stantially that of the heater plus the "idle" current of the transformer.

Although it is theoretically possible to use a 110-volt relay, and to eliminate the step-down transformer, this is usually undesirable, as parts of the circuit are then "hot," and require extra insulation and protection.

### EXTENSION TO HIGHER POWER HEATERS

The thermostat control here described will handle heaters drawing up to about one kilowatt, the exact upper limit being set by the capacity of the relay used.

By connecting a power relay, wound for operation at line voltage, across the "to heater" terminals of Fig. 1, and using that relay to control the heaters, this same circuit can be used to control any size heater desired.

### APPLICATIONS

Although originally designed to operate an ink dryer on a tape recorder, this type of thermostat control has since been used with satisfactory results on an instrument house, an explosives storage building, a crystal oven, and to control defrosters on an instrument tower. Comparative absence of r–f disturbances makes this type of thermal control ideal for use in radio and meteorological laboratories.

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## A Shadow Casting Unit for the RCA Electron Microscope

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THE shadow casting technique[1] has been found useful in electron microscopy for the study of surfaces and for the observation of specimens which are too transparent to give sufficient contrast by the usual method. Shadow casting has, however, involved the use of an auxiliary vacuum chamber for the deposition of the metallic films. The unit described here eliminates the necessity for auxiliary equipment by using both the vacuum and the vacuum gate system of the microscope itself. It consists of a brass evaporating chamber, the open end of which is held against the seat of the door of the specimen chamber of the microscope by atmospheric pressure. To use the device, the specimen screen is placed in the conventional specimen holder or cartridge and this is placed in the holder in the evaporating chamber. The angle at which the evaporated metal strikes the specimen screen is adjustable, as shown in Fig. 1. The evaporating chamber is then held tightly against the door of the electron microscope while the vacuum gate is operated, so as to connect the auxiliary pump, and then the value is turned so as to open the

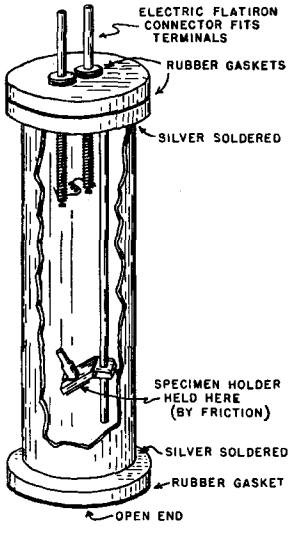


FIG. 1.

chamber to the high vacuum. The force provided by the atmosphere is sufficient to make the rubber gaskets seal.

The vacuum necessary for sharp shadows corresponds to the operating vacuum of the microscope and may be checked on the thermocouple gauge. During evaporation it is important to prevent overheating of the unit, especially of the gaskets on either end. If long evaporation time or great power dissipation is required, the unit should be watercooled. For routine shadow casting the thermal capacity of the unit may be made sufficiently great by using brass tubing of at least $\frac{3}{16}$-inch wall thickness in the construction of the chamber.

The unit described was built for the RCA type B electron microscope, and it will apply also to the type EMB. With some obvious modifications it can be made applicable to the type EMU.

[1] Robley C. Williams and Ralph W. G. Wyckoff, J. App. Phys. **15**, 712 (1944) and Proc. Soc. Biol. Med. **58**, 265 (1945); Lars Thomassen, Robley C. Williams, and Ralph W. G. Wyckoff, Rev. Sci. Inst. **16**, 155 (1945).