American-Marsh Pumps—Description

The steam end of the American-Marsh Pump is equipped with an improved steam valve which embodies several very desirable features. The main steam valve is of the balanced piston type equipped with expansion rings on the heads to take up wear, while the auxiliary valve is of the semi-rotative disc pattern which wears to a perfect seat. It is mechanically actuated by a lever arm connected to the crosshead which is attached to the piston rod.

American-Marsh Pumps are positive in action, possess a perfect self-governing element and will not hang up under varying conditions. There are no noisy tappets, no internal trip tubes and no lost motion.
Explanation

With steam piston and steam chest valve, as shown in Figure 3, the steam passes into the chest at A and through the throat passage B into the steam cylinder through C and D.

The exhaust steam passes out of the steam cylinder through ports D', E and F.

The operation of the steam chest valve is as follows: the live steam passes through port K, Figure 2, into the chamber where the auxiliary valve is located and this steam pressure holds the auxiliary to its seat at M.

The auxiliary valve seat, as shown in Figure 4, is drilled with ports G and G', which connects the ends of the chest with steam or exhaust pressure through ports J and J' as shown in Figure 1.

The valve stem lever is connected by the valve rod to the crosshead which is clamped to the piston rod.

The valve stem lever oscillates the auxiliary valve, Figure 5, which by bringing the opening O over the port G' allows steam to pass to one end of the steam chest and the auxiliary valve exhaust port N is over the port G which permits the steam in back of the other end of the chest to exhaust through port H into the main exhaust, and this results in the valve being moved to the opposite side thereby reversing the direction of the movement of the steam piston.

Hole L is for balancing steam valve so that the head of steam valve will not move too far and close throat B.

The length of the stroke may be adjusted to suit varying conditions by means of the two regulating screws located at the side of the auxiliary valve stem lever. On pumps having ten inch stroke or longer, cushion valves are also furnished at each end of steam cylinder which regulate the escape of the exhaust steam, forming a cushion at the end of each stroke. These cushion valves should be opened so as to allow the steam piston to strike the heads lightly, and then closed just enough to prevent striking and the pump will then make a full stroke.

Explanation of Self-Governing Element

By referring to the cut it will be noted that the inner area of the steam valve head is reduced by an amount equal to the cross-sectional area of the valve stem or body, whereas the area of the outer head is larger. As the piston moves toward the right, the same steam pressure which is forcing the piston is also communicated through port B into the space back of the steam valve. We, therefore, have two opposing forces pushing against opposite sides of the steam valve head, the admission steam acting against the lesser area of the inside head tending to force the valve to the left and thereby reducing the opening at B, and the cylinder steam coming up through port L, acting against the greater area of the outside head, forcing the valve to the right and tending to enlarge the opening at B. The valve is thus held in perfect balance at all times.
It therefore follows that if the piston moves easily, much pressure cannot exist in the steam cylinder, as the piston would rapidly fly away from it, and inasmuch as the pressure in the steam cylinder and in the outer end of the valve chamber, as explained above, is always the same, the pressure acting against the outer head of the steam valve would have slight force to enlarge the opening at B. On the other hand, if the pump is working against heavy pressure and the piston moves hard, the steam pressure in the cylinder would increase and the pressure against the outer area of the valve head would overcome the resistance of the admission steam against the inner area and thereby increase the opening at B.

The importance of this feature cannot be overestimated, as the pump is at all times automatically regulated and only just enough steam is admitted to the cylinder to do the required work. The pump can never run too fast to take suction and should the water supply give out when the throttle is wide open, no injury can occur to the moving parts. The steam valve does not require setting. It has no dead center, and the pump will always start the moment steam is admitted.
American-Marsh Pumps are made of the very best of material and are rugged and substantial in design. Steam and water cylinders are joined by heavy cast-iron yokes with ring and plug fit to insure perfect alignment of wearing parts. Special bronze fittings (not common brass) are furnished regularly, without extra charge, consisting of removable bronze liners, bronze piston rods, valve seats, valve bolts, springs, and we furnish either a good grade of hard or soft rubber valves or bronze valves as the service may require.

Regular equipment consists of pump complete ready for operation, including set of wrenches and drain cocks. Lubricators on steam pumps are furnished only at an extra charge while oil cups are furnished as regular equipment with all power pumps. When desired, mechanical oil pumps of standard makes are furnished complete with brackets and attachments at bottom market prices. Cast-iron drip pans are furnished for all pumps, if desired, at regular extra charge. Improved lagging is furnished for steam cylinders, when desired, consisting of eighty-five per cent magnesia of ample thickness covered by Russia iron of rust-proof type secured by polished steel bands. Cylinder heads are insulated with the same material and covered with polished steel heads.

