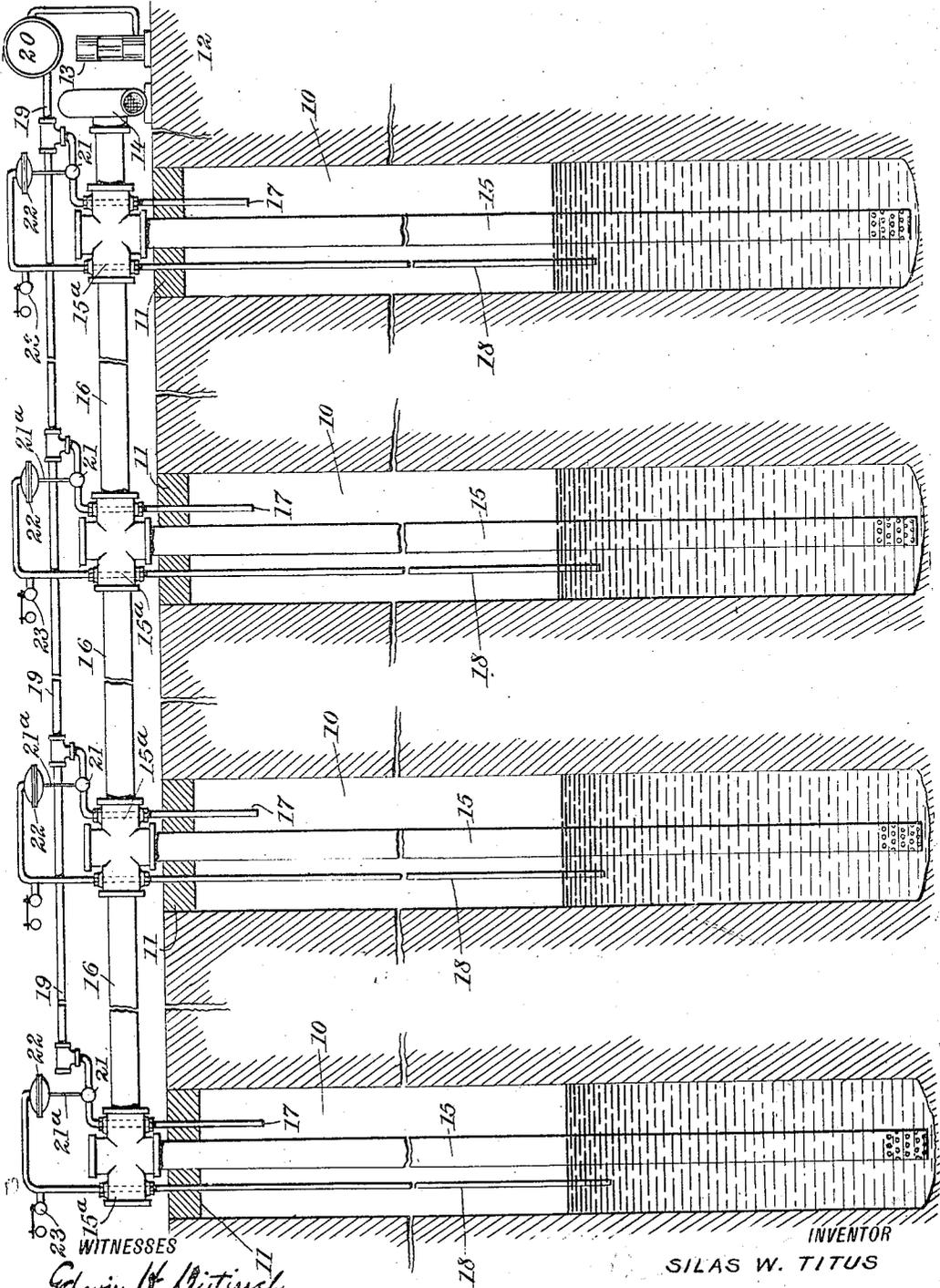


S. W. TITUS.
APPARATUS FOR PUMPING.
APPLICATION FILED JAN. 14, 1913.

1,069,353.

Patented Aug. 5, 1913



WITNESSES
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APPARATUS FOR PUMPING.

