

W. E. PEDLEY.
 JET PUMP.
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1,031,289.

Patented July 2, 1912.

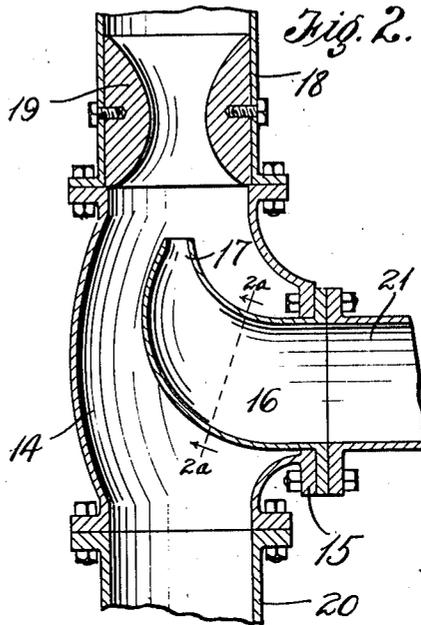
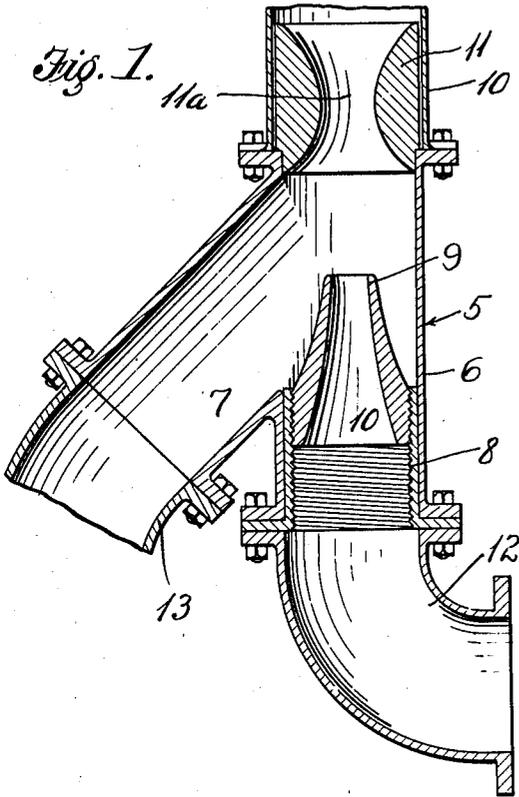


Fig. 3.

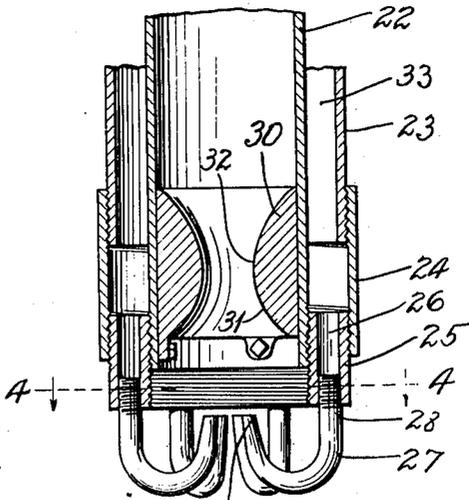


Fig. 4.

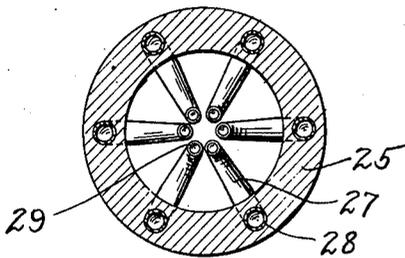


Fig. 2a.



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UNITED STATES PATENT OFFICE.

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JET-PUMP.

1,031,289.

Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, WILLIAM E. PEDLEY, a citizen of Great Britain, residing at Riverside, county of Riverside, State of California, have invented new and useful Improvements in Jet-Pumps, of which the following is a specification.

This invention relates to jet pumps in which a jet forced through a nozzle produces a suction and entrains the water which is to be pumped. In jet pumps as usually constructed there is a considerable loss of efficiency due to the fact that the entrained current is not drawn in, in the direction in which the propelling or driving stream flows from the nozzle.

The object of this invention is to produce a pump of improved form in which the entrained stream is brought in so as to flow in the direction which the jet from the nozzle is projected.

In the drawing forming a part of the annexed specification, Figure 1 is a vertical section through a jet pump constructed in accordance with my invention and showing a single nozzle. In this form of the pump the entrained current is brought on an incline to the driving jet. Fig. 2 is a view similar to Fig. 1 but showing a form of pump in which the nozzle projects directly into the entrained stream so that the direction of the entrained stream is not changed. Fig. 2^a is a section on the line 2^a-2^a of Fig. 2. Fig. 3 is a vertical section showing the form of pump adapted to be used in a deep tubular well and in which a plurality of nozzles are employed which entrain an upward current through the pipe and these nozzles project in the same direction in which the entrained water flows. Fig. 4 is a horizontal section taken on the line 4-4 of Fig. 3.

Referring more particularly to the parts, 5 represents the main-casing of the pump as shown in Fig. 1 and the casing has a vertical leg or barrel 6 on the side of which an inclined inlet 7 is formed. Within the barrel 6 I provide a bushing 8 which is threaded internally to receive the nozzle 9, said nozzle having a conical bore 10 there-through, the slot of which converges upwardly.

