July 8, 1952 A. E. NITTKA 2,602,398

JET BOOSTER PUMP

Filed Oct. 17, 1947

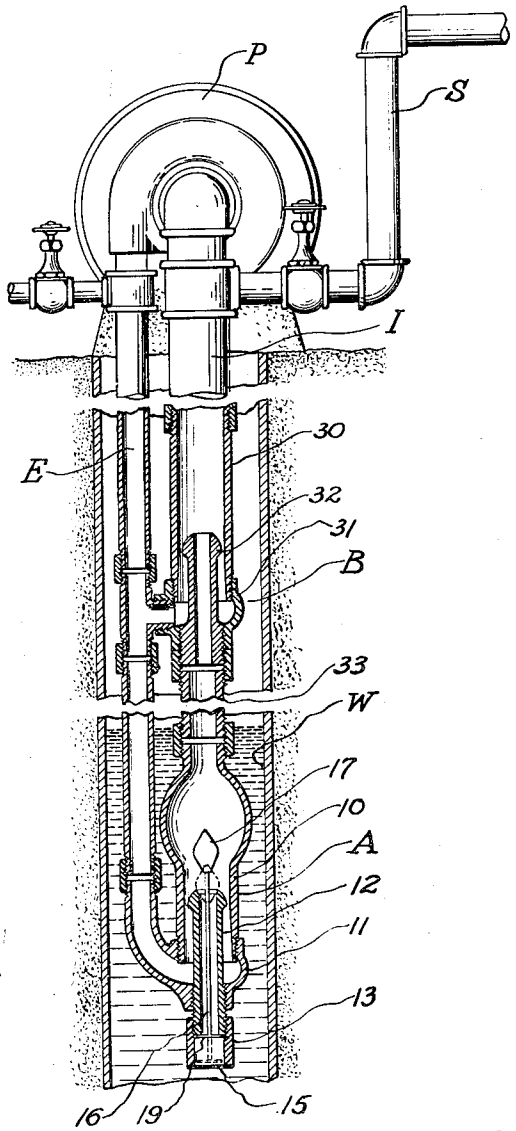


Fig. 1

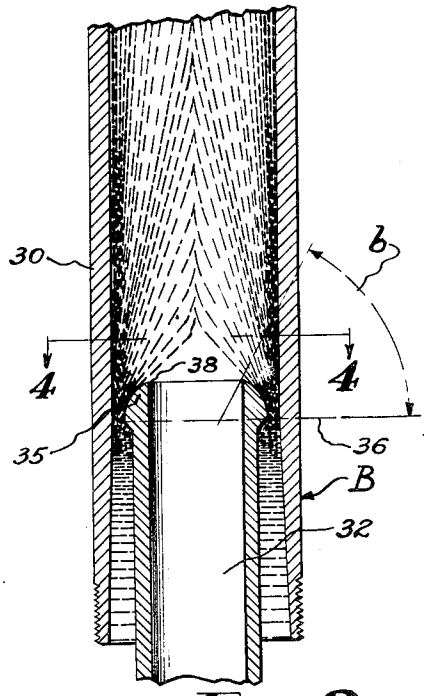


Fig. 2

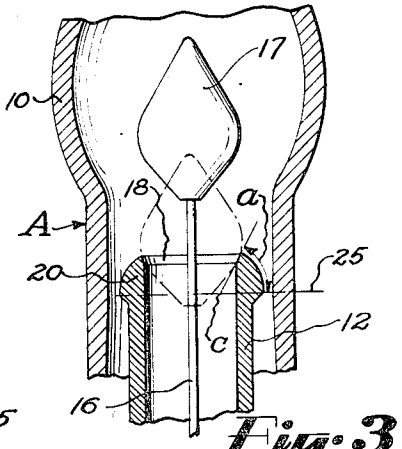


Fig. 3

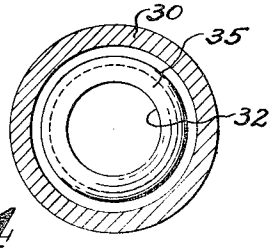


Fig. 4

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Patented July 8, 1952 2,602,398

UNITED STATES PATENT OFFICE

2,602,398

JET BOOSTER PUMP

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Application October 17, 1947, Serial No. 780,478

2 Claims. (Cl. 103—260)

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The present invention relates to a jet type pump and an object of the invention is to provide a jet type pump in which the nozzle thereof is of a particular shape to provide a more efficient pumping action than afforded by the usual type of nozzles.

