

AMERICAN-Standard

KEWANEE SQUARE-HEAT GENERATOR

UNITS M-335, M-425, M-505

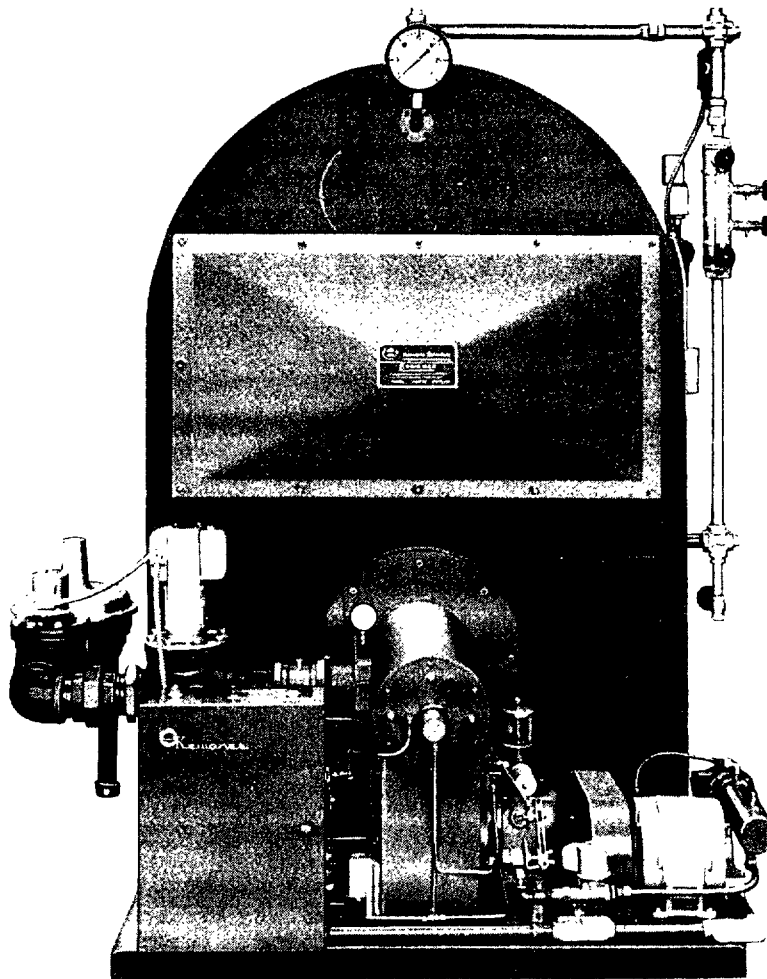
FOR NO. 2, 4 OR 5 OIL — GAS — COMBINATION GAS — OIL