To the upper end of the barrel 5 the lower end of the delivery pipe 10 is attached and in this pipe a thimble 11 is mounted having a double conical bore, the middle portion of

the bore being contracted to form a narrow throat 11^a. To the lower end of the barrel 5 the elbow 12 is attached by which the jet is brought into the pump and the pipe connection 13 is attached to the inlet 7 for bringing in the current which is raised by the operation of the jet.

In the operation of this pump, water under pressure flows in from the elbow 12 and up through the nozzle 9 so that this jet is projected upwardly through the thimble 11, it being understood that the thimble and the nozzle 9 are in alinement. This water passing up through the thimble entrains a stream of water through the inlet 7 and this water is carried with the jet and raised. On account of the threaded bushing 8 it is possible to adjust the nozzle 9 with respect to the thimble so that where the pressure and velocity of the jet is small, the nozzle may be adjusted to a point very near the thimble and vice-versa.

In the form of the invention shown in Fig. 2, 14 represents the casing which is of elongated globe form and having a hub 15 at one side for attaching the jet nozzle 16. This jet nozzle extends into the interior of the globe casing 14 and its nose 17 projects longitudinally with the casing and on the longitudinal axis thereof. In the upper end of the casing the lower end of the delivery pipe 18 seats and this delivery pipe is provided with a thimble 19 similar to the thimble 11. As indicated in Fig. 2^a this nozzle 16 is flattened in a plane of the longitudinal axis of the pump so that it offers very little obstruction to the entrained current of water which flows up from the inlet pipe 20 which is attached to the lower end of the casing 14. To the nozzle 16 is attached a supply pipe 21 which brings in water under considerable pressure which flows as a jet from the nose 17 of the nozzle. With this arrangement the entrained water is given an impulse by the jet in the same direction exactly in which the water is flowing. With this construction, the position of the nozzle being fixed, the throat may be raised or lowered so as to adjust the relative distance between the said nozzle and the said throat to suit varying pressures, said throat being secured in any desired position by the set screws.

In Fig. 3 I show a modified form of the invention which is adapted for raising water from a tubular well. In this form of the

invention I provide an inner casing 22 and an outer casing 23. To the lower end of the outer casing 23 a coupling 24 is attached and between this coupling and the inner casing 22 an annular nozzle ring 25 is attached, said nozzle ring having a plurality of openings or ducts 26 in which a plurality of U shaped nozzles 27 are attached, said nozzles being formed of bent tubes having threaded shanks 28 which screw into the lower ends of the ducts 26, which are threaded to receive the shanks as will be readily understood. These nozzles are arranged so that they project inwardly in a radial direction and their ends 29 turn upwardly near the central axis on the inner casing and at a slight distance below the lower end of the nozzle ring. Within the inner casing 22 just above the lower end thereof I provide a thimble 30 which is similar in form to the thimble 11 having a double conical or convex bore 31 with a reduced throat 32 at its middle point through which the jets issue from the nozzle and the entrained water passes upwardly. With this form of the invention the water under pressure comes down the annular space 33 between the inner casing and the outer casing and issues from the nozzles 27 in the form of a plurality of upwardly directed jets which entrain the water and draw it upwardly between the nozzles and through the thimble. The plurality of nozzles shown in Fig. 3 may be so set that all of the streams converge toward the narrow point in the throat 32, or the nozzles may be set on the points of a hexagon as indicated in Fig. 4, but so arranged as to throw parallel streams, and in that case an additional nozzle may be used and set at the central point of said hexagon, so that the group of nozzles become more evenly grouped and arranged.

Instead of bringing the water power downwardly through the annular space 33 it will be readily understood that it may be driven downwardly through the central pipe 22, the annular space 33 being used for the discharge. In this case the nozzles are of course screwed into a plug, which screws into the annular ring and are turned outwardly or in the reverse position from that indicated in Fig. 3 and the contracted throats would then be arranged in the annular ring between the two pipes. In this instance there may be separate throats arranged for

each nozzle, or two or more nozzles may be directed to one thereof, which is then formed as if two or more throats had been bored in the annular ring and the intervening portion then cut out so as to afford a curved contracted slot, the vertical section of such a slot, along the radial lines of the tube pipes, being the same as the vertical section through the center line of the ordinary contracting throat. In the same manner two or more nozzles or a single nozzle having a curved slot shape discharge outlet may be used and adjusted to discharge through each one of the curved slot shaped throats. Such a form may be used in an ordinary tubular well, using the well casing as the outer of the two pipes.

What I claim is:—

1. A jet pump having a plurality of bent nozzles adapted to converge streams of liquid to entrain the pumped liquid in a direct line through a throat, a thimble mounted in the pump and formed with said throat, the said throat being arranged at such a distance from the nozzles as to receive and converge streams therefrom.

2. A jet pump formed with spaced casings and having a ring mounted between them formed with liquid receiving passages, a series of return nozzles mounted in said passages and adapted to direct pumping streams into the inner pipe, the said nozzles being adapted to entrain the water in an opposite direction to the power water in performing the pumping operation.

3. A jet pump provided with a casing spaced around the pump tube, a space for power water being arranged between them, a series of curved nozzles extending from said space and adapted to entrain the pumped liquid in an opposite direction to the power liquid within the said pump tube, the said nozzles having elongated oval discharge openings and an adjustable throat piece arranged within the pump tube at a proper distance from the nozzles to receive the entraining liquids therefrom.

In witness that I claim the foregoing I have hereunto subscribed my name this 30th day of January, 1911.

WILLIAM E. PEDLEY.

Witnesses:

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