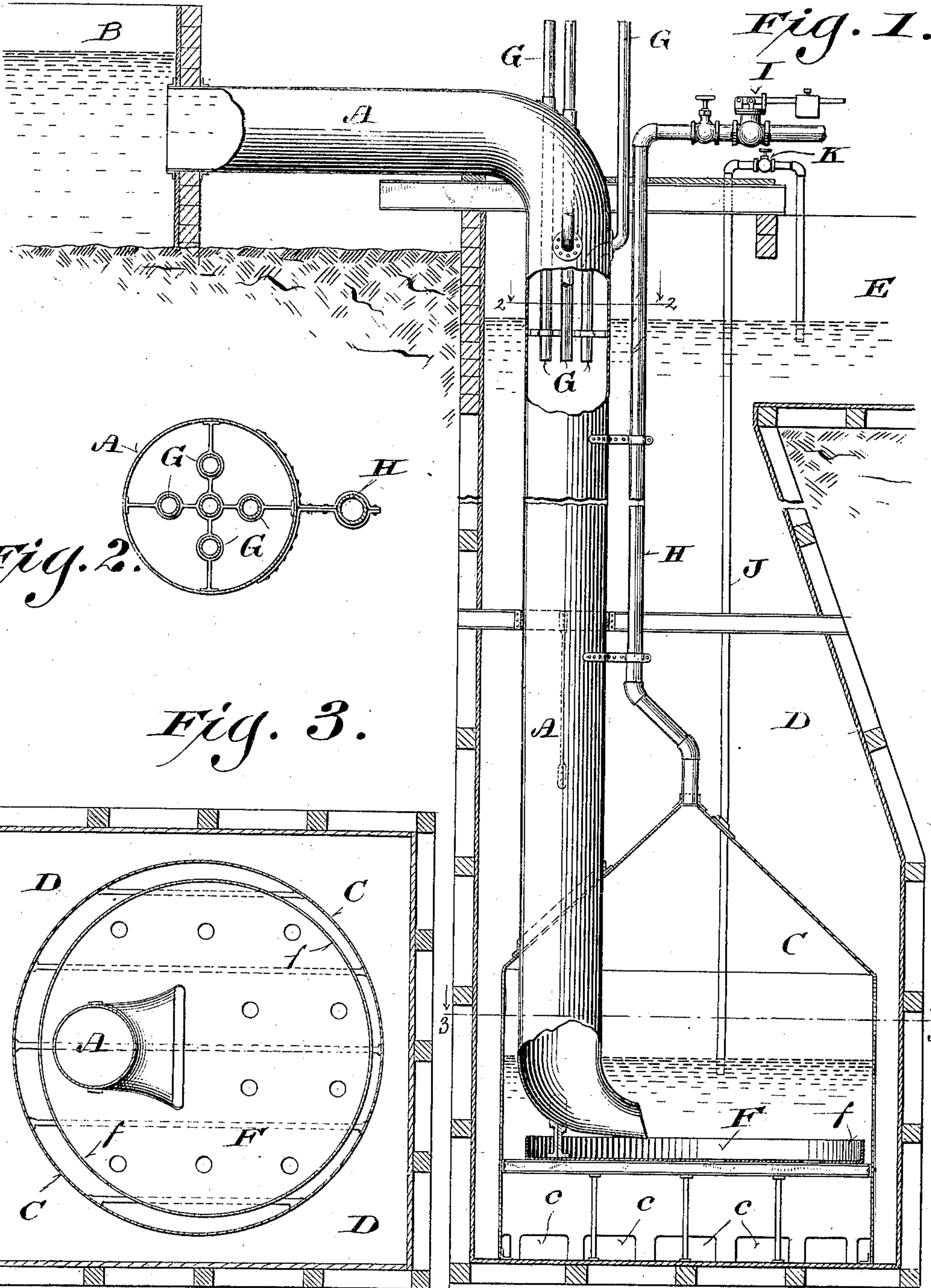
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F. C. STARKE.
HYDRAULIC AIR COMPRESSOR.

(Application filed July 30, 1900.)

(No Model.)



Witnesses:
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UNITED STATES PATENT OFFICE.

FRED C. STARKE, OF MILWAUKEE, WISCONSIN, ASSIGNOR OF TWO-THIRDS
TO CLAUDE L. FRANKLYN AND JOHN K. RUSSELL, OF SAME PLACE.

HYDRAULIC AIR-COMPRESSOR.

SPECIFICATION forming part of Letters Patent No. 662,884, dated November 27, 1900.

Application filed July 30, 1900. Serial No. 25,234. (No model.)