PLAINTIFF'S EXHIBIT

ASI-1199

LOW PRESSURE
STEAM OR
WATER

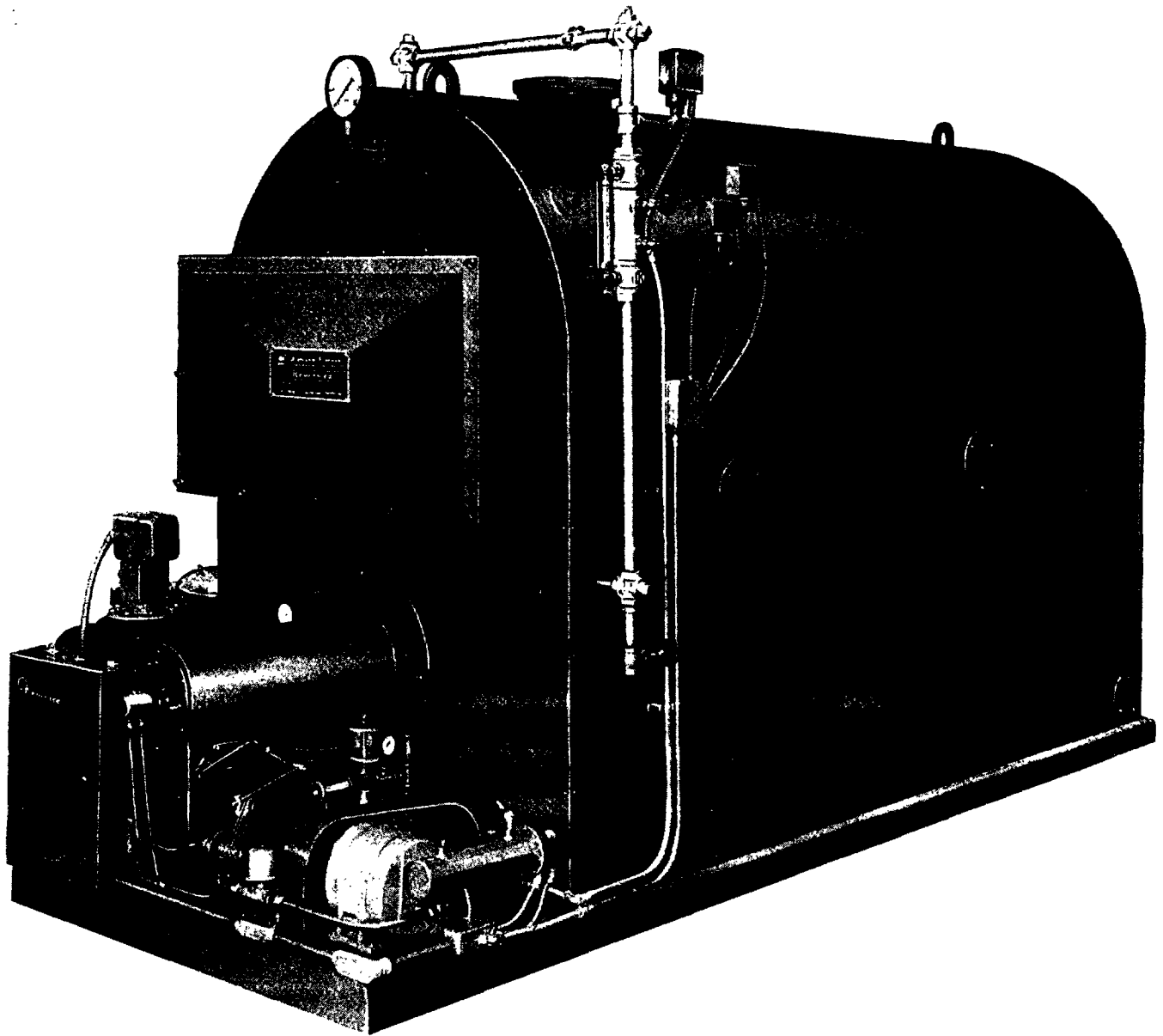
U/L
LISTED



3,350,000 TO
— 5,050,000 Btuh

THE MOST COMPACT GENERATOR AVAILABLE

KEWANEE SQUARE-HEAT GENERATOR



THREE LARGER SIZES — WIDER RANGE OF FUELS

The Square-Heat Generator described in Bulletin 1349D is extended in range of sizes to 3,350,000, 4,250,000, and 5,050,000 btu output (nominal 100, 125 and 150 boiler horsepower). Also available for firing with No. 4 and No. 5 oil in addition to No. 2 oil and gas.

Check the many quality features of the Square-Heat Generator in Bulletin 1349D, as well as the added features in this supplement.

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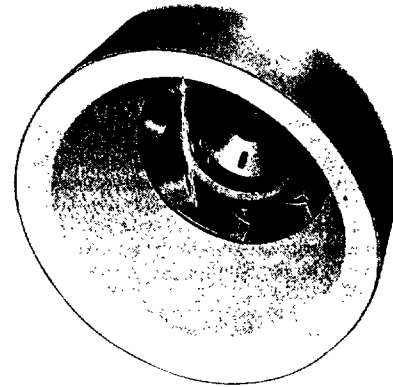
KEWANEE SQUARE-HEAT GENERATOR

BURNER FEATURES

Units 335 through 505 feature full modulation with proved low fire start. Fuel and air supply are regulated throughout the firing range by a modulating motor controlled by a boiler mounted pressure or temperature modulating potentiometer. Enforced low fire start is provided by an interlock on the modulating motor. Combination electronic flame safeguard and programmer assures safe operation with prepurge, postpurge, and proved ignition for both fuels.

