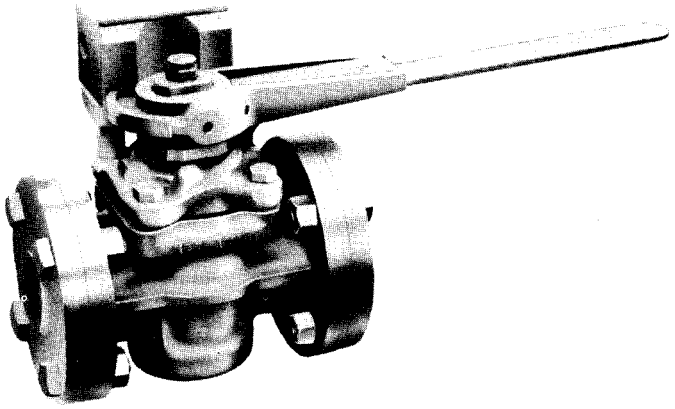


fireye

FM SUPERVISORY COCKS

FACTORY MUTUAL FM APPROVED

FIREYE FM SUPERVISORY COCK for OIL OR GAS FUELS

GENERAL DESCRIPTION

The FIREYE FM SUPERVISORY COCK is a fuel shut off valve which when substituted for the usual burner cock achieves electrical interlocking between a burner cock and flame safeguard system. This is accomplished by a position-indicating double-pole double-throw switch which is an integral part of the cock. The switch reliably indicates when the cock is closed. The construction of the switch enclosure is such that it may be sealed, thus the switch cannot be tampered with either electrically or mechanically unless the seal is broken.

The plug of the FIREYE FM SUPERVISORY COCK must be rotated approximately 15 degrees beyond the position where fuel passage through the valve has been cut off before the switch indicates that the cock is closed.

FIREYE FM SUPERVISORY COCKS are available in semi-steel construction at working pressure ratings of 325 psig in sizes ¾" through 2", 125 psig in sizes ¾" through 2½", and 75 psig in sizes 3" through 6".

FIREYE FM SUPERVISORY COCKS are available in two different steel constructions at working pressure ratings of 300 psig in sizes ¾" through 2½", 200 psig in 3" and 4" sizes, 150 psig in sizes 1" through 2½", and 100 psig in 3" and 4" sizes.

Lubrication of the unit is simple. Under ordinary conditions the unit should be lubricated weekly unless the cock is operating in a hot oil line, in which case lubrication should be added each time the cock is operated.

SPECIFICATIONS

TEMPERATURE LIMITS:

Ambient Temperature	125°F.
Fluid Temperature	250°F.

SWITCH CONTACT RATINGS:

5 Amps. @ 250 volts A.C.
10 Amps. @ 125 volts A.C.

DESIGNATION:

A typical cock designation is:

F M 4 C T

F M	4	C	T
Basic Prefix	Pipe size in number of quarter inches; 4 represents 1".	Maximum pressure. See Table I for code.	"T" stands for threaded cock; "F" for flanged.

MAXIMUM WORKING PRESSURE CODE:

TABLE I

Code Letter	Maximum Working Pressure (psig)
A	75
B	100
C	125
D	150
E	200
F	300
G	325

FM SUPERVISORY COCK CAPACITIES

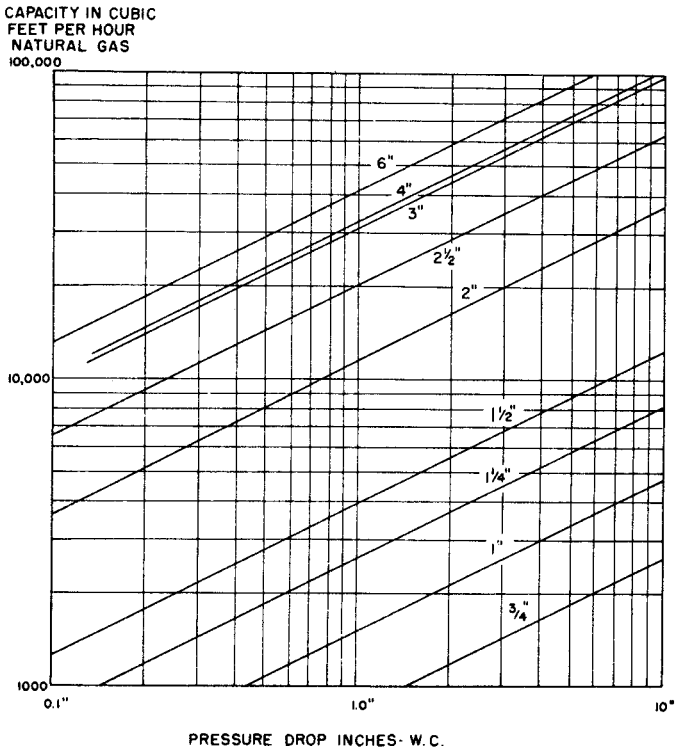


Figure 1.

