

## SOUTHWESTERN RADIOLOGICAL HEALTH LABORATORY

## INTRALABORATORY TECHNICAL REPORT

December 8, 1965

## AUTOMATED CHAMBER EVACUATOR

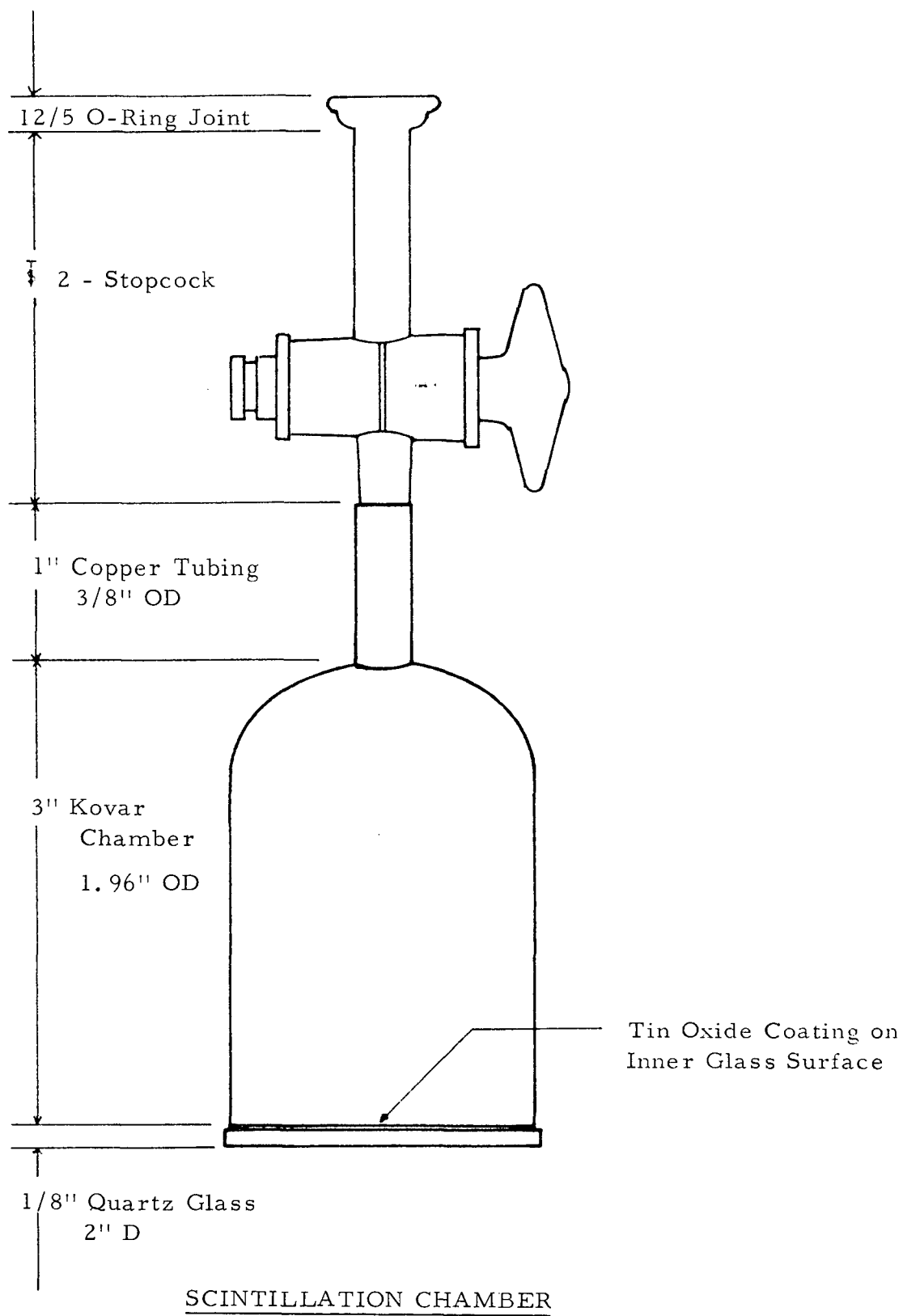
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## INTRODUCTION

In the analysis of Ra-226 by the radon emanation technique, the alpha emissions of Rn-222 are counted in a specially designed scintillation chamber (Diagram 1). The chambers consist of Kovar cups with an inner coating of phosphor material and a quartz window coated with tin oxide. With proper care, these chambers may be used until the phosphor material wears out.

