No. 669,255. Patented Mar. 5, 1901.

A. M. HEWLETT.

APPARATUS FOR ELEVATING WATER.

(Application filed Feb. 4, 1896.)

(No Model.)

Fig. 1.

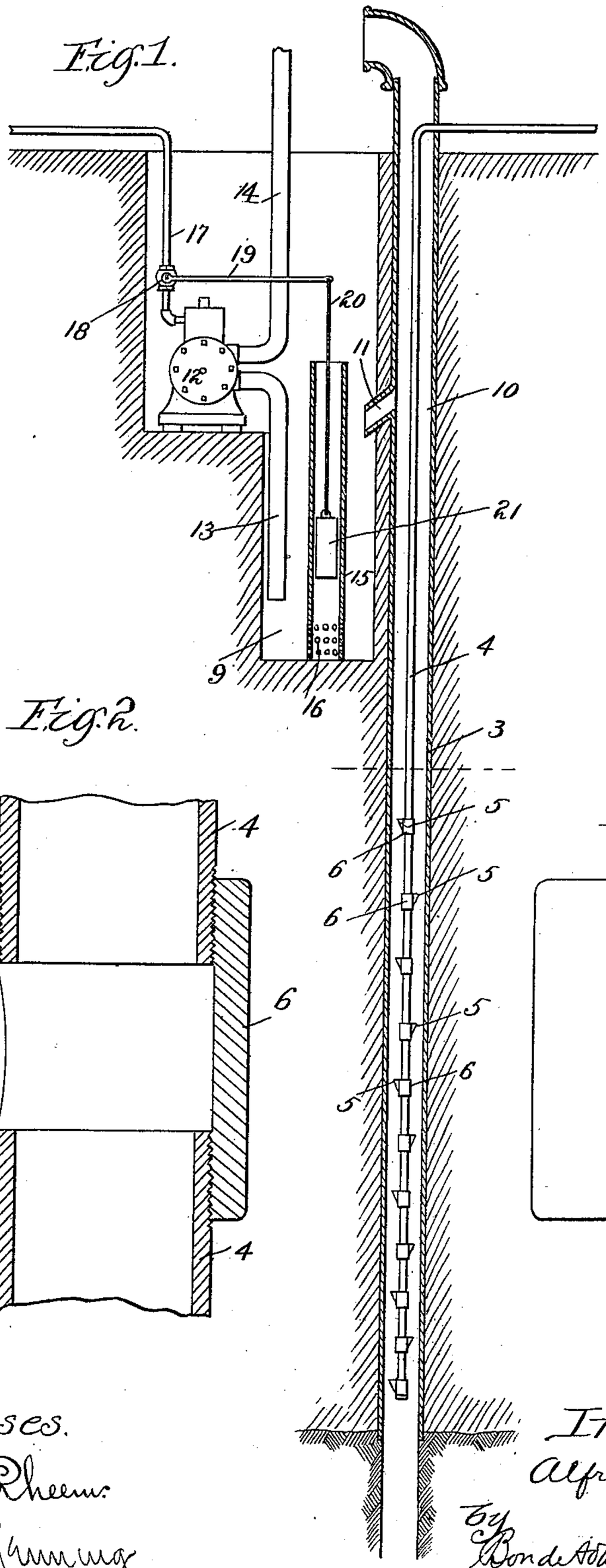
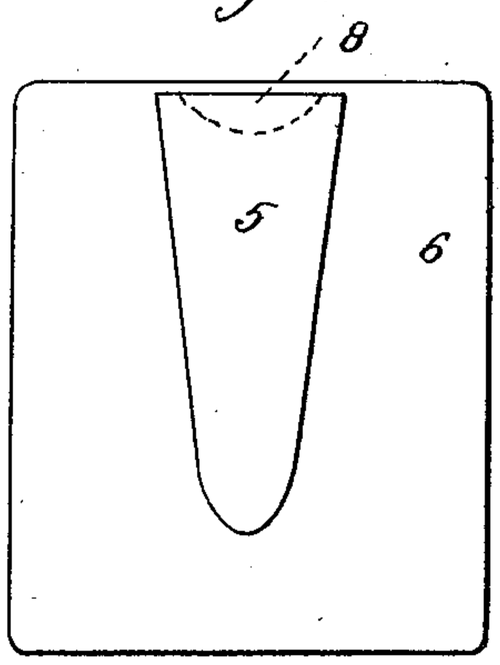


Fig. 2.

