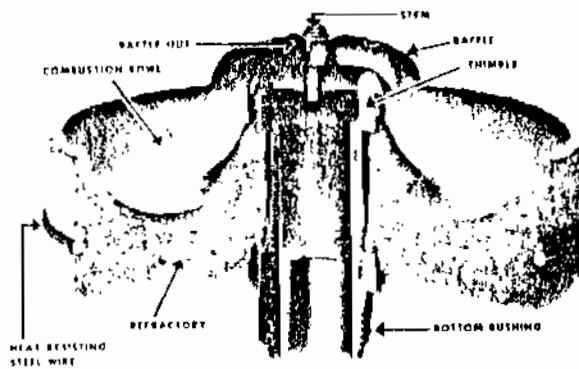
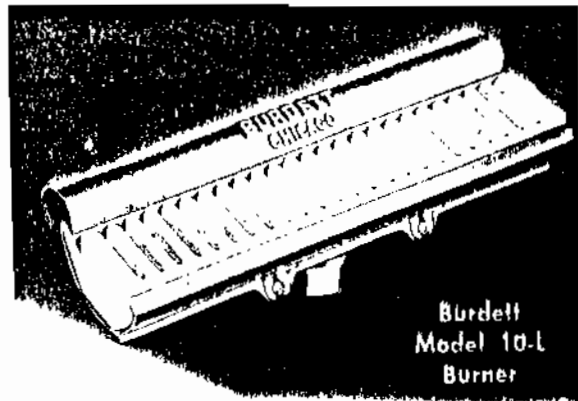


# THE BURDETT BURNER



Note this cross-section of the Burdett Burner. It is constructed of but four basic units. Simplicity of design and construction assures you a minimum of maintenance.



Burdett  
Model 10-L  
Burner

## BURDETT RADIANT BURNERS

Burdett gas fired infra red burners are heavy duty ceramic element industrial burners. Only Burdett offers complete lines of both line type and cup type infra red burners. Model 10L line burners are available with maximum outputs ranging from 14,000 to 50,000 BTU/Hr. They can be manifolded together to yield thermal outputs ranging from 14,000 to 100,000 BTU/Hr per lineal foot

Burdett Cup burners are available with maximum thermal outputs ranging from 19,000 to 170,000 BTU/Hr per burner. They can be manifolded together to yield thermal outputs from 20,000 BTU/Hr to 200,000 BTU/Hr per lineal foot for single rows of burners. Burdett cup burners can also be manifolded into radiant panels with densities as high as 600,000 BTU/Hr per square foot

Burdett burners are available as individual units, or with complete combustion systems for industrial heating processes. They offer unparalleled efficiency in such industrial processes as paint baking and curing, drying, drum heating, batch kettle heating and lead pot heating. Special high temperature versions are available in some models for operation in temperature environments as high as 1,600 degree F. Because of their unique design, Burdett burners can be operated in any position - vertical, horizontal, inverted, or otherwise to suit the heating requirements.

Radiant heat advantages include: uniform high quality of product; low investment, maximum fuel economy, processing time greatly reduced

The drawing on the reverse side shows a typical installation of Burdett 10L line burners in an industrial oven. Gas savings as high as 50% have been achieved by this type of installation in hot air convection type ovens

**BURDETT BURNER MFG. DIV.**

# **BURDETT GAS FIRED INFRA RED BURNERS**

## **I. INTRODUCTION TO RADIANT HEAT**

Heat transmission by radiation plays an important role in industry, although its techniques are not as widely known as those of convection and conduction. Radiant Heat is the transfer of heat in the form of electromagnetic waves much the same as ordinary light waves, but at a longer wave length. Radiant energy travels at the speed of light and is reflected and refracted according to the laws of optics. Radiant heating differs from both convection and conduction heating in that the presence of matter is not required for radiant heat transmission. When radiant heat is absorbed by a body, (solid or liquid) the energy carried in the wave is converted directly to sensible heat in the body, resulting in a rise in temperature. Any radiant heat source emits energy composed of an infinite number of frequencies. Infra Red radiation is in the band of wave lengths that extends from approximately 0.75 to 400 microns. Infra Red energy is generally divided into near Infra Red radiation (0.75 to 2.7 microns) and far Infra Red radiation (2.7 to 400 Microns). For industrial heating applications, the most useful wave length band extends from approximately 1.0 to 10.0 microns.

The rate of radiant heat transmission is defined by the Stefan-Boltzmann law according to which the rate of heat transfer between a radiant source at temperature " $T/s$ ", and an absorbing body at temperature " $T/b$ " is proportional to  $(T/s^4 - T/b^4)$ , i.e. to the difference of the fourth powers of their respective temperatures. In contrast, in convection the rate of heat transfer is proportional only to the temperature difference between the body being heated and the surrounding air. Consequently, convection heat transfer is extraordinarily slow when compared with the almost instantaneous effects of radiant heat. Some of these considerations inspired the late Mr. John B. Burdett - the founder of this Company to invent generators capable of converting gas fuels into Infra Red energy of best suited characteristics for industrial process-heating.

## **II. BURNER OPERATION**

Burdett Infra Red Burners generate intense infra red radiation through

**BURDETT BURNER MFG. DIV**

burning virtually any kind of gas which is flammable. The burners can operate on gas fuels with a calorific value anywhere between 320 to 3200 BTU **per** cubic foot. Data Sheet "C" presents schematically the operating principles of a Burdett cup **type** burner. The burners are supplied with proper air-gas mixture, which remains constant throughout the operation through the use of a 16 oz. Burdett turbo-pressure combustion air blower and properly designed air-gas mixing valve train. The combustion mixture is supplied through the thimble. The flow direction is reversed by the baffle and flows tangentially over the surface of the glowing refractory cup. The combustion mixture is ignited just as it leaves the baffle, so that the radiant refractory cup becomes a combustion chamber and insures complete combustion of the mixture passed across its surface.

The thermal capacity range of BURDETT cup type burners is extraordinarily wide. Each individual burner has a turndown ratio of 4 to 1 for any given baffle setting. Additional turndown range of up to 10 to 1 is provided by the adjustable baffle feature of the burners. Data Sheets C-1 to C-6 indicate the thermal capacity range of the standard BURDETT cup burners. The densities is very simple. All that is needed is to disengage the lock-nut and turn the baffle on the threaded stem to the appropriate position and lock it with the nut.

BURDETT line type burners provide a turndown ratio of about 5 to 1. Data Sheets L-1 and L-2 show the thermal capacity range of the standard BURDETT line burners. All BURDETT line burners are of the fixed orifice type except the model 10LC which is also available in an adjustable orifice version called the model 10LCA.

## **APPLICATIONS**

There are many possible applications for infra red process heating, including some that at first glance might not appear so. Some materials, such as glass and water, which are transparent to visible light, absorb infra red very well. Thus BURDETT IR burners are ideally suited ~~fbi-~~ use in glass annealing and decorating lehrs. They are particularly well suited to drying operations in which the product is moving in web form, or on a belt type conveyor, such as **paper**, board, accoustical tile, etc.

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Another excellent application for BURDETT IR burners is the industrial finishing industry. Here they can be used to obtain increased production without extending paint bake ovens. This is because the installation of infra red burners in existing ovens will allow faster bring-up to temperature of the products in the oven. When used in new ovens. IR burners permit shorter oven lengths for a given production capacity.

BURDETT IR burners can also be installed in existing convection type ovens to increase their production capacity and operating efficiency, utilizing a Radiant Booster Combustion System. The most frequent causes of production rate limitations in heat processing equipment are:

1. Insufficient temperature capacity in the equipment
2. Insufficient ability to handle line speeds in the equipment
3. A combination of the two.

The BURDETT Radiant Booster converts existing convection type ovens to Radiant-Convection heat processing equipment. It is well know that convection type heating equipment generally provides uniform, but slow heating of products. The addition of a Radiant Booster Combustion System permits much faster heating of the product because the very rapid direct radiant heating from the IR burners is added to the convection heating already existing. Furthermore, the uniformity of the convection heating is retained because the re-circulated air is retained. BURDETT drawings No. 10-1, 10-2 and 10-3 show how a BURDETT Radiant Booster Combustion System can be used to improve the efficiency of a typical industrial oven in addition to increasing its production capacity.

There are many other proven areas where BURDETT gas fired infra red burners offer advantages over other heating techniques. These are too numerous to explain in detail here. A partial list:

Annealing	Drum Heating	Pre Heating
Baking	Heat Treating	Post Heating
Curing	Melting	Roll Heating
Drying	Moisture Removal	Thawing

**BURDETT BURNER MFG. DIV.**

In addition to the above, there are numerous applications to which BURDETT cup burners are uniquely suited. A few of these are:

Batch Kettle Heating

High Intensity heating

Batch Ovens

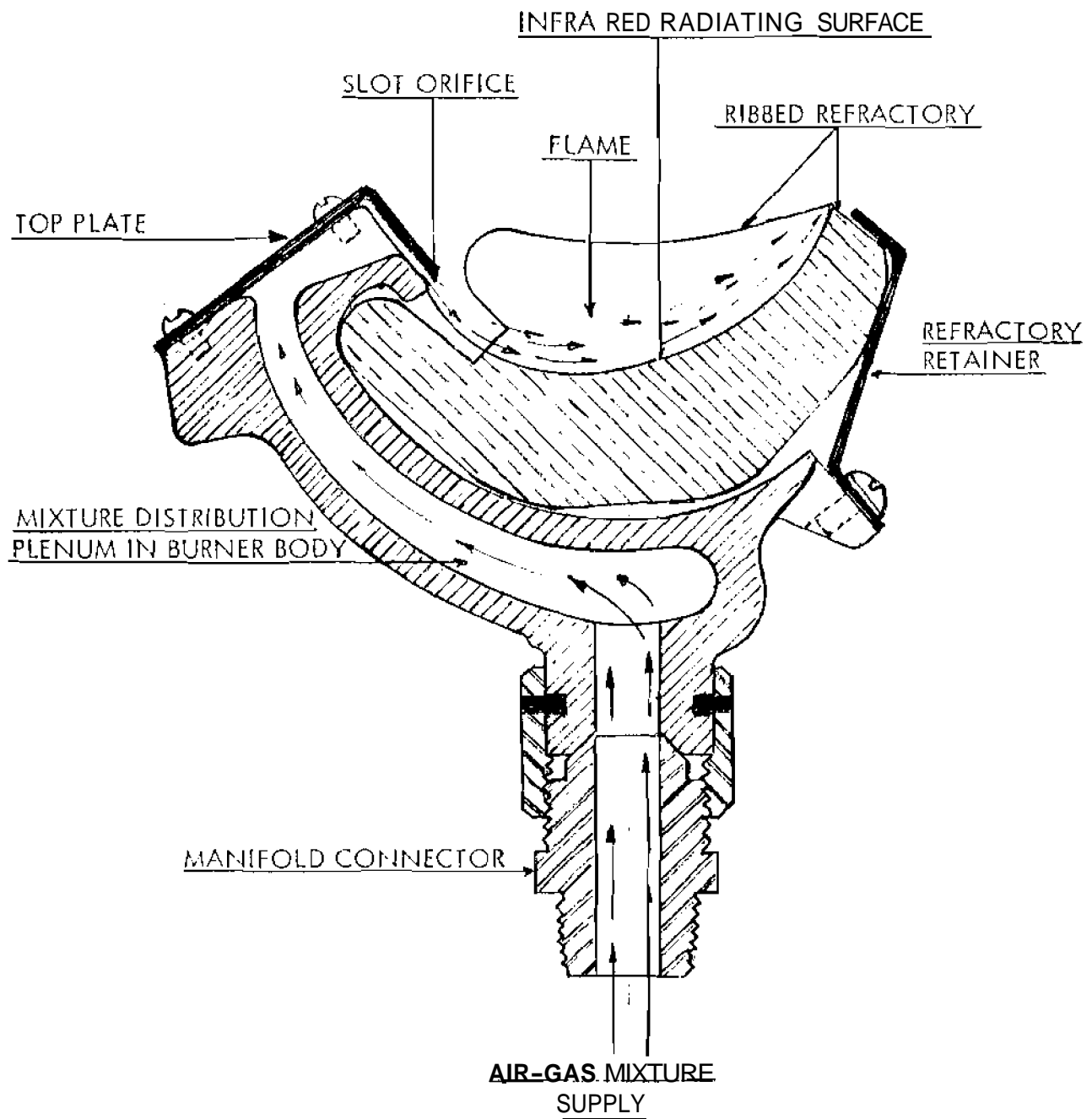
Spot Heating

Battery Plate Processing

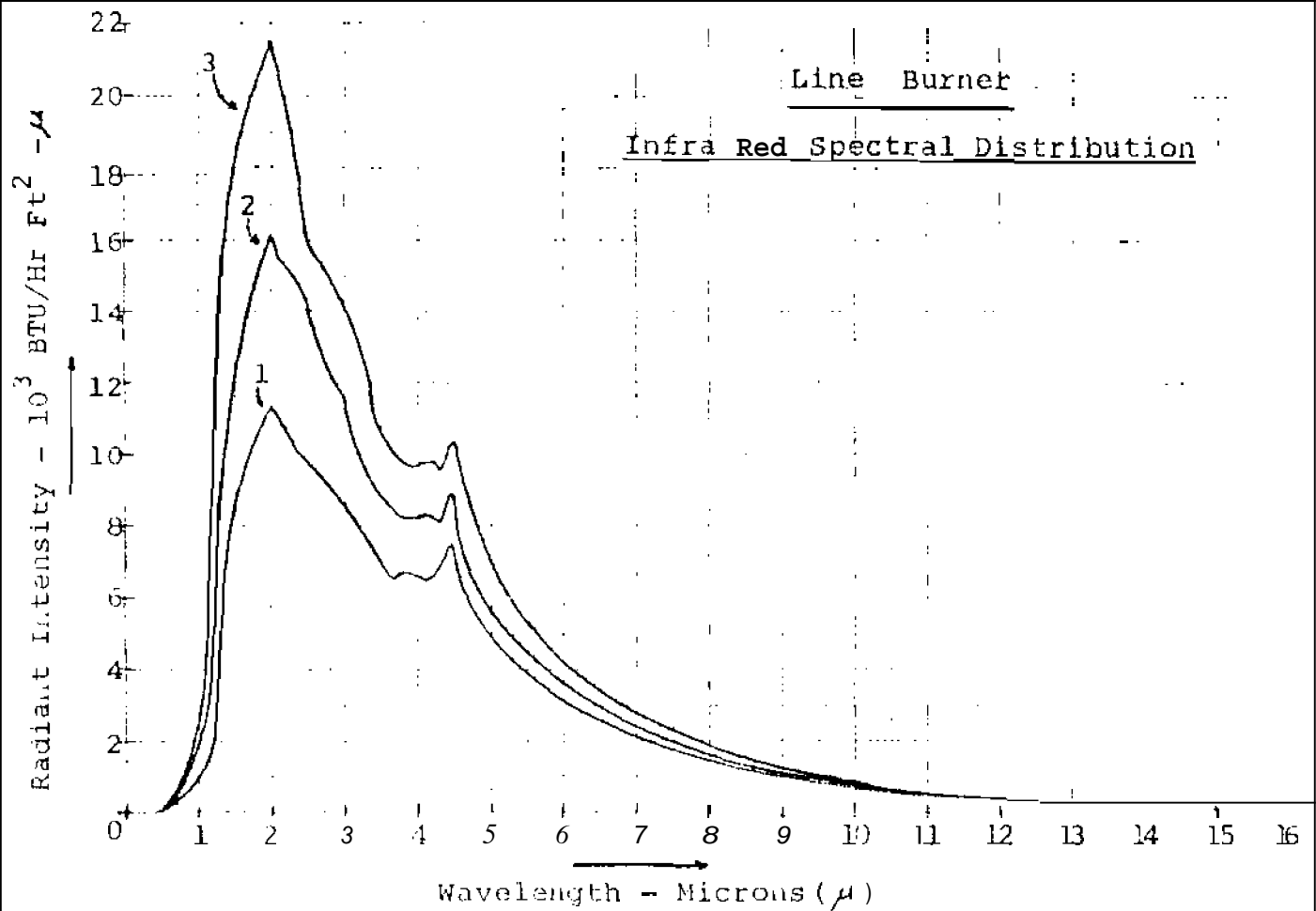
Proportionate Heating

Potentials for additional processes are numerous. In general, nearly all conveyORIZED industrial heating processes will show improved efficiency, productivity and quality through the installation of BURDETT IR burners. Let us hear from you. Our factory specialists are waiting to help you with your heat processing problems.

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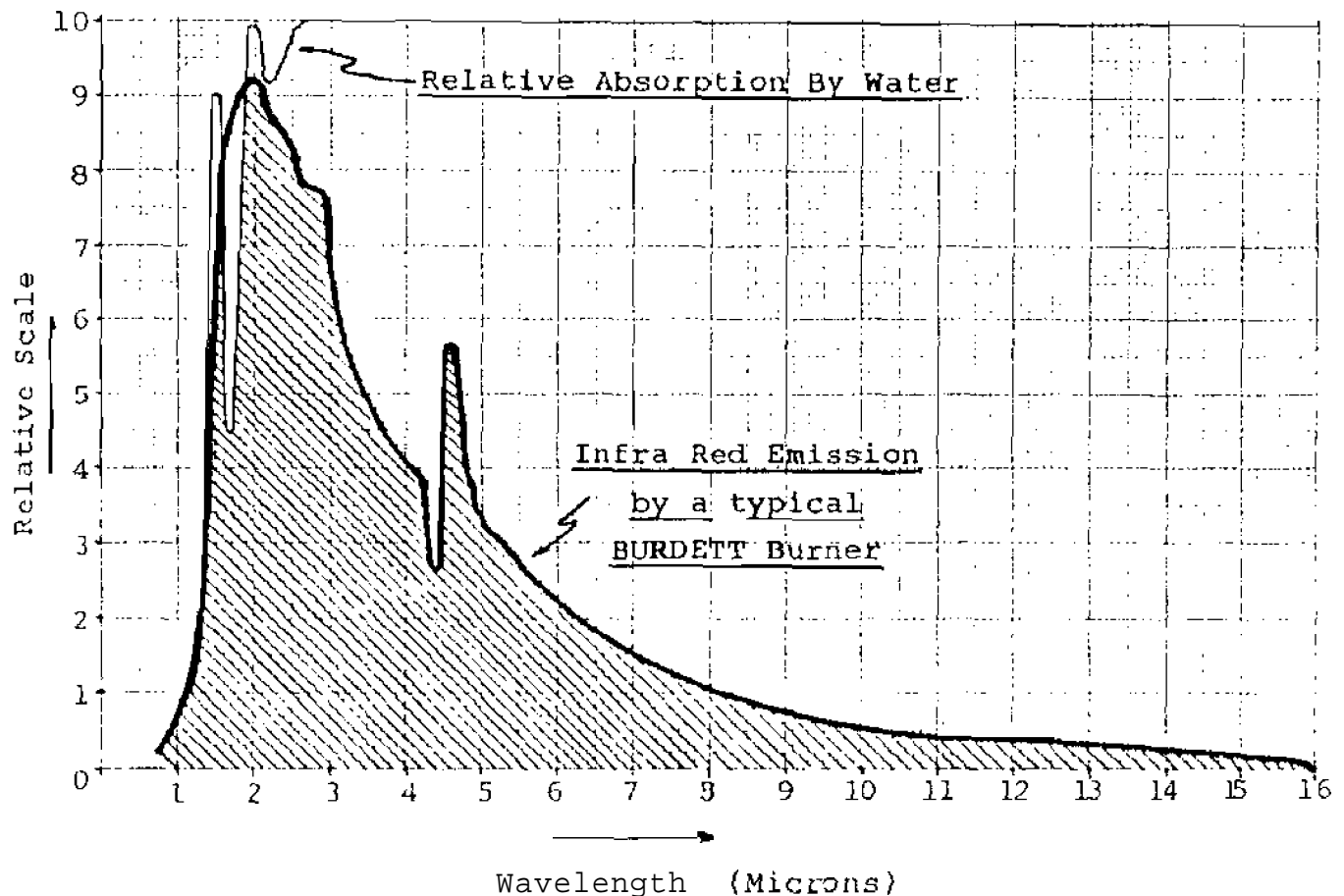
SCHEMATIC VIEW OF  
BURDETT 10L BURNER



BURDETT LINE BURNERS - INFRA RED EMISSION

Curve	Red Brightness Temperature (°F)	Total Normal Infra Red Radiation (BTU/Hr - Ft <sup>2</sup> )	Effective Emissivity
1	1,800	38,000	0.86
2	2,000	51,500	0.81
3	2,300	62,800	0.51

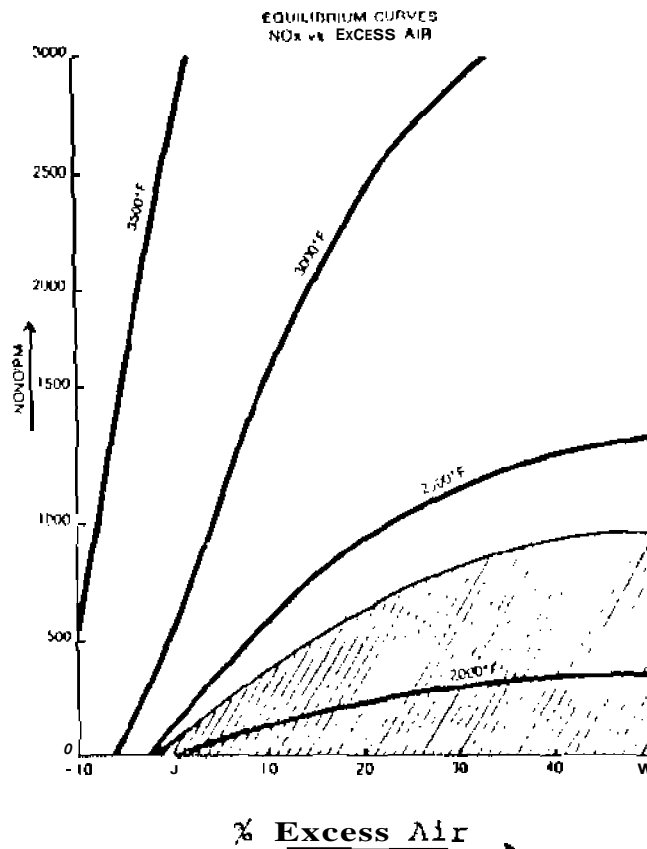
Data Source: Tests conducted by the American Gas Association Laboratories, Cleveland, Ohio. Data Published in A.G.A. Research Bulletin No. 2.



BURDETT infra red burners are ideally suited for the rapid and fuel-effective evaporation of water. The graph above shows the infra red emission spectrum of a typical BURDETT burner. Plotted on the same scale is the relative absorption spectrum of liquid water. The shaded area under the emission curve of the burner represents the portion of the emitted infra red energy which is absorbed by water. The fuel saving and highly productive performance are explained by the fact that water absorbs almost 95% of the infra red energy which is emitted by the BURDETT burners.

This high level of absorption by water of the infra red energy emitted by BURDETT burners means that BURDETT burners can contribute substantially to fuel conservation and to diverse improvements in the productivity of (1) drying water remnants after metal cleaning and pretreating processes, (2) evaporating aqueous carriers of a variety of paints, porcelain enamels, emulsions, adhesives and other processed materials, as well as (3) removing undesired water contents from foods, wood based, clay based fibrous and a host of other products.