In cleaning the chambers for re-use, they are evacuated with a vacuum pump, flushed with aged air, and re-evacuated. This procedure is repeated until the background has attained a constant minimum value. In the past, this decontamination has been done by hand, which is time consuming and inefficient. To improve this cleaning step, an apparatus has been constructed that automatically decontaminates the chambers. This device does a better job of cleaning the chambers and requires much less time and attention on the part of the operator.

Diagram 1



## GENERAL DESCRIPTION OF APPARATUS

The apparatus (see Diagram 2) consists of a wooden rack (A) built to hold from one to six chambers (B). The individual chambers are connected, by means of a toggle valve (C) and tubing, to a common header system (D). The air and vacuum lines are connected to opposite ends of this header system through two solenoid valves (E).

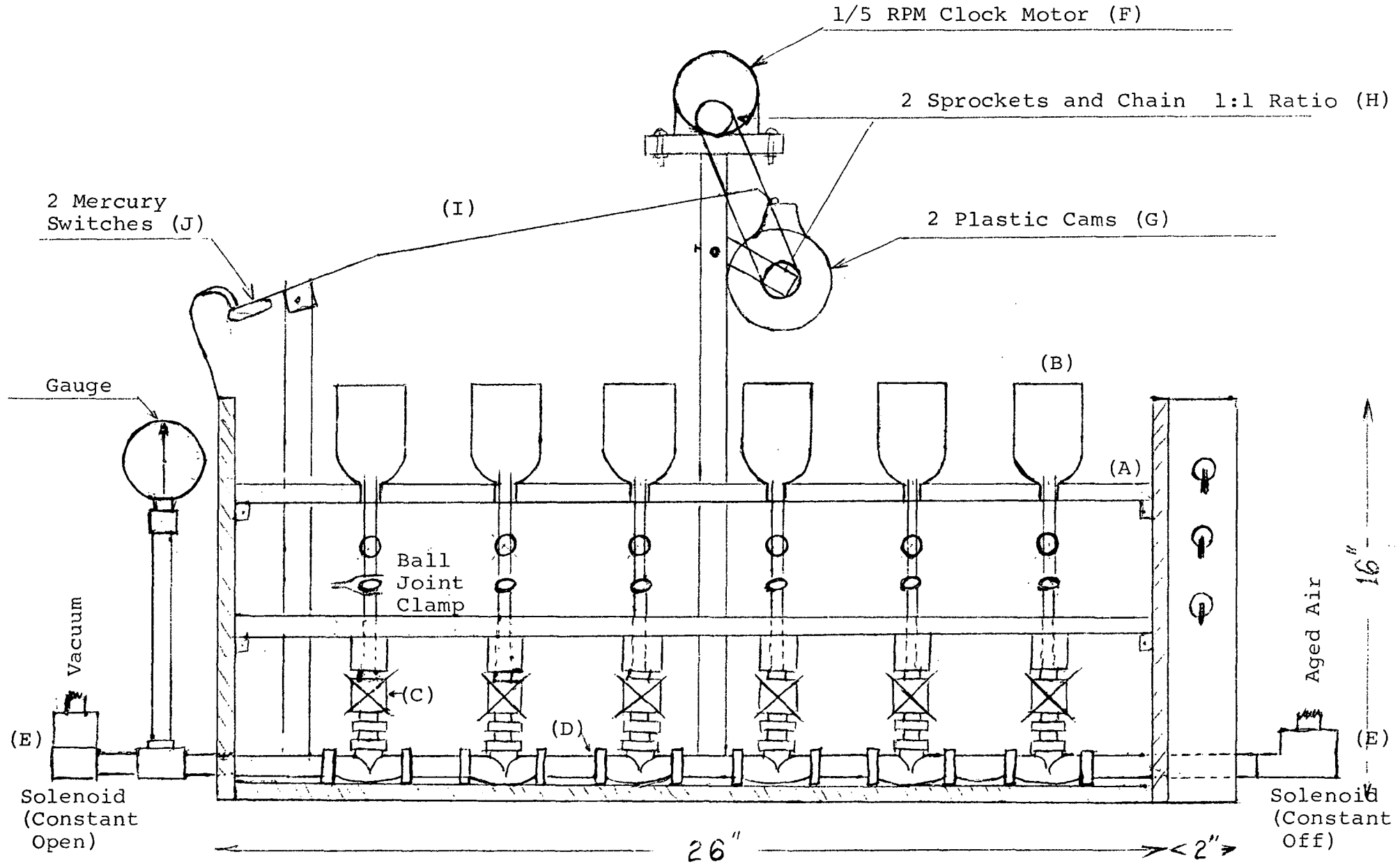
A 1/5 RPM clock motor (F) is mounted to the rear of the apparatus. This motor rotates two plastic cams (G) through a chain and sprocket drive (H). As the cams rotate, they raise and lower two rocker arms (I) on which are mounted two mercury switches (J). The mercury switches control the solenoid valves on the air and vacuum inlets.

