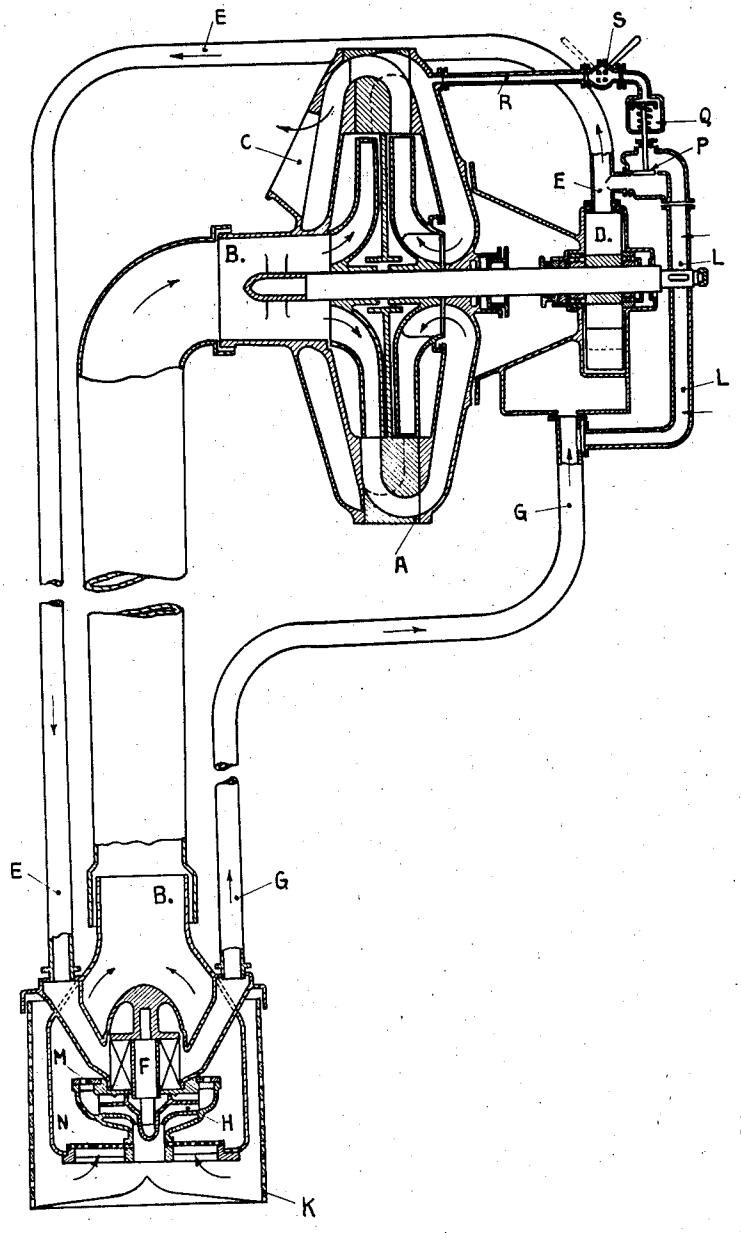
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PRIMING MECHANISM FOR PORTABLE PUMPS

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PRIMING MECHANISM FOR PORTABLE PUMPS

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1 Claim. (Cl. 103—113)

It is well known that for the priming of pumps that have to suck the liquid from a certain depth two methods are in use: viz. to rarefy the air in the suction piping and in the pump barrel (by means of an air pump, ejector or the like), or to fill the suction pipe with water (by means of the water contained in the delivery piping, in a tank or the like).

These two methods are not sufficient when the suction piping is not well tight, that is to say, when external air can rush in or water can leak out or when the foot valve does not close tightly. The said methods are not convenient when the pump is run discontinuously and the foot valve is leaky; in such cases the flow of water ceases and it becomes necessary to repeat the priming operations, this involving time losses that may entail serious consequences in the case of fire extinction.

