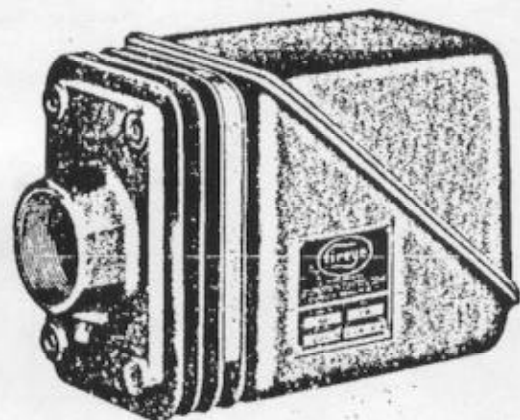


Boiler #1
1946



SPECIFICATIONS AND INSTALLATION SHEET

FIREYE PHOTOELECTRIC FLAME-FAILURE SAFEGUARD TYPE F18T-1



FIREYE TYPE F18T-1

Type F18T-1 Flame Failure Safeguard is designed to protect commercial and industrial oil burning equipment. It is approved by Underwriters' Laboratories, Inc., Associated Factory Mutual Fire Insurance Companies, Canadian Standards Association and the City of New York Board of Standards and Appeals. It consists of a phototube and amplifying system, housed in a dust-tight aluminum case. The entire control is mounted directly on the furnace wall and is aligned in a manner which permits the photoelectric cell to observe the flame through a 2" pipe connection which serves as both a sighting tube and a support for the equipment.

Features

Light from the oil flame passes through a series of filters which protect the phototube from combustion products and heat radiation. A series of radiating fins and insulating spacers are provided between the mounting plate and housing which serve the purpose of thermally insulating the housing from high boiler wall temperatures. The radiating fins enable conducted heat to be carried away by convection currents, and serve to dissipate heat generated in the heat-absorbing filter.

The first filter, located between the first and second cooling fin, is of clear pyrex, and replaces the usual pyrex sight-glass. It is removable for cleaning by swinging out the bracket on which it is mounted. An air space is provided between the first fin and this filter, so that for installations in natural-draft boilers, air may be drawn in across the clear filter, as an aid to keeping it clean. This air space does not admit sufficient air to alter the draft noticeably. If the combustion chamber operates at pressures above atmospheric, it will be necessary to run a line from an air supply to the 1/8" pipe hole located on the mounting plate, to prevent combustion products from condensing on the clear pyrex filter.

A heat-absorbing filter is located in back of the clear filter, and serves the purpose of removing heat radiation from the light beam. For oil flames of high intensity, this filter is quite dense and highly absorbent. Under such conditions it may become quite hot, and is therefore placed between two radiating fins. It is removable in the same manner as the clear filter, so that it may be replaced without excessive difficulty in case of breakage.

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Flame Failure Safeguards  For Oil and Gas Flames

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Fireye is equipped with an hermetically sealed time-delay element, which prevents the relay from dropping out during purely transient flame disturbances which temporarily shut off light from the optical system, such as is occasioned by a flickering flame.

Fireye Phototube Type IP40 designed for high temperature installation is superior for industrial operations to any other available phototube.

A pilot light is provided in the side of the housing and is visible through an angle of 180°. The housing is sealed positively dust-tight by a gasketed clear glass lens, directly in front of the phototube, and is accessible on removal of the housing cover.

A cover switch prevents unsafe operation of the control by insuring that the relay coil is deenergized and flame failure contacts 3 and 4 are open when the cover is removed. A contact projects from an insulating stud at the center of the terminal block. A spring located in the cover must make contact with this stud and provide an electrical path to ground through the cover screws before the control will operate. It is essential, therefore, that the cover be in place and the screws tightened before placing the unit in service.

