

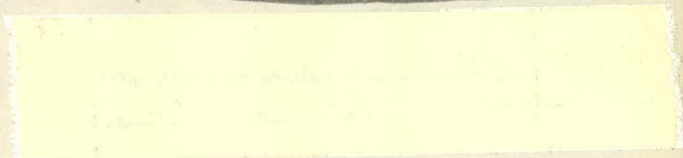
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CF-53-5-102



DATE: May 15, 1953  
SUBJECT: Test of Allis-Chalmers Canned Rotor Mercury Pump  
TO: F. L. Culler  
FROM: J. R. Parrott

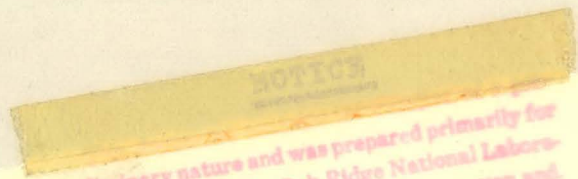
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1.0 Introduction

Allis-Chalmers Canned Rotor Mercury Pumps (serial No. AP-120) were purchased for use in the Test Facility. The head-capacity, power-input, and overall efficiency curves were determined for this pump.

Specifications for the Allis-Chalmers Pump called for the delivery of approximately 6 GPM at a head of 70 ft of mercury.

2.0 Operating Characteristics at Various Total Dynamic Heads

This pump performed with an 18 psig constant suction head and gave flow rates of 18 GPM at the specified head. It is recommended that, in order to obtain maximum efficiency and minimize the control problem, the impellar be trimmed to meet specifications.

Power consumption varied from 12 kw at 23-3 GPM to 3 kw at shut-off. Maximum overall efficiency of 35% was attained at a TDH of 74 ft and a flow of approximately 14 GPM (see Fig. 1 and Table 1).

