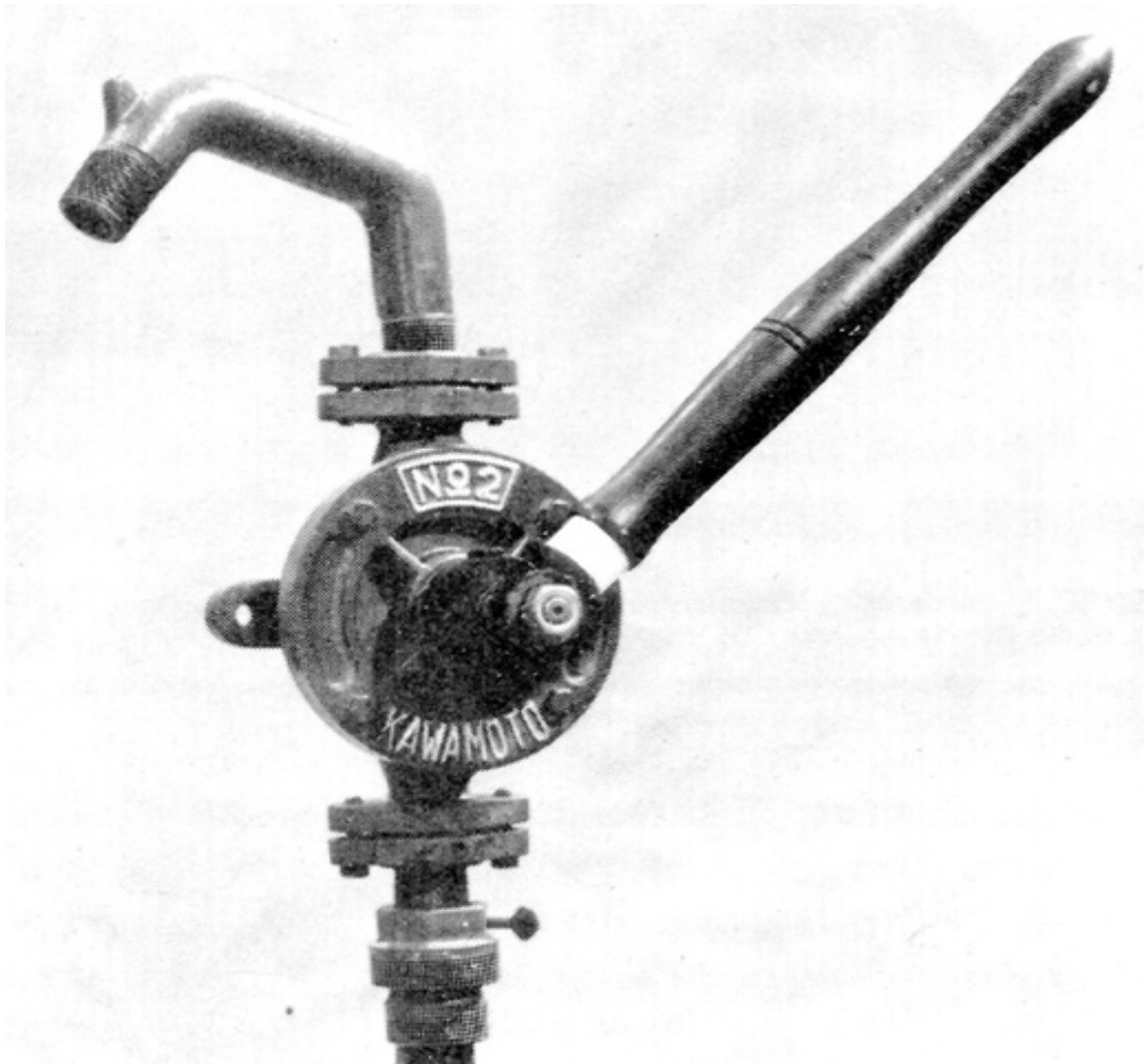


Evaluation Report 74



Monarch 2SR Semi-Rotary Hand Pump

A Co-operative Program Between



MONARCH 2SR SEMI-ROTARY HAND PUMP

MANUFACTURER:

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DISTRIBUTOR:

Oliver Industrial Supply Ltd.
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RETAIL PRICE:

Please refer to "THE MANUFACTURER STATES THAT"