GENERAL SPECIFICATIONS

SUPPLY VOLTAGE:	115 or 230 Volts.
SUPPLY FREQUENCY:	50/60 Cycles.
POWER CONSUMPTION:	10 Watts
SENSITIVITY	15 Ft. candles
AMBIENT TEMPERATURE RANGE:	32°F—150°F.
RELAY CONTACTS:	Single-pole, Double-throw.
CONTACT RATING:	1/8 HP—115 or 230 Volts AC. 345 VA Ind. Load—300 Volts or less AC. 10 A Non-Ind.—115 Volts AC. 5 A Non-Ind.—230 Volts AC.
VACUUM TUBE.	Type 7A5.
PHOTOTUBE:	Type IP40.
TUBE LIFE:	10,000 hours, approximately.
PILOT LIGHT:	Type Mazda 47. Photoswitch Part #27-55—Voltage 6-8.
WEIGHT:	12½ pounds.
DIMENSIONS:	Refer to Figure 3 on Page 4.

COMBUSTION



CONTROL

INSTALLATION

Location and Mounting

The F18T-1 mounting plate is equipped with a 2" female pipe taper thread, so that the control may be screwed directly to a standard 2" pipe extending from the boiler wall. This pipe is supplied by the customer. If the boiler wall is of steel construction, the pipe may be welded directly to the wall, or may be screwed into a bolted angle flange. The pipe should be so mounted that it permits a view of the bright, steady cone of flame, at both high and low fire. It should also be mounted such that the hottest part of the firebrick is not in the line of sight when the flame goes out. (Refer to Figures 1 and 2 below.)

It is desirable that the length of pipe between the control and boiler wall be as short as possible, and if the boiler wall is constructed of refractory material, or is more than 2" thick, it is desirable to taper the hole in the refractory so that its diameter is larger on the inside of the combustion chamber.

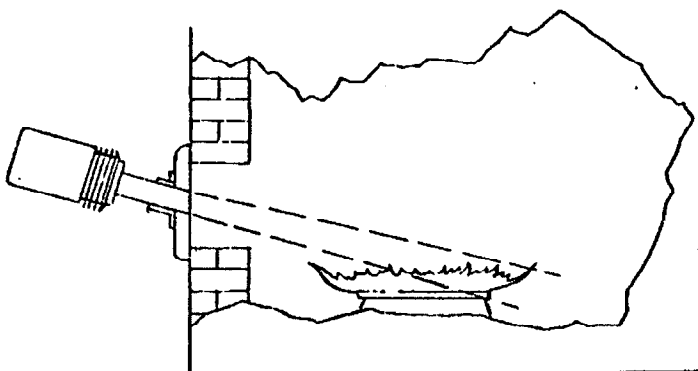
The control may be mounted by screwing onto the pipe mounted on the boiler wall, and tightened with a 2 $\frac{5}{8}$ " wrench on the flats provided on the mounting plate.

Checking Alignment

In order to check Type F18T-1 to make sure that it "sees" the oil flame under all firing conditions (high-low flame, draft, etc.), place jumper between terminals 3 and 4 to short the F18T-1 out of the circuit. Remove cover of F18T-1 and watch cathode (curved "target" plate) of photocell located directly in front of glass lens either directly or by use of small mirror (where it is impossible to see photocell cathode by direct view) and check for impingement of strong light on cathode surface from oil flame at all times and under all firing conditions.