Fig. 3.



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UNITED STATES PATENT OFFICE.

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APPARATUS FOR ELEVATING WATER.

SPECIFICATION forming part of Letters Patent No. 669,255, dated March 5, 1901.

Application filed February 4, 1896. Serial No. 578,052. (No model.)

To all whom it may concern:

Be it known that I, ALFRED M. HEWLETT, a citizen of the United States, residing at Kewanee, in the county of Henry and State of Illinois, have invented a certain new and Improved Apparatus for Elevating Water, of which the following is a specification, reference being had to the accompanying drawings, in which—

Figure 1 is a vertical section illustrating my invention. Fig. 2 is an enlarged detail, being a vertical section, showing the construction of the air-discharge nozzles; and Fig. 3 is an enlarged detail, being a front elevation of one of the air-nozzles.

This invention relates to certain improvements in apparatus for elevating water, and the novel features thereof will be set forth in the following specification and claims.

My invention consists in certain improvements, which will be more specifically hereinafter pointed out.

Referring to the drawings, 3 indicates the well-tube, which is extended down, preferably, to the stratum from which the water is derived and terminates above at the surface of the earth. The well-tube is made up of a number of connected sections and presents a clear and unobstructed passage for the water.

4 indicates a compressed-air-inlet pipe, which is arranged within the well-tube and extends down to the point where the water sinks when the elevating apparatus is in operation. The compressed-air pipe 4 is connected to a suitable compressor and discharges the compressed air into the well in an upward direction from a series of discharge-nozzles 5. As shown in Fig. 1, the nozzles are placed comparatively close together, their distance apart depending somewhat upon the height to which the water is to be lifted; but the closer together they are the less pressure is required to elevate the water. Furthermore, the lower nozzles are provided with larger orifices than the upper ones, so that a larger amount of air is introduced into the well at greater depths, only sufficient of the air being introduced through the upper nozzles to start the upward flow of the water. The nozzles are also arranged to discharge the air alternately at opposite sides of the pipe 4, so that the air will thoroughly permeate the water. The uppermost nozzle 5 is placed a short distance below the normal water-level.

The result of the construction above described is that water may be aerated by the use of compressed air under a comparatively low pressure, and inasmuch as the interior of the well-tube is unobstructed, except for the air-tube and the nozzles carried by it, an exceedingly large volume of water may be elevated, as the entire mass of water in the well is caused to rise under the pressure of the external head of water. In this respect my apparatus differs from any prior construction of which I am aware.

In order that the nozzles 5 may resist the flow of the water as little as possible, they are arranged close to the air-tube 4 and are tapered, as shown in Figs. 2 and 3. The nozzles 5 further serve as a means for uniting the sections of the air-pipe, as they are provided with a sleeve 6, screw-threaded at its ends, by means of which the sections of the air-tube are united.

As the discharge of the air from the nozzles 5 is resisted by the pressure of the water above them, I provide for relieving the discharge-orifices 7 of such nozzles to a considerable extent from pressure by forming a concavity 8 at the upper side of such nozzles and enlarging the upper portion of such nozzles as above stated, so that the water in passing up is directed away from the discharge-orifice. The upwardly-moving water thereby forms an arch above each nozzle, relieving the nozzle from pressure to a great extent.

While elevating apparatus having the construction above described is efficient for elevating water to considerable heights when the height to which the water is to be elevated is so great that the water cannot be lifted to the surface by compressed air except under such great pressure that it cannot be economically compressed, I provide an auxiliary steam force-pump apparatus, which receives the water after it has been partially elevated by the compressed-air apparatus, the steam force-pump being lowered into the ground to a depth which will enable it to be satisfactorily operated. Such an auxiliary pump is illustrated in Fig. 1, wherein 9 indicates a well arranged beside the deep well 10 at a convenient distance above the normal water-level

