General Electric Inverted Oil Burner and Control.—The various controls necessary for proper operation must be brought into action according to a properly timed cycle and this is accomplished by the master or primary control.

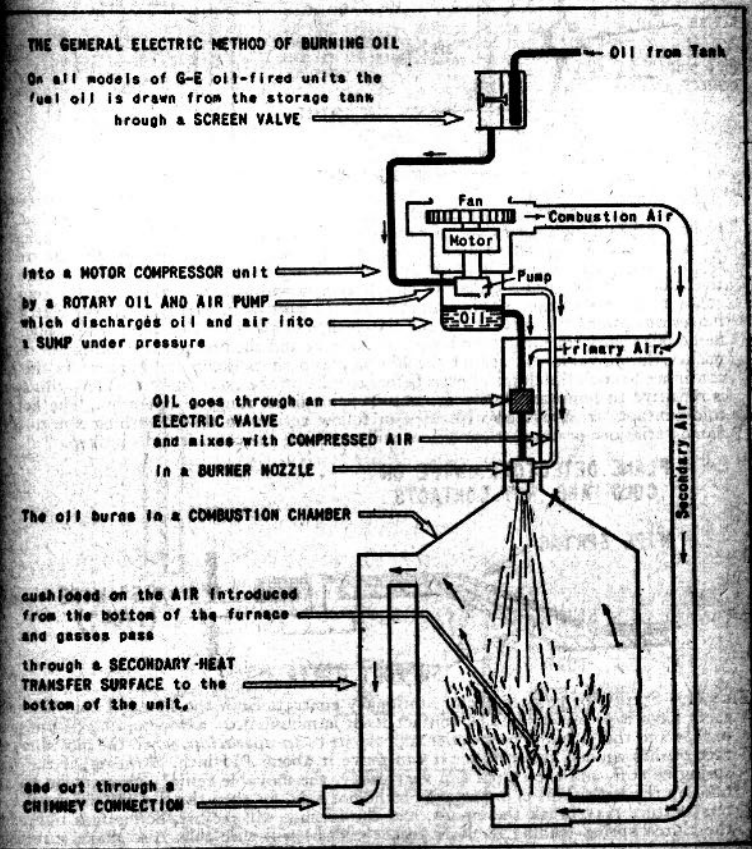


Fig. 9—Diagram showing essential parts of General Electric inverted oil burner of the automatic heating equipment shown in the accompanying illustrations.

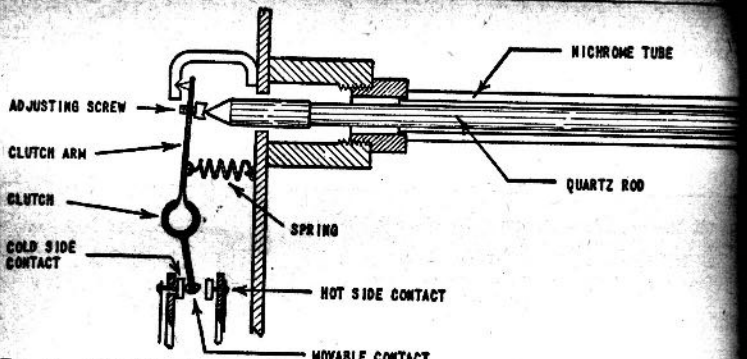


FIG. 10.—Detail showing operation of General Electric thermal switch flame detector ty CR 786502. The sensitive element is made up of a nichrome tube and a quartz rod. T nichrome has a high coefficient of expansion, the quartz has practically zero expansi This difference is translated into motion of the contacts. ***In operation,*** as heat striki the nichrome tube causes it to expand and become longer, the rod moves farther in the tube and the spring pulls the clutch arm downward, which breaks the cold s contact and makes the hot side contact. As the tube continues to heat, the clutch a moves downward still farther and the clutch slips to allow for this movement. Should t flame fail at any time, the tube begins to contract and the first upward motion of the pushes the movable contact off the hot side and shuts down the burner. As the tu continues to cool, the clutch slips as before to take up the excess motion. Thus, this swi is sensitive to temperature change at any point in its range of operation. The hot a cold contacts are provided with wipe or follow action, so that breathing due to slig flame variations or draught conditions will not cause the contact to be broken.