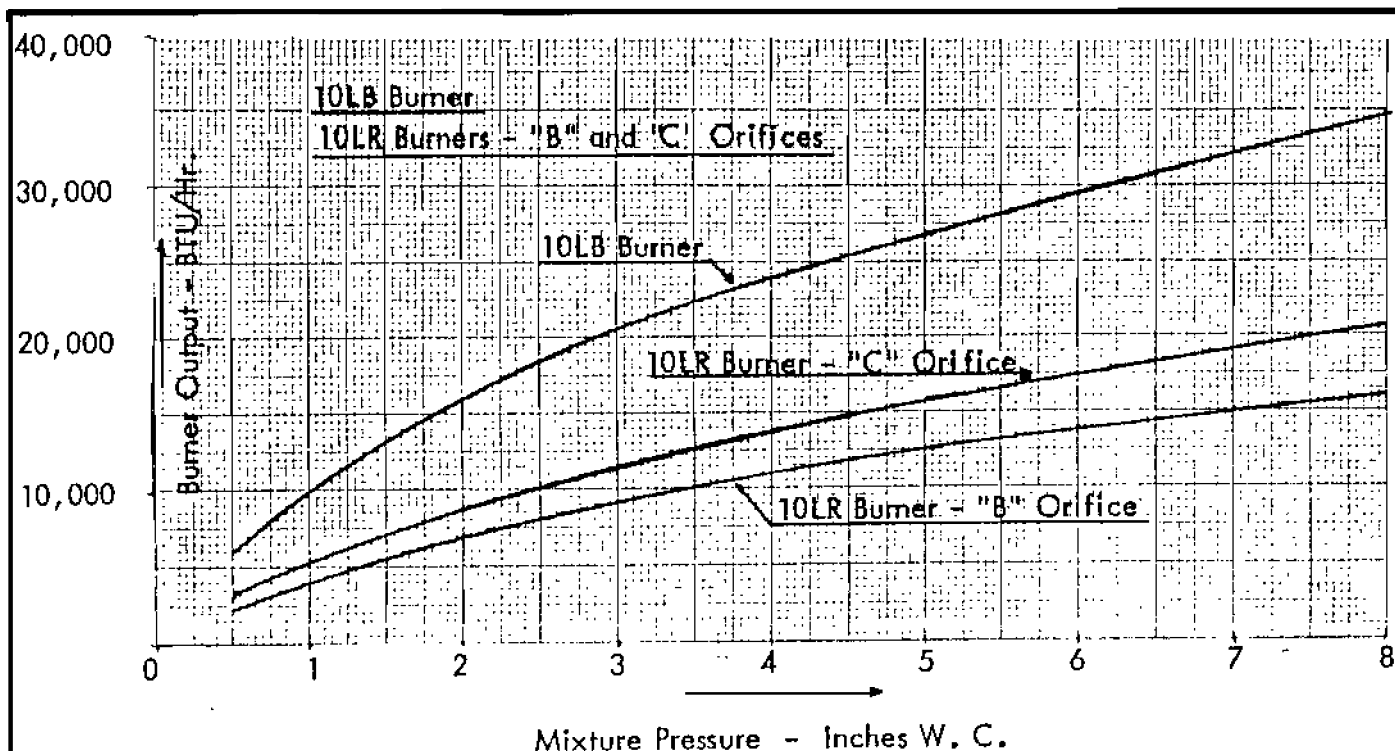




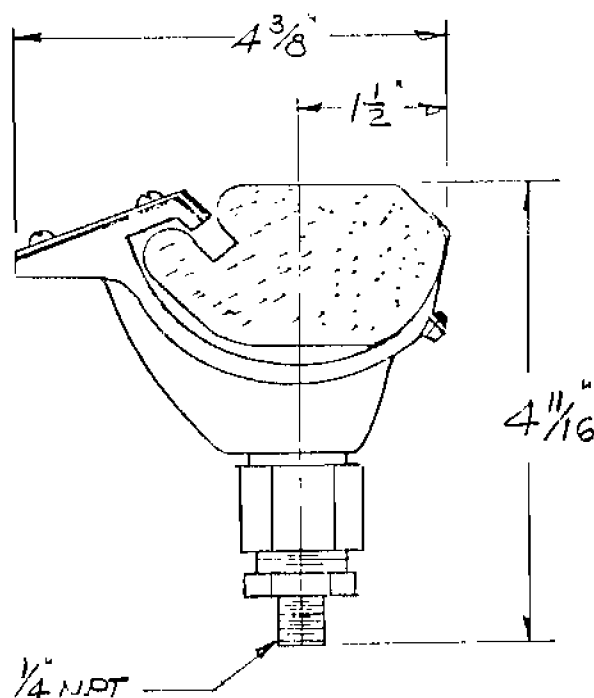
Graph showing oxides of nitrogen in flue gases of a flame versus % of excess combustion air for various flame temperatures.

The hatched area shows the typical operating flame temperature range for BURDETT gas fired infra red burners (1600 to 2300 °F). As can be seen from the graph, even at their maximum flame temperature of 2300 °F, BURDETT burners emit substantially less than 100 ppm NO<sub>x</sub> at their normal operating condition of 0% excess air. Furthermore, when operated with flame temperatures of 2000 °F or less and 0% excess air, BURDETT burners will emit virtually no oxides of nitrogen.

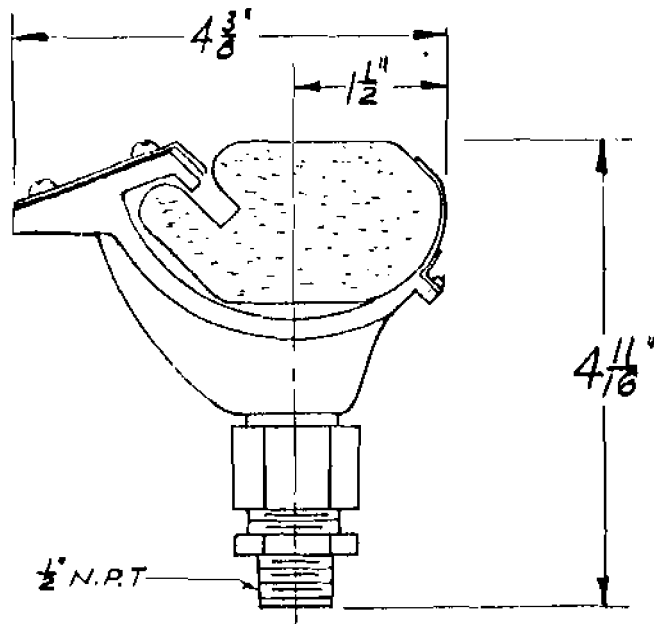
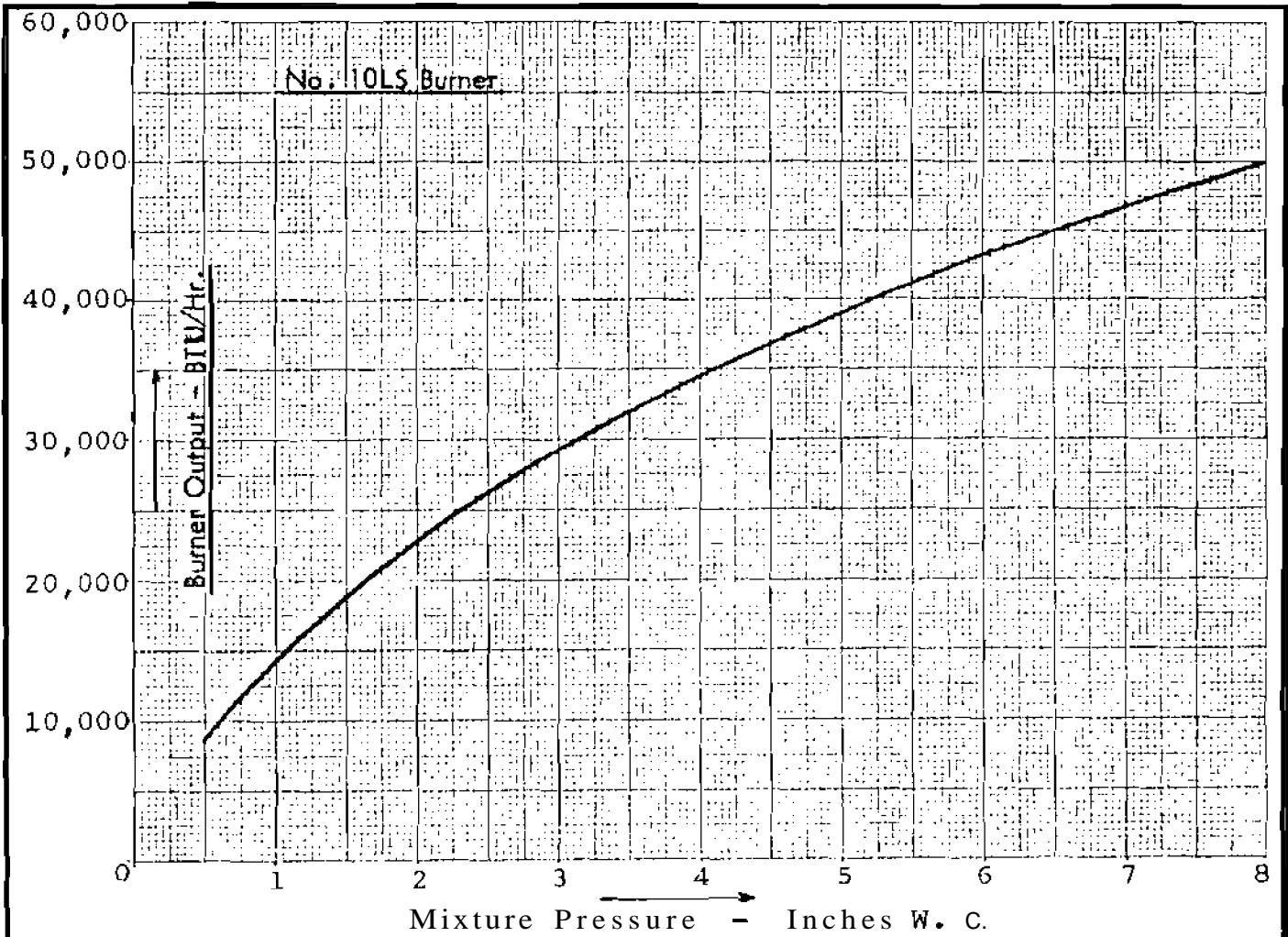
In contrast, typical air heating burners with flame temperatures in the 3000 to 3500 °F range will give off 700 to 3000 ppm of NO<sub>x</sub> even with 0% excess air. Actual emissions will frequently be much higher since most air heating burners are operated with substantial excess air.



Note: For 10LR Burners - Specify "B" or "C" Orifice.