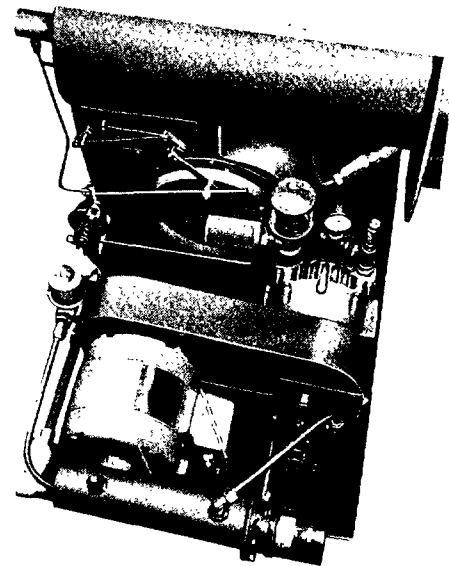
BURNER FIRING HEAD

Exclusive design of burner firing head provides quiet, stable combustion of gas or oil at all inputs. The radial-jet gas burner provides smooth firing with excellent flame retention. The pilot flame on the exclusive ring-type gas-electric ignition assembly surrounds the oil spray and contacts the tip of each gas jet for smooth lighting with maximum safety.



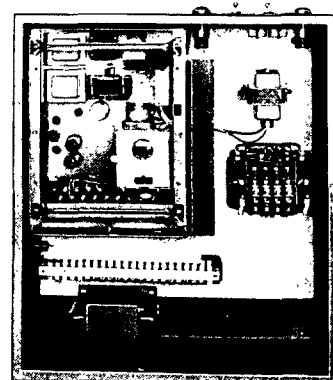
AIR-OIL UNIT

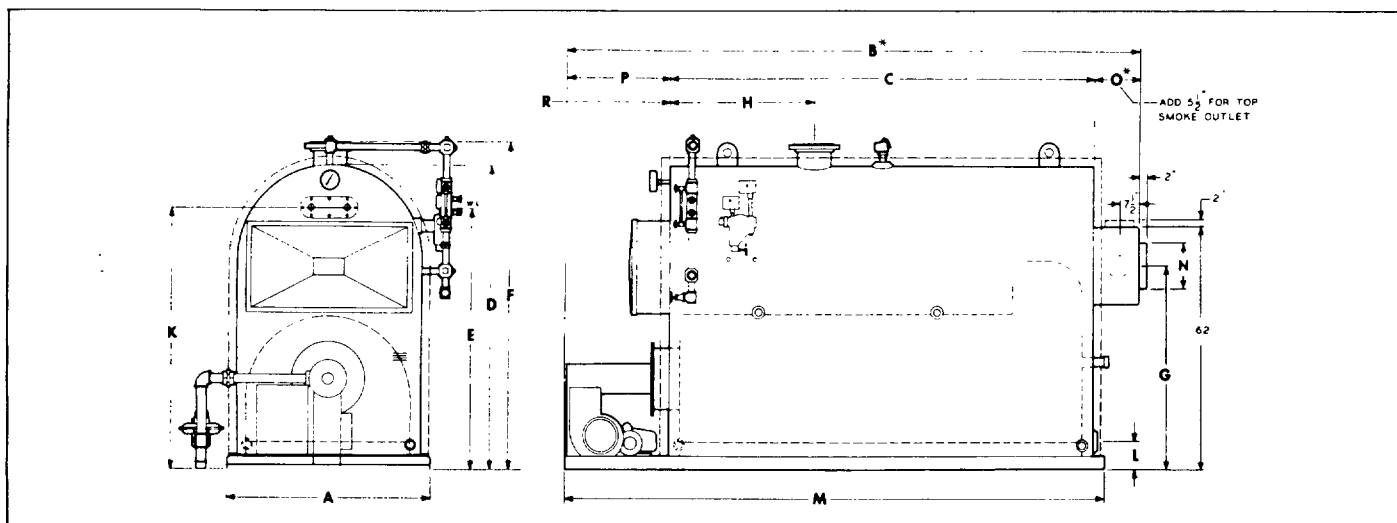
The air-oil unit assembly includes air compressor and oil pump, belt-driven by one motor, and all necessary accessories to provide the fine oil atomization required for clean, efficient oil firing. A thermostatically controlled electric oil heater maintains uniform oil temperature to compensate for varying viscosities of residual oils. The multi-louvered opposed-blade air damper provides accurately measured air supply to match fuel supply for top operating efficiency at all firing rates.