Table I

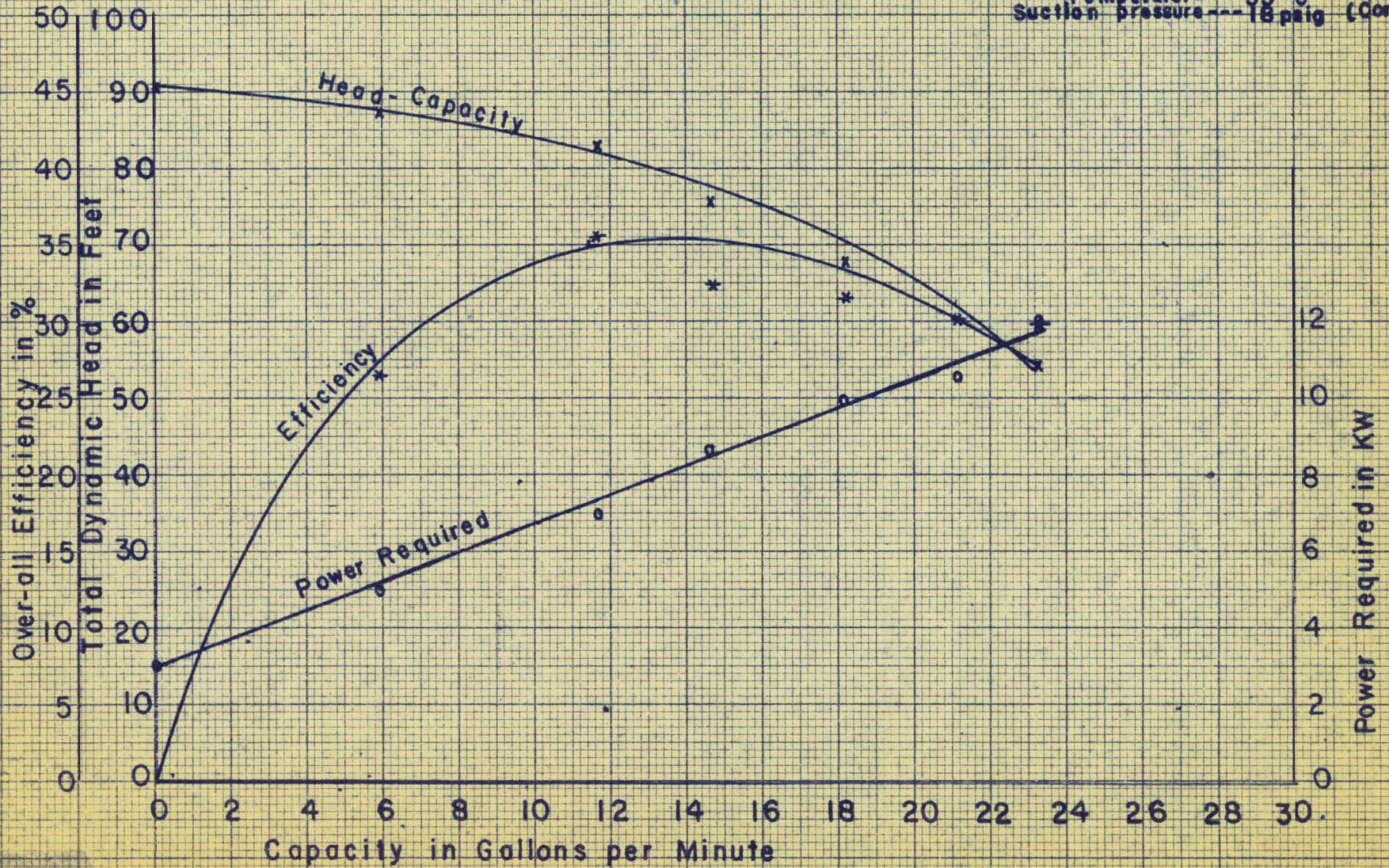
TDH (ft)	Flow Rate (GPM)	Power Input (kw)	Overall Efficiency (%)	Cooling H <sub>2</sub> O Temp. Rise (°C)	Hg Temp. Rise (°C)
54.2	23.3	12.0	29.9	32	1
60.3	21.2	10.5	31.1	29	1
67.8	18.2	10.0	31.4	29	2
75.4	14.7	8.75	32.3	26	3
83.2	11.7	7.0	35.7	22	-
87.3	6.0	5.0	26.5	16	4
90.6	shut-off	3.0	-	13	-



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FIGURE I  
CHARACTERISTIC CURVES OF ALLIS CHALMERS  
CANNED ROTOR HEAVY METAL PUMP

Liquid Pumped --- Mercury  
Temperature --- 35°C  
Suction Pressure --- 18 psig (Const.)



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### 3.0 Test Procedure

Testing of this pump involved the use of a head tank, throttling valve, and a catch tank mounted on a load cell capable of weighing up to 10,000 lbs. of mercury (see Fig. 2).

A constant suction pressure on the pump was maintained by manually regulating the air pressure on the suction tank. Mercury was collected and weighed in the weigh tank for one setting; then, by venting the suction tank and pressurizing the weigh tank, returned for the next series of runs.

Cooling water to the pump was held constant at 1/4 GPM and 30 psig.

