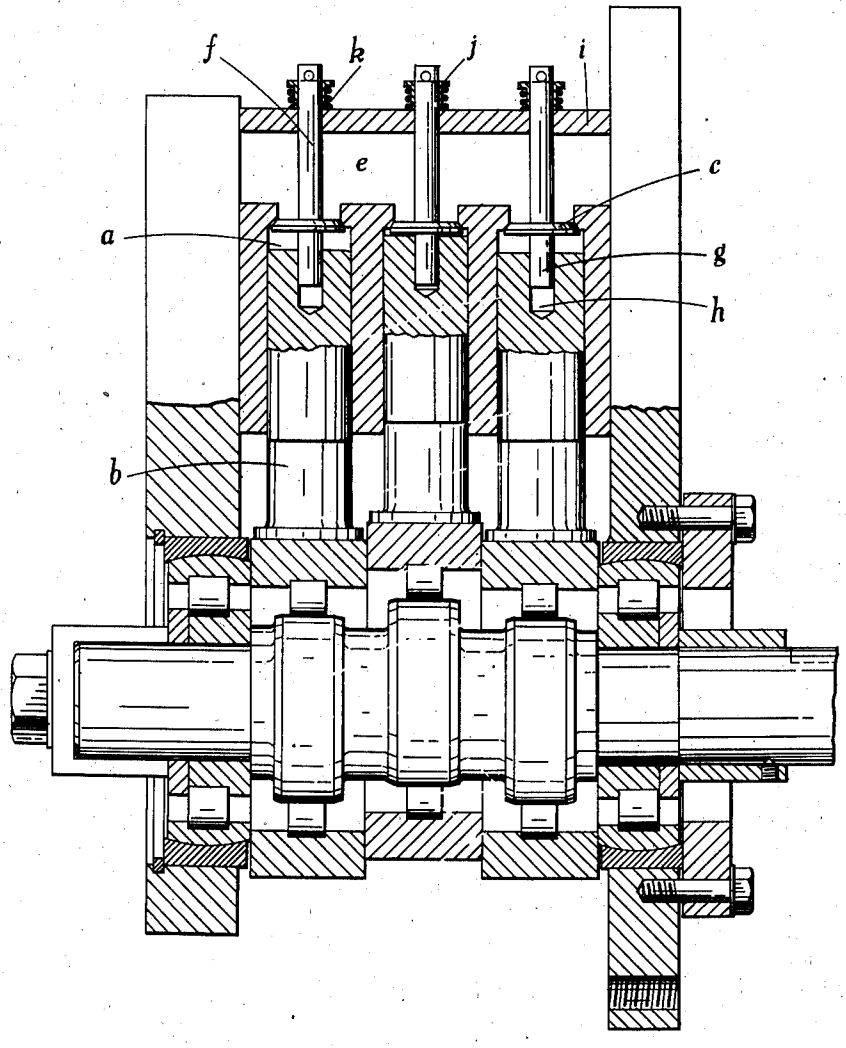
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RECIPROCATING RAM PUMP

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Fig. 1.



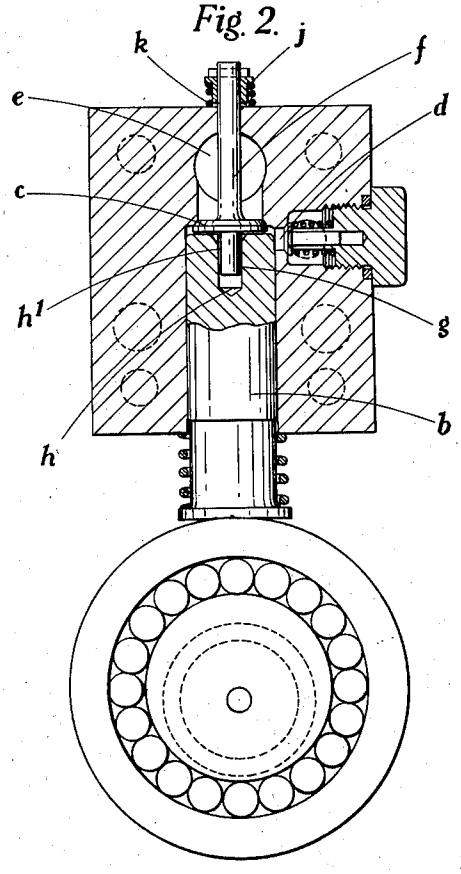
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Fig. 2.



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RECIPROCATING RAM PUMP

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In Great Britain June 28, 1939

2 Claims. (Cl. 103—169)

This invention relates to improvements in connection with the inlet valves of high speed reciprocating ram pumps of the kind in which the rams have a stroke which is preferably less than one-half inch and which are capable of working efficiently at speeds greater than 500 reciprocations per minute, such for example, as the pump described and claimed in the specification of our Patent No. 2,168,850.

Pumps of the above kind, owing to their high speed and very high volumetric efficiency, are comparatively small in size and in consequence it is particularly important that the inlet passage shall be as free from obstruction as possible.

In the example of pump shown in the specification of the above mentioned patent, the inlet valve is located in the end of each pump bore so as to oppose the end of each ram, whilst its stem extends across the inlet passage and is guided by a guide member which also projects into said inlet passage.

The object of the present invention is to provide, in a high speed pump of the above type, a construction in which the inlet passage is free from obstruction by an interiorly projecting valve guide.