Three on-off switches are mounted on a panel at the front of the apparatus. These switches control power to the clock motor and the two mercury switches.

The operating cycle of the apparatus consists of the following steps:

1. For approximately 4.5 minutes, the rocker arms ride on the lower portion of the cam. In this position, the vacuum is on and the air is off.
2. As the cam lobe begins to raise the rocker arms, the vacuum is switched off and the air comes on. The air remains on for about 30 seconds while the rocker arms are raised.
3. The rocker arms drop down the back side of the cam lobe, turning the air off and the vacuum back on. This completes the cycle.

Diagram 2



## OPERATING PROCEDURE

1. Mount a chamber on the apparatus using a ball-joint clamp.
2. Turn on air and vacuum lines.
3. Open toggle valve (C) and turn on the three front panel switches. Allow the chamber to remain on the apparatus from one to three hours depending on the amount of contamination. One hour is sufficient for most routine samples.
4. Close toggle valve (C) and remove chamber. Make background count to see if all contamination has been removed. Any chambers not meeting minimum background requirements should be returned for further cleaning.

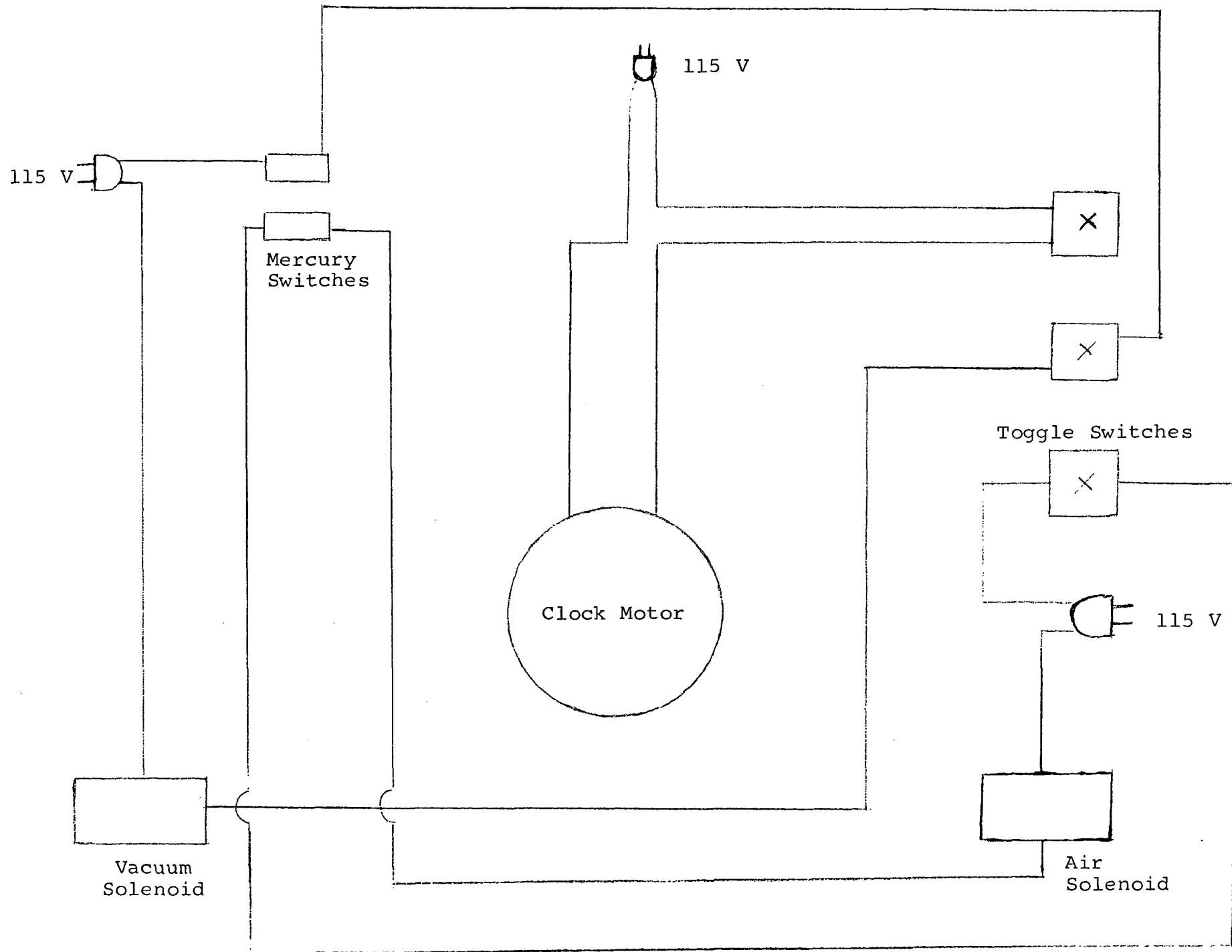
## DISCUSSION

The method of manually decontaminating chambers requires the full time of the operator and takes about one hour per chamber. The new apparatus will handle up to six chambers at a time and requires only a few minutes of the operator's time to load and unload. While the apparatus is in operation, the operator is free to do other work.

