No. 691,512. Patented Jan. 21, 1902.

. E. WHITNEY.

PUMP.

(Application filed Apr. 29, 1901.)

(No Model.)

Fig. 3.

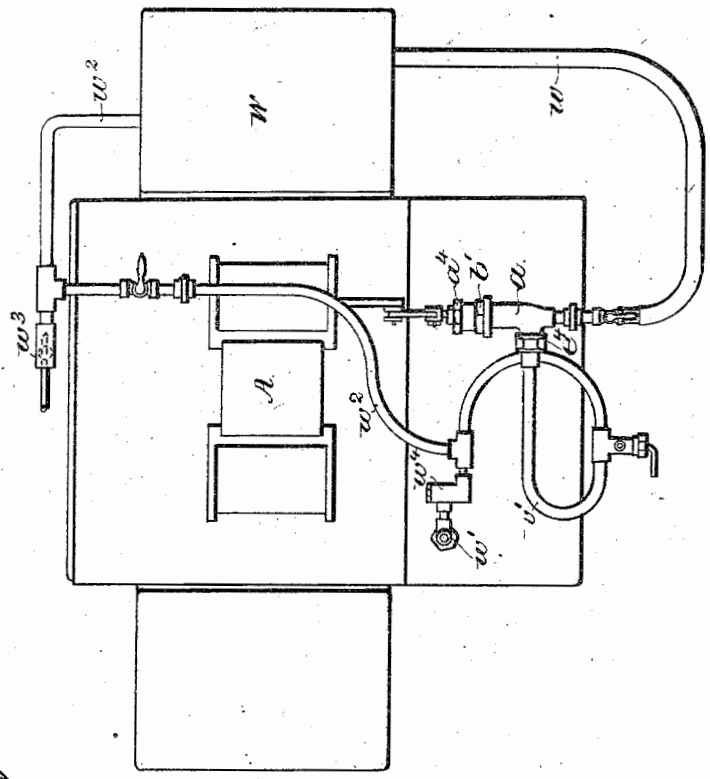


Fig. 2.

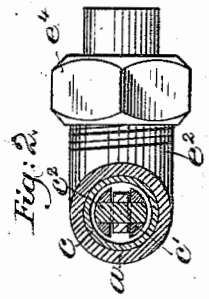
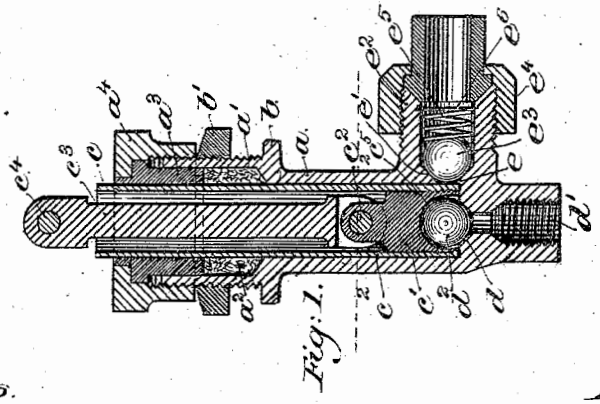


Fig. 1.



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UNITED STATES PATENT OFFICE.

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PUMP.

SPECIFICATION forming part of Letters Patent No. 691,512, dated January 21, 1902.

Application filed April 29, 1901. Serial No. 57,918. (No model.)

To all whom it may concern:

Be it known that I, GEORGE E. WHITNEY, a citizen of the United States, residing at Boston, in the county of Suffolk and State of Massachusetts, have invented an Improvement in Pumps, of which the following description, in connection with the accompanying drawings, is a specification, like letters on the drawings representing like parts.

My invention has for its object to provide a novel and improved pump adapted for any of the uses to which pumps are ordinarily applied. My invention, however, is particularly useful in connection with and is designed with especial reference to motor-vehicles where it is desirable to use a pump of the smallest possible size and of the highest efficiency.