CONTROL CABINET

The heavy-gauge steel, dust proof control cabinet is completely prewired and ready for connection to a source of power. Control cabinet components include Fireye FP-2 flame safeguard system, and all necessary relays, switches and controls for full automatic operation.





RATINGS AND DATA

Unit Number	M-335	M-425	M-505
Rating —MBh	3350	4250	5050
—horsepower	100.0	126.9	150.8
—steam per hour 212°F. . . lbs	3452	4380	5204
—steam (gross) sq ft	13958	17708	21042
—steam (MCA net) sq ft	10490	13110	15733
Firing rate—oil, 140,000 btu gph	30.0	38.0	45.0
—oil, 150,000 btu gph	27.9	34.8	41.7
—gas MBh	4181	5312	6312
Heating surface sq ft	450	562	675
Furnace volume cu ft	72.0	88.1	103.4
Safety valve capacity—steam per hour . lbs	3350	4250	5050
Minimum stack diameter in	12	15	18
Supply size in	8**	8**	8**
Return size in	4	4	4
Gas control size in	2 1/2	3	4
Gas pressure required in wc	7	8	8
Approximate dry weight lbs	7300	8200	10300

** 150 lb. American Standard Flange

DIMENSIONS (inches)

Unit Number	M-335	M-425	M-505
A —Boiler maximum width	54	54	54
—Jacket width	53	53	53
—Insulation thickness	2	2	2
B —Length overall*	131	152	172
C —Boiler length	91	112	132
—Jacket length	95	116	136
D —Boiler height	78	78	78
—Jacket height from floor	80	80	80
E —Waterline height	64 1/2	64 1/2	64 1/2
F —Steam or Water supply height	83	83	83
G —Smoke outlet height	52	52	52
H —Steam or Water supply location	27	38	48
K —Coil connection height	66 1/2	66 1/2	66 1/2
L —Return height	7	7	7
M —Base length	121 1/2	142 1/2	162 1/2
N —Vent opening	16	16	18
O —Smokebox*	12	12	12
P —Burner to boiler	28	28	28
R —Required tube replacement length	93	114	134

* Add 5 1/2 inches for top smoke outlet

KEWANEE BURNER DATA

Unit Number †	M-335	M-425	M-505
Input			
—Gas MBh	4181	5312	6312
—No. 2 oil, 140,000 btu . . . gph	30.0	38.0	45.0
—No. 5 oil, 150,000 btu . . . gph	27.9	34.8	41.7
Fuel Control—Gas	Modulating	Modulating	Modulating
—Oil	Modulating	Modulating	Modulating
Air Control	Modulating	Modulating	Modulating
Flame Safeguard and Programming System	Fireeye FP-2	Fireeye FP-2	Fireeye FP-2
Gas Controls (UL, 1000 btu/cf, 0.6 sp. gr.)			
—Required inlet pressure . . . in wc	7	8	8
—Control group size in	2 1/2	3	4
Motors — Electrical Characteristics			
—Forced draft fan hp	1 208/220/ 240-60-3	1 1/2 208/220/ 240-60-3	2 208/220/ 240-60-3
—Air atomizing air-oil unithp	1 208/220/ 240-60-3	1 208/220/ 240-60-3	1 208/220/ 240-60-3
—Pressure atomizing oil pump . . .hp	1/3 230-60-1	1/3 230-60-1	1/3 230-60-1
Controls — Electrical Characteristics	115-60-1	115-60-1	115-60-1
Oil Heater — for No. 4 or No. 5 oil watts	3000	3000	4000

† Unit suffix denotes fuel and type of fuel burning equipment:

- FG for gas
- FO for No. 2 oil (pressure atomizing)
- FO2 for No. 2 oil (air atomizing)
- FO5 for No. 4 or No. 5 oil (air atomizing with electric heater)
- FGO for gas - No. 2 oil (pressure atomizing)
- FGO2 for gas - No. 2 oil (air atomizing)
- FGO5 for gas - No. 4 or No. 5 oil (air atomizing with electric heater)