It is especially in connection with fire service that all the insufficiency of the abovesaid methods shows itself. The transport of priming water on board the fire engines is not practical because of the water weight, because the water is liable to freeze and because it is not known how much water will be required. On the other hand, a sufficient rarefaction of the air is not always quickly obtainable or even possible because the rashly mounted, movable pipe lines often possess but a scanty tightness. Finally if no water is available except at depths in excess of 8–9 metres or by the use of long and tortuous suction piping, the firemen are helpless in regard of the necessity of prompt action, since the violence of a fire is avoided by immediate intervention even with a small amount of water. The problem becomes sometimes important also in the case of exhaustion pumps, in pump works for land reclaiming or irrigation purposes.

The device according to the present invention allows the pumps to exert their sucking action even in the case of defective tightness of the piping or other parts; it even reveals these deficiencies and opposes itself to or compensates the effects thereof. It avoids the time losses consequent on the suction piping emptying itself during the momentary stoppages of the pumps, such as occur when the pump is shifted from one position to another, and finally permits of having a certain amount of water available at once even where the depth of the water or the length of the suction piping would otherwise make a prompt intervention impossible notwithstanding that the pumps and piping are in perfect order.

In order to obviate, at least partially, some of the inconveniences set forth, it has heretofore been proposed in fixed pumps to inject the water adjacent to the lower openings of the suction pipe thereof by means of another pump sunk in the liquid and driven from the main pump shaft by means of additional shafts and gears, but as the second pump is mechanically connected through rigid members to the first one, it is not possible to adapt the system, for instance, to portable pumps adapted for suction from any desired water level, which is often necessary in practical use, such as in the case of fire-pumps and the like. Moreover, devices are involved which require the stopping or separation of the priming pump from the main pump when the latter must draw in water through the priming pump, and hence there always results a low efficiency. It has also been proposed to operate the priming or subsidiary pump sunk at the foot of the suction pipe by means of a hydraulic turbine fed from a reservoir or by the main pump itself, but in such a case, besides the occurrence of the aforesaid inconveniences resort must be had to priming by using an overhead water reservoir, but this is inadmissible in the case of fire-pumps. Moreover, the resulting arrangement is very complex and of low efficiency, as the discharge of the turbine must be maintained free by means of a second auxiliary pump overcoming the movement of the water which has worked in the turbine. The same inconveniences forming obstacles to the suction, lowering the efficiency and rendering impossible the application to movable pumps, such as fire-pumps and the like, occur in devices wherein it has been attempted to perform the priming by means of an ejector placed at the foot of the suction pipe and fed by a water pipe branching off from the pressure pipe of the main pump. Finally, also the use of air compressors for raising the water mixed with air so as to make the same of lower specific weight (this system having been proposed to overcome great suction heads) also does not solve the problem, as in the case of fire-pumps, said mixture of water and air will not serve at all.

The device forming the subject matter of this invention obviates all mentioned inconveniences particularly because it is applicable to portable pumps, such as fire-pumps and the like, designed for sucking water from various levels, no modifications or special handlings being required whatever the suction head may be and no water reservoirs under pressure are required. When the priming has been accomplished, the main

pump is adapted to suck in water directly, i. e. not through any device or auxiliary pump, and this is automatically done, without special manipulations or previous surveys which cannot be expected from a fireman. This device comprises primarily, a bottom group independent from the main pump and adapted to be connected with the same only by means of the usual flexible pipes of hemp or rubber. Secondly this bottom group comprises an organic assemblage of an auxiliary centrifugal pump, a motor for the same, two valves or a group of valves located the one in the pressure pipe of the auxiliary pump and the other in the suction pipe of the main pump. These devices are thus connected by means of internal conduits to the group and by couplings of the pipings in such manner that, as soon as the priming of the main pump has been effected, the latter will automatically and directly suck in water, which will then not pass through the auxiliary pump. This latter pump works in parallel relation with the main pump if the movement thereof is not shut off, while in case the barometric suction head corresponds to a water level higher than the atmospheric pressure, the auxiliary pump continues automatically to work in series with the main pump. Thirdly, the motor of the auxiliary pump is not driven by water branched off from a reservoir or from the main pump, but by another liquid such as oil, etc., which circulates in a closed circuit by the action of a circulation pump independent from the main pump, which circulation pump may be driven either by the motor of this latter or by an independent motor. Fourthly, all the features of the device mentioned may be maintained, but the closed hydraulic central circuit for the auxiliary pump may be replaced by an electric circuit or else by a pneumatic circuit, changing correspondingly of course the motor of the auxiliary pump and the machine feeding the same.