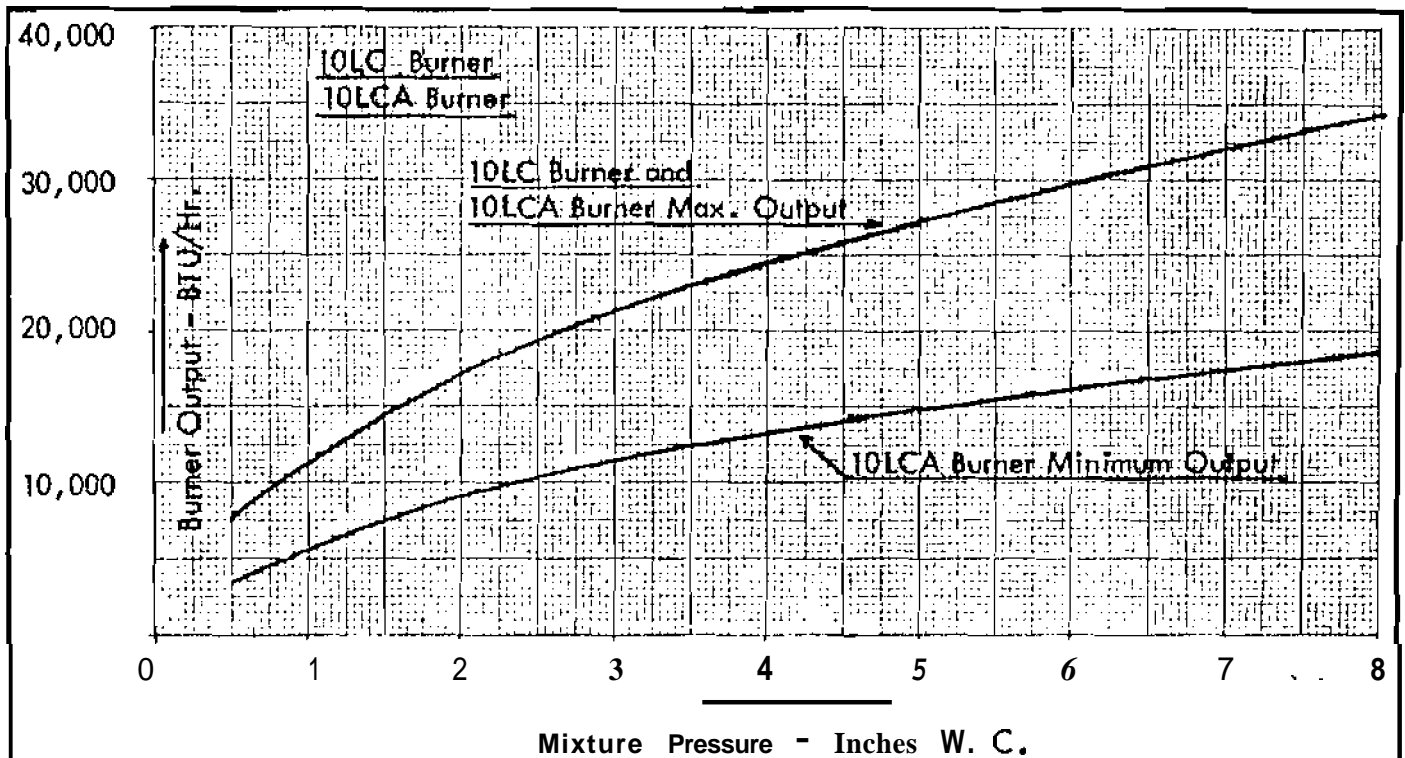


10LB and 10LR Burners

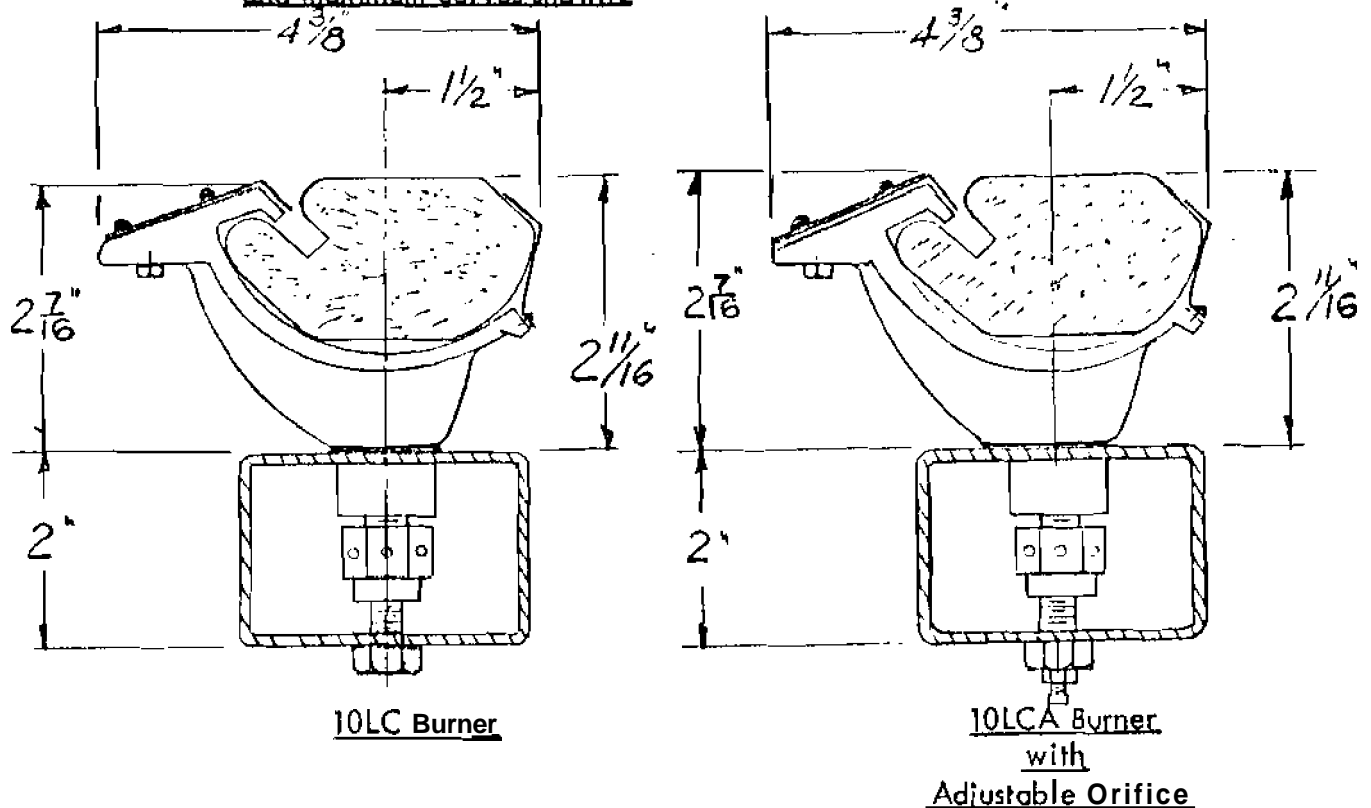


No. 10LS Burner

BURDETT MANUFACTURING COMPANY



Note: 10LCA Burner may be adjusted for any output curve between the minimum and maximum curves shown.