of the water in the well 10. 11 indicates a discharge-pipe by which the water is discharged from the well 10 into the well 9. 12 indicates the steam force-pump, which is lowered into the well 9 and is mounted at about the level of the discharge-pipe 11. 13 indicates the suction-pipe of the pump 12, which opens into the lower portion of the well 9. 14 indicates the discharge-water-outlet pipe of the pump 12. 15 indicates a stand-pipe or guide-tube arranged in the well 9, which tube is provided with perforations 16 at its lower end, so that the water in the well may enter it. 17 indicates a steam-supply pipe for the pump 12, in which is a valve 18. 19 indicates a lever connected to the stem of the valve 18 in such manner that as the lever 19 is vertically moved the valve 18 will be opened or closed. 20 indicates a rod by which is suspended a float 21 in the tube 15. The arrangement is such that when the water rises in the well the float 21 will rise, thereby lifting the outer end of the lever 19 and opening the valve of the pump, which will then operate to discharge the water from the well 9. When the level of the water in the well 9 is lowered sufficiently, the float 21 will descend, moving the lever 19 in the same direction and closing the valve 18, thereby stopping the pump. By this construction there is no danger of injury to the pump, as it is regulated entirely by the depth of water in the well 9 and cannot operate except when the lower end of the suction-pipe 13 is immersed in water.

I have not shown a detailed view of the force-pump, as it is evident that the pump may be of any desired construction which is capable of discharging the water.

It will be understood that the accompanying drawings are not drawn even approximately to scale; but they serve to illustrate the invention. In order to convey an idea of the proportions of the various parts, I would say that in applying the invention to a well eleven hundred feet deep, in which the normal level of the water when not being pumped is two hundred feet from the surface, the well-tube or casing being four inches in diameter, the compressed-air pipe is lowered to a depth of about one thousand feet, the lower jets being placed at about five feet apart and the upper jets about ten feet apart. Furthermore, the discharge-orifices in the upper jets are one-eighth of an inch in diameter, those in the intermediate jets three-sixteenths of an inch in diameter, and those in the lower jets of one-fourth of an inch in diameter. The pumping apparatus is arranged at about one hundred feet above the normal level of the water. With an apparatus having this construction I am now elevating water from the well at the rate of one hundred and fifty thousand gallons per day, whereas formerly by the use of a double-acting deep-well pump I was enabled to elevate not more than eighty thousand gallons per day.

It will be understood that I do not wish to be limited to the proportions above given, as they may be very greatly varied without departing from the spirit of my invention. I have merely given the figures as illustrating the proportions used in actual practice by me.

The use of the compressed-air elevating apparatus, in combination with the pumping apparatus arranged to receive the water elevated part way to the surface, is exceedingly economical, owing to the fact that the compressed air may be used under low pressure and elevates the water from great depths to the pumping apparatus, which in turn elevates it to the surface. By thus providing for the elevation of the water by the use of steam pumping mechanism a considerable saving is effected, since, as is well understood by engineers, the steam-pump is the most economical device for such purposes, provided the pump can be supplied with all the water which it will handle, as is the case with the apparatus above described. Furthermore, the steam-pump may be used to distribute the water to the place where it is needed after its elevation to the surface.

That which I claim as my invention, and desire to secure by Letters Patent, is—

1. In an apparatus for elevating water, the combination with a well, of an air-pipe extending down thereinto, composed of a plurality of sections and couplings connecting said sections, said couplings consisting of a sleeve having a laterally-projecting tapered nozzle arranged to discharge in an upward direction, the broader portion of said nozzle being uppermost and having a discharge-orifice in its upper surface, substantially as described.

2. In an apparatus for elevating water, the combination with a well, of an air-pipe extending down thereinto, composed of a plurality of sections and couplings connecting said sections, said couplings consisting of a sleeve having a laterally-projecting tapered nozzle arranged to discharge in an upward direction, the broader portion of said nozzle being uppermost and having a discharge-orifice in its upper surface, said nozzles having concavities at their discharge-openings, substantially as described.

3. A coupling consisting of a sleeve open at its ends and having between its ends a laterally-projecting tapered nozzle, the broader portion of said nozzle being uppermost, and having a discharge-orifice in its upper surface, substantially as described.

4. A coupling consisting of a sleeve open at its ends and having between its ends a laterally-projecting tapered nozzle, the broader portion of said nozzle being uppermost, and having a discharge-orifice in its upper surface and the concavity around the discharge-orifice, substantially as described.

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