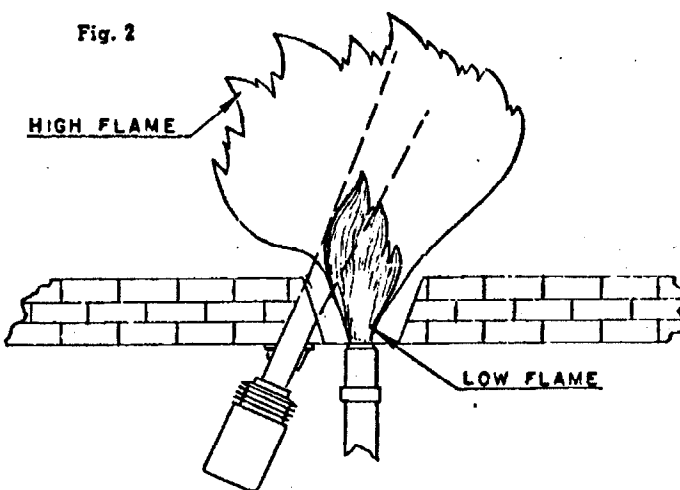
If the cathode of the photocell is not seeing flame at all times, **THE SIGHT TUBE OR LOCATION OF THE F18T-1 MUST BE CHANGED SO THAT IT DOES SEE THE OIL FLAME UNDER ALL FIRING CONDITIONS.** If this is not done, the F18T-1 will cause false safety shutdown when it does not see the flame. (Be sure to remove the jumper from terminals 3 and 4 and replace cover after checking, to put F18T-1 back into the circuit.)

Fig. 1



Fireeye F18T-1 Mounted On Front Plate for Rotary Type Burner.

Fig. 2



Fireeye F18T-1 Mounted Through Brick Work.

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Wiring

Two 1/2" I.P.S. threaded conduit holes are provided at the rear of the control. Wiring terminals are accessible from the rear by removing the housing cover. Fireye Type F18T-1 is wired in accordance with Wiring Diagram Figure 4. One pair of relay contacts (terminals 3 and 4) are closed under normal flame conditions while the other pair (terminals 4 and 5) are open. These contacts may be used directly to control single-phase burner motors within their rating, to shut off an oil valve, or to operate a programming control, etc.

When used directly connected to the burner motor, or oil valve, a knee-switch, foot-switch, or push-button should be used, so that the control contacts may be shorted for a brief period until combustion is established.

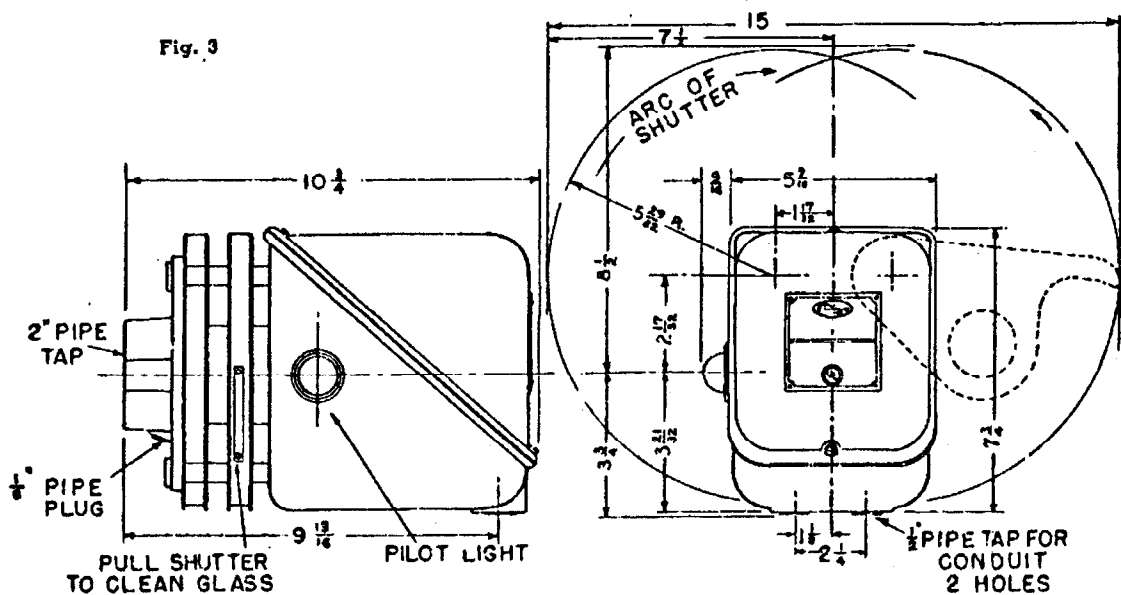
Special Note On the Use of Type F18T-1 with Program Relays of Other Manufacturers:

The relay output of the F18T-1 (Terminals 3 and 4) should be connected to the contacts of the program relay which are generally marked "Combustion Control" or abbreviated "Com. Control." This places the relay of Type F18T-1 in parallel with the contacts of the main safety (normally closed) relay in the program relay which controls the burner ignition and valve circuits.