OUTLINE DIMENSIONS AND WEIGHTS

Four construction classes are available for either threaded or flanged connection. Figure 2 is an outline dimensional drawing of the screwed valves whose physical dimensions are given in Table II, Tables IIA, IIB.

Figure 3 is an outline dimensional drawing of the flanged valves whose physical dimensions and weights are given in Table III, Tables IIIA, IIIB, and IIIC.

LUBRICATION

Lubrication of the FIREYE FM SUPERVISORY COCK serves a triple purpose. It minimizes wear, provides easy operation in opening and closing the cock and provides a tight seal to the line which it serves when the cock is in a closed position.

Need for lubrication is indicated by a noticeable increase in the force required to operate the unit. Weekly lubrication is generally adequate (depending on frequency of cock operation) when the fluids are fuel gases and unheated fuel oil. When the cock is used in a hot oil line, lubricant should be applied each time the cock is operated.

When the FIREYE FM SUPERVISORY COCK is used for hydrocarbon liquids and gases, water or crude distillates, Rockwell-Nordstrom lubricant No. 555 is recommended for use. This is available in stick, bulk or bulk tube and is applied to the cock in the manner indicated in Figure 4.

TYPICAL APPLICATIONS

GENERAL

There has long been a need to integrate the operation of the burner cocks, always present on the fuel lines of multiple burner boilers, with the flame failure safeguard system to ensure that all burner cocks and safety shut-off valves are closed following a shutdown, and that:

1. During the purge period all burner cocks and safety shut-off valves are closed.

2. When each main burner is lighted, the fuel will be turned on without a surge, by requiring that first the safety shut-off valve is opened and then the burner cock.

3. During the firing of the boiler if a burner is shut down, all burner cocks and safety shut-off valves for that burner are closed.

Two typical applications of the use of FIREYE FM SUPERVISORY COCKS are as follows:

Application 1. Integrated With Flame Failure Safeguard System

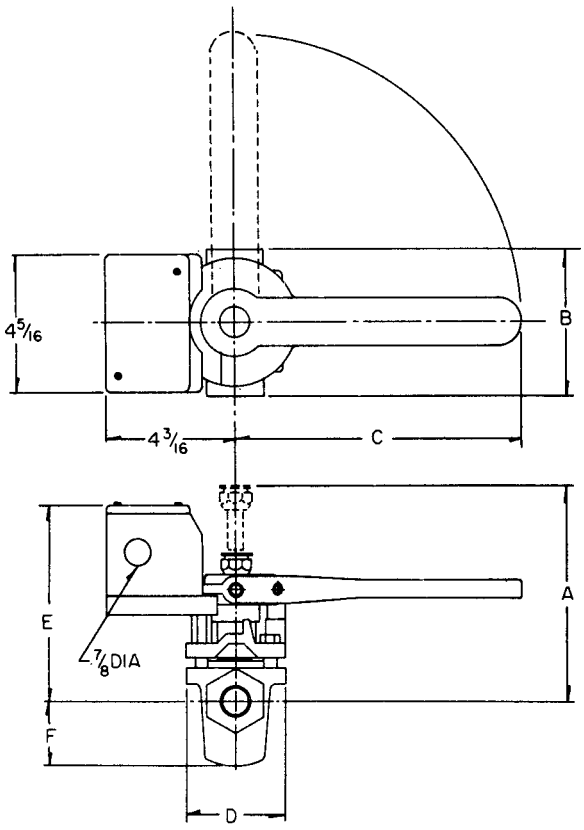
Figure 6 is a schematic wiring diagram which shows the electrical interconnections in a flame failure safeguard system, utilizing FIREYE FM SUPERVISORY COCKS.

In general terms, the sequence of operations for the system are as follows:

1. The FIREYE FM SUPERVISORY COCKS on all main fuel lines as well as pilot lines must be closed and none of the individual burner circuits must be in a flame failure alarm condition. Provided the above is so, when the start purge button is depressed, a five-minute purge is initiated, if the flow of air through the boiler is at least 50% of the maximum rate. The FIREYE FM SUPERVISORY COCKS must remain closed and the air flow rate maintained during the entire purge period.

2. When the purge period is completed ensuring at least four complete changes in the boiler furnace, passes and stack, a green light is illuminated and the individual burner circuits are then in a condition that any burner may be lighted.

3. The operator may then depress the 51CQ1 push button. If flame failure safeguard is in "flame out" position, the pilot safety shut-off valve and ignition system is energized, the timing of the pilot proving period starts and the flame failure alarm circuit is latched in. The pilot is then lighted by first opening the pilot safety shut-off valve followed by operating the pilot FIREYE FM SUPERVISORY COCK.



NOTE:
DIMENSION "A" IS DISTANCE REQUIRED TO REMOVE GREASE FITTING.