To all whom it may concern:

Be it known that I, FRED C. STARKE, a citizen of the United States, residing at Milwaukee, in the county of Milwaukee and State of Wisconsin, 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, forming a part thereof.

My invention relates to apparatus in which air is entrained and compressed by a confined falling body of water and separated from the water while it is under pressure.

The main object of the invention is to more effectively or completely separate the compressed air from the water, and thereby make apparatus for this purpose more efficient and economical, and generally to improve the construction and operation of apparatus of this class.

It consists in certain novel features in the construction and arrangement of component parts of the apparatus, and particularly of those parts by which the separation of the air from the water is effected, as hereinafter particularly described, and pointed out in the claims.

In the accompanying drawings like letters designate the same parts in the several figures.

Figure 1 is a vertical section of a hydraulic air-compressing apparatus embodying my improvements. Fig. 2 is an enlarged horizontal section on the line 2 2, Fig. 1; and Fig. 3 is a horizontal section on the line 3 3, Fig. 1.

A is a vertically-disposed pipe forming a descending conduit for water. It may be conveniently constructed of boiler-plate or sheet metal, but may be made of wood or other suitable material. It is bent horizontally at its upper end and has an intake-opening communicating with a dam or head-race B or other water-supply, the level of which is always above said opening. At its lower end it is bent horizontally and has a laterally-directed and horizontally-extended discharge-opening.

C is a chamber into one side of which the lower end of the pipe A projects. It is preferably made of circular form in cross-section, as shown in Fig. 3, and has a conical top,

as shown in Fig. 1. It is preferably constructed of boiler-plate or sheet metal and has a discharge-opening or series of openings *c c* extending all around the bottom.

When the natural fall of water is insufficient to afford a column of the required height to produce the desired pressure, a well is sunk for the pipe A and the separating-chamber C at its lower end. In this case the well may be walled up with timber and boards or plank to form an ascending water-conduit D, with which the outlet at the bottom of the chamber C communicates. At its upper end this well or conduit opens into a tail-race E, which is below the head-race B or other water-supply. The depth of the well or the height of the ascending water-conduit D determines the extent or degree to which the air can be compressed in the apparatus. Where the natural fall is sufficient to afford a water column of the required height without sinking a well, the ascending conduit may be built up of any suitable material to the required height, either around or at one side of the descending conduit or pipe A.

F is a spreading-table supported horizontally in the chamber C above the outlet at the bottom thereof. It is preferably made circular or of a shape corresponding with that of said chamber, in which it is inclosed, and it is formed or provided with an upturned rim *f* and with a perforated bottom, which allows a part of the water discharged thereon to pass directly through it to the outlet at the bottom of the separating-chamber. A space is left between the edge or rim of the table and the walls of the chamber, this space being narrower or smaller on that side toward which the water is discharged from the pipe A and increasing in area toward the opposite side, so as to check and partially reverse the flow of water and allow the air to more readily and completely separate therefrom.

G G are air-inlet pipes leading from a point above the level of the water-supply through and into the pipe A in or near the upper bend thereof and terminating therein below the level of the water-supply.

H is an air-delivery pipe leading out of the apex or upper part of the chamber C and provided with an automatic regulating-valve I

for maintaining a back pressure of air and preventing the water from filling the upper part of the chamber C and rising in said pipe.

J is a blow-off pipe extending from a point
5 within said chamber at or near the level at which it is desired to maintain the water-level therein. It is provided with a valve K and is preferably bent at its upper end to terminate and discharge below the surface of
10 the water in the conduit D or tail-race E in order to prevent the disagreeable noise which would be produced by the discharge from said pipe into the open air.

My improved apparatus operates as follows:

15 Water being supplied to the head-race B and kept at a level therein above the intake-opening of the pipe A flows through said pipe and is discharged therefrom at its lower end upon the spreading-table F. The rapid fall of the
20 water through the pipe A tends to produce a vacuum at the lower ends of the air-inlet pipes G, and thereby air is drawn through said pipes into and entrained with the water in its descent through the pipe A. The air
25 thus entrained with the water is subjected to the pressure of the water column in the well or ascending conduit D, such pressure increasing as the air approaches the lower end of the pipe A. Upon its discharge from the
30 lower end of the pipe A the water spreads out over the table F and its flow is checked. The entrained air thus allowed to separate from the water is caught and held in the upper part of the chamber C under a pressure equal
35 to the weight of the water column in the well or ascending conduit D. The water from which the air has thus separated flows in part through the openings in the table F and over the rim of said table between it and the walls
40 of chamber C into the lower part of said chamber, thence through the outlet-openings c at the bottom of said chamber into the well or ascending conduit D, in which it rises, flowing off from the upper part thereof through
45 the tail-race E. The regulating-valve I is set to maintain sufficient back pressure in the delivery-pipe H to prevent the water from rising and filling the upper part of the chamber C and flowing into said pipe when the compressed air is used as fast as it is produced.
50 In case the compressed air is not used as fast as it is produced, the valve K being open, the excess will be discharged through the blow-off pipe J, when the water-level in the chamber C descends nearly to the lower end of said
55 pipe.