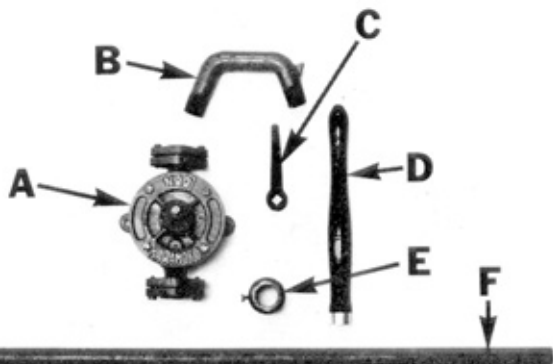


FIGURE 1. Monarch 2SR Semi-Rotary Hand Pump: (A) Pump Body, (B) Pump Spout, (C) Pump Handle Adaptor, (D) Pump Handle, (E) Bung Adaptor, (F) Suction Pipe..

SUMMARY AND CONCLUSIONS

Normal pumping rates for the Monarch 2SR semi-rotary hand pump were from 45 to 85 strokes per minute. The flowrate at an average pumping rate of 65 strokes per minute, at zero suction and discharge heads, was 24 L/min (5.3 gal/min). A maximum flowrate of 47 L/min (10.3 gal/min) was obtained at 130 strokes per minute but could only be maintained for about 15 seconds. Increasing the suction head to 0.9 m (3 ft) and the discharge head to 1.8 m (6 ft), at 65 strokes per minute, resulted in an 8% reduction in flowrate.

Pumping effort increased significantly with increased pumping rates, suction and discharge heads. The required pumping force at the end of the pump handle increased from 19 N (4.3 lb) at 45 strokes per minute to 38 N (8.5 lb) at 85 strokes per minute. Increasing the suction and discharge heads from zero to 0.9 m (3 ft) and 1.8 m (6 ft), respectively, increased pumping effort by 24%, when operating at 65 strokes per minute.

The Monarch 2SR was very portable. The pump was easy to position in a fuel supply tanksince it was equipped with a rotating bung adaptor.

The Monarch 2SR was relatively safe to operate. The pump handle could not be locked against the pump body, which could result in fuel being accidentally pumped. When filling a tank, care must be exercised to prevent overflow.

A descriptive brochure containing a comprehensive parts list was supplied with the pump.

Three mechanical problems occurred during the test. The bung adaptor thumb screw bent due to overtightening and had to be replaced. The wooden handle split when the iron adaptor was attached to it and the pump leaked slightly around the shaft.

RECOMMENDATIONS

It is recommended that the manufacturer consider:

1. Providing a means of locking the pump handle to prevent accidental pumping and theft.

2. Supplying a stronger thumb screw or a capscrew to allow the bung adaptor to be adequately tightened.
3. Supplying an outlet hose and nozzle as standard equipment and making available, as an option, an outlet nozzle with an automatic shut-off.

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Project Technologist: L. B. Storzynsky

THE MANUFACTURER STATES THAT

The model 2SR is manufactured by Kawamoto of Japan, not Monarch Industries Ltd. Monarch was buying from Kawamoto and selling to the Canadian and U.S. markets. However, due to the rise in the Japanese yen, the drop in the Canadian dollar, plus duty and freight charges, the unit became too expensive and was discontinued from our catalogue as of December 1, 1978.

GENERAL DESCRIPTION

The Monarch 2SR is a self priming, hand operated, double action oscillator pump. It is designed for pumping gasoline, diesel fuel, solvents, or lube oil from above ground tanks or drums equipped with either 40 mm (nominal 1.5 inch NPT) or 50 mm (nominal 2 inch NPT) openings. It is equipped with a 1016 mm (40 in) non-adjustable suction pipe, and a 20 mm (0.75 in) inside diameter outlet spout threaded for a 25 mm (nominal 1 inch NPT) hose connection. No outlet hose is supplied. For the test, a 2.44 m (8 ft) long, 25 mm (1 in) inside diameter, hose was supplied by P.A.M.I. The pump is equipped with a 381 mm (15 in) wooden pump handle.

Detailed specifications are given in APPENDIX I.

SCOPE OF TEST

The Monarch 2SR was evaluated for ease of operation and safety. Pump performance characteristics and pumping effort at various pumping rates, suction and discharge heads were determined with diesel fuel.