SCREWED COCK

TABLE II

Model	Size (IPS)	Lbs Weight	MWP (PSI)	DIMENSIONS A	B	C	D	E	F
FM10CT	2-1/2	40	125#	9-1/2	7-5/16	17-1/2	5-1/4	7-3/4	3-5/8
FM12AT	3	56	75#	10-13/16	8-1/16	23-3/4	6	8-13/16	4-3/16

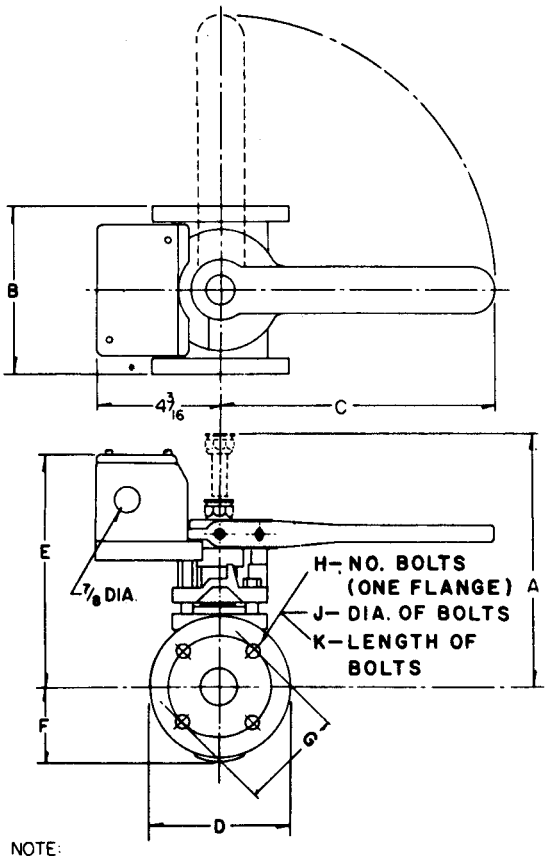
TABLE IIA

Model	Size (IPS)	Lbs Weight	MWP (PSI)	DIMENSIONS A	B	C	D	E	F
FM3GT	3/4	10	325#	6-1/2	3-3/4	9	3	6-1/16	3
FM4GT	1	13	325#	6-3/4	4-7/8	9	3-1/8	6-7/16	2-3/16
FM5GT	1-1/4	18	325#	7-3/16	5-3/8	9	3-7/16	6-3/4	2-1/2
FM6GT	1-1/2	23	325#	7-9/16	6-5/8	17-1/2	3-13/16	7-1/8	2-3/4
FM8GT	2	31	325#	9	7-7/8	17-1/2	4-1/2	7-9/16	3-3/16

TABLE IIB

Model	Size (IPS)	Lbs Weight	MWP (PSI)	DIMENSIONS A	B	C	D	E	F
FM3FT	3/4	11	300#	6-7/8	3-7/8	9	3	6-5/8	1-3/4
FM4FT	1	13	300#	7-3/8	4-1/8	9	3-1/8	6-7/8	2-1/16
FM5FT	1-1/4	22	300#	8-3/8	5-1/4	9	3-3/4	7-11/16	2-9/16
FM6FT	1-1/2	22	300#	8-3/8	5-1/4	17-1/2	3-3/4	7-11/16	2-9/16
FM8FT	2	31	300#	9-7/8	8-1/8	17-1/2	4-3/16	8-1/8	3
FM10FT	2-1/2	51	300#	10-1/4	10	17-1/2	5-1/4	8-7/8	3-5/8
FM12ET	3	77	200#	12-1/8	10	23-3/4	6-1/8	9-7/8	4-1/4

Figure 2. Outline Dimensional Drawing of Screwed Cock



NOTE:
DIMENSION "A" IS DISTANCE REQUIRED TO REMOVE GREASE FITTING.

FLANGED COCK

TABLE III

Model	Size (IPS)	Lbs Weight	MWP (PSI)	DIMENSIONS A	B	C	D	E	F	G	H	J	K
FM4CF	1	15	125#	6-3/4	5-1/2	9	4-1/4	6-7/16	2-3/16	3-1/8	4	1/2	1-3/4
FM6CF	1-1/2	24	125#	7-9/16	6-1/2	17-1/2	5	7-1/8	2-11/16	3-7/8	4	1/2	2
FM8CF	2	34	125#	9	7-1/2	17-1/2	6	7-9/16	3-3/16	4-3/4	4	5/8	2-1/4
FM10CF	2-1/2	50	125#	9-1/2	8-1/4	17-1/2	7	7-3/4	3-5/8	5-1/2	4	5/8	2-1/2
FM12AF	3	68	75#	10-13/16	9	23-3/4	7-1/2	8-13/16	4-3/16	6	4	5/8	2-1/2
FM16AF	4	83	75#	11-5/16	9	23-3/4	9	9-5/16	4-5/8	7-1/2	8	5/8	3
FM24AF	6	150	75#	13-3/8	10-1/2	23-3/4	11	11-1/8	5-15/16	8-1/2	8	3/4	3-1/4