In pumps as ordinarily constructed and adapted for the above use there is a relatively large amount of clearance between the plunger and the inlet and discharge valves, and this clearance is a serious objection. For instance, if the water in the supply-tank becomes exhausted, or if there be any leak in any of the supply connections, air will be drawn into the pump-cylinder, and so much of this air as is contained in or can be compressed into this clearance cannot be expelled from the cylinder by the reciprocations of the plunger, and the air thus compressed into this clearance by successive strokes of the plunger soon reaches such a pressure that even when expanded to fill the entire cylinder upon the upstroke of the plunger it prevents the lifting of the inlet or suction valve, and consequently prevents the entrance of water to the pump-cylinder after the tank has been refilled or the leak stopped. The pump is then "air-locked," as it is commonly known. This is particularly dangerous when the pump is used in connection with any form of automatic regulator, for reliance being placed upon the regulator the latter will frequently call for more water while the pump is thus air-locked and unable to meet the demand. Great difficulty is also encountered in providing pumps that are cheaply and compactly made and in which the valve-closures are sufficiently tight to insure permanent successful operation of the pump.

One aim of my present invention is to provide a pump having so little clearance that when pumping against any ordinary pressure it is impossible to compress therein a sufficient volume of air to prevent the lifting of the inlet valve or valves on the return stroke of the plunger. My invention also aims to otherwise simplify and improve a pump so that it may be safely relied upon to perform its intended functions at all times.

In the drawings, Figure 1 is a vertical section of a pump, illustrating one form of my invention; Fig. 2, a cross-section taken on the dotted line 2 2, Fig. 1; and Fig. 3, a diagrammatic view illustrating one manner of using my improved pump in connection with motor-vehicles.

Referring to the drawings in the particular form of my invention there shown, a is the pump barrel or cylinder of suitable capacity and construction, it being here shown as counterbored at a' to receive the packing a^2, held in place by the gland a^3, acted upon by the internally-threaded nut a^4, screwed upon the threaded exterior of the end of the pump-cylinder. Instead of the particular form of packing here shown any other well-known means may be employed for maintaining proper working fit between the plunger and the pump-cylinder.

The pump-cylinder is shown provided with a ring-like lip b, between which and the nut b', also threaded upon the exterior of the cylinder, may be clamped any suitable support for the pump to hold the latter in working position. Within the pump-cylinder is arranged the plunger or piston c, that may be of suitable shape and construction and of proper length determined by the stroke of the pump. As here shown, the said plunger is tubular in form and has threaded in its lower end the plug or head c', to which is jointed at c^2 the lower forked end of the pitman or connecting-rod c^3. The connecting-rod extends upwardly within the tubular portion of the plunger and beyond the upper end of the latter is jointed at c^4 or otherwise suitably connected to a working part of the engine A, Fig. 3, or other means for reciprocating said plunger.

The lower end of the pump-cylinder a is shown as formed to provide the annular con-

ical valve-seat d, within which enters the inlet-passage d', with which the inlet-pipe of the pump is connected in usual manner. The inlet-valve is shown at d^2 and is preferably in the form of a ball, because I have found in practice that a ball-valve may be more safely relied upon to maintain permanently a tight fit with its seat than any other form of valve. I attribute this largely to the fact that when the ball is lifted from its seat by the action of the inflowing fluid it is kept constantly turning or moving, and thus rarely presents the same portion of its surface twice in succession in contact with its seat.

It will be noticed that the inlet-valve d^2 is substantially wholly within the pump-cylinder, in the walls of which its seat is formed, and that the movement of the valve in lifting from its seat likewise is within the said cylinder. In other words, its movements are substantially wholly within the limits of the stroke of the plunger, the latter being recessed or cupped at its end, as at c^5, to clear said valve. Thus when the plunger is in its lowermost position its end practically meets the end of the cylinder surrounding the valve, and the walls of its cup-shaped depression substantially fit the valve itself, so that, practically speaking, all clearance is eliminated.