Other objects and advantages of the invention will be apparent from the following description of a preferred form of the invention, reference being made to the accompanying drawings wherein:

Fig. 1 is a view, partly in section, of a water well and a pumping system for the well including my improved booster jet pumps;

Fig. 2 is a fragmentary view in section of one form of jet booster pump showing the pattern of water ejected through the jet structure;

Fig. 3 is a fragmentary view in section of another form of jet booster pump; and,

Fig. 4 is a view taken on line 4—4 of Fig. 2.

It is common practice to provide jet effects within the intake pipe of a well pump, for example, to assist in raising the level of water in the intake pipe and these jets are known as jet booster pumps. The present invention is directed to a design of jet pump which produces a more even and controlled distribution of the liquid propelled through the jet so that a greater suction action will be created to produce maximum efficient economical operation of the jet.

Referring now to Fig. 1 of the drawings, I have shown a well casing W with a centrifugal pump P positioned above the well. The pump P may be of any well known motor driven centrifugal type having an intake pipe I tapped by a pipe S which extends to a storage tank, for example, not shown. The pump also includes an exhaust pipe E which extends down into the well alongside the intake pipe I. The pipe E furnishes water under pressure to two jet booster pumps A and B. When pump P operates water is drawn through the pipe I into the pump and exhausted through pipe E and the exhausted water is projected upwardly through the jet pumps in such a manner to produce a vacuum and thereby draw water upwardly into the intake pipe I. Water not drawn into pump P flows through pipe S.

Referring more particularly to the jet structure shown at A, there is provided an outer sleeve 10 which is connected to the pipe I by a suitable coupling and an inlet elbow 11 is connected to the lower part of the sleeve 10. An inner sleeve or nozzle 12 extends through the elbow 11 and projects into sleeve 10 and terminates within the sleeve. Preferably, a sleeve 13 is threaded on the lower end of the nozzle 12 and this sleeve is provided with a grill 15 across the bottom thereof to exclude relatively large particles from the inlet to pipe I. A valve stem 16 extends through the nozzle and the upper end of the stem is provided with a tapered valve body 17 which is adapted to seat on an annular valve seat 18 formed about the top of the nozzle 12. The lower end of stem 16 has a perforated disk 19 attached thereto which limits the upward movement of the valve body 17 by engagement with the lower end of the nozzle 12. The valve and nozzle structure thus far described is similar to that disclosed in my U. S. Patent No. 2,391,734 dated December 25, 1945. As set forth in that patent the valve closes when the pump is shut down and retains the water in the pipe I so that priming of the pump for subsequent operation is unnecessary.

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A bead 20 is formed about the upper end of the nozzle 12 and I have discovered that by forming the contour of the bead as herein disclosed water entering the elbow 11 and passing upwardly between the walls of the sleeves 10 and 12 will create a low pressure area immediately above the end of the nozzle 12 in such a manner that an extremely efficient pumping action will draw water from the well upwardly through the nozzle 12 and into the sleeve 10. I have discovered that the contour of the bead, when examined on a section taken on a radial plane of the nozzle 12, should be in the form of an arc having its center in a plane parallel to the plane of the end of the nozzle and the arc should extend through an angle from the said parallel plane of 55°, approximately. In the drawing the parallel plane is indicated by the line 25 and the angle is indicated at a. The center of the arc is indicated at c. By forming the bead in this manner the water passing upwardly between the outer side of nozzle 12 and the inner wall of sleeve 10 is scattered or dispersed throughout an area above the end of the nozzle 12 in the manner illustrated in Fig. 2 which shows a jet structure similar to that described, but without the valve. As may be seen, the pattern of the dispersion defines an inverted cone shaped area immediately above the end of nozzle 12 which area will be a low pressure area adjacent the nozzle end with a broad entraining stream which efficiently propels water upwardly from the nozzle. This dispersion of the water throughout the area described creates a lower pressure area over the end of the nozzle than is possible in the usual jet pumps in which the water is projected in a more or less solid stream which does not converge adjacent to the nozzle end.