TABLE IIIA

Model	Size (IPS)	Lbs. Weight	MWP (PSI)	DIMENSIONS A	B	C	D	E	F	G	H	J	K
FM4GF	1	18	325#	6-3/4	6-1/4	9	4-7/8	6-7/16	3-3/16	3-1/2	4	5/8	2-1/2
FM6GF	1-1/2	32	325#	7-9/16	7-1/2	17-1/2	6-1/8	7-1/8	3-5/4	4-1/2	4	3/4	2-3/4
FM8GF	2	42	325#	9	8-1/2	17-1/2	6-1/2	7-9/16	3-3/16	5	8	5/8	2-3/4

TABLE IIIB

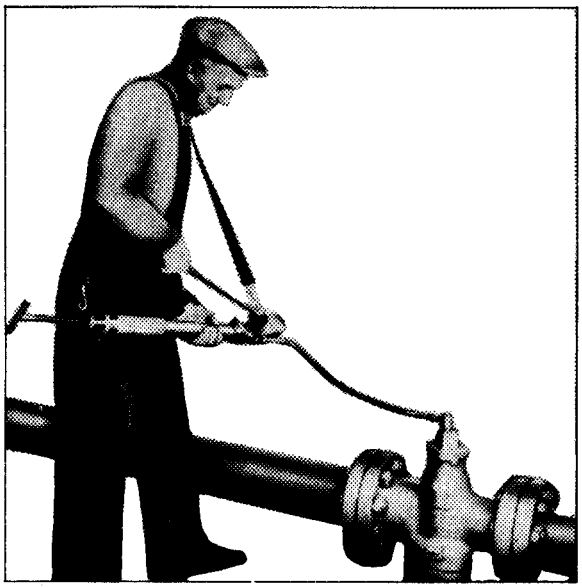
Model	Size (IPS)	Lbs Weight	MWP (PSI)	DIMENSIONS A	B	C	D	E	F	G	H	J	K
FM10DF	2-1/2	53	150#	10-1/4	7-1/2	17-1/2	7	8-7/8	3-5/8	5-1/2	4	5/8	2-3/4
FM12BF	3	81	100#	12-1/8	8	23-3/4	7-1/2	9-7/8	4-1/4	6	8	5/8	1-3/4
FM16BF	4	103	100#	12-5/8	9	23-3/4	8	10-7/16	4-13/16	7-1/2	8	5/8	2

TABLE IIIC

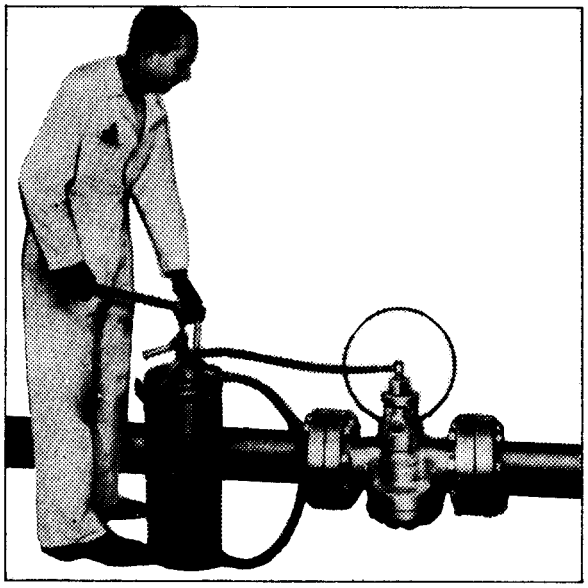
Model	Size (IPS)	Lbs Weight	MWP (PSI)	DIMENSIONS A	B	C	D	E	F	G	H	J	K
FM4FF	1"	20	300#	7-3/8	6-1/4	9	4-7/8	6-7/8	2-1/16	3-1/2	4	5/8	2-1/2
FM6FF	1-1/2	36	300#	8-3/8	7-1/2	17-1/2	6-1/2	7-11/16	2-9/16	4-1/2	4	3/4	2-3/4
FM8FF	2	45	300#	9-7/8	8-1/2	17-1/2	6-1/2	8-1/8	3	5	8	5/8	2-3/4
FM10FF	2-1/2	85	300#	10-1/4	9-1/2	17-1/2	7-1/2	8-7/8	3-5/8	5-7/8	8	3/4	3-1/4
FM12EF	3	87	200#	12-1/8	11-1/8	23-3/4	8-1/4	9-7/8	4-1/4	6-5/8	8	3/4	3-1/2
FM16EF	4	131	200#	13-5/8	12	23-3/4	10	10-7/16	4-13/16	7-7/8	8	3/4	3-3/4

NOTE: COMPANION FLANGES NOT FURNISHED.