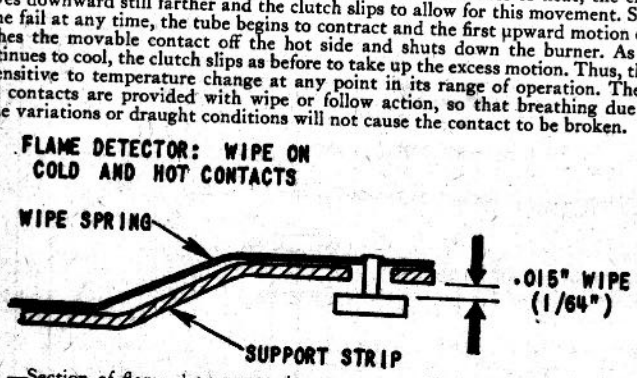
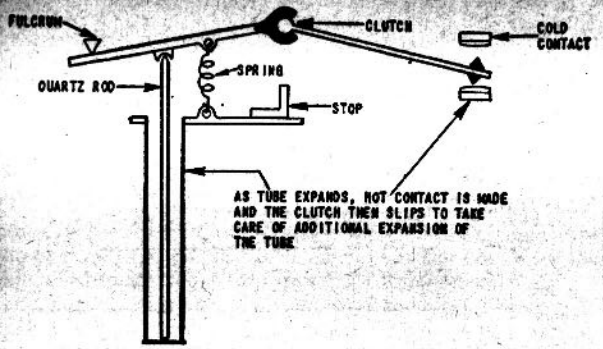
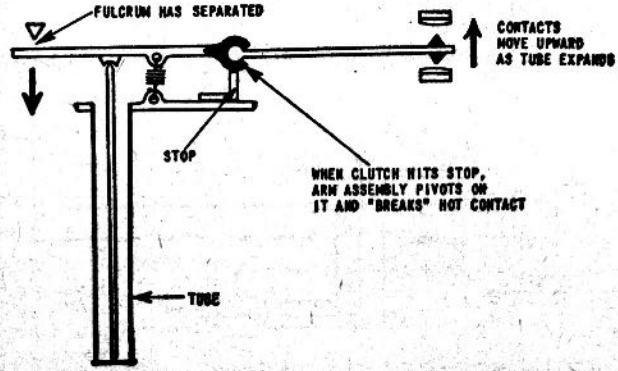


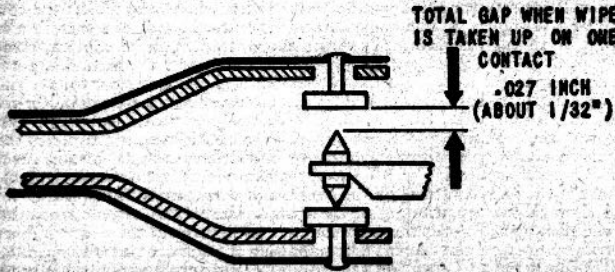
FIG. 11.—Section of flame detector stationary contact. Both the hot and cold side co tacts have *wipe* or *follow*. The contact itself is mounted on a wipe spring of phospho bronze and this is held by a heavier support strip. ***In operation,*** when the movable co tact pushes against this contact it can move it about .015 inch. However, if the wip spring be stiff, and the clutch slip very easily, the movable contact may not be able t take up the wipe. This is important on the hot side, for then the slightest fluctuation i temperature may break the circuit, and the furnace will recycle. Sometimes tightenin the clutch spring (sliding it closer to the clutch) will cure this. Also make sure ther is no grease on the clutch. Dirt or corrosion behind the contact may also cause insufficien wipe by limiting the movement. Wipe is also lost if the wipe spring become bent so th the contact stays back against the support strip and therefore has no movement.



12.—Normal flame detector action.



13.—Pivoting of flame detector after clutch strikes stop.



14.—Flame detector contact adjustment.