1,069,353.

Specification of Letters Patent.

Patented Aug. 5, 1913.

Application filed January 14, 1913. Serial No. 741,971.

To all whom it may concern:

Be it known that I, SILAS W. TITUS, a citizen of the United States, residing at the city of New York, borough of Brooklyn, Kings county, in the State of New York, have invented certain new and useful Improvements in Apparatus for Pumping, of which the following is a full, clear, and exact specification.

My invention relates to improvements in apparatus for pumping and the same has for its object more particularly to provide a simple, efficient and reliable method of, and apparatus of raising water and other liquids from wells and other sources of deep supply.

Further said invention has for its object to provide an apparatus by means of which water or liquid located at a point too low for a suction pump to lift may be easily and efficiently raised to a level where the suction pump may become effective to lift said water or liquid and distribute the same as may be desired.

Further said invention has for its object to provide an apparatus wherein air under pressure is employed to raise a liquid from a low level to such level where a suction pump may become effective to lift the same simultaneously from a series of wells or receptacles and at the same time the air pressure which is utilized to that end employed to equalize the pressure in all such wells or receptacles.

To the attainment of the aforesaid objects and ends my invention consists in the method hereinafter pointed out, and in the novel details of construction and in the combination, connection and arrangement of parts hereinafter more fully described and then pointed out in the claims.

For the purposes of this application I shall describe my invention in connection with a series of deep wells such as oil or water wells in which the level of the liquid is constantly or only occasionally at a level too low to permit of the pump to become effective to raise the liquid.

In the accompanying drawings I have shown in diagrammatic form my invention applied to a series of wells and in said drawings 10 designates a series of deep oil or water wells which have been sunk in the ground and each having its upper end sealed by a closure 11 in the form of a bushing, plug, cement or other suitable means. 12 denotes a pumping station in which is lo-

cated an air compressor 13 and a suction pump 14.

Within each of the wells 10 is disposed a suction pipe 15 of such length as will permit the pump to raise the liquid into which the lower end of said suction pipe extends. The upper end of each of said suction pipes extends through the closure 11, at the upper end of the well, and has its projecting end connected by means of a T-joint 15^a to a main suction line 16 leading to the pump 14. The T-joint 15^a is closed at its upper end, and through its horizontal members extend an air pressure pipe 17, and an air pressure relief or equalizing pipe 18. The said pipes 17 and 18 merely pass through the ends of said T-joint and have no direct communication therewith nor with the main suction pipe 16.

19 denotes a main air line which extends from a receptacle 20 receiving air from the compressor 13. Any well known means may be provided upon the receptacle 20 whereby the operation of the compressor may be automatically discontinued when the pressure within said receptacle 20 reaches a predetermined degree, and be set in operation again when the pressure falls below said predetermined pressure.

The air pressure pipe 17 is connected at its upper end to the main air line 19, and is provided with a valve 21 having its stem 21^a connected to a diaphragm 22 connected to the upper end of the air equalizing pipe 18. In order to relieve the equalizing pipe 18 and diaphragm 22 of the excess of pressure beyond that required to seat the valve 21, a relief valve 23 is provided which will permit of the escape of air beyond the pressure required to seat the valve 21. 22 denotes a diaphragm arranged in the upper end of said equalizing pipe 18 which is adapted to control the operation of the valve 21. The air pressure pipe 17 extends but a short distance into the well 10, while the air equalizing pipe 18 extends downwardly through the closure 11 and has its lower end adjusted to a point sufficiently above the lower end of the suction pipe 15 to maintain the liquid level at such height within the suction pipe 15 as will enable the pump to act properly thereon. The operation of the apparatus is as follows: If we assume that the level of the liquid within the several wells is too low to enable the suction pump 14 to raise the same through the suction pipe