KEWANEE SQUARE-HEAT GENERATOR

STANDARD AND OPTIONAL EQUIPMENT

UNITS
M-335, M-425, M-505

STANDARD EQUIPMENT

OPTIONAL EQUIPMENT

ALL UNITS

1. Three-Pass ASME Code Boiler
2. Refractory Filled Extended Skid Type Base
3. Gas Tight Insulated Front Smokebox
4. Pyrex Observation Ports (Front & Rear)
5. 2" Firetubes
6. Gas Tight Rear Smokebox with Horizontal Discharge (Rear) Vent
7. Wrap-around Insulated Steel Jacket
8. Lifting Loops
9. Washout Plug Socket Wrench & Flue Cleaner with Handle
10. Operating Limit Control
11. Safety High Limit Control
12. Modulation Operating Control
13. Forced Draft Burner
14. Control Cabinet Mounted on Boiler Base Including: Fireye FP-2 Flame Safeguard and Programming Control, Magnetic Starter(s) Control Circuit Transformer, Control Circuit Fuse, Burner "On-Off" Switch, Indicating Lights (2), Necessary Relays, Numbered Terminal Strip, Engraved Nameplates
15. Air Flow Safety Switch
16. Blower Motor Horsepower & Voltages —
1 HP, 208/220/240 V, 60 cy, 3 ph. (Unit 335)
1½ HP, 208/220/240 V, 60 cy, 3 ph. (Unit 425)
2 HP, 208/220/240 V, 60 cy, 3 ph. (Unit 505)
17. Control Voltage —
115 V, 60 cy, 1 ph. Includes Reduced Voltage Transformer
18. Modulated Firing Sequence with Low Fire Start
19. Modulating Motor with Low Fire Interlock
20. Gas-Electric Ignition Assembly Including: Ring Type Pilot Burner, 6000 V Transformer, Gas Valve, Gas Pressure Regulator, Gas Cock
21. Lead Sulphide Flame Detector
22. Listed Standard and Selected Optional Equipment Mounted, Piped, Wired, Ready for Field Connection to Fuel, Water, Steam and Electricity. (Exceptions: Items shipped separately to prevent shipping damage).
23. Factory Firetest
24. Starting Service

STEAM UNITS

1. No. 767 Low Water Cut-Off
 2. Kewanee Water Column
 3. Safety Valve(s)
 4. Compound Steam and Vacuum Gauge
 5. Water Gauge, Glass and Try Cocks
1. No. 157 Combination Water Column, Low Water Cut-Off and Pump Control
 2. No. 51-2 Combination Water Feeder, Low Water Cut-Off and Alarm Switch (Not Mounted)
 3. Second Low Water Cut-Off
 4. Surface Blow-Off

HOT WATER UNITS

1. No. 764 Low Water Cut-Off
 2. Relief Valve(s)
 3. Combination Altitude Gauge & Thermometer
1. No. 51-2 Combination Water Feeder, Low Water Cut-Off and Alarm Switch (Not Mounted)
 2. Second Low Water Cut-Off

PRESSURE ATOMIZING OIL UNITS

1. Forced Draft Pressure Atomizing Oil Burner for No. 2 Oil
 2. Two-Stage Oil Pump Assembly with Gauge, Relief Valve, ½ HP Motor
 3. Variable Capacity Oil Nozzle
 4. Oil Solenoid Valve
 5. Modulating Oil Metering Valve
 6. Oil Filter (Not Mounted)
1. Direct Spark Electric Ignition
 2. Oil Controls for FM
 3. Oil Controls for FIA
 - *4. Oil Controls for Local Code Requirements

AIR ATOMIZING OIL UNITS

1. Forced Draft Air Atomizing Oil Burner for No. 5 or Lighter Oil
 2. Air-Oil Unit Including: Air Compressor, Motor, Air Pressure Regulator, Air Metering Valve, Inlet Air Filter, Check Valve, Air Pressure Safety Switch, Air Gauge, Oil Pump Assembly with Gauge and Relief Valve.
 3. Air-Oil Unit Motor Horsepower and Voltage — 1 HP, 208/220/240 V, 60 cy, 3 ph.
 4. Thermostatically Controlled Electric Oil Heater—
3000 Watts (Unit 335 and 425)
4000 Watts (Unit 505)
 5. Air-Oil Atomizing Nozzle
 6. Oil Solenoid Valve
 7. Modulating Oil Metering Valve
 8. Air Purge Relay and Valve
 9. Oil Strainer (Not Mounted)
1. Oil Controls for FM
 2. Oil Controls for FIA
 - *3. Oil Controls for Local Code Requirements
 4. Omit Electric Heater For No. 2 Oil

GAS UNITS

1. Forced Draft Radial-Jet Flame Retention Type Gas Burner
 2. UL Gas Control Group Including: Automatic Motorized Gas Valve, Automatic Solenoid Safety Gas Valve, Gas Pressure Regulator, Modulating Gas Volume Control Valve, Gas Pressure Gauge, Gas Cock
1. Gas Controls for Other than Standard Pressures
 2. Gas Controls for FM
 3. Gas Controls for FIA
 - *4. Gas Controls for Local Utility Requirements.

