

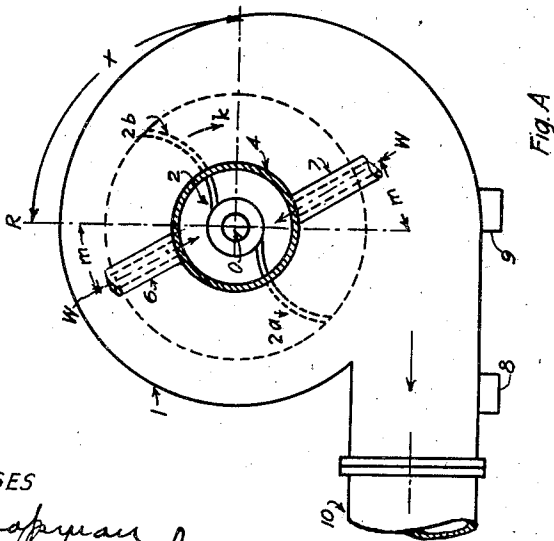
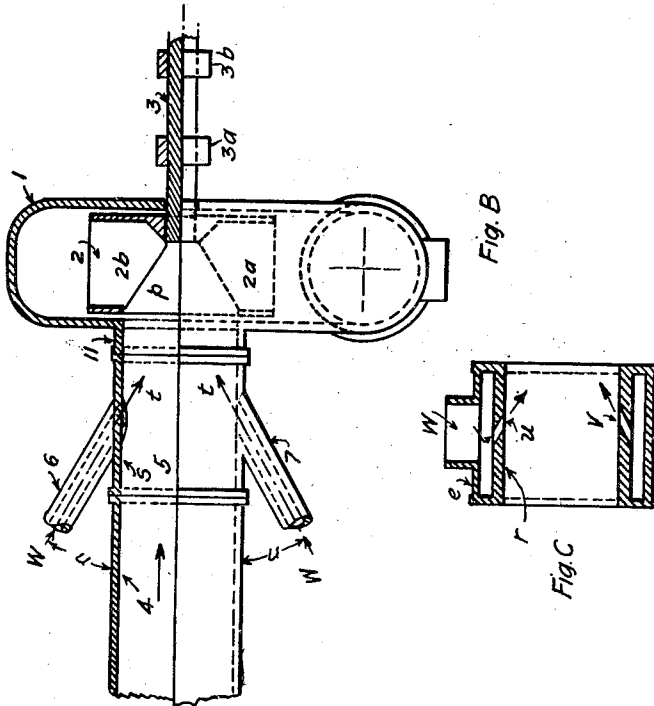
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WITNESSES

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1 Claim. (Cl. 103--5)

My invention has to do with a centrifugal pump and particularly the type used for hydraulic dredging and a means for increasing the pressure at the intake of the pump impeller. The pump when operated will have attached to it several feet of suction pipe and a discharge pipe. The pump must develop not only a suction lift which causes fluid to flow to the pump through the suction pipe, but also must maintain a pressure and rate of flow at the pump discharge outlet.

As the fluid actually passes through the impeller it is first subjected to a negative pressure at the impeller inlet and then a positive pressure as it leaves the impeller. Obviously there is a zone in the impeller which is neither positive nor negative and is equal to the atmospheric pressure.

The total suction lift developed by the impeller can never be greater than the atmospheric pressure or less than about 15 pounds per square inch due to the vaporization of the fluid. This limited head then is required to overcome the entrance head, velocity head and friction head in the suction pipe and also the vertical lift of the fluid mixture if the pump impeller is above the intake water surface.

Another loss of head in the suction system is the sharp angle which the fluid must follow as it enters the pump case and passes radially through the impeller. This loss is particularly important when the fluid becomes heavy by the addition of solids.