For example: When connecting the F18T-1 to the Minneapolis-Honeywell relay, Type R161B, connections would be made from terminals 3 and 4 of F18T-1 to terminals 2 and 6 of R161B. (Refer to Figure 5.)

Operation

Combustion is started by holding closed the circuit to the F18T-1 Control relay contacts while the oil flame is ignited. When flame is seen, the control relay will close and maintain this circuit closed. If flame failure occurs, this circuit will open immediately and shut down the burner, and at the same time the pilot light in the side of the housing will light and indicate the failure. The burner will not shut down on a flickering flame or should air currents momentarily divert the flame from the line of sight.



FIREYE TYPE F18T-1

COMBUSTION



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Wiring Diagrams

The following diagrams show Fireye Type F18T-1 wired for use with a knee switch or various types of program relays.

Figure 4 shows the F18T-1 wired directly to the Burner motor or oil valve plus the knee switch which is used only while starting the burner.

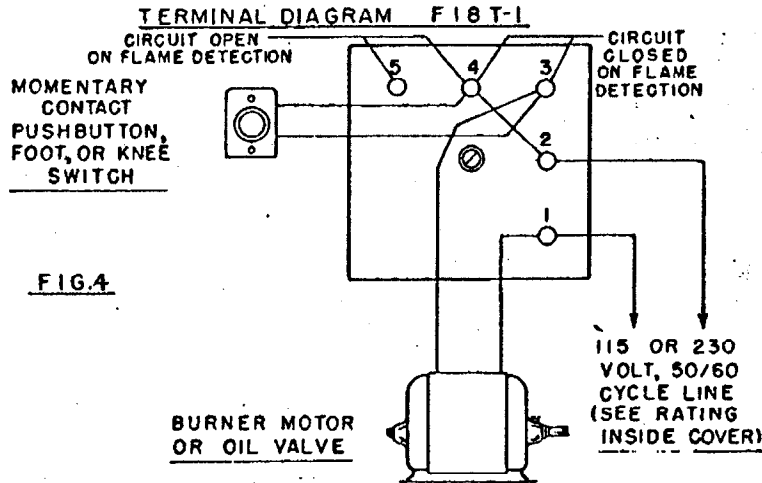


Figure 5 shows the F18T-1 wired in conjunction with a Minneapolis-Honeywell program relay type R161A-B or C. In this hookup the F18T-1 replaces the usual stack switch.