COMBINATION GAS-OIL UNITS

1. Manual Fuel Changeover Switch
- *1. Automatic Fuel Changeover Switch

* On Special Application Only.

KEWANEE SQUARE-HEAT GENERATOR

TYPICAL SQUARE-HEAT GENERATOR SPECIFICATIONS

FOR UNITS M-335, M-425, M-505

The contractor shall furnish and install . . . Model No. . . . Square-Heat Generator(s) for (No. (2)(4)(5) oil), (gas), or (combination gas—No. (2)(4)(5) oil) firing. The unit(s) shall be of 3-pass firebox design with arched upright crown sheet and two passes of firetubes, and constructed in accordance with the ASME Code for (15 lbs. steam) (30 lbs water).

The unit(s) shall contain not less than . . . cubic feet of furnace volume and shall have a gross output rating of not less than . . . MBh. Heat release shall not exceed 61,000 Btu per cubic foot of furnace volume.

Normal water line of unit(s) shall not exceed . . . inches. A pyrex observation port shall be provided at the rear of the firebox. Front flue access cover, with refractory securely keyed in place and of a size permitting easy access to all fire tubes, shall be mounted on a gas-tight, insulated front smokebox. Gas-tight rear smokebox shall be provided with a (rear) (top) outlet.

Unit(s) shall be provided with a wrap-around steel jacket with 2" mineral fiber insulation and smooth enamel finish.

All tubes shall be set with a roller expander at each end. No welding of tubes to the tube sheets nor use of refractory baffling to provide the second or third pass will be permitted.

Unit(s) shall be assembled and wired, with burner, controls, trim, insulated steel jacket and refractory filled skid type base installed at the factory.

Fuel burning equipment shall be forced draft type: Factory assembled, wired, mounted, and tested. The entire unit shall bear the Underwriters' Laboratories label and shall be ready for field connection to power and fuel supply. Equipment shall include forced draft fan with air damper; dual high limit controls; modulating operating control; flame sensing device; and control cabinet containing Fireye FP-2 electronic flame safeguard and programmer, burner on-off switch, necessary switching relays, two indicating lights for major operations, numbered terminal strips, color-coded wiring and engraved nameplates.

All motors shall be for . . . volts, . . . cycle, . . . phase operation. Controls shall be 115 volt, 60 cycle, single phase. Magnetic motor starters with thermal over-load protection and a step-down control circuit transformer shall be provided in the control cabinet when other than 115 volt motors are specified.

Fuel burning equipment shall be set and adjusted by a factory-authorized representative to burn . . . G.P.H. of No. (2)(4)(5) oil (and)(or) . . . C.F.H. of . . . Btu cu. ft. (natural)(manufactured) (L.P.) gas having a . . . sp.gr. with . . . inches W.C. pressure at inlet of burner manual gas cock. Unit efficiency, based on flue gas analysis, shall be not less than 80%. *Note: Specify job altitude if over 2,500 ft. above sea level.*

Owner's representative shall be present to receive instructions in care and maintenance of the unit at the time it is started up by the service representative. Contractor shall provide a free service period of 90 days after startup.

NOTE: Select applicable paragraphs below according to fuel and unit size. The following equipment conforms to UL requirements. Specify additional controls if FM or FIA insured, or subject to special local utility requirements.

FOR GAS UNITS

Gas burner shall be of the radial-jet flame retention type including a main gas control group consisting of an automatic motorized gas valve, automatic solenoid safety gas valve, gas volume control valve, gas pressure regulator, gas gauge, and gas cock; gas-electric ignition assembly consisting of a ring-type pilot burner, 6000 volt ignition transformer, automatic gas valve, gas pressure regulator, and gas cock; air flow safety switch; lead sulphide flame detector; low fire interlock; and all necessary controls and linkage for full modulation type of operation with proved low fire start. Fuel-air control shall provide full modulating regulation of the air damper and the gas volume control valve by means of a motor operator.