Referring now to the jet booster pump B, this pump is similar to that of A except that the valve 17 is eliminated and the sleeve 30, which corresponds to sleeve 10, has no enlargement therein but is straight walled. In this construction the sleeve 30 is connected in the intake pipe I and an elbow 31 is attached to the lower end thereof. An inner sleeve or nozzle 32 extends upwardly through the elbow 31 and terminates within the sleeve 30. The lower end of the nozzle 32 is connected by a suitable coupling to a pipe 33 which is connected to the upper end of the lower sleeve 10. The nozzle 32 is provided with a bead 35 surrounding the upper end thereof and the contour of the bead, when examined on a section taken on a radial plane through the nozzle, the outer edge of the bead is in the form of an arc which extends from a plane indicated at 36, which is parallel to the plane of the upper end of the nozzle, through a 60° angle, as indicated at *b*. The center of the arc is located in the plane indicated at 36. The action of this booster is similar to that of the booster A although there is no valve seat at the upper end of the nozzle 32. It will be noted in this connection I prefer that the arc of the bead section intersects the inner wall of the nozzle 32 so that a sharp edge is formed about the top of the nozzle as indicated at 38.

The arcuate contours of the beads preferably extend from 55° to 60°, although a few degrees leeway may be had. The water flowing along these contoured surfaces tend to cling to the surfaces so that a dispersion as described occurs.

I also deem it important that the upper end edge of the inner sleeve be relatively sharp so that there will be a minimum of surface to which the water will tend to adhere.

Comparative tests show that the jet structure described herein will produce a much more stable and stronger stream of water.

Tests show that for the same head pressure on the jet stream a decidedly greater volume of liquid will be entrained by the jet produced by the herein described jet structure than by any jet structure known to me. The stream of liquid issuing from my jet pump will be steadier and have more velocity than is possible with prior known structures.

Although I have described the booster jets as being employed in a deep water well, it is to be understood that they may be employed in any system in which it is desired to promote the passage of fluid through a conduit.

I claim:

1. A jet pump comprising an outer sleeve and an inner concentric sleeve, the inner sleeve having a bead surrounding the end thereof within the outer sleeve, said bead having a diameter greater than the diameter of the inner sleeve upon which it is formed whereby liquid flowing between the inner and outer sleeves is considerably accelerated in velocity at said bead, the outer end contour of the bead, viewed in longitudinal cross-section, being in the form of an arc extending through substantially 55–60° from the end of the inner sleeve and terminating in a transverse plane through the maximum diameter of the bead, the center for scribing said arc lying on said transverse plane approximately intermediate the longitudinal axis of the inner sleeve and the bore thereof, for dispersing liquid flowing thereover in conical convergence closely adjacent the end of said inner sleeve, and thereby creating a strong suction adjacent the end of the inner sleeve.

2. A jet pump comprising an outer sleeve and an inner concentric sleeve, the inner sleeve having a bead surrounding the end thereof within the outer sleeve, the diameter of the outer sleeve in the area immediately adjacent the bead being constant, said bead having a diameter greater than the diameter of the inner sleeve upon which it is formed whereby liquid flowing between the inner and outer sleeves is considerably accelerated in velocity at said bead, the outer end contour of the bead, viewed in central longitudinal cross-section, being in the form of an arc, which has its axis on a transverse plane at right angles to the longitudinal axis of the inner sleeve extending through the maximum diameter of the bead, the center for scribing said arc lying on said transverse plane approximately intermediate the central longitudinal axis of the inner sleeve and the bore thereof, for dispersing liquid flowing thereover in conical convergence closely adjacent the end of said inner sleeve, and thereby creating a strong suction adjacent the end of the inner sleeve.

ALFRED E. NITTKA.

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2,391,734	Nittka	Dec. 25, 1945