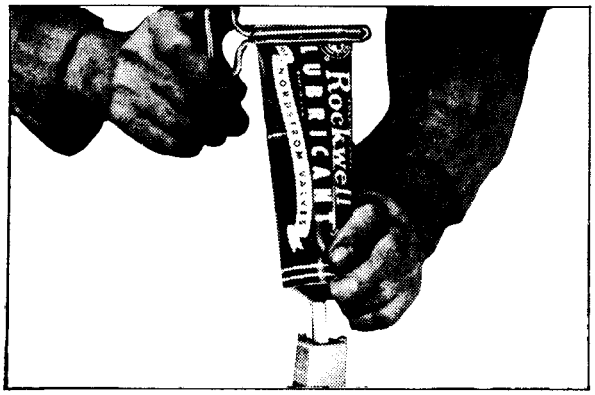
Figure 3. Outline Dimensional Drawing of Flanged Cock



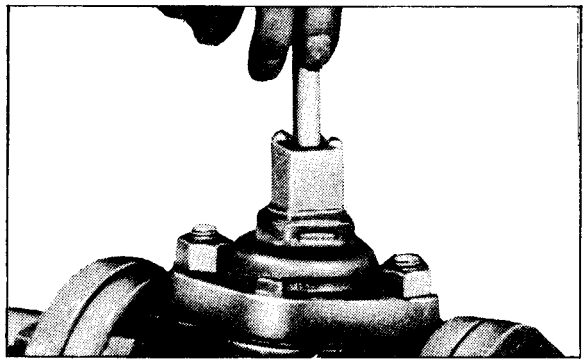
The hand-operated gun is loaded by either gun tube or size "K" stick lubricants.



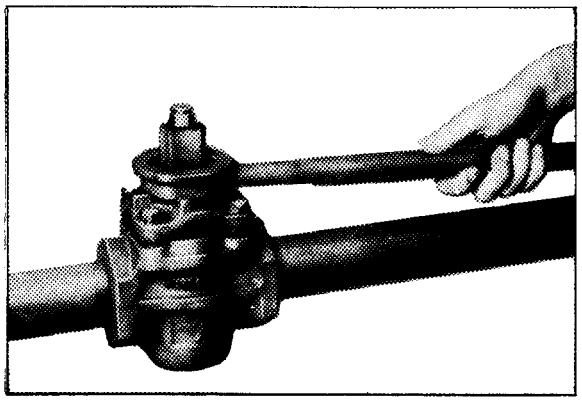
Bulk lubricants in 5 quart cans or 5 gallon pails are used to load bucket pumps.



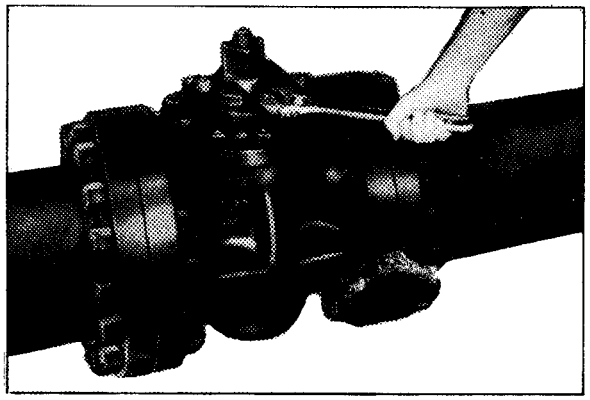
Bulk Tube Lubricant



Stick Lubricant



Adjustment of screwed gland type. Tighten or loosen gland.



Adjustment of bolted gland type. Apply even tension to the three bolts.

Figure 4. Lubrication of the FIREYE FM SUPERVISORY COCK

4. With pilot flame detected, at the end of the pilot proving period (10 seconds) a light is illuminated, indicating that the operator may proceed to light the main burner which must be done by first opening the main burner safety shut-off valve and then slowly opening the FIREYE FM SUPERVISORY COCK. However, if desired, any or all pilots may be lighted before proceeding to light a main burner.

5. As soon as the main burner FIREYE FM SUPERVISORY COCK has been opened, the trial-for-ignition timer for the main burner starts to time and at the end of 10 seconds turns off the pilot and opens the pilot scanner circuit. Continued burner operation is dependent on the main flame being detected by the main flame scanner for the fuel being fired.

6. In case of a flame failure either during normal operation or during the light-off procedure, the alarm horn will sound indicating a flame failure and the alarm bell for the cock system will also sound. To silence the alarms, the operator must first close all the FIREYE FM SUPERVISORY COCKS on the burner where flame failure occurred (this will silence the alarm bell) and move the fuel selector switch to the "off" position to silence the horn and reset the flame failure alarm system. The start purge button must then be depressed to initiate a new purge timing period.