15, the compressor 13 is then put in operation and air forced through the main air pipe 19, branch pipes 17 and into the several wells. As air is forced into the wells the tendency thereof is to cause the level of the liquid within said wells surrounding the suction pipe 15 to be depressed, and consequently rise within said suction pipe 15. As soon as the pressure has been attained necessary to raise the liquid within the suction pipe 15 to the level where the suction pump 14 will become effective to raise the water further in said suction pipe 15 the pump will draw the same through the main pipe 16 to the pump 14 by means of which it is then delivered to the point or place of discharge. Should the air pressure produced in any one or more of the wells be greater than is necessary to raise the liquid within the suction pipe 15 to the level where the suction pump 14 becomes effective, the level of the liquid in the well outside of the suction pipe 15 will fall correspondingly and as soon as it falls far enough the lower end of the equalizing pipe 18 becomes unsealed. When this occurs the excess air pressure is permitted to pass into the equalizing pipe 18, and actuate the diaphragm 22 to close the valve 21. Whatever pressure in excess of that necessary to close the valve 21 may exist in the well is then released by the relief valve 23 which is adjusted to open before the valve 21 can open. When the air pressure desired to be maintained within the well is again restored, the valve 21 will automatically open and permit air to enter again through the pipe 17 in order to continue the working pressure.

It is to be noted that by means of my invention the air pressure within each well will be automatically regulated in order to suit the varying character of the ground or material into which the well is sunk, as well as the level at which the liquid is maintained in the well.

Having thus described my said invention what I claim and desire to secure by Letters Patent is:—

1. The combination with a subterranean source of liquid supply and a sealed well extending into the same, of a suction pipe extending into said well, means for maintaining air under sufficient pressure within said well to raise the liquid level to a predetermined height within said suction pipe, an air relief pipe extending into said well and into the liquid therein to a given point below the level of said liquid, and means for controlling the discharge of excess air pressure when the liquid within said well falls therein and unseals the end of said air relief pipe, substantially as specified.

2. The combination with a subterranean source of liquid supply and a sealed well extending into the same, a suction pump, a

suction pipe extending therefrom into said well, a source of air under pressure, an air pipe leading therefrom and extending into said well, an air relief pipe connected to said air pipe and extending into said well, and valve means for controlling the pressure within said well when the liquid falls therein and unseals the end of said relief pipe, substantially as specified.

3. The combination with a subterranean source of liquid supply and a sealed well extending into the same, a suction pump, a suction pipe extending therefrom into said well, a source of air under pressure, an air pipe leading therefrom and extending into said well, an air relief pipe connected to said air pipe and extending into said well, valve means for controlling the supply of air under pressure to said well, and a safety-valve for relieving the excess of air pressure within said valve beyond the pressure required to seat the valve controlling the admission of air to said well, substantially as specified.

4. The combination with a subterranean source of liquid supply and a series of sealed wells extending into the same, of a suction pump, a main suction pipe extending therefrom, branch suction pipes connected to said main suction pipe and extending into said wells, a source of air supply under pressure, a main air pipe extending therefrom, branch air pipes connected to said main air pipe and extending into said wells and terminating at a point above the liquid level therein, valve means for separately controlling said branch air pipes, air relief pipes having their lower ends extending into said wells and into the liquid therein, and diaphragms communicating with the upper ends of said relief pipes and connected to the valves in said branch air pipes for actuating the same to discontinue the supply of air to the wells when the pressure rises beyond a predetermined amount, substantially as specified.

5. The combination with a subterranean source of liquid supply and a series of sealed wells extending into the same, of a suction pump, a main suction pipe extending therefrom, branch suction pipes connected to said main suction pipe and extending into said wells, a source of air supply under pressure, a main air pipe extending therefrom, branch air pipes connected to said main air pipe and extending into said wells and terminating at a point above the liquid level therein, valve means for separately controlling said branch air pipes, air relief pipes having their lower ends extending into said wells and into the liquid therein, diaphragms communicating with the upper ends of said relief pipes and connected with the valves in said branch air pipes for actuating the same to discontinue the supply of

air to the wells when the pressure rises beyond a predetermined amount, and safety valves arranged in said relief pipes for releasing the excess of air pressure within
5 said wells beyond the amount necessary to actuate the diaphragms to close the valves controlling the admission of air under pressure to said wells, substantially as specified.

Signed at the city of New York, in the county and State of New York, this ninth 10 day of January one thousand nine hundred and thirteen.

SILAS W. TITUS.

Witnesses:

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