FOR PRESSURE ATOMIZING OIL UNITS

Oil burner shall be of the pressure atomizing type for No. 2 oil with a two-stage oil pump assembly with internal relief valve mounted on the boiler skid. Burner shall include variable-flow oil atomizing nozzle; oil solenoid valve; oil metering valve; gas-electric ignition assembly with ring-type pilot burner, 6000 volt ignition transformer, automatic gas valve, gas pressure regulator and gas cock; air flow safety switch; lead sulphide flame detector; low fire interlock; and all necessary controls and linkage for modulated firing with proved low fire start. Fuel-air control shall provide modulated regulation of the air damper and the oil metering valve by means of a motor operator.

FOR AIR ATOMIZING OIL UNITS

Oil burner shall be of the air atomizing type for No. 5 or lighter oil with an air-oil unit consisting of air compressor, motor, air pressure regulator, air metering valve, inlet air filter, check valve, air pressure safety switch, air gauge, oil pump assembly and relief valve mounted on the boiler skid. Burner shall include air-oil atomizing nozzle; oil solenoid valve; oil metering valve; air purge relay and valve; thermostatically controlled electric oil heater (*omit for No. 2 oil*); gas-electric ignition assembly consisting of a ring-type pilot burner, 6000 volt ignition transformer, automatic gas valve, gas pressure regulator and gas cock; air flow safety switch; lead sulphide flame detector; low fire interlock; and all necessary controls and linkages for modulated firing with proved low fire start. Fuel-air control shall provide modulated regulation of the air damper and the oil metering valve by means of a motor operator.

FOR COMBINATION GAS-PRESSURE ATOMIZING OIL UNITS

Gas-oil burner shall consist of a combination radial-jet flame retention type gas burner and pressure atomizing oil burner for No. 2 oil including all necessary controls for modulated type of operation with proved low fire start. Gas controls shall include a main gas control group consisting of an automatic motorized gas valve, an automatic solenoid safety gas valve, gas volume control valve, gas pressure regulator, gas gauge, and gas cock. Oil controls shall include a two-stage oil pump assembly with internal relief valve; variable-flow oil atomizing nozzle; oil solenoid valve; oil metering valve. Controls for both fuels shall include a lead sulphide flame detector; air flow safety switch; low fire interlock; and gas-electric ignition assembly consisting of a ring-type pilot burner, 6000 volt ignition transformer, automatic gas valve, gas pressure regulator and gas cock. Fuel-air control shall provide modulated regulation of the air damper, the gas volume control valve, and the oil metering valve by means of a motor operator. Changeover from one fuel to the other shall be accomplished by means of a manual fuel selector switch in the control cabinet. No changes in linkage, burner position, or mechanical adjustment shall be necessary when changing fuels. The fuel selector switch shall provide, through the combustion control relay, proper ignition timing for the fuel being burned.

FOR COMBINATION GAS-AIR ATOMIZING OIL UNITS

Gas-oil burner shall consist of a combination radial-jet flame retention type gas burner and air atomizing oil burner for No. 5 or lighter oil with all necessary controls for modulated type of operation with proved low fire start. Gas controls shall include a main gas control group consisting of an automatic motorized gas valve, automatic solenoid safety gas valve, gas volume control valve, gas pressure regulator, gas gauge and gas cock. Oil controls shall include an air-oil unit consisting of an air compressor, motor, air pressure regulator, air metering valve, inlet air filter, check valve, air pressure safety switch, air gauge, oil pump assembly and relief valve; air-oil atomizing nozzle; oil solenoid valve; oil metering valve; air purge relay and valve; thermostatically controlled electric oil heater (*omit for No. 2 oil*). Controls for both fuels shall include lead sulphide flame detector; air flow safety switch; low fire interlock; and gas-electric ignition assembly consisting of a ring-type pilot burner, 6000 volt ignition transformer, automatic gas valve, gas pressure regulator and gas cock. Fuel-air control shall provide modulated regulation of the air damper, the gas volume control valve, and the oil metering valve by means of a motor operator. Changeover from one fuel to the other shall be accomplished by means of a manual fuel selector switch in the control cabinet. No changes in linkage, burner position, or mechanical adjustment shall be necessary when changing fuels. The fuel selector switch shall provide, through the combustion control relay, proper ignition timing for the fuel being burned.