7. If a flame failure occurs when two or more burners are firing and one or more burners continue to fire, it is not necessary to wait out the five-minute purge timing or to restore the air flow to that required during the five-minute purge period. In this case, depressing the start purge button will initiate a one-minute timing at the end of which time the burner that failed may be restarted.

8. Whenever a burner is not firing, the opening of either the FIREYE FM SUPERVISORY COCKS on the pilot line or the main fuel lines will cause the alarm bell to sound and it can only be silenced by closing all of the cocks on the burner. Consequently, when a boiler is shut down for any length of time, all of the FIREYE FM SUPERVISORY COCKS must be closed or the alarm bell will sound continuously.

Application 2. Multiple Burner Oven or Furnace System

Another use of the FIREYE FM SUPERVISORY COCK is in a multiple burner oven or furnace system. Figure 7 is a schematic diagram covering such an installation.

In a system of this type, safety cocks are installed on each pilot and main fuel line of each burner. One safety shut-off valve is required on the pilot gas line and one on the main fuel line for burners with a common fuel supply. This system is intended for use where it is either physically impractical or economically difficult to justify a flame failure safeguard system together with pilot and main flame safety shut-off valves on each burner of a furnace or oven equipped with a number of small burners.

The system indicated in Figure 7 provides for the following:

1. The purge timer cannot be energized unless all of the FIREYE FM SUPERVISORY COCKS – both pilot and main flame – are closed.

2. By using an air flow switch in the limit circuit, the proper volume of purging air is ensured.

3. The pilot cannot be energized until the purge time is completed.

4. The main flame manual reset valve cannot be opened until the purge time is completed and the pilot valves are opened.

Switching Contacts

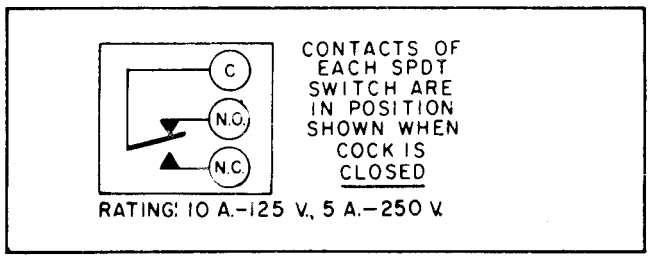


Figure 5. Terminal Connection Diagram

Two (2) SPDT switches are integral with the FIREYE FM SUPERVISORY COCK. The switch terminals are identified, on the body of each switch, as "COMMON", "NORM. OPEN", and "NORM. CLOSED", It must be noted that the "normal position" of the Cock is that existing when the Cock is closed to flow of liquid or gas. When the Cock is closed, the individual contacts of each switch are made up as shown in Figure 5, i.e., continuity exists between switch terminals "COMMON" and "NORM. OPEN", and open-circuit exists between switch terminals "COMMON" and "NORM. CLOSED".

Schematic diagrams incorporating these switches show switch contacts in the position occupied when the FIREYE FM SUPERVISORY COCK is closed.