The accompanying figure is a diagrammatic illustration of an embodiment of the invention shown by way of example. A is the main pump (of the centrifugal or other type), B is the attachment for the suction piping, C is the attachment for the delivery piping. On the axis of the main pump, a small pump D (of the capsulism or other type) is mounted; the pump D conveys a water or oil current through the piping E—E_1—E_2 to a motor F (of the capsulism or other type), the delivery pipe G—G_1 of which returns the liquid to the pump D. On the axis of the motor F, the rotor H of the priming pump (of the centrifugal or other type) is keyed, by which the water entering through the strainer K is forced into the suction piping B of the main pump; in this manner the main pump is primed at once.

When it is desired that the device shall work only during the very short priming period, provisions should be made for disengaging the shaft of the pump A from the shaft of the pump D, or a by-pass should be provided between E and G; however, the device operates in a perfectly automatic manner as described without any inconvenience or drawback whatever. On the contrary, if the device has to work as continuous primer, the unit will be a simple one as diagrammatically shown in the accompanying figure.

The short circuit connection, as shown on the drawing, comprises the shunt pipe L, the ends of which are connected to the suction conduit G and pressure conduit E, respectively, of the operating pump D.

A valve P is inserted in the shunt pipe L and is normally kept closed by means of a spring acting on a piston connected with the valve and mounted for movement in a ram Q. Said ram communicates with the pressure side of the main pump A by means of a tube R, in which an operating cock S is inserted.

When the cock S closes the communication between the ram Q and the pressure side of the main pump A and connects the ram Q with the outside, the valve P is closed by the action of the spring acting on the piston connected with the valve. The pump D is then ready for the priming of the main pump A. When the latter is in operation and it is desired to operate the pump D idly, the cock S is manipulated to bring the ram Q into communication with the pressure side of the main pump A, and in this case part of the liquid flows into the ram Q and forces down the piston, thus opening the valve P which short circuits the pump D.

The boundaries of the invention are not overstepped if the priming pump is applied to any other type of main pump, or if the types and modes of driving the circulation pump D, the priming pump H and motor F are altered (for H—F, electric, or pneumatic sets etc. may obviously be substituted, instead of hydraulic sets). The motor-priming pump set may also be a complex independent from the main pump, and be attached to the latter when the necessity of so doing presents itself.

Neither are the boundaries of the invention exceeded, if the invention is embodied in constructive forms other than those that are shown on the accompanying diagram and that have made a specific description of the invention possible.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is:—

Device for priming and increasing the suction head for a portable pump adapted to suck in water at various levels, such as a fire pump and the like, including the combination, with a main suction pump having a suction pipe, there being means for driving the same, of a group of devices cooperating with said main pump comprising a driven fluid pump, a rotary pump located at the lower end of said suction pipe having a motor directly coupled thereto for driving the same, a pressure pipe and a return pipe connecting said motor and said driven fluid pump in a closed hydraulic circuit so that said fluid pump may drive said motor by means of a circulating liquid, and means for shunting said pressure and return pipes about said fluid pump and either causing said main pump to directly suck up the water through the suction pipe while the auxiliary pump is idle, or causing the main pump and the auxiliary pump to operate in series or parallelism, at will, comprising a shunt pipe connecting said pressure and return pipes, a check valve in said suction pipe, a check valve interposed between one of the pipes connecting the fluid pump and auxiliary pump motor and the shunt pipe, and means for controlling said valves.

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