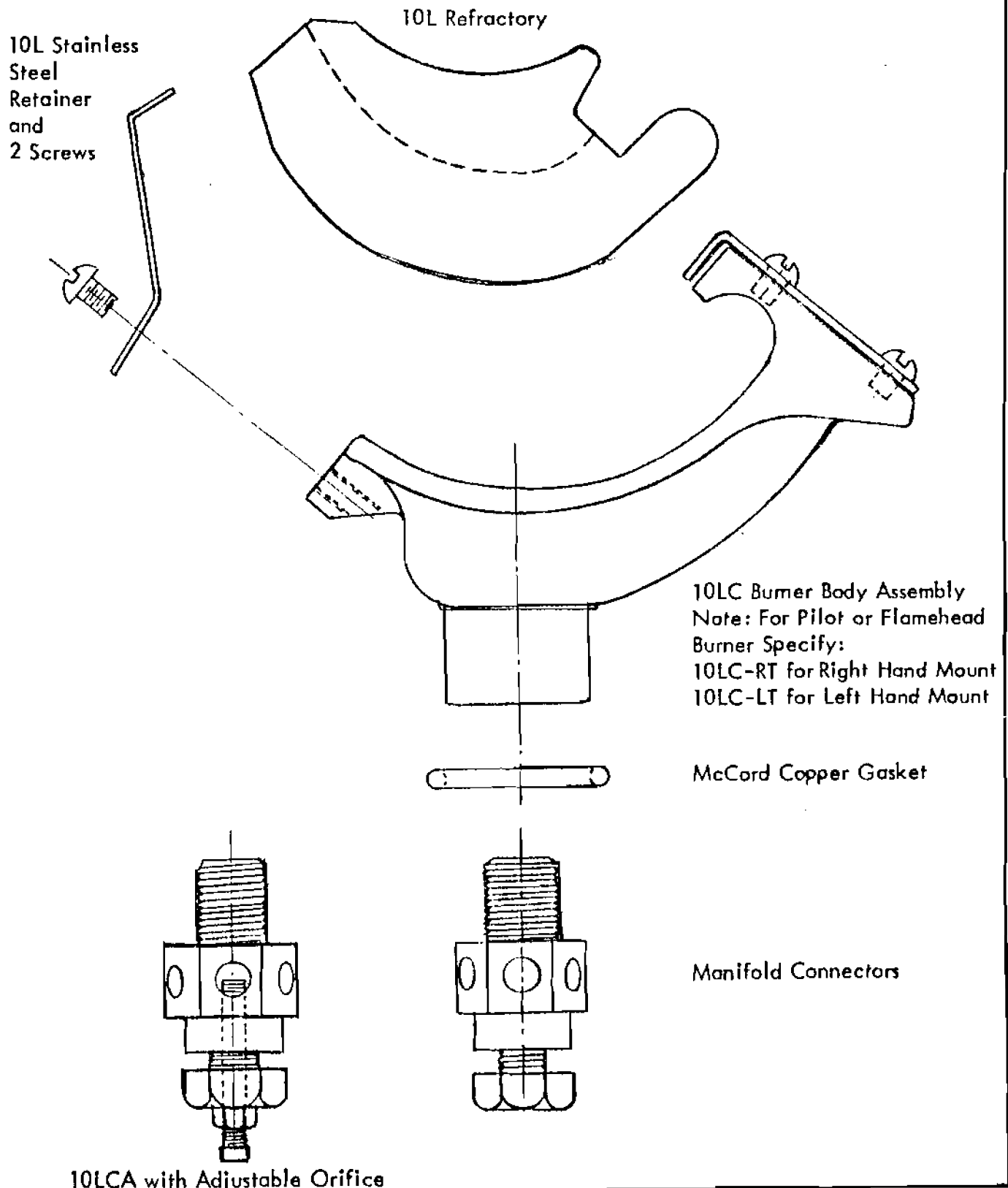




# BURDETT ENGINEERING DATA SHEET No. L-10C

## BURDETT No. 10LC BURNER PARTS

New Style

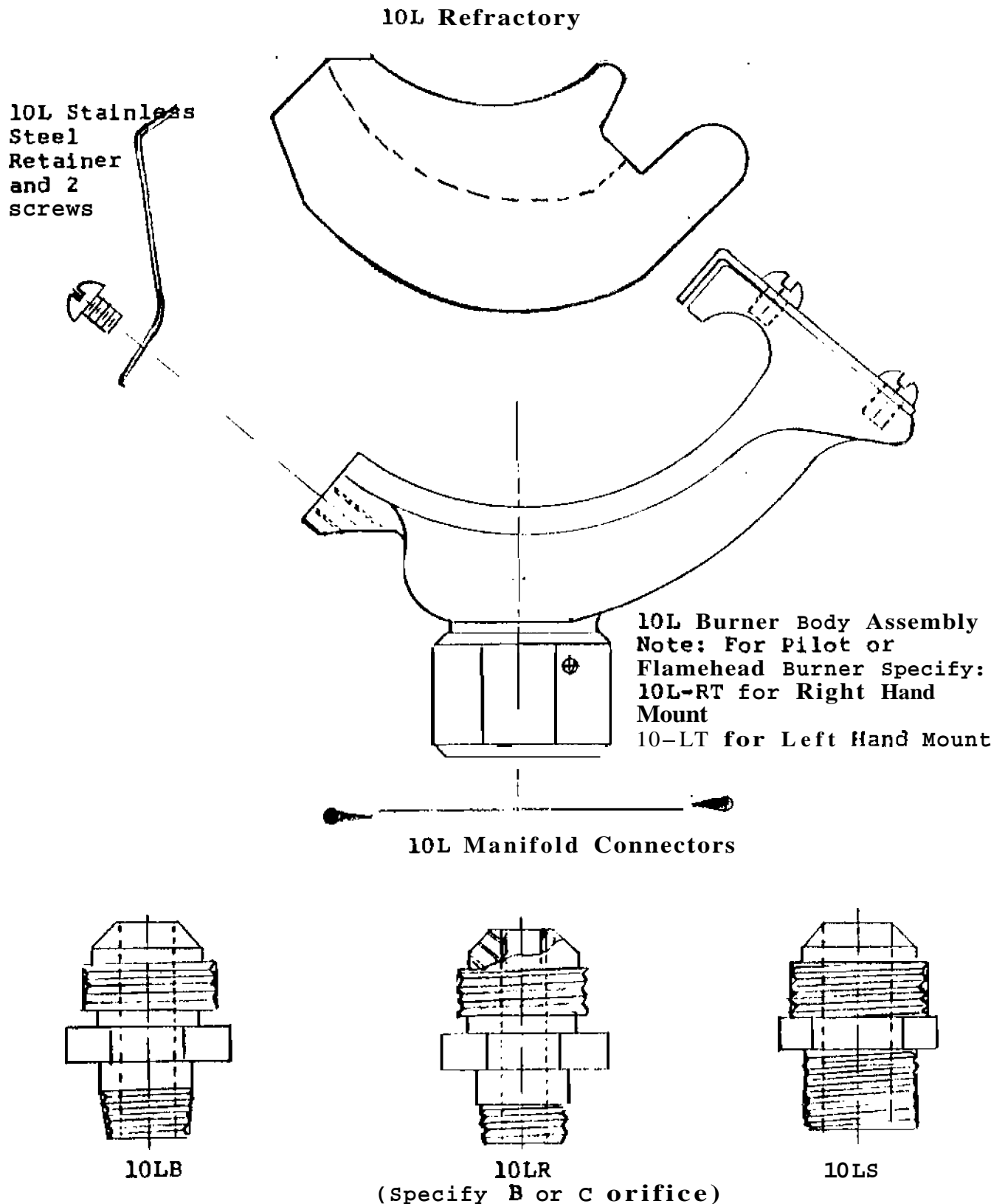


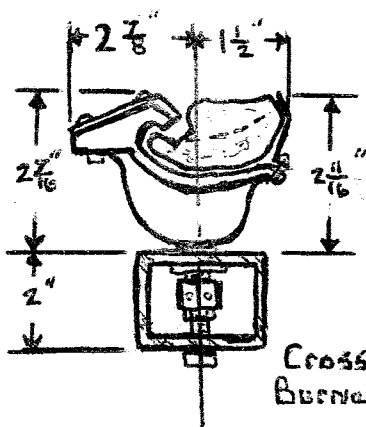


# BURDETT ENGINEERING DATA SHEET No. L-10

## BURDETT NO. 10L BURNER PARTS

New Style





AUB-I-6  
Ignitor or Flame head  
Used As Flame head  
AUB-MB-RH right hand  
mtg. bracket

10LC

Burners on 12" Ctrs.

AUB-I-6  
Ignitor or Flame-  
head  
Used As  
ignitor

Face End

AUB-MB-LH left hand mtg. bracket

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REVISIONS

Revised 12-5-88

BURDETT MFG. CO. CHICAGO, ILL.

Typical BURDETT 10LC Burner Rectangular Tube  
Manifold

CUST. ORD.

SCALE

JOB NO.

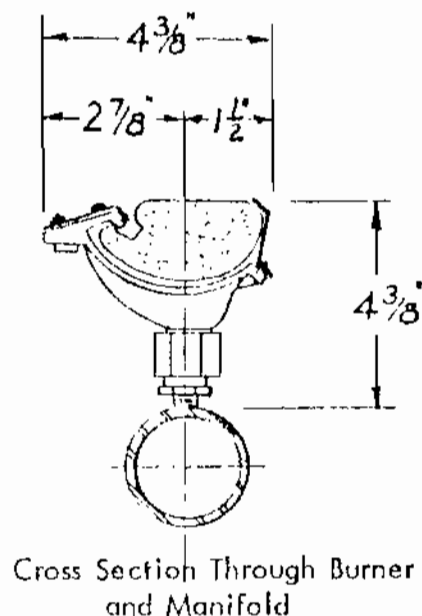
DRAWING NO.

DATE 5/7/75

DRAWN BY id

M-10LC

15



Flamehead End  
 BM #AUB-10L-PF Ignitor or Flamehead  
 Used as Flamehead  
 BM #AUB-10L-F-RH right hand mtg. bracket. (Specify BM #AUB-10L-F-LH for left hand mtg. bracket.)

BM No. 10LB-RT Burner

BM No. 10LB Burner

Burner Manifold  
 Burners on 12" Ctrs.

BM No. 10LB-LT Burner

Ignitor End  
 BM #AUB-10L-PF  
 Ignitor or Flamehead  
 Used as Ignitor

NOTE: For higher burner output, specify 10LS instead of 10LB burners.

BM #AUB-10L-F-LH left hand mtg. bracket

FEED  
 END

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REVISIONS

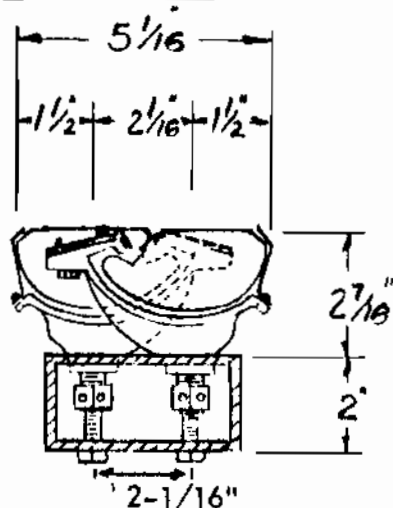
Revised 12-5-88

BURDETT MFG. CO. CHICAGO, ILL.

Typical BURDETT 10L Burner Pipe Manifold Arrangement

CURT. ORD.	SCALE	JOB NO.	DRAWING NO.
DATE	BY		M-10L





Cross Section Through Burners and Manifold

Flamehead End  
BM #AUB-10L-PF Ignitor or Flamehead  
Used as Flamehead

BM #AUB-10L-F-RH right hand mtg. bracket. (Specify BM #AUB-10L-F-LH for left hand mtg. bracket.)

BM No. 10LC-RT Burner

BM No. 10LC Burner

Burner Manifold  
Burners on 12" Ctrs.

BM No. 10LC-LT  
Burner

Ignitor End  
BM #AUB-10L-PF  
Ignitor or Flame-  
head  
Used as  
Ignitor

Note: For Adjustable Orifice  
Burners, Specify No. 10LCA  
Burners

BM #AUB-10L-F-LH left hand mtg. bracket

FEED  
END

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REVISIONS

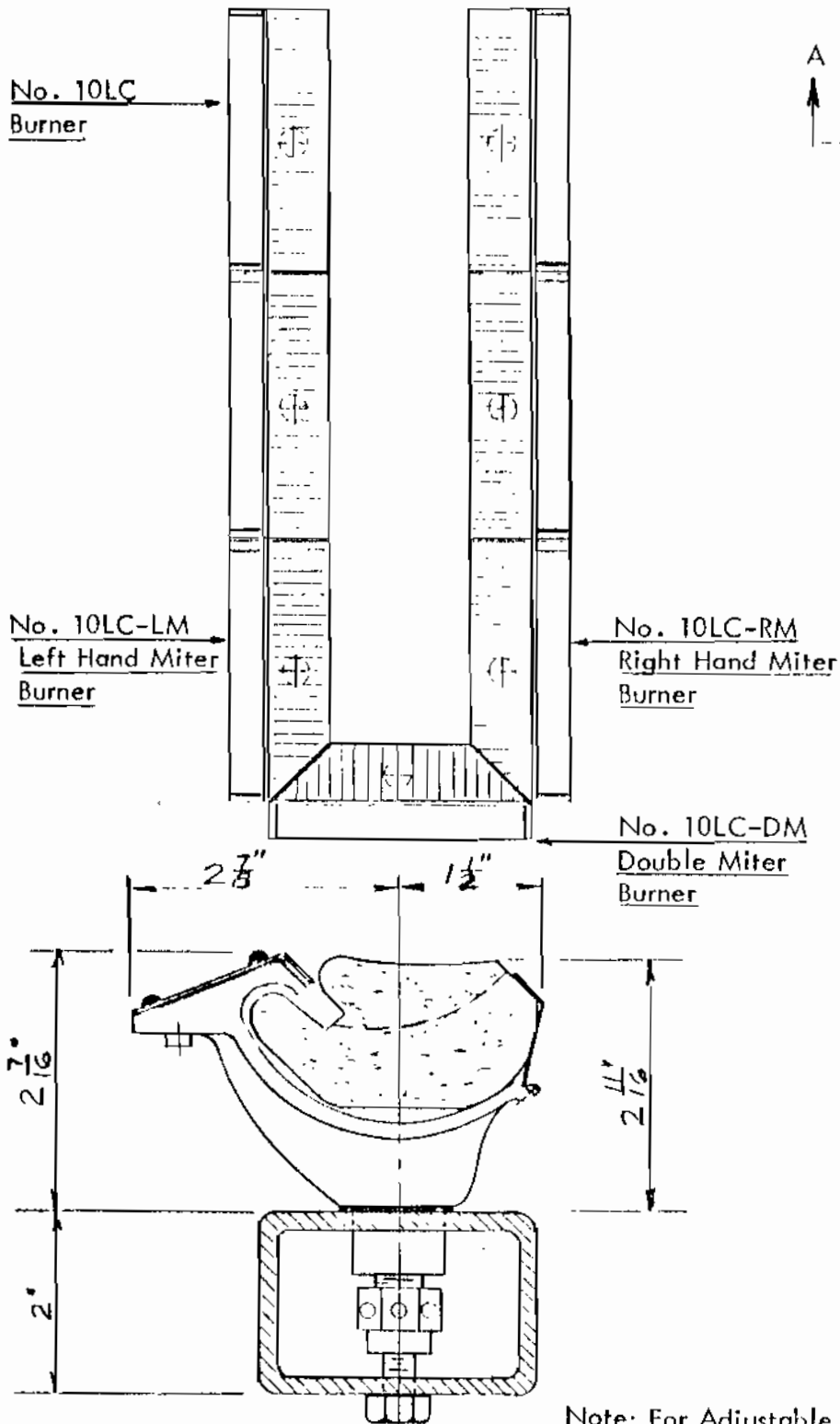
Revised 12-5-88

BURDETT MFG. CO. CHICAGO, ILL.