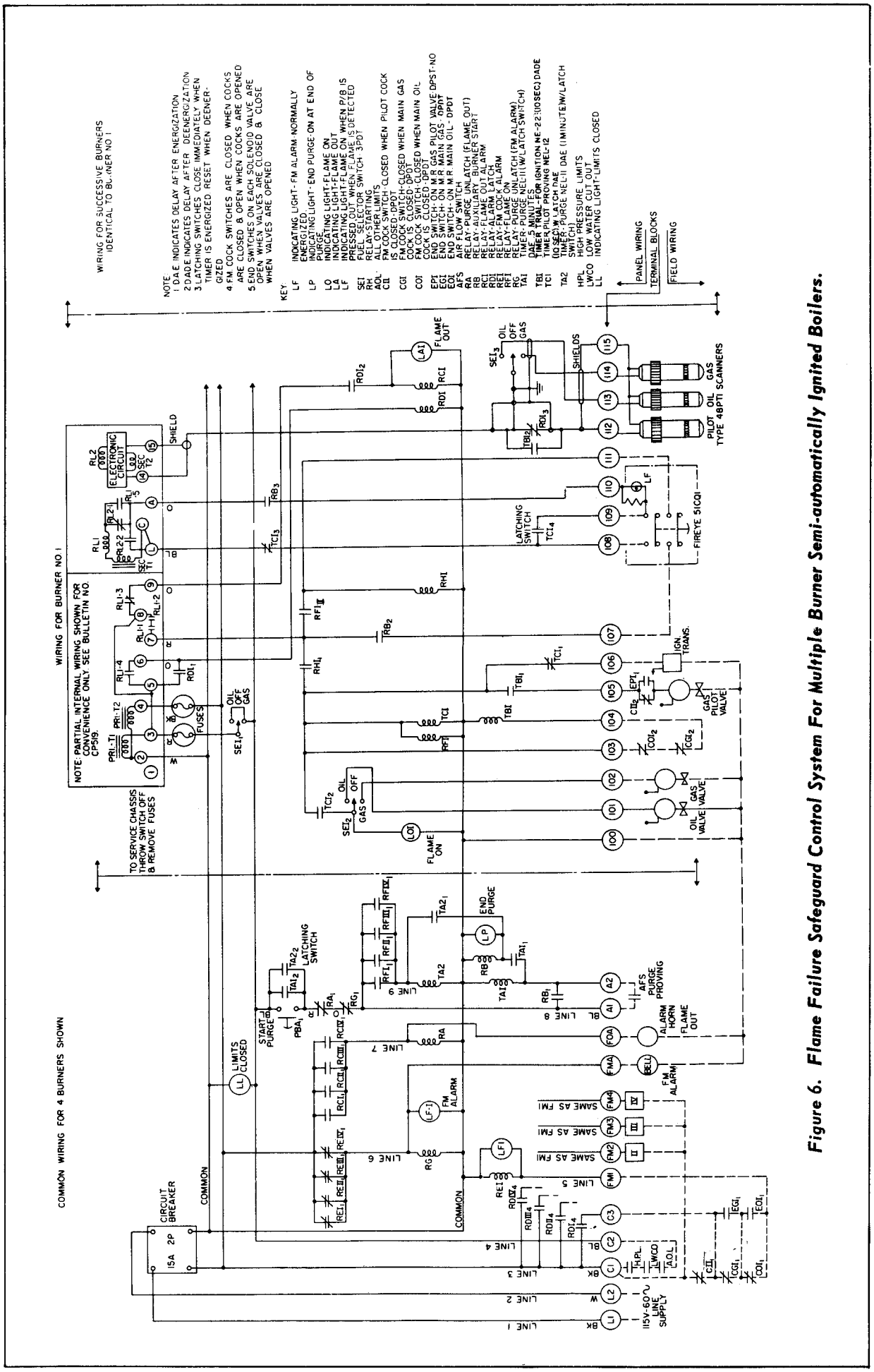
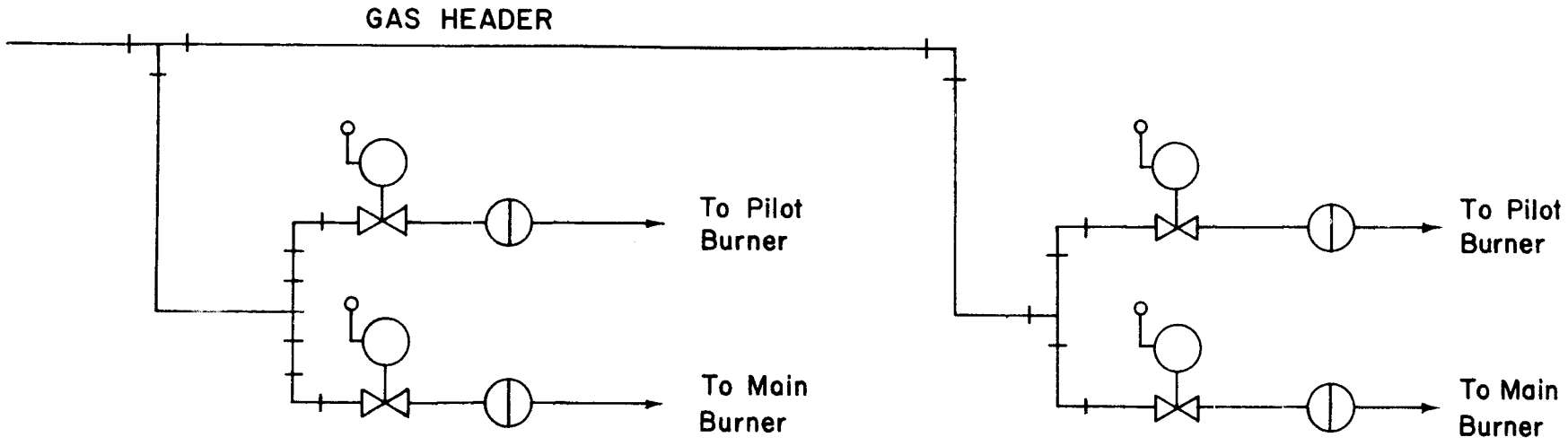


Figure 6. Flame Failure Safeguard Control System For Multiple Burner Semi-automatically Ignited Boilers.