The pump-cylinder a at its delivery end and at one side is shown perforated, as at e, to provide a discharge port or passage, the same entering an annular conical discharge-valve seat e, also formed in or on the wall of the said cylinder, but opening exteriorly therefrom and preferably within the threaded nipple e^2. In the discharge-passage formed within this nipple e^2 and seated upon the seat e' is the discharge-valve e^3, also preferably spherical in shape for reasons above stated. The discharge-pipe is connected in suitable manner, as by the coupling c^4, with the nipple e^2. While not always necessary, yet it is useful to hold the discharge-valve e^3 lightly to its seat by a spring—such, for instance, as indicated at e^5—interposed between the valve and the wires e^6, properly supported within said nipple. By forming the two valve-seats d and e' in the wall of the pump-cylinder itself I am enabled to bring the two seats into such close proximity to the plunger and to each other that the clearance is reduced to a minimum, as is apparent from the drawing Fig. 1, and it is perfectly evident that any fluid, whether water or air, that may be drawn into the pump-cylinder must be completely expelled, or substantially so, therefrom at each downstroke of the plunger. Thus there can never be sufficient air or fluid compressed within the pump-cylinder and the connections leading thereto upon the downstroke of the plunger to prevent proper lifting of the inlet-valve under the action of the water seeking to enter the cylinder through the inlet-passage d'.

Referring to Fig. 3, the water-tank of a typical motor-vehicle is indicated at W, the inlet-pipe w leading therefrom and being connected with the inlet-passage of the pump. The delivery-passage e of the pump is shown connected with the delivery-pipe w', that leads to the boiler, with a by-pass w^2, leading back again to the water-tank under the control of a valve located, for instance, at w^3, and with a check-valve at w^4 to prevent water from the boiler entering the by-pass. The whole capacity of the pump may be relied upon at all times, and the portion thereof that is delivered into the boiler may be regulated at will by opening or closing the valve w^3, that regulates the proportion of the pump delivery that will return through the by-pass to the water-tank.

It will be apparent from the foregoing description and from the drawings that a pump made in accordance with my invention is extremely compact, in fact being reduced almost to the smallest possible dimensions for a given capacity. It is also extremely cheap to manufacture, for the entire cylinder is in one body or casting, and the cylinder may be bored out and the inner valve-seat formed at a single operation by boring straight in from the top and the discharge-passage with the discharge-valve seat similarly formed by boring in from the side. More than this, the arrangement of the valve-seats as shown and described insures always a proper operation of the pump without any objectionable clearance.

While I have here shown and described my invention in the best form yet devised by me, my invention is not restricted to the particular form shown and described, for it is evident that it may be varied in many particulars as to arrangement and construction without departing from the spirit and scope of my invention, and while I prefer to use ball-valves, for reasons hereinbefore stated, obviously any well-known or suitable form of valve may be used.

Having described my invention and without limiting myself as to details, what I claim, and desire to secure by Letters Patent, is—

1. The herein-described pump comprising a cylinder having an inlet-passage in one of its ends, and a ball-valve therefor contained substantially wholly in said cylinder, a plunger cup-shaped at its end to receive closely the said ball-valve when the latter is seated, an outlet-passage leading laterally from said cylinder at its delivery end and provided with an outwardly-directed valve-seat formed in the wall of said cylinder, a ball-valve therefor in and controlling said outlet-passage, said ball-valve when seated being substantially tangent to the inner circumference of said cylinder whereby substantially all clearance is eliminated at the end of a plunger-stroke.

2. The herein-described pump comprising a one-piece body, bored longitudinally to provide a pump-cylinder having an inlet-passage in one of its ends and a ball-valve therefor contained substantially wholly in said cylin-

der, a laterally-extended portion on said body, bored to provide an outlet-passage for and at the end of said cylinder, an outwardly-directed valve-seat formed in the wall of said cylinder and a spring-supported ball-valve therefor in and controlling said outlet-passage, said valve when seated being substantially tangent to the inner circumference of said cylinder, and a plunger cup-shaped at its end to receive closely the said inlet ball-valve when the latter is seated, whereby substantially all clearance is eliminated at the end of a plunger-stroke.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

GEORGE E. WHITNEY.

Witnesses.

FREDERICK L. EMERY.

ANNIE E. CHESLEY.