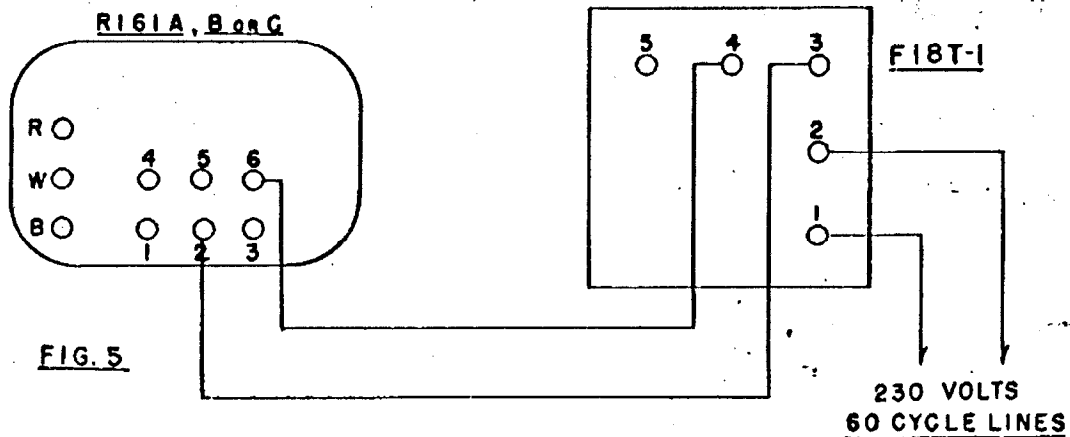
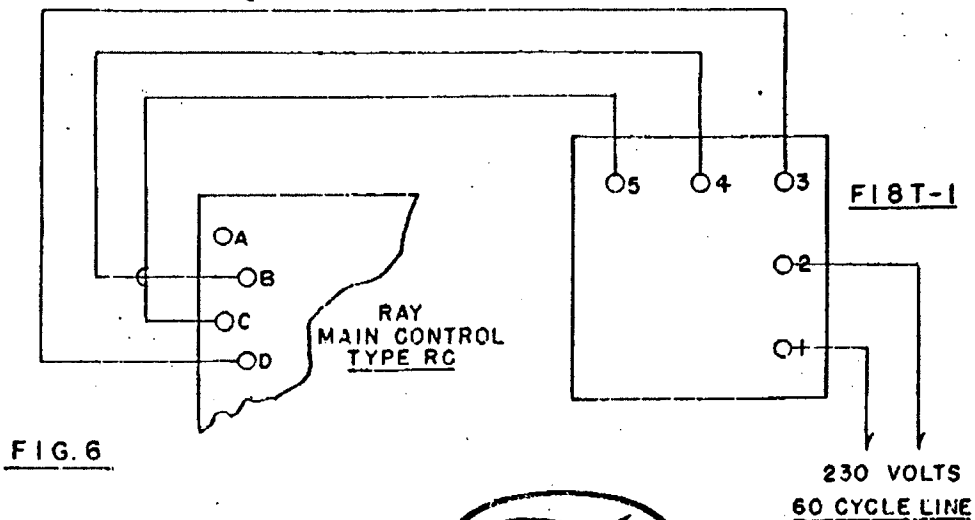


Figure 6 shows the F18T-1 wired with Ray Automatic Burner control main panel Type RC. In this hookup the F18T-1 replaces the dual stack switch.



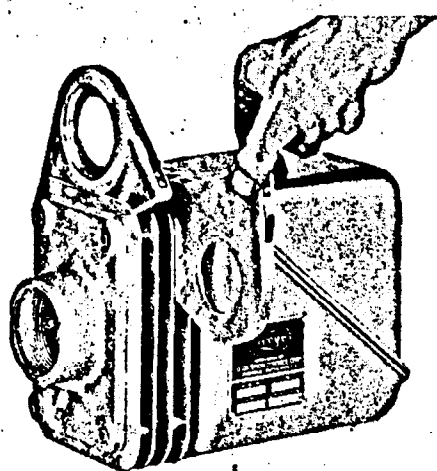
COMBUSTION



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FIREYE TYPE F18T-1



Maintenance

Fireeye Type F18T-1 control is designed to require a minimum of maintenance. The clear pyrex filter should be cleaned periodically at intervals which should be determined for the particular installation. Under good conditions this should not be necessary more often than once a month. The filter is removable by placing a finger underneath the bracket and swinging it out. This may be done while the burner is in operation without disturbance. If the filter does not clean easily with ordinary wiping, a little ammonia may be used.

The life of the phototube and vacuum tube in the F18T-1 circuit is conservatively rated at one year of continuous operation. However, due to the possibility of extreme line voltage conditions and small operating margins, it is recommended that these tubes be changed every six months. The vacuum tube is Type 7A5 and the phototube is Type 1P40. Replacements may be purchased at a local tube supplier, or from Combustion Control Corporation.

Photo Tube & Sensor

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