When the sum of the losses mentioned above exceeds the suction lift capacity of the impeller the pump will fail to operate satisfactorily due to the development of the water vapor at the impeller. The impeller will accumulate a mixture of air and water vapor and will stop pumping with a sudden decrease in pressure at the pump discharge pipe. As a matter of fact the water in the discharge pipe will probably reverse its direction momentarily and even build up a positive pressure in the suction pipe when the suction head reaches its limit.

The object of my invention is to relieve the impeller of part of its responsibility for overcoming all of the various suction head losses. Obviously to do this energy must be added to the suction stream from a source other than that developed by the impeller at the impeller intake. This is accomplished by introducing a relatively small stream of water at high velocity which will dissipate its energy in the slower moving suction stream entering the impeller.

Another object of the invention is to clear the impeller blades of sticky material, which may have adhered to vane surfaces, by the impact of the high velocity stream.

Also water vapor has a tendency to accumulate at various parts of the impeller and particularly at the tips of the vanes at the impeller intake. The deterioration of the pump metals at various surfaces due to the negative pressure condition is known as cavitation. The jet will eliminate to a certain extent this effect by breaking up the air pockets.

My invention is now described. Fig. A and Fig. B are elevation views of a centrifugal pump of which Fig. A is the side view of the pump looking at the suction. Fig. C is a section of a modified form of an inlet to the pump. Numeral 1 designates the case in which the impeller 2 revolves. The impeller vanes 2a and 2b may consist of a greater number than two. Impellers are also made with but one vane. The pump case is supported on the blocks 8 and 9. The impeller is supported by the shaft 3 and bearings 3a and 3b, and receives its power to rotate through the shaft by means of a motor or other power unit. The shaft supporting the impeller enters the back of the case and the suction pipe is attached to the front of the case. The suction pipe is 4, of which 5 is a part. The extended pump case is 11. The discharge pipe is 10 in Fig. A. The nozzles 6 and 7 are for operating and directing the fluid jets. The independent source of water W supplies the jets. Preferably the jet enters the pump case at an angle m to the radius O—R, Fig. A, and at an angle n to the direction of the stream in the suction pipe. One or more jets can be used effectively.

When the pump is in operation the impeller is revolving in the direction indicated by k , Fig. A, and fluid is flowing into the pump unit through the suction pipe 4 and 5, suction inlet 11, impeller inlet p and impeller passages or so-called ports, to the case and case outlet.

Water from a suitable water source is supplied to the nozzles 6 and 7 as a means for developing a high velocity jet. The jet is directed toward the impeller as well as to impinge upon the impeller surfaces.

Obviously it is possible to extend the pump case inlet 11 of the pump case proper so as to incorporate the pipe section 5 and make it unnecessary to provide this detachable part in order to accommodate the jet.

Part 5 can be constructed with an annular

chamber, Fig. C, which can be attached to the pump case in place of 5 in Fig. B, and by means of a fluid source W, direct the jet to the impeller. The wall *r* in Fig. C corresponds to the wall *s* in Fig. B. The exterior wall of the annular section is *e*. The inlet passages *u* and *v* are the equivalent of nozzle 6 and 7 which direct the high velocity fluid at W to the impeller inlet *p*.

When the improvement to the pump is in operation the high velocity jet will dissipate its energy in the zone indicated at the impeller inlet *p* and thereby facilitate the passing of the fluid mixture through the impeller and improve the pump operations materially by enabling the pump to maintain a more satisfactory suction lift. It is evident that the jets entering at an angle give an additional swirl and help the water enter the impeller thereby.

I claim:

In a centrifugal pump having a pump case and an impeller in said case, said case having an intake opening in axial alignment with said impeller, and a discharge opening; in combination a plurality of nozzles on the intake side of said impeller to provide sources of added energy in conveying and directing liquid through the pump, said nozzles being disposed with respect to said impeller and each other to direct crossing but separated jets in the general direction of the suction flow, and each nozzle being disposed to direct its jet along a path leading from one side of the intake opening and through the impeller ports toward the discharge zone of said impeller opposite to said one side, said path being spaced from the region of the axis of said impeller in the direction of the rotation of the said impeller.

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