RESULTS AND DISCUSSION

PUMP PERFORMANCE

Pumping Rate: Pumping rates from 45 to 85 strokes per minute were determined as the normal range a farmer could continuously operate the pump when filling a large tractor tank. A maximum pumping rate of 130 strokes per minute was reached but was impossible to maintain for any reasonable length of time.

Flowrate: Pump performance characteristics with diesel fuel for two different suction and discharge heads are given in FIGURE 2. Suction head is the distance the fuel level is below the pump intake opening and discharge head is the height the outlet nozzle is held above the pump. Suction heads of 0 and 0.9 m (0 and 3 ft) correspond to full and empty levels of typical farm truck fuel storage tanks.

increased pumping rates increased the flowrate by about 0.36 L (0.08 gal) per stroke. Flowrate at the average pumping rate of 65 strokes per minute was 24 L/min (5.3 gal/min).

Increasing suction and discharge heads reduced the flowrate. Increasing the suction and discharge heads from zero to 0.9 m (3 ft) and 1.8 m (6 ft), respectively, at 65 strokes per minute, decreased the flowrate from 24 L/min (5.3 gal/min) to 22 L/min (4.8 gal/min). This combination of suction and discharge heads is more severe than would be encountered in transferring fuel to most machinery and represents an 8% decrease in flowrate.

The maximum flowrate obtained was 47 L/min (10.3 gal/min) at a pumping rate of 130 strokes per minute. This pumping rate could only be maintained for approximately 15 seconds.

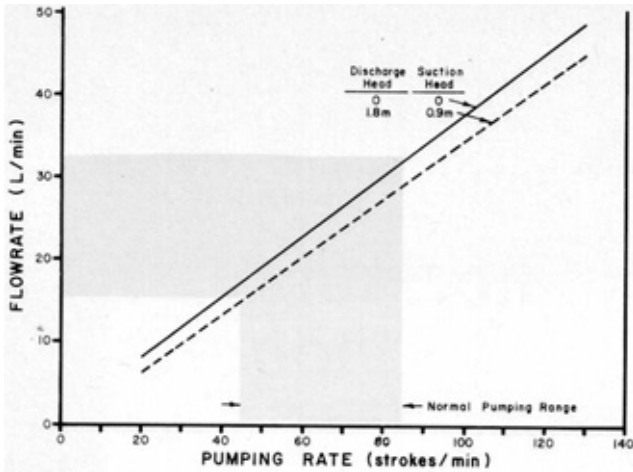


FIGURE 2. Flowrate with Diesel Fuel at Two Suction and Discharge Heads.

EASE OF OPERATION

Pumping Effort: Pumping effort is the hand force that has to be exerted, perpendicular to the end of the pump handle, to operate the pump. FIGURE 3 shows the hand force needed at various pumping rates, suction and discharge heads. Pumping effort increased with increasing pumping rates and with increased head. At a pumping rate of 85 strokes per minute, with zero suction and discharge heads, pumping effort was 38 N (8.5 lb) compared to 19 N (4.3 lb) at 45 strokes per minute. At an average pumping rate of 65 strokes per minute, pumping effort increased from 29 N (6.5 lb) at zero suction and discharge heads to 36 N (8.1 lb) with suction and discharge heads of 0.9 m (3 ft) and 1.8 m (6 ft), respectively.

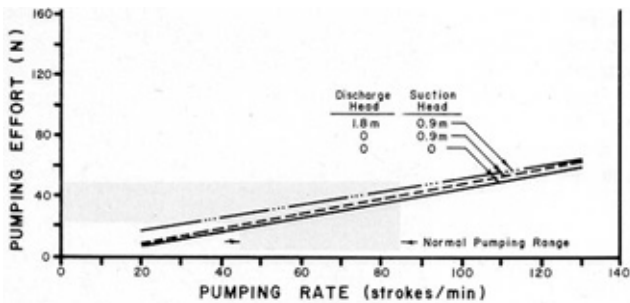


FIGURE 3. Pumping Effort with Diesel Fuel at Various Pumping Rates. Suction and Discharge Heads.

Fuel Tank Connection: The Monarch 2SR was portable and was equipped with a 40 mm (nominal 1.5 inch NPT) and a 50 mm (nominal 2 inch NPT) bung adaptor to fit fuel tank openings. The bung adaptor turned relative to the pump body, making it very easy to install and position in a fuel supply tank.