Sectional View of Steam Chest, Showing Steam Valve
Simplex vs. Duplex

"A great deal has been said and written on the superior merits of duplex direct-acting steam pumps, which is calculated to deceive operators and purchasers alike. There are some points which escape, seemingly, the observation of engineers in regard to duplex steam pumps. They do not, it is claimed by the designers of the pump illustrated herewith, have two independent pumps. They have in reality only one. If anything gives way or breaks on either pump, both are disabled; and as a double number of parts are more liable to break down or give out than one-half that number of parts, it is self-evident that a good single steam pump is more reliable than two pumps so constructed, when one depends entirely on the action of the other for its movements; and what is more important still is the question of economy in the use of steam in the two kinds; the advantage is greatly in favor of the single type of the same capacity, from the fact that the single pump makes only one-half the number of stops, traveling a given number of feet in a given time, and with one-half the waste of steam; and from another fact that all duplex pumps have four long ports or passageways in each cylinder, or eight long ports in the two cylinders, while the single pump has only two ports, and as steam in the ports is of no use in propelling the pistons, the steam wasted in the eight ports in a duplex pump is enormous.

"A greater waste of steam occurs in the clearance in the cylinder ends, it is further claimed, than in a single pump, through the uncertainty of the length of stroke, that varies under the slightest change of condition, either in the friction of the stuffing boxes or the slightest variation of pressure. In other words, there are in a duplex pump more than double the number of parts, with double the number of chances to break down; also double the waste in clearance in the cylinders through having double the number of long steam and separate exhaust passages in each cylinder, which makes the direct-acting duplex pump by far the most extravagant pump in the use of steam that has ever been designed as a hydraulic motor, especially for light service; and as proof of this statement there are many cases on record where a direct-acting duplex pump has been applied as a vacuum pump to a non-condensing steam engine, where it has not done much more than get rid of the exhaust steam, as the amount of steam required to run the pump is, in many cases, in excess of the gain of the vacuum produced on the main engine."
Directions for Setting up and Running American-Marsh Steam Pumps

All pumps are carefully tested under steam, and are properly packed before leaving our works. They are shipped intact, ready to attach pipes and put in operation.

Before connecting steam pipe to pump, blow out thoroughly with full steam pressure to dislodge and remove all dirt and chips.

Do not use smaller pipe than specified in table of details. If line is long, make it one or two sizes larger. This applies particularly to suction pipe.

Run the pipes as direct as possible. Turns and valves obstruct the water far more than length of pipe.

The suction pipe must be air-tight. A number of small leaks will supply the pump with air to its full capacity, so that little or no water can be raised.

The capacity of pump is reduced by long and high suction lines, because the friction and elevation partly overcome the head due to vacuum, and prevent full supply entering water cylinder, except at slow or moderate speed; therefore, it is necessary to select larger pumps and install larger pipes than are ordinarily used for these conditions.

A foot valve should always be used if suction is long or high, and a strainer used in connection with same, if there is danger of dirt or rubbish entering the pipes and pump from this source.

A vacuum chamber on suction at or near pump is always an advantage on high lifts, and even on moderate lifts it is an actual necessity if high speed is desired.

Hot water cannot be raised to any considerable height by suction. If supply is very hot, it will vaporize under vacuum action of pump, and should be arranged to flow readily to suction.

To prevent freezing in cold weather, drain by opening cocks and plugs provided for this purpose; break suction and run a few minutes to clear of water before leaving.

Don’t pull the pump apart to see what is inside as long as it does its work well. Let steam end alone if pump behaves badly, until satisfied the trouble is not in water end or pipes.

The gasket packing between the steam chest and cylinder must be patterned from the planed surface on top of cylinder (not lower part of chest), carefully duplicating all holes, and making certain that the drilled ports at each end are unobstructed either by dirt or packing at point of register with corresponding holes in chest.

In starting pump, open drip-cock or valve in delivery until water appears, to relieve pressure on delivery valves if pump hesitates or is slow to pick up suction.

See that the pump receives a little oil continuously. Do not let the lubricator run dry. We strongly recommend the use of a mechanical oil pump which receives its motion from the action of the pump. This insures a positive flow of oil and only when the pump is in operation.

If unable to locate trouble, do not hesitate to write us for information. State carefully the conditions under which the pump is operating (with sketch if necessary), how long used, size and shop number of pump which will be found stamped on yoke between the two cylinders.
To Correspondents

It is important that a pump be designed especially to meet the requirements of the proposed service. We should therefore be fully advised as to the conditions under which the pump is expected to operate.

A rough sketch, showing position of pump in relation to the point of discharge and supply, giving distances and pipe sizes, would be of much assistance in determining size and style of pump required; also answers to the following questions, referring to them by number:

Question List

1. What is maximum pumping capacity required, in gallons, per hour?
2. Is water clear, gritty, salt, alkaline, or acidulous?
3. Vertical height suction lift; length and size of pipes?
4. Vertical height discharge; length and size of pipes?
5. What pressure steam available to operate pump, and how far from boiler?
6. Are side runs of pipe inclined or horizontal?
7. Number and nature of turns or bends in the pipe lines.

Careful attention to these points will save correspondence.
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