Various changes in the minor details of construction and arrangement of parts may be made within the spirit and intended scope of
60 my invention.

I claim—

1. In a hydraulic air-compressor the combination of a compressed-air chamber, an ascending water-conduit into which said chamber opens at the bottom, a spreading-table in
65 said chamber above the outlet-opening at the bottom thereof, a descending conduit having

a water-intake opening and air-inlet at the upper end and a lateral outlet-opening at its lower end which projects into one side of said
70 chamber over said table and is directed across said table toward the opposite side of said chamber and an air-delivery pipe leading out of the upper part of said chamber, substantially as and for the purposes set forth. 75

2. In a hydraulic air-compressor the combination of an ascending water-conduit, a chamber opening at or near the bottom into the lower part of said conduit, an air-delivery pipe leading out of the upper part of
80 said chamber, a horizontally-disposed water-spreading table inclosed in said chamber above the outlet-opening from the bottom thereof and having an upturned rim, a descending conduit or pipe having a water-intake opening above the upper outlet end of
85 the ascending conduit, and a laterally-directed discharge-opening at its lower end which projects at one side of said chamber over said table and air-inlets leading from a point above
90 the level of the water-supply into the upper end of the descending conduit below the level of the water-supply, substantially as and for the purposes set forth.

3. In a hydraulic air-compressor the combination of a descending water conduit or pipe having a water-intake opening and air-inlets at the upper end and a laterally-directed and horizontally-extended discharge-opening at the lower end, an air-separating chamber into one side of which the lower end of
95 said conduit or pipe projects and opens, an ascending water-conduit leading out of the lower part of said chamber and having a discharge-opening below the water-intake opening at the upper end of the descending conduit, a horizontally-disposed spreading-table located in said chamber between its outlet
100 and the discharge-opening of the descending conduit, and an air-delivery pipe leading out of the upper part of said chamber, substantially as and for the purposes set forth. 105

4. In a hydraulic air-compressor the combination of a separating-chamber, an ascending water-conduit with which said chamber
115 communicates at the bottom, a perforated spreading-table arranged horizontally in said chamber above its outlet, a space being left all around between it and the walls of said chamber, a descending water conduit or pipe extending above the ascending conduit and having at its upper end a water-intake and air-inlet and at its lower end, which projects into said chamber, a lateral discharge-opening directed across said table toward the opposite side of said chamber, and an air-delivery pipe leading out of the upper part of said chamber, substantially as and for the purposes set forth. 125

5. In a hydraulic air-compressor the combination of a separating-chamber, an ascending water-conduit with which said chamber communicates at the bottom, a descending water-conduit having at its upper end a wa- 130

ter-intake and air-inlet and at its lower end, which projects into one side of said chamber, a laterally-directed discharge-opening, a water-spreading table arranged horizontally in
5 said chamber directly below the discharge-opening of said descending conduit, a space being left all around said table and the walls of said chamber and said space being narrower on the side of said table toward which
10 the water is discharged from the descending conduit and increasing in area toward the other side, and an air-delivery pipe leading out of said chamber, substantially as and for the purposes set forth.

15 6. In a hydraulic air-compressor the combination of a separating-chamber, an ascending water-conduit with which said chamber communicates at the bottom, a spreading-table arranged horizontally in said chamber
20 above the bottom, a descending water-pipe bent horizontally and terminating in an intake-opening at its upper end and projecting into said chamber and having a lateral discharge-opening over said spreading-table at
25 its lower end, air-inlet pipes leading through

the wall of said descending pipe at or near the bend or elbow at its upper end from a point above to a point below the level of the water-supply, and an air-delivery pipe leading out of the upper part of said chamber, 30 substantially as and for the purposes set forth.

7. In a hydraulic air-compressor the combination of a separating-chamber having a conical top and an outlet around the bottom, an ascending water-conduit into which said 35 outlet opens, an air-delivery pipe leading out of the apex of said chamber, a spreading-table within said chamber above the outlet at the bottom thereof and a descending pipe having a water-intake and air-inlet at its up- 40 per end and a lateral discharge-opening at its lower end which projects at one side of said chamber over said table, substantially as and for the purposes set forth.

In witness whereof I hereto affix my signature in presence of two witnesses. 45

FRED C. STARKE.

Witnesses:

CHAS. L. GOSS,
M. L. EMERY.