Filling A Fuel Tank: The Monarch 2SR was equipped with an outlet spout threaded for a 25 mm (nominal 1 inch NPT) outlet hose connection. No outlet hose or nozzle were supplied with the pump. It is recommended a hose and nozzle be supplied as standard equipment, and an automatic shut-off nozzle be made available as an option.

Pumping at 65 strokes per minute, it took from 9.5 to 10 minutes to fill a 225 L (50 gal) tractor fuel tank with filler opening typically located 1 m (3.3 ft) higher than the top of a typical farm truck fuel supply tank.

Servicing: The Monarch 2SR was not equipped with either an inlet or outlet strainer. The pump required no lubrication.

SAFETY

The pump handle could not be locked to the pump body. This could result in fuel being accidentally pumped which could be a safety hazard near running engines. It is recommended that the manufacturer consider providing a means of locking the handle to the pump body to prevent accidental pumping and theft. Care must be exercised to avoid overfilling of fuel tanks.

OPERATOR'S MANUAL

A descriptive brochure containing a comprehensive parts list was supplied with the Monarch 2SR.

MECHANICAL PROBLEMS

The Monarch 2SR was operated for about 3 hours. The intent of the test was an evaluation of functional performance and an extended durability evaluation was not conducted.

Three mechanical problems were encountered during the functional evaluation. The wooden handle split in two places (FIGURE 4) when the cast iron adaptor was installed in the pump handle.

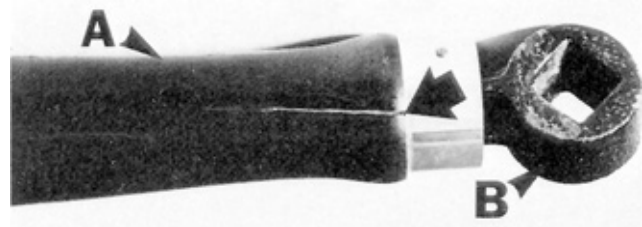


FIGURE 4. Split Pump Handle: (A) Pump Handle, (B) Cast Iron Adaptor.

The pump leaked slightly around the pump shaft, requiring tightening of the graphite packing nut. The thumb screw that tightens the bung adaptor to the suction pipe (FIGURE 5) bent since a plier had to be used to adequately tighten it. It is recommended that the manufacturer supply a capscrew or a thumb screw that will allow tightening of the bung adaptor to the suction pipe without bending.

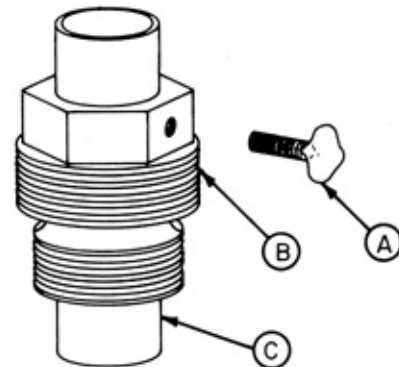


FIGURE 5. Bung Adaptor: (A) Thumb Screw, (B) Bung Adaptor, (C) Suction Pipe.

APPENDIX I

SPECIFICATIONS

MAKE Monarch Semi-Rotary Hand Pump

MODEL: 2SR

OVERALL DIMENSIONS:

- height 500 mm (19.7 in)
- width 260 mm (10.2 in)
- length 212 mm (8.3 in)
- pump handle length 380 mm (15 in)

TOTAL WEIGHT:

13 kg (29 lb)

SUCTION PIPE:

- size 25 mm (nominal 1 inch NPT)
- standard length 1016 mm (40 in)
- storage tank bung adaptor 40 and 50 mm (nominal 1.5 and 2 inch NPT)

OUTLET SPOUT:

- size 20 mm (0.75 in) inside diameter, threaded for a 25 mm (nominal 1 inch NPT) outlet hose

APPENDIX II

METRIC UNITS

In keeping with the Canadian metric conversion program, this report has been prepared in SI units. For comparative purposes, the following conversions may be used.

- 1 litre per minute (L/min) = 0.22 Imperial gallons per minute (gal/min)
- 1 metre (m) = 1000 millimetres (mm) = 39.37 inches (in)
- 1 Newton (N) = 0.22 pounds force (lb)
- 1 kilogram (kg) = 2.20 pounds mass (lb)



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