CONTINENTAL OIL COMPANY

RESEARCH AND DEVELOPMENT DEPARTMENT

ANALYTICAL RESEARCH SECTION
RESEARCH SERVICES DIVISION

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ADDRESS INQUIRY TO:

O. F. Folmer, Jr.

TO: R. E. Laramy

SUBJECT: MEASUREMENT OF AIR FLOW RATES OF AERATOR PUMPS

PURPOSE: To measure the air flow rate achieved by aerator pumps when the pumps are filling a seven-liter sample bag.

SUMMARY: The flow rates achieved by two different pumps were measured both at maximum flow and with the flow restricted. While flow rates were very erratic over short periods, the rate showed little long-term variation.

EXPERIMENTAL:

Two pumps were used; both were designed as aerators for fish tanks and both were powered by carbon-zinc "D" cells. One (Napco) was powered by a single "D" cell while the Lew's Model #999 had two "D" cells.

The test apparatus is shown in Figure 1. At the start of the test the air bag is empty. The pump and a stop watch are started simultaneously. As the air bag fills, air is displaced from the can and periodically measured with the "bubble" meter. At the end of the test, the pump and bubble meter are disconnected and the bag is emptied with a vacuum line.

It is necessary to connect the pump (and any restrictions used) directly to the "bubble" meter and to measure the flow rate before starting a test when using a different flow rate. This flow rate is used to calculate the time required to fill the seven-liter bag so that the test can be stopped before the bag bursts. These small pumps generate sufficient pressure to burst a bag.

RESULTS AND DISCUSSION:

The maximum flow rates achieved by the pumps are shown in Figures 2B and 3B. Decreased flow rates, intended to fill the air bag over extended periods of time, are best attained by using a single in-line restrictor. The overall flow rate with such a restrictor remains fairly constant until the bag is full or nearly so. With the combination of a bypass restrictor and an in-line restrictor, the flow rate decreased continuously almost from the beginning; the flow rate at the end of the test was one-half to two-thirds that at the start.

Figure 2A shows the results of two 30-minute runs, a one-bour run, and a two-hour run with the Napco pump.

Figure 3A shows the results of a two-hour run with the Lew's pump.

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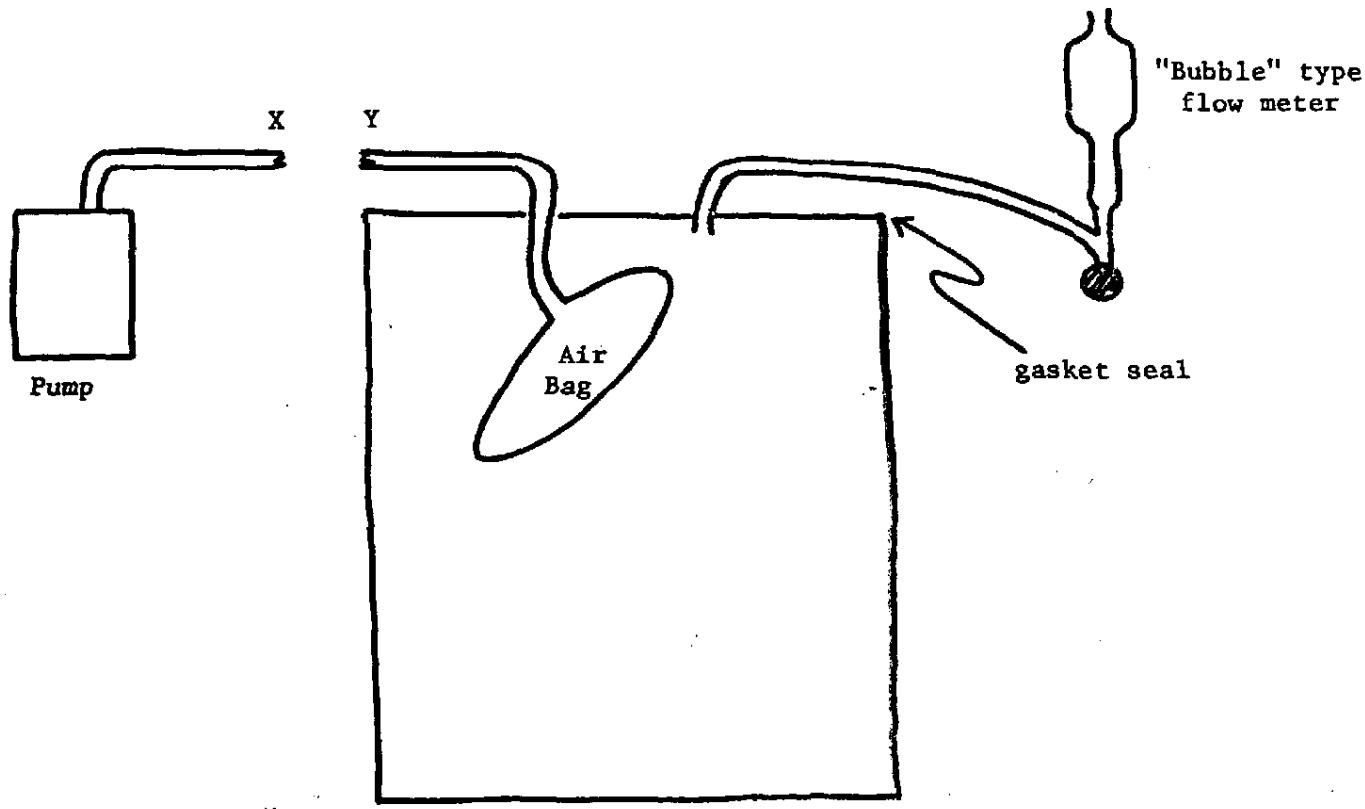