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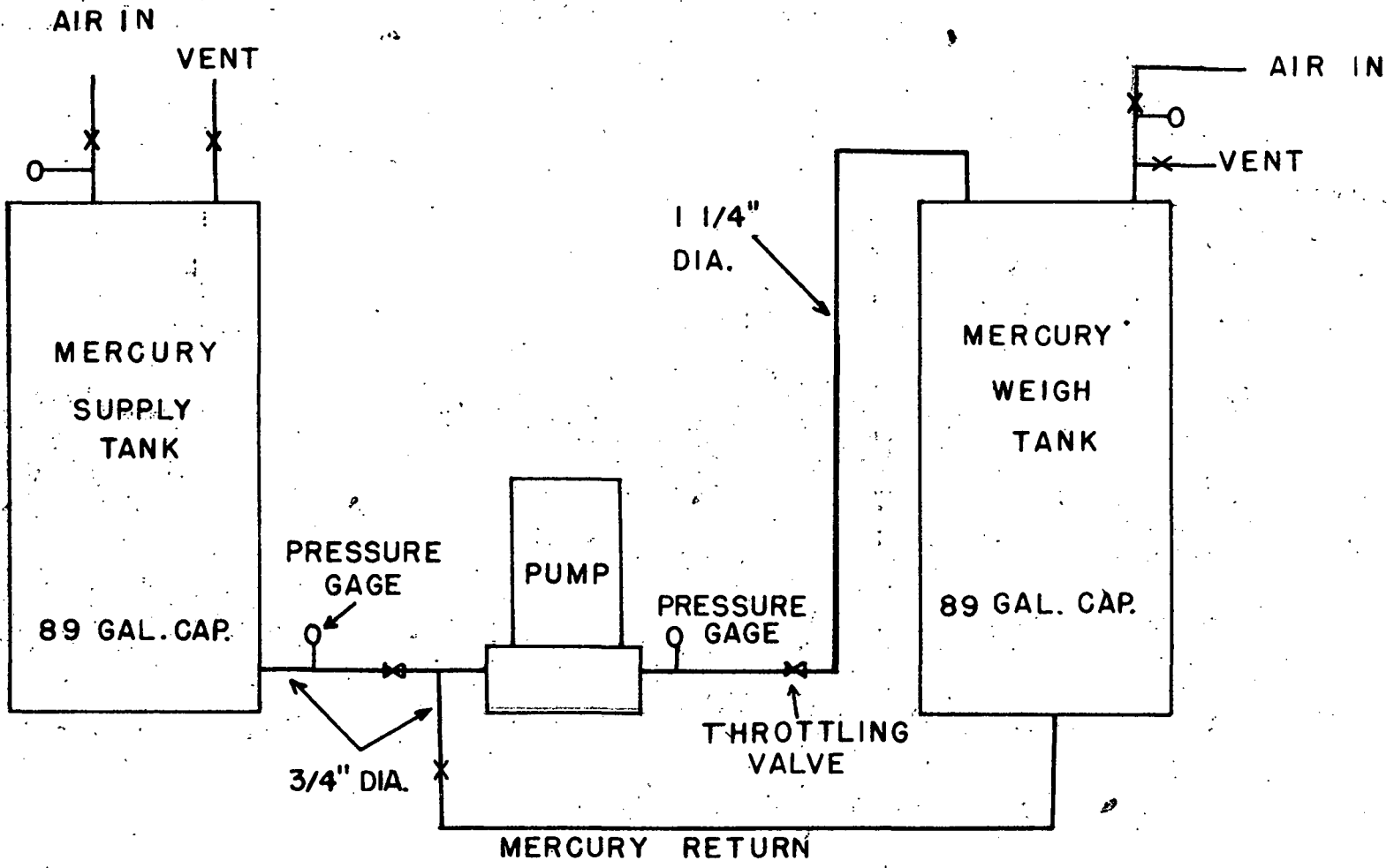


FIGURE 2  
PUMP TEST LOOP

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4.0 Recommendations for Installing and Operating Canned Rotor Pumps

Due to the intricate design, high cost, and inexperience in the operation of this type pump, several precautions should be taken before and during operation of these pumps. The most important of these are enumerated below:

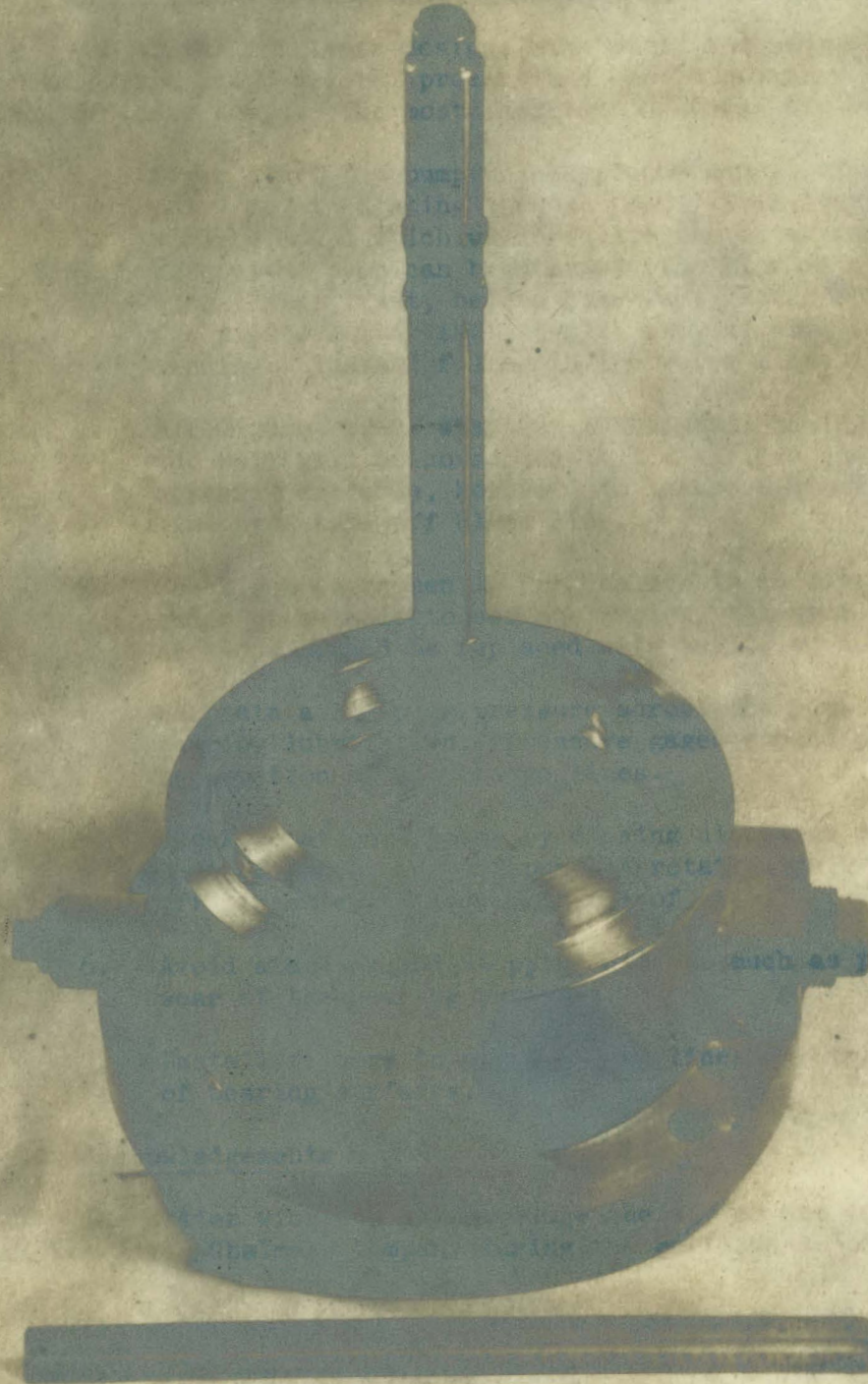
1. Never start the pump unless proper amount of water (1/4 GPM at 30 psig) is circulating through pump. Even though automatic controls will be added which will require the water valve to be opened before the pump can be started, the flow rate should be checked, visually at least, before start-up. Water should be turned off a few minutes after shut down to prevent sweating on the stator winding. Install filter in the water line.
2. Bleed pump before start-up. The small tubing out of the top of the unit will be connected to the suction side of the pump. It appears desirable, however, to insure against an air lock in this line by a take-off bleed line.
3. Check pumps frequently for leakage in cooling water tubing. In order to be able to see the tubing, the metal cover over the connections should be replaced with Lucite or contain a Lucite window.
4. Maintain a 100 psig pressure across the pump to insure sufficient bearing lubrication. Pressure gages should be installed on both the suction and discharge lines.
5. Check rotation of pump by closing discharge valve and noting shut-off pressure. If pump is rotating in wrong direction, shut-off pressure will be about 65% of rated.
6. Avoid starting and stopping unit as much as possible to prevent wear of the bearing surfaces.
7. Install filters in pump suction lines to avoid plugging or scoring of bearing surfaces.