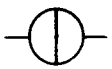
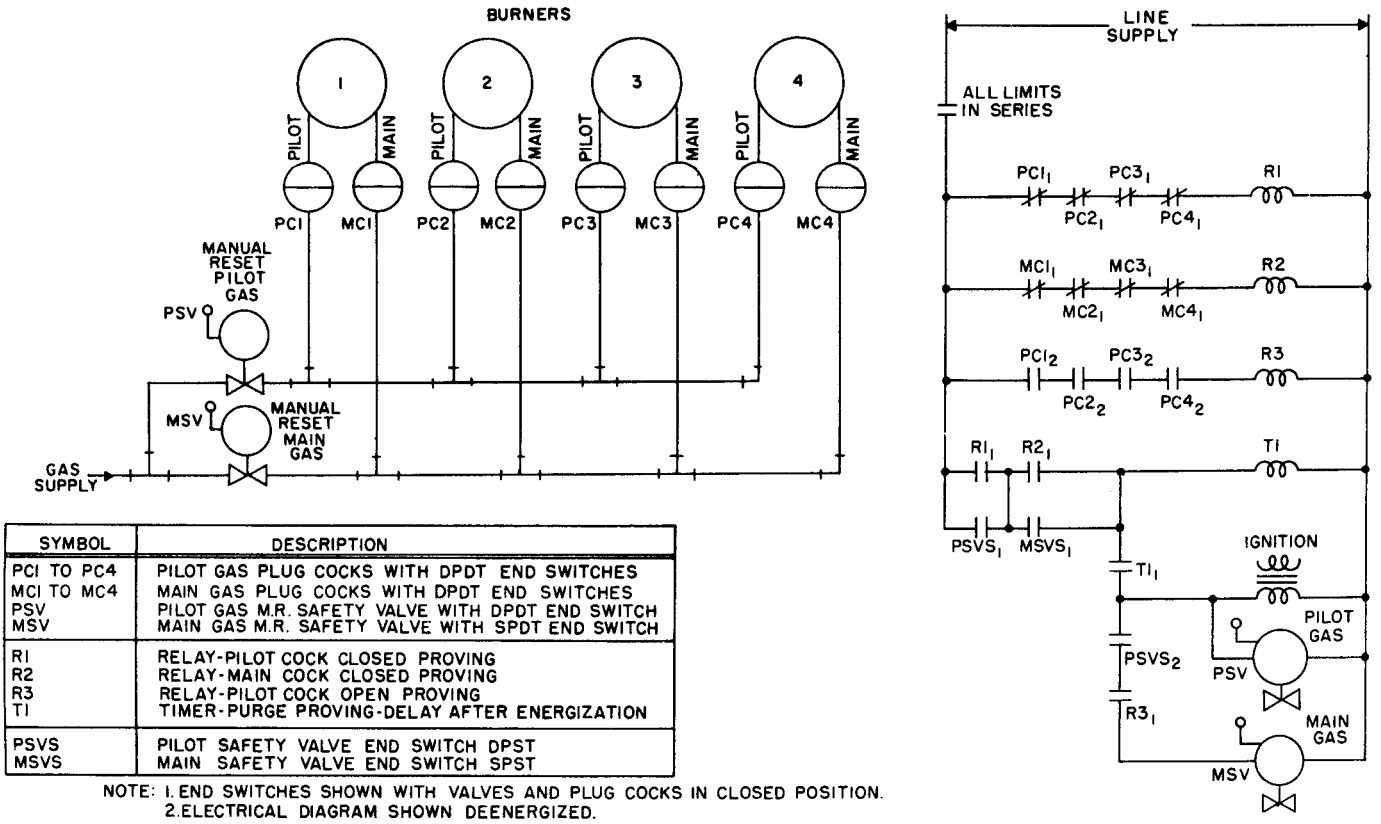
SYM.	DESCRIPTION
	Manual Reset Valve With Interlock Switches
	Fireye F M Supervisory Cock

Figure 7. Piping Diagram.



SYMBOL	DESCRIPTION
PCI TO PC4	PILOT GAS PLUG COCKS WITH DPDT END SWITCHES
MCI TO MC4	MAIN GAS PLUG COCKS WITH DPDT END SWITCHES
PSV	PILOT GAS M.R. SAFETY VALVE WITH DPDT END SWITCH
MSV	MAIN GAS M.R. SAFETY VALVE WITH SPDT END SWITCH
RI	RELAY-PILOT COCK CLOSED PROVING
R2	RELAY-MAIN COCK CLOSED PROVING
R3	RELAY-PILOT COCK OPEN PROVING
TI	TIMER-PURGE PROVING-DELAY AFTER ENERGIZATION
PSVS	PILOT SAFETY VALVE END SWITCH DPST
MSVS	MAIN SAFETY VALVE END SWITCH SPST

NOTE: 1. END SWITCHES SHOWN WITH VALVES AND PLUG COCKS IN CLOSED POSITION.
2. ELECTRICAL DIAGRAM SHOWN DEENERGIZED.

Figure 8. Schematic Diagram for Interlocking Manual Reset Valves and Fireye FM Supervisory Cocks on Furnaces or Ovens not Equipped with Flame Safeguards.

GUARANTEE

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