X ═══ Y Direct open tube connection for maximum flow rate

X Combination in-line restrictor and bypass restrictor to decrease flow into bag.

X ═══ Y Single, in-line restrictor to decrease flow into bag.

FIGURE 1

DIAGRAM OF FLOW RATE TEST APPARATUS

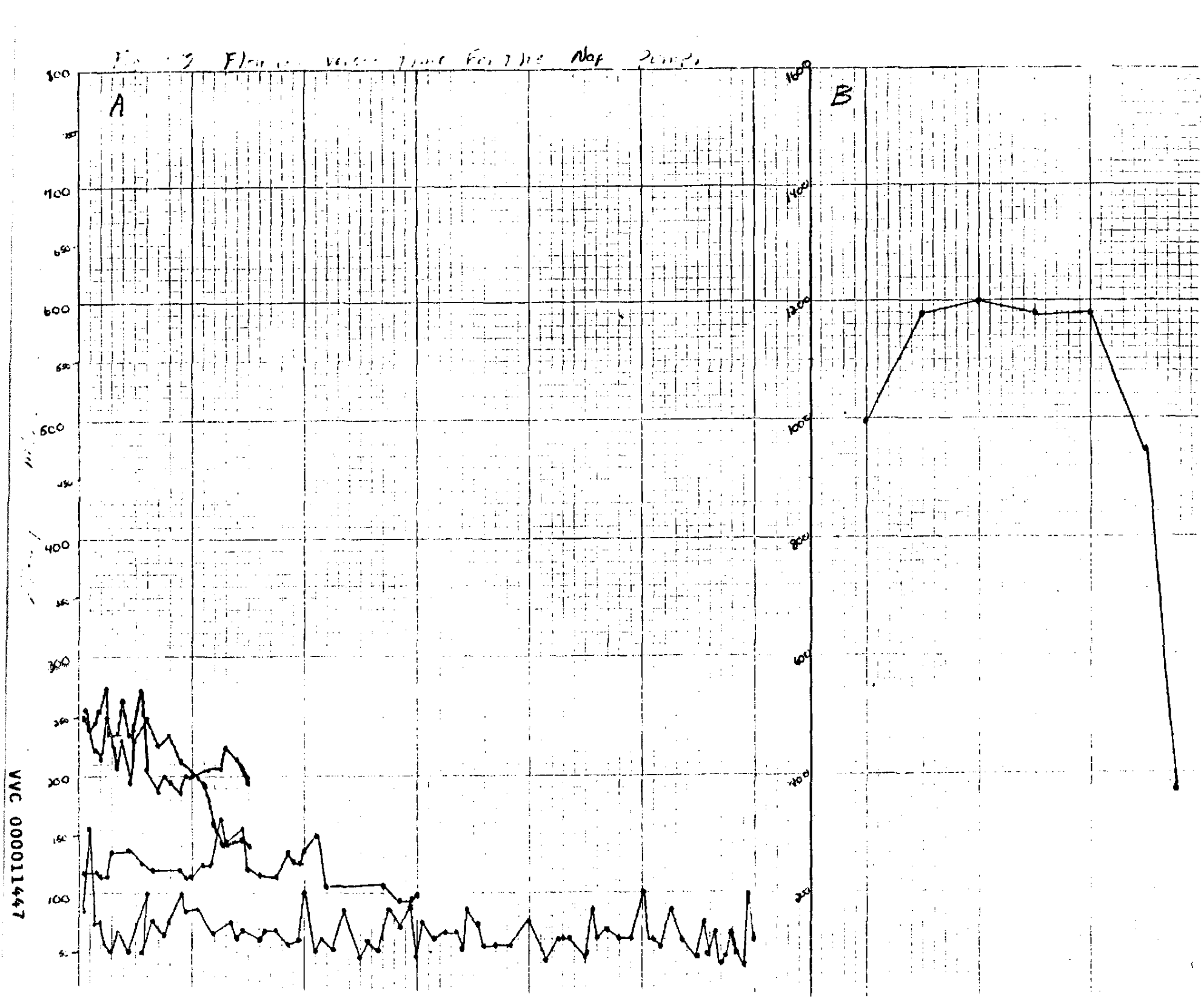

Figure 3 Flow Rate versus Time for the Lewis Pump