5.0 Acknowledgements

The writer wishes to acknowledge the advice and aid of Mr. Ralph Jerman of the Allis-Chalmers Company during the performance of this test.

  
J. E. Parrott

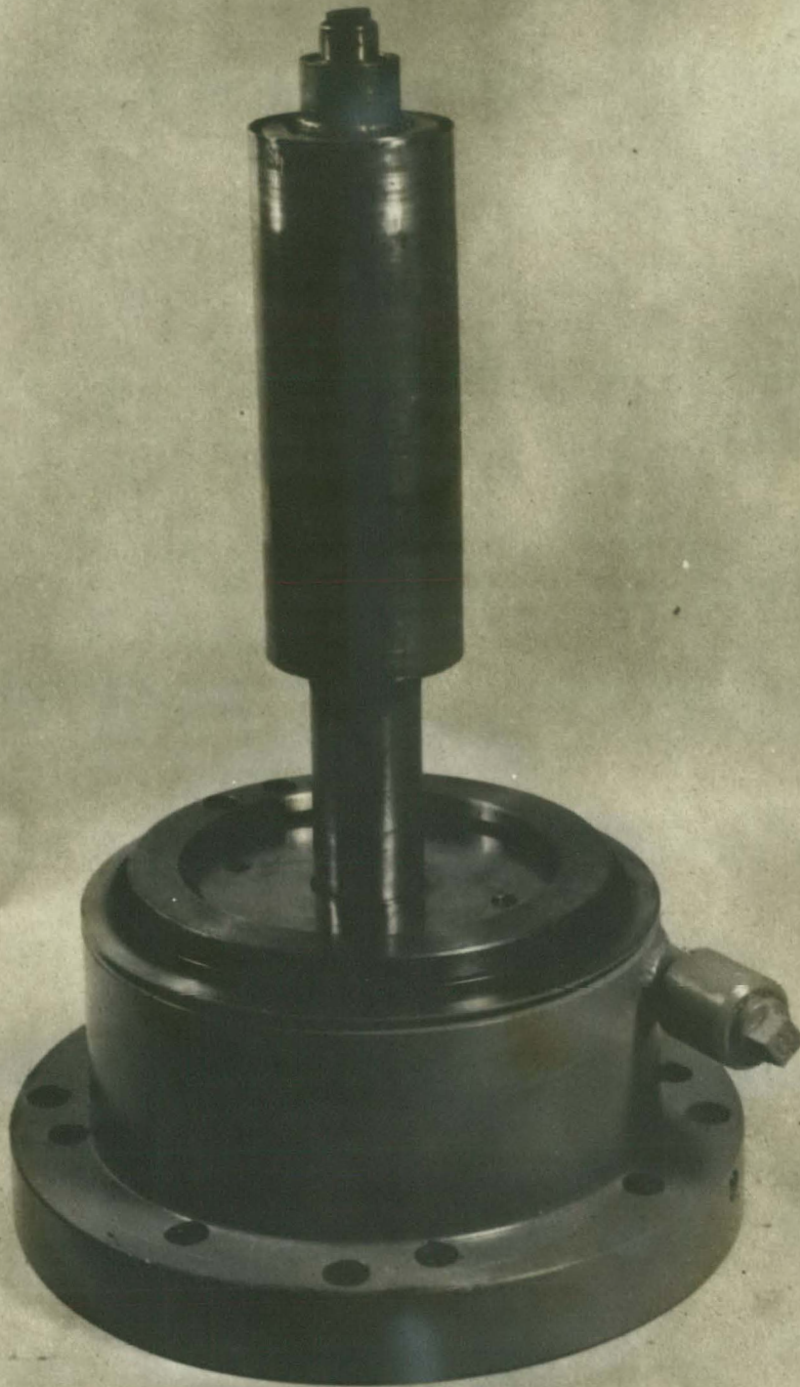
JRP/rcp



170113  
ALLIS-CHALMERS



Hermetically sealed heavy liquid centrifugal pump with fluid piston type bearings