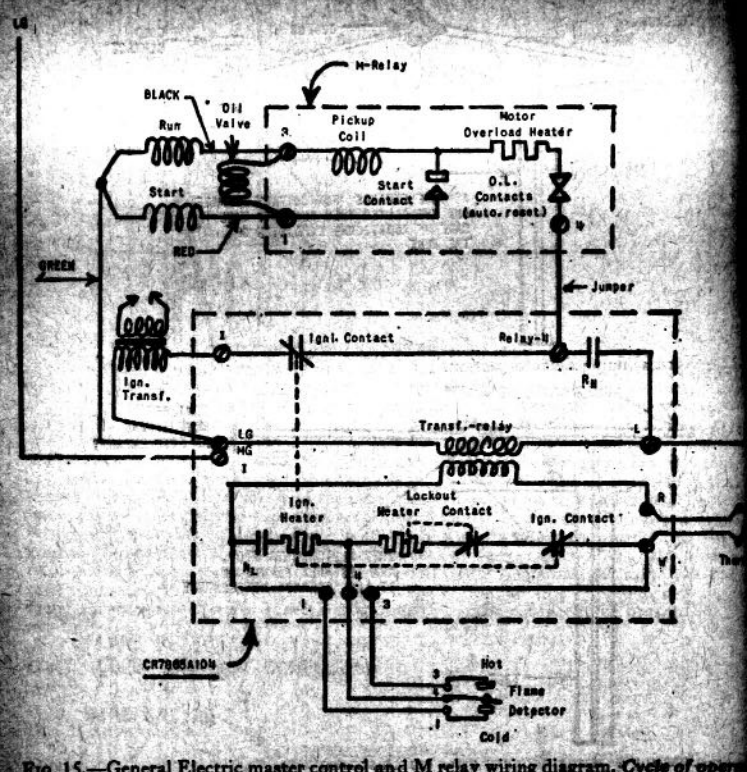


FIG. 15.—General Electric master control and M relay wiring diagram. *Cycle of opera* 1, The room thermostat or the domestic water switch closes and makes the conn between R and W shown. 2, The flame detector is on the cold side so there is a co circuit from W through the normally closed low voltage ignition contact, throug normally closed lockout contact, through the lockout heater to thermal 4, throug cold side contacts of the flame detector to terminal 1, through the low voltage side transformer relay and back to R. 3, This circuit energizes the transformer-rela causes R_L and R_H to close. R_L provides a holding circuit while the flame detec traveling from the cold side to the hot side. 4, When R_H closes, it completes the to the ignition transformer through normally closed line voltage ignition contac the spark is generated. Closing of R_H also completes the circuit through the motor load contact of the M relay, through the overload heater, through the pick up coil relay and through the run winding of the motor. The inrush current through th winding and pick up coil closes the start contacts and energizes the start winding. motor comes up to speed the current drops allowing the start contacts to open. 5, T valve coil is connected to 1 and 3 of the M relay. This puts it across the start an windings of the motor. The oil valve coil is energized and the needle picks up wh

15.—*Text continued.*

rt circuit is de-energized. Flame is not established until a short instant after the tor compressor starts. 6. When flame is established, the flame detector leaves the cold e and starts moving toward the hot side. When it leaves the cold side, the current in secondary of the transformer relay must flow through R_L, through the ignition heater d also through the lockout heater, the lockout contacts and ignition contacts. If the rent flow through the lockout heater for more than 28 seconds it will cause the lock- t contacts to open and stop the burner. These contacts must be reset manually if they en. The flame detector will normally get over to the hot side in 5 to 10 seconds. When reaches the hot side it provides a low resistance path in parallel with the lockout heater. e current will flow through this low resistance and not through the heater. Assuming e flame detector has reached the hot side in less than 28 seconds, everything is normal. Current started through the ignition heater when the flame detector left the cold side. ty seconds later this heater causes both ignition contacts to open. Current continues flow through the ignition heater as long as the burner is operating. When the thermo- t or domestic water switch is satisfied everything shuts down and the ignition heater ls off. Sixty seconds later both ignition contacts will close. This period then is a scav- ging period at the end of the heating cycle. The burner cannot start up again until this iod is over.