The use of this new apparatus results in a savings in man hours of approximately one hour per sample. This is equivalent to about six man weeks per year under the current sample load.

The apparatus has been proven quite usable and convenient for routine use.

# WIRING BLOCK DIAGRAM



## APPENDIX

### Parts List - Automated Chamber Evacuator

- 1 Solenoid-Asco, 115 volt, 10.5 watts, 1/4 inch pipe -  
Constant close for air
- 1 Solenoid-Asco, 115 volt, 10.5 watts, 1/4 inch pipe -  
Constant open for vacuum
- 1 Electric timer motor, 115 volts, 1/8 inch shaft, 1/5 RPM
- 1 Gage, 2 inch face, 30 psi to 30 inch Hg.
- 6 Vacuum toggle valves, Hoke, press helium test  $\pm 10^{-6}$  torr
- 3 Switches, toggle, on-off
- 2 Switches, mercury, glass
- 1 Sprocket, fine tooth, 1/8 inch shaft hole
- 1 Sprocket, fine tooth, 1/4 inch shaft hole
- 1 Steel chain, 14 inch

### Pipe and Fitting

- 5 Brass nipples, 3 inch long, 3/4 inch diameter
- 8 Brass nipples, short, 1/4 inch diameter
- 4 Brass nipples, 3 inch, 1/4 inch diameter
- 6 Brass tees, 3/4 inch diameter
- 1 Brass tee, 1/4 inch diameter
- 8 Brass bushing, 3/4 inch male to 1/4 inch female
- 1 Brass bushing, 1/4 inch female
- 2 Brass elbows, 1/4 inch diameter



## Material

Rubber vacuum tubing

Plexiglass, 3/4 inch thick

Machine screws

Aluminum rod, 3/4 inch diameter

Aluminum bar, 3/4 inch thick

Electrical household wire