and water cooled motor windings. Pump casing and bearing shaft assembly.



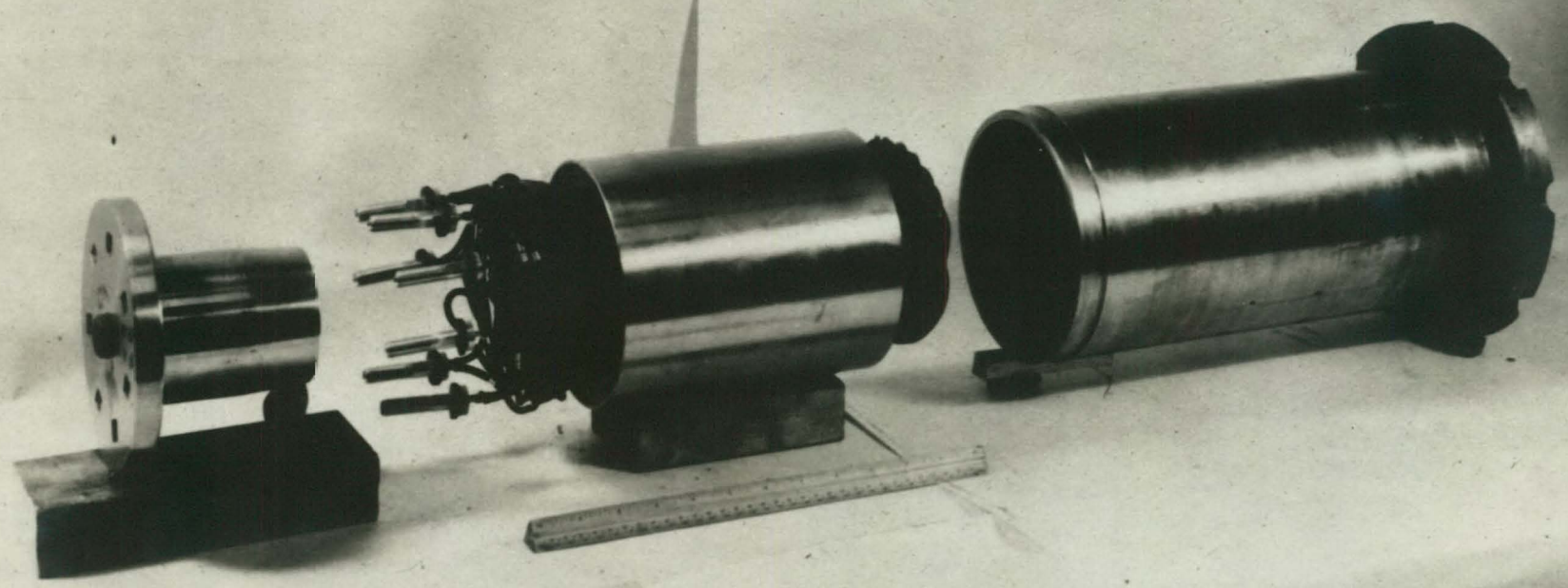
170114  
ALLIS-CHALMERS



Hermetically sealed heavy liquid centrifugal pump with fluid piston type bearings and water cooled motor windings. Pump casing and bearing shaft assembly with rotor, impeller and wearing ring.