Broadly the present invention consists of a high speed reciprocating ram pump, of the type in which each inlet valve opposes the end of a ram, wherein the inlet valve is guided in bearings on opposite sides of its head, one said bearing being formed in the opposing end of the pump ram and the other bearing in the wall of the inlet passage remote from the valve seat, the arrangement being such that the portion of the valve stem which extends across the inlet passage is exposed so as to provide an inlet passage which is free from obstruction by an interiorly projecting valve guide.

To take a particular example in the case of a high speed pump having a stroke of one quarter of an inch and having ¾" diameter manifold and ¼" diameter valve spindle, the cross-sectional area of the inlet passage which is obstructed by a guide member is approximately .149 square inch. The cross sectional area of the inlet passage of the same size of pump but embodying the feature of the present invention is .254 square inch or an increase in effective area of 70%. The reduction in velocity due to this increased inlet passage area is very considerable, the velocity in the case of the present construction being at least half that possible in the earlier construction.

In order to guide the inlet valve accurately in relation to its seat, the guiding hole in the end of each ram end has to be truly concentric to within .0005" and, as the length of each such hole is determined by the length of stroke of the ram, it is necessary that the length of the hole and therefore the stroke of the ram shall be kept as short as possible, as the longer the hole the more difficult it is to obtain the required accuracy. It is for this reason, principally, that the invention is most suitable in the case of high speed pumps having a ram stroke of ½" or less.

In order that the invention may be clearly understood and carried into effect, one example of a high speed pump embodying an inlet valve construction according to the present invention will now be described by aid of the accompanying drawing in which—

Fig. 1 is a part sectional elevation of a three-throw pump according to the present invention.

Fig. 2 is a transverse view, partly in section, taken at right angles to Fig. 1.

The pump illustrated conforms to the high speed pump claimed in the specification of our Patent No. 2,168,850 in that it comprises pump bores *a*, a ram *b* slidable in each pump bore so as almost completely to fill the same at the inner end of the stroke, a seating at the inner end of each pump bore for the reception of a mushroom type, automatically operating, inlet valve *c*, a delivery passage *d* in the side wall of each pump bore at its inner end and in close proximity to the inlet valve, and means for imparting a comparatively short stroke to each ram.

In the example illustrated an inlet passage *e*, common to the three pump bores, is provided, and, as will be seen by referring to Fig. 1, such passage is not obstructed by any inwardly projecting valve guide. This result is attained by the use of an inlet valve having a main stem *f* on one side of its head and a supplementary stem *g* on the opposite side of the head, said stems being in axial alignment with each other. When such valve is fitted in the pump the supplementary stem extends into the pump chamber whilst the main stem extends across the inlet passage. The supplementary stem is guided in a small bore or bearing *h* in the pump ram so that the two may move relatively to each other, a longitudinal passage *h'*, see Fig. 2, being provided between the wall of the said bore and the valve stem projecting therein to prevent liquid from becoming locked or trapped in the upper end of said bore. The main valve stem is

guided in a short bore or bearing in the outside wall *i* of the inlet manifold, said stem extending through said wall and being provided with a washer *j*, between which and the outside face of the pump body is interposed a valve spring *k*.

It will thus be seen that by an arrangement as just described the portion of the main valve stem which extends across the inlet passage is exposed so as to provide an inlet passage which is free from obstruction by an interiorly projecting valve guide, a feature which is of particular importance in the case of the smaller sizes of pump, such, for example, as pumps the rams of which have a stroke of less than half an inch. The invention is not, however, limited to such smaller sizes of pump as the construction can, with advantage, also be employed in high speed pumps of the larger sizes.

We claim:

1. A high speed reciprocating ram pump comprising in combination a pump bore, a ram slidable within said pump bore, an inlet passage at the inner end of said bore and co-axial therewith, a valve seat at the inner end of said passage and opposing the end of said ram, an inwardly opening mushroom type inlet valve cooperating with said seat, a further inlet passage disposed transversely of said first mentioned inlet passage, and communicating therewith, a stem projecting rearwardly from the underside of the head of said inlet valve through both said inlet passages, an opening in the outer wall of said transverse inlet passage for the slidable reception of said valve stem, a valve spring on the outer extremity of said valve stem which projects beyond the outside of said inlet passage wall, a longitudinal bore extending inwards up the interior of the pump ram from the inner end thereof and a further valve stem projecting from the inside face of the valve head and co-axial with the first mentioned valve stem, said further valve stem fitting slidably and with clearance within the longitudinal bore in the inner end of the pump ram, the complete arrangement being such that the portion of the outer valve stem which extends across the inlet passages is exposed so as to provide inlet passages which are substantially free from obstruction.

2. A high speed reciprocating ram pump comprising in combination a pump bore, a ram slidable within said pump bore, an inlet passage at the inner end of said bore and co-axial therewith, a valve seat at the inner end of said passage and opposing the end of said ram, an inwardly opening mushroom type inlet valve cooperating with said seat, a further inlet passage disposed transversely of said first mentioned inlet passage, and communicating therewith, a stem projecting rearwardly from the underside of the head of said inlet valve through both said inlet passages, an opening in the outer wall of said transverse inlet passage for the slidable reception of said valve stem, a valve spring on the outer extremity of said valve stem which projects beyond the outside of said inlet passage wall, a longitudinal bore extending inwards up the interior of the pump ram from the inner end thereof and a further valve stem projecting from the inside face of the valve head and co-axial with the first mentioned valve stem, said further valve stem fitting slidably within the longitudinal bore in the inner end of the pump ram, and a longitudinal passageway provided between the wall of the longitudinal bore of the pump ram and the valve stem projecting therein to provent liquid from being trapped within said bore, the complete arrangement being such that the portion of the outer valve stem which extends across the inlet passages is exposed so as to provide inlet passages which are substantially free from obstruction.

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