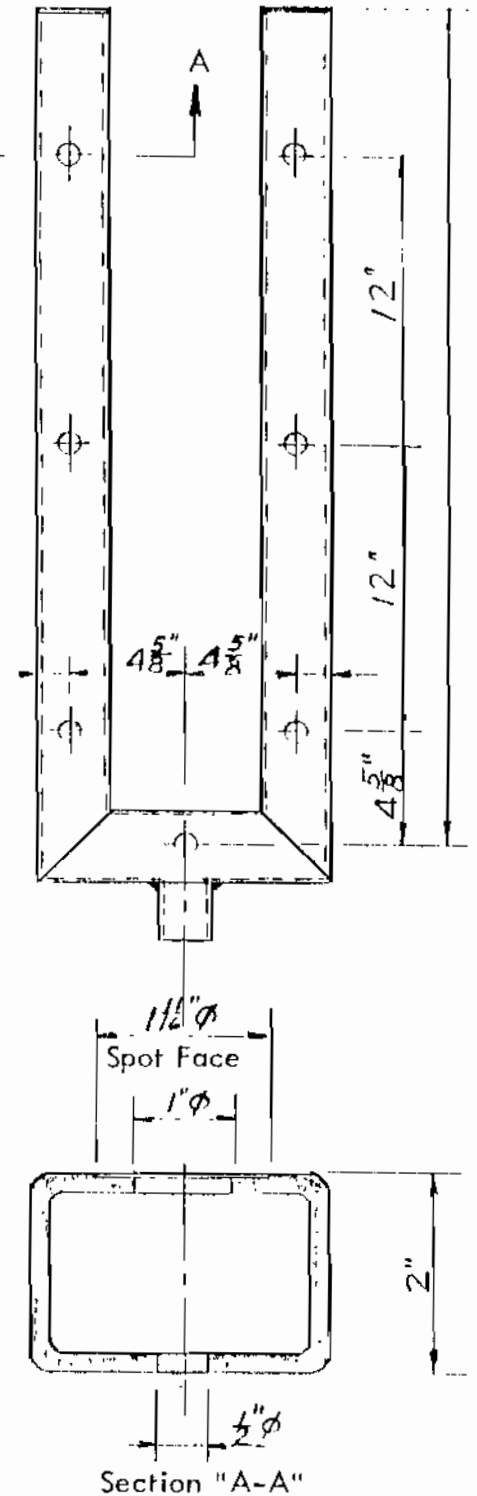
Typical BURDETT 10LC Burner Rectangular Tube  
Manifold, Alternate Mounting Arrangement

CUST. ORD.	SCALE	JOB NO.	DRAWING NO.
DATE 5/7/75	DRAWN BY ip		M-10LC

# BURNER LAYOUT



# MANIFOLD LAYOUT



Note: For Adjustable Burner Output Specify No. 10LCA

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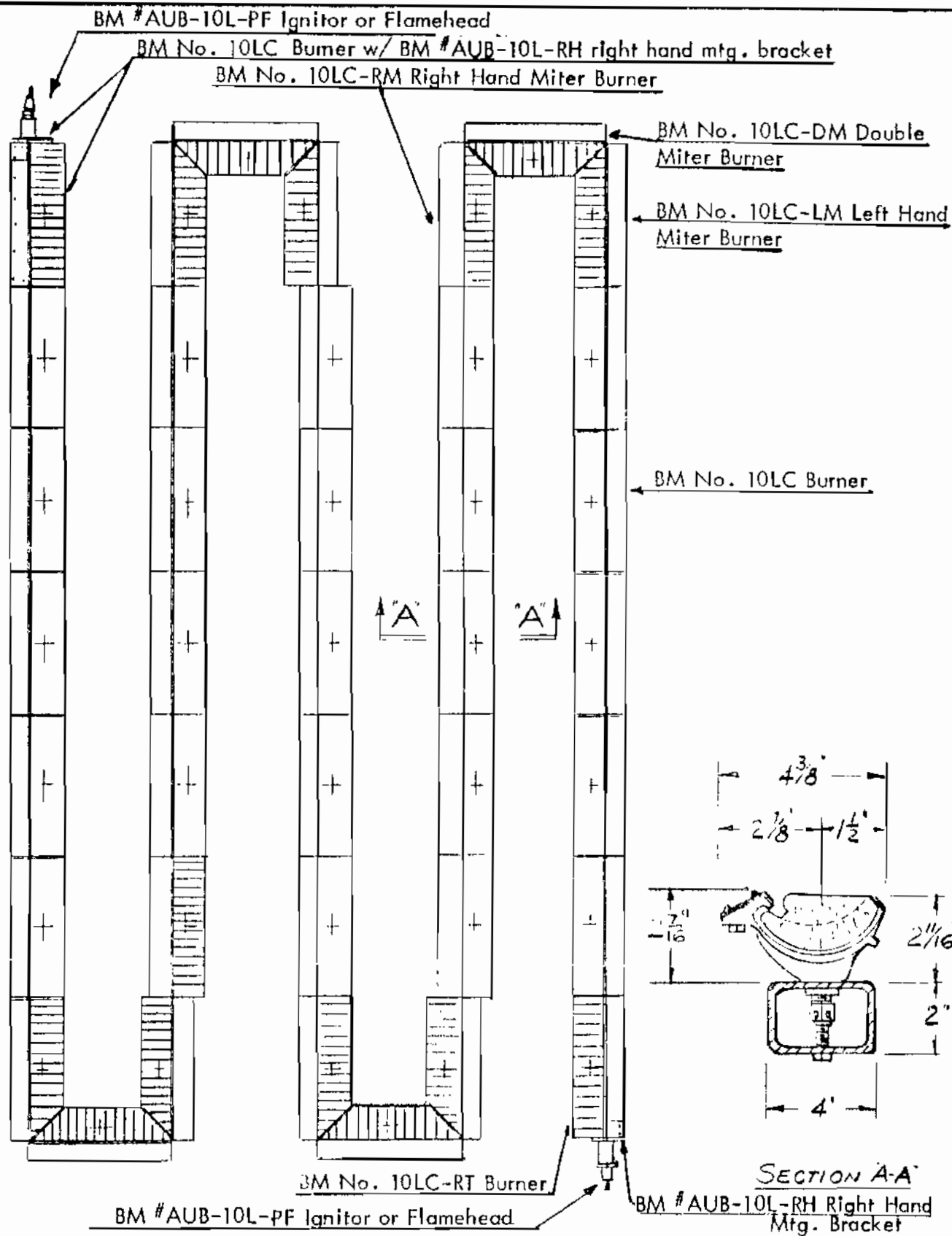
## REVISIONS

Revised 12-5-83

BURDETT MFG. CO. CHICAGO, ILL.

BURDETT No. 10LC Burners on Rectangular Tube  
Manifold - "U" Layout - 2" x 3" Tube Standard

CUST. ORD.	SCALE	JOB NO.	DRAWING NO.
DATE 5/12/75	DRAWN BY ip		M-10LC-1



Note: For Adjustable Burner Output, Specify No. 10LCA Burners.

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MFG. CO.

REVISIONS

Revised 12-5-88

**BURDETT MFG. CO. CHICAGO, ILL.**

BURDETT No. 10LC Burners on Rectangular  
Tube Manifold - Serpentine Layout

CUST. ORD.

SCALE

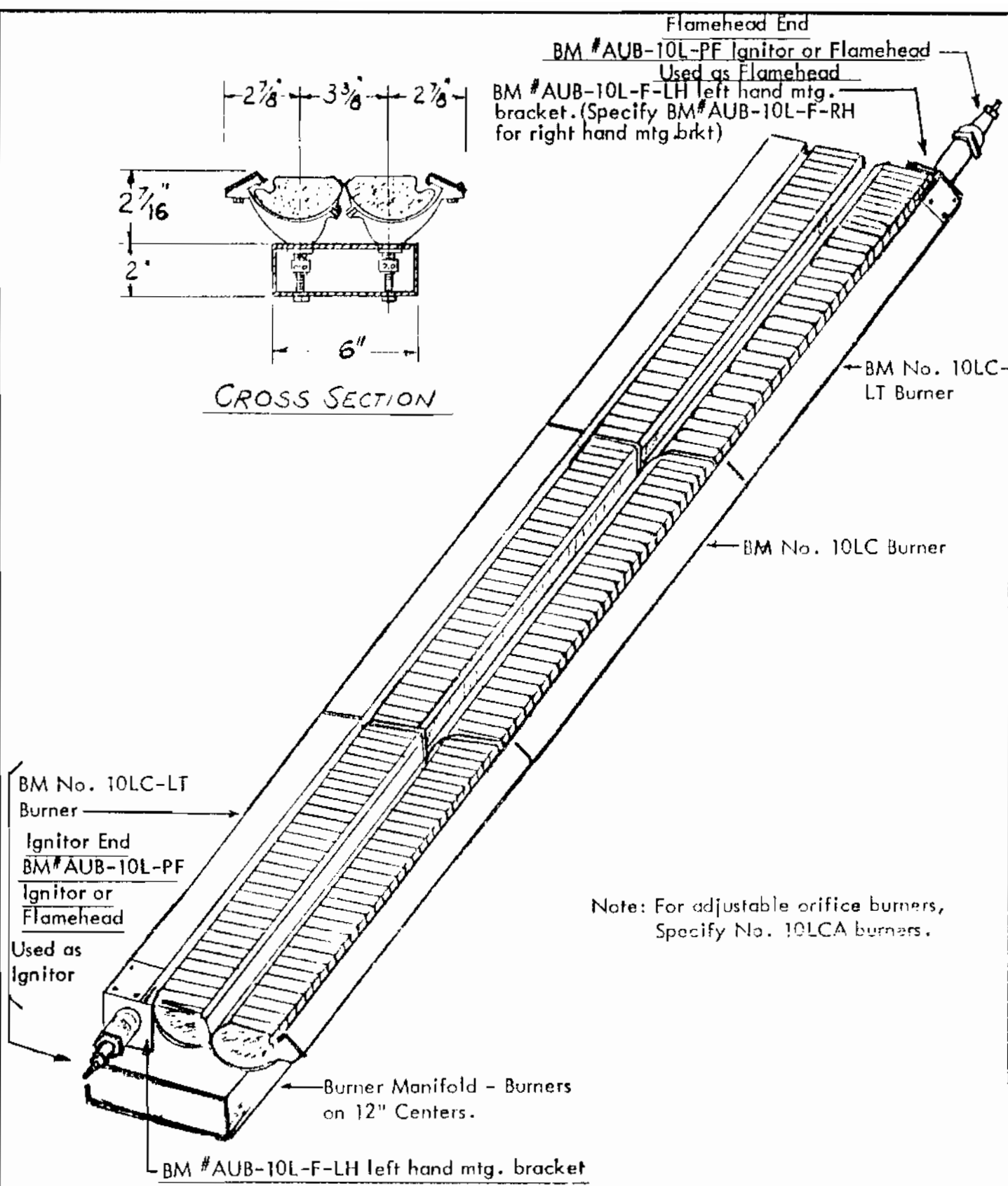
JOB NO.

DRAWING NO.

DATE 5/15/75

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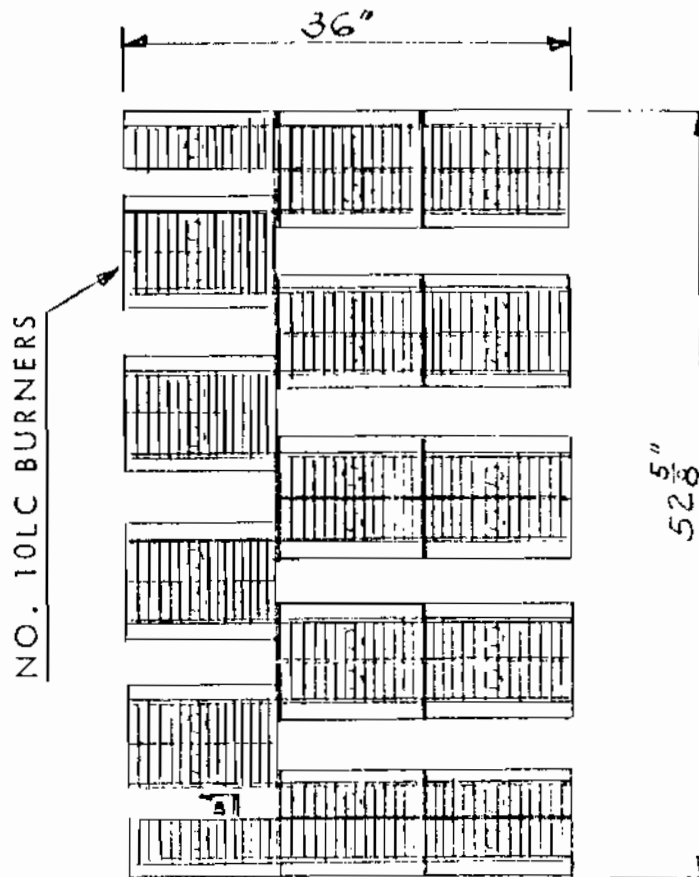
M-10LC-2



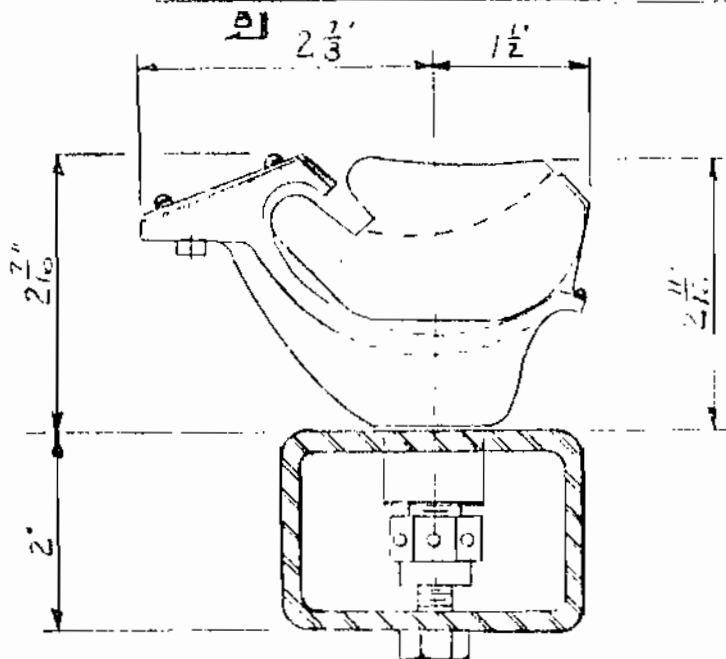
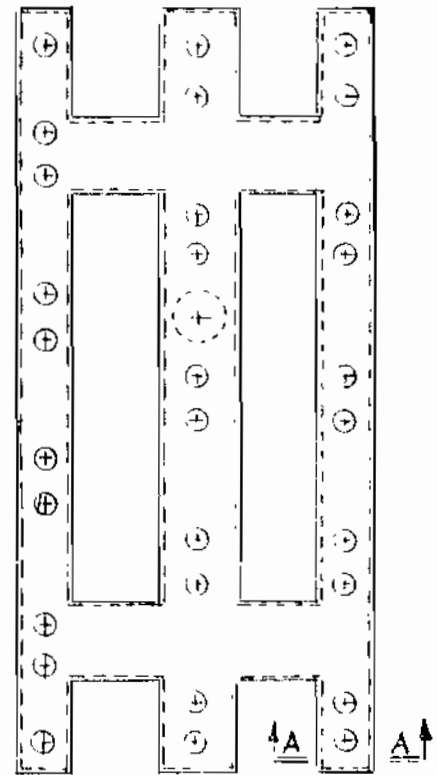
Note: For adjustable orifice burners, Specify No. 10LCA burners.

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		BURDETT No. 10LC Burners on Rectangular Tube Manifold, Double Row Mounting Arrangement			
		CUST. ORD.	SCALE	JOB NO.	DRAWING NO.
		DATE 5/29/75	DRAWN BY: jp		M-10LC-3

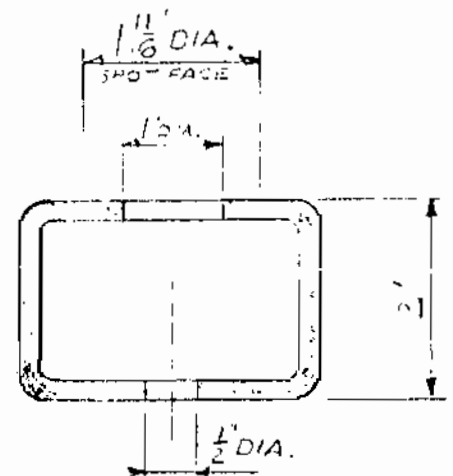
# BURNER LAYOUT



# MANIFOLD LAYOUT



SECTION "B-B"



SECTION "A-A"

Note: For Adjustable Burner Output Specify No. 10LCA

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## REVISIONS

**BURDETT MFG. CO. CHICAGO, ILL.**

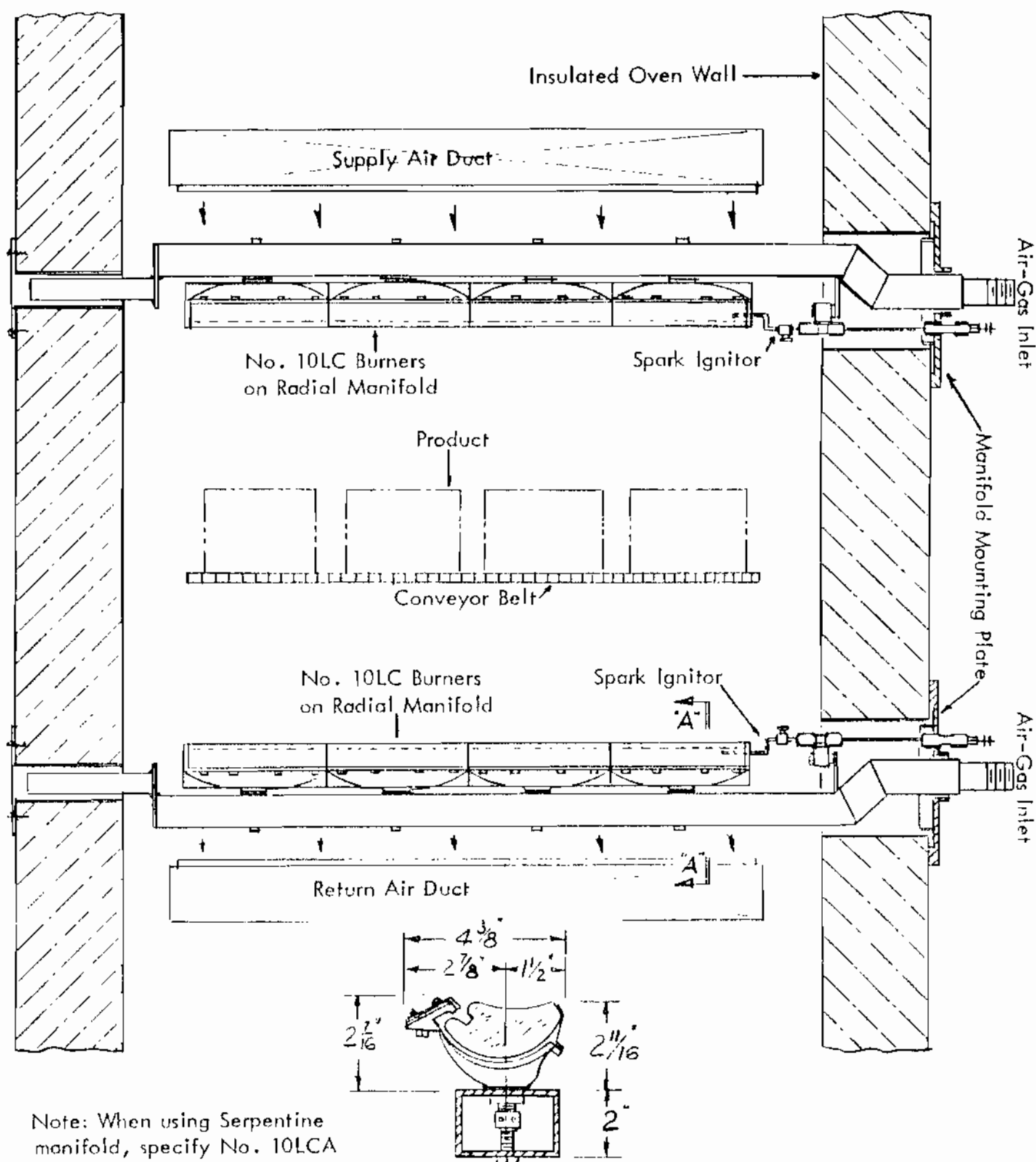
BURDETT No. 10LC Burners on Rectangular  
Tube Manifold - Radiant Panel Array

CUST. ORD.  
DATE 6-22-82

SCALE  
DRAWN BY JP

JOB NO.

DRAWING NO.  
M-10LC-5



Note: When using Serpentine manifold, specify No. 10LCA burners to balance temperature across belt width.

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REVISIONS

BURDETT MFG. CO. CHICAGO, ILL.

Typical Belt Conveyor Oven With  
BURDETT No. 10LC Burners On  
Radial Manifold

CUST. ORD.

SCALE

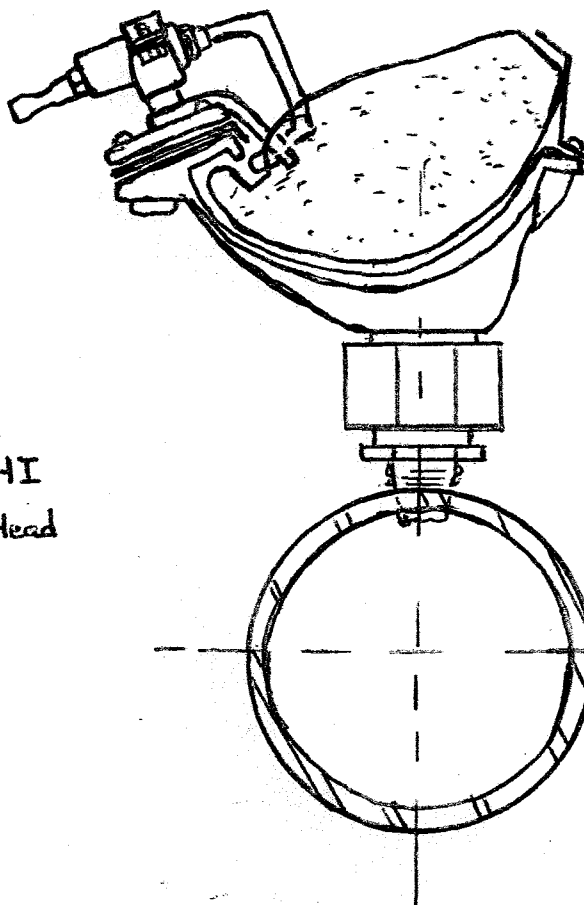
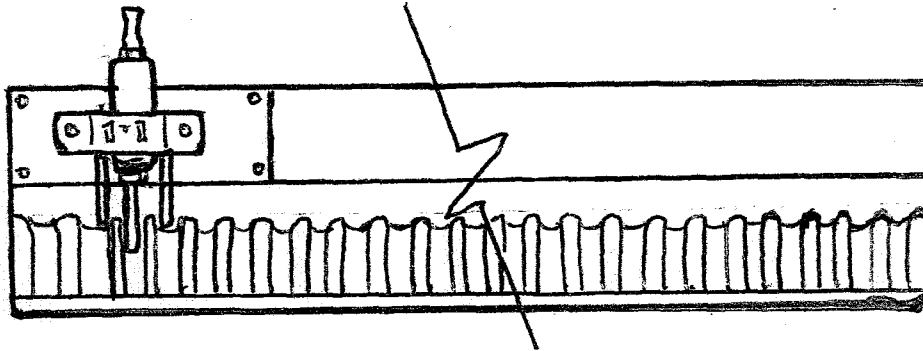
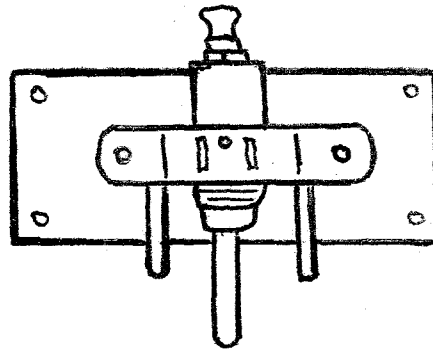
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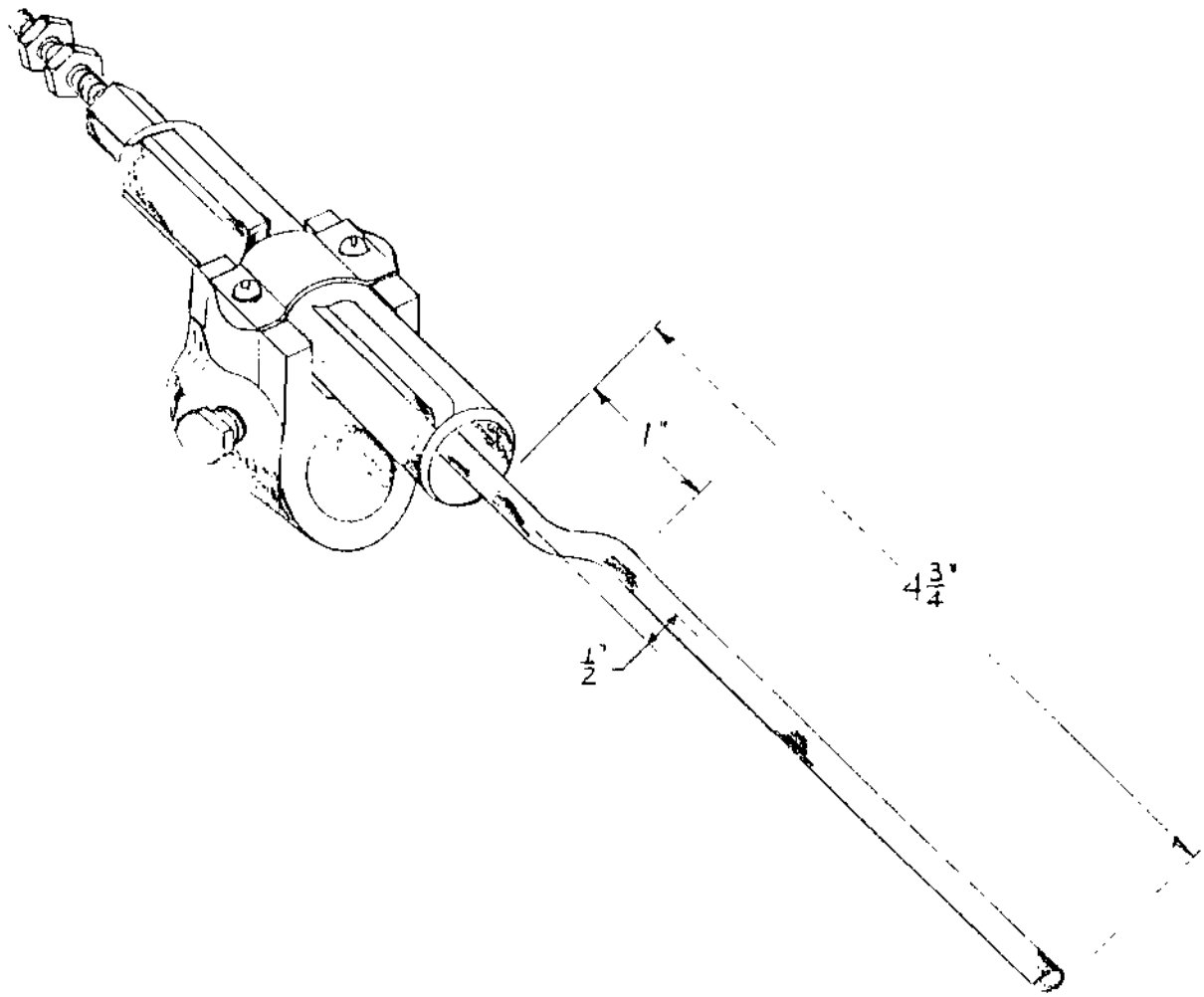
DATE 5/29/75

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CO - 1

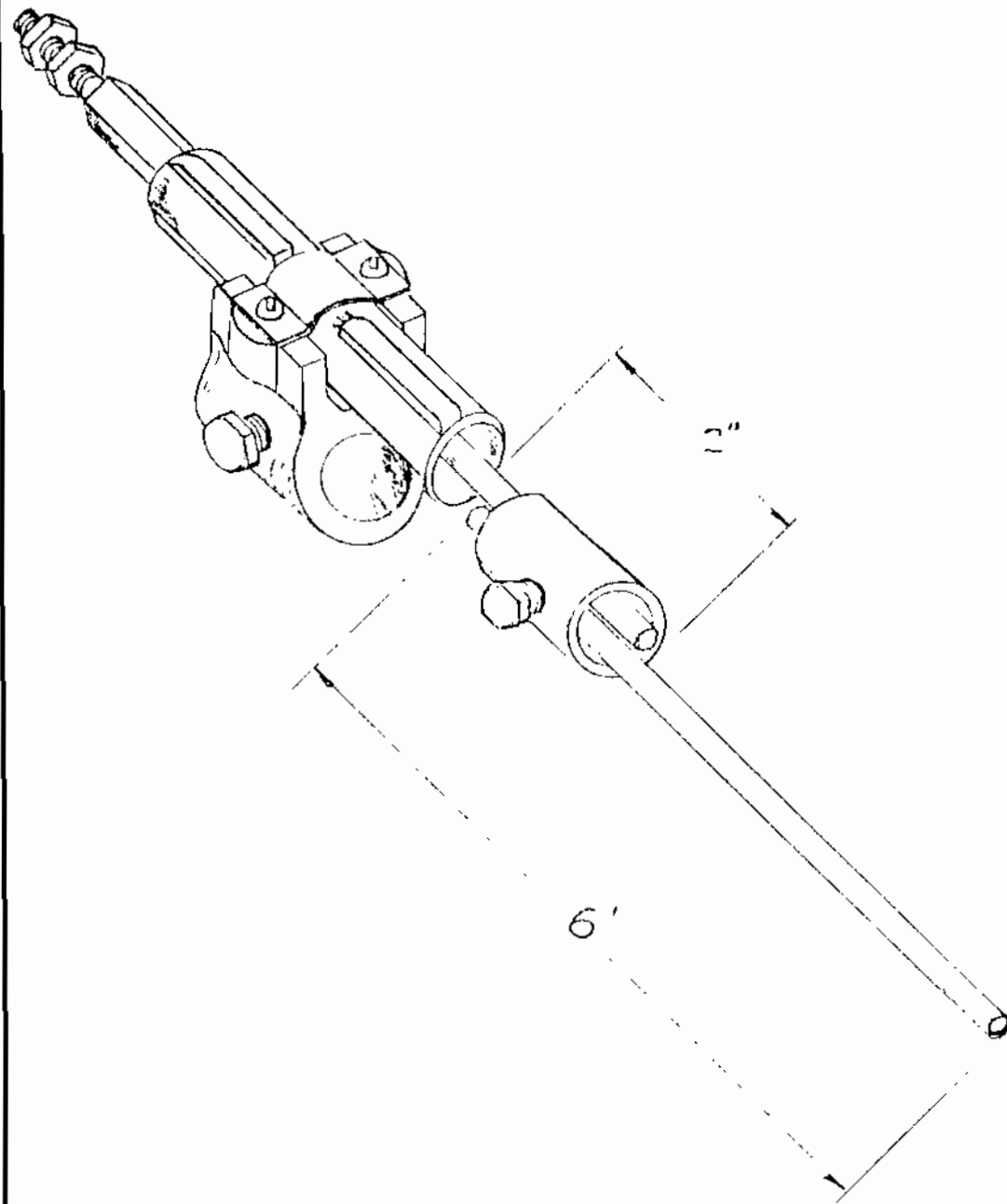


BMGDOFHI  
Igniter / Flame Head

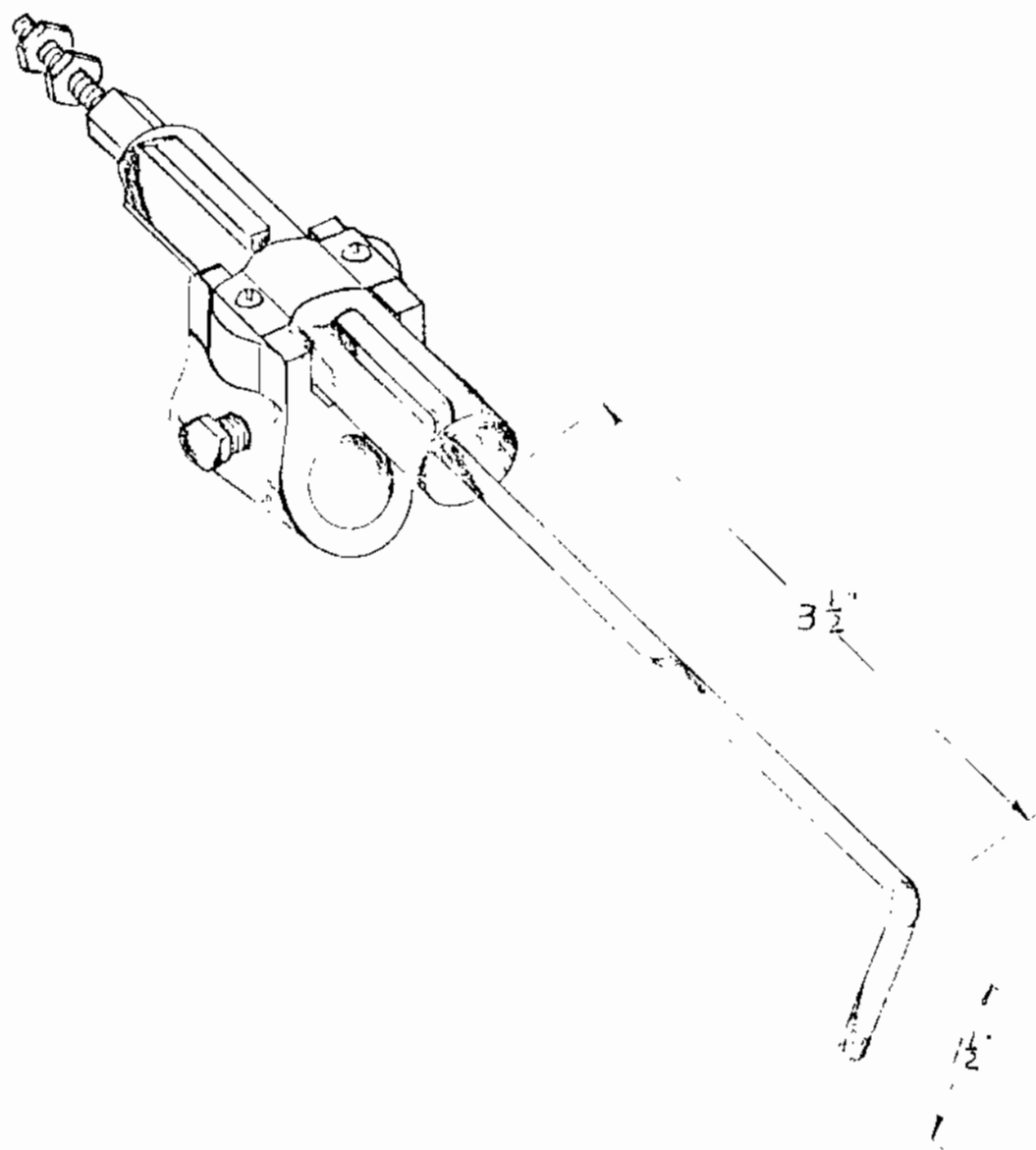


BURDETT Model BM8005P-10L Spark Ignitor Assembly For 10L Burners.