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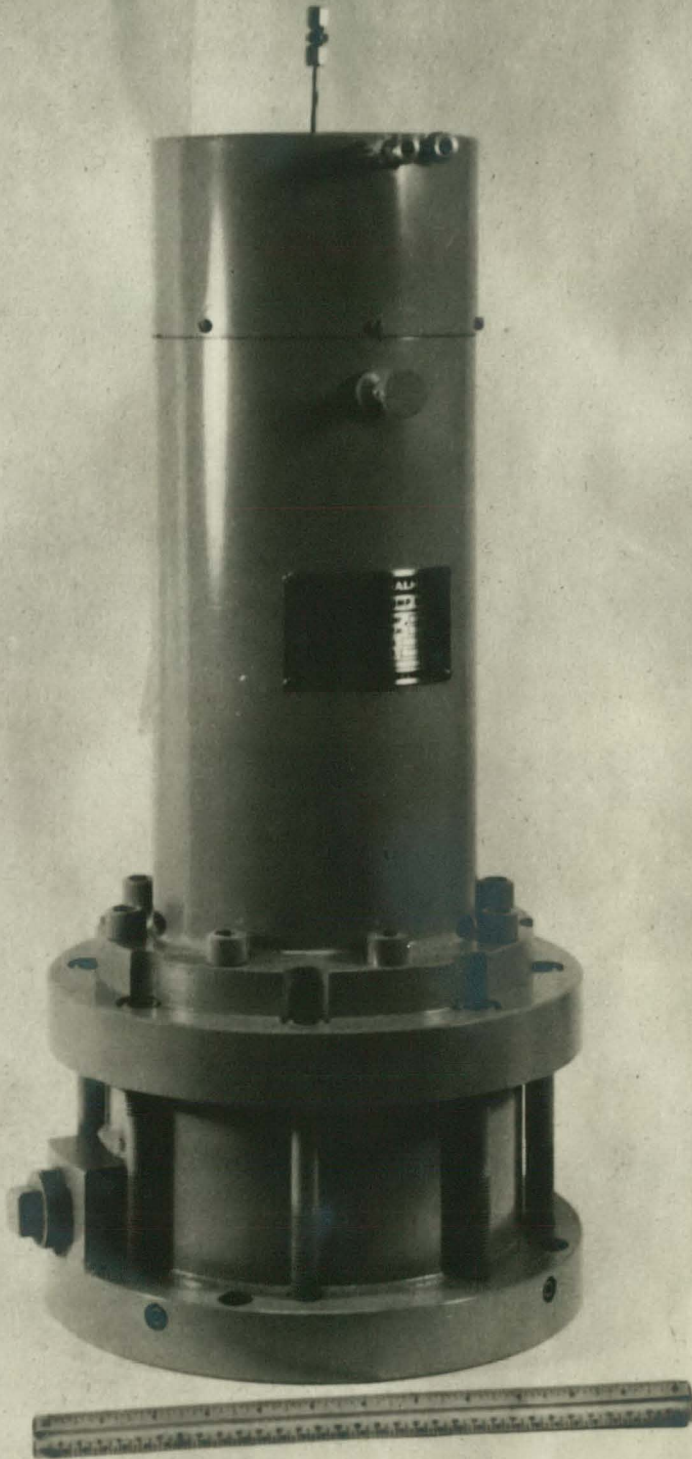


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170115  
**ALLIS-CHALMERS** 

Hermetically sealed heavy liquid centrifugal pump with fluid piston type bearings and water cooled motor windings - motor end plate and back-up ring assembly, stator assembly and stator housing, tubular winding, water cooled.



170118  
ALLIS-CHALMERS



Hermetically sealed heavy liquid centrifugal pump with fluid piston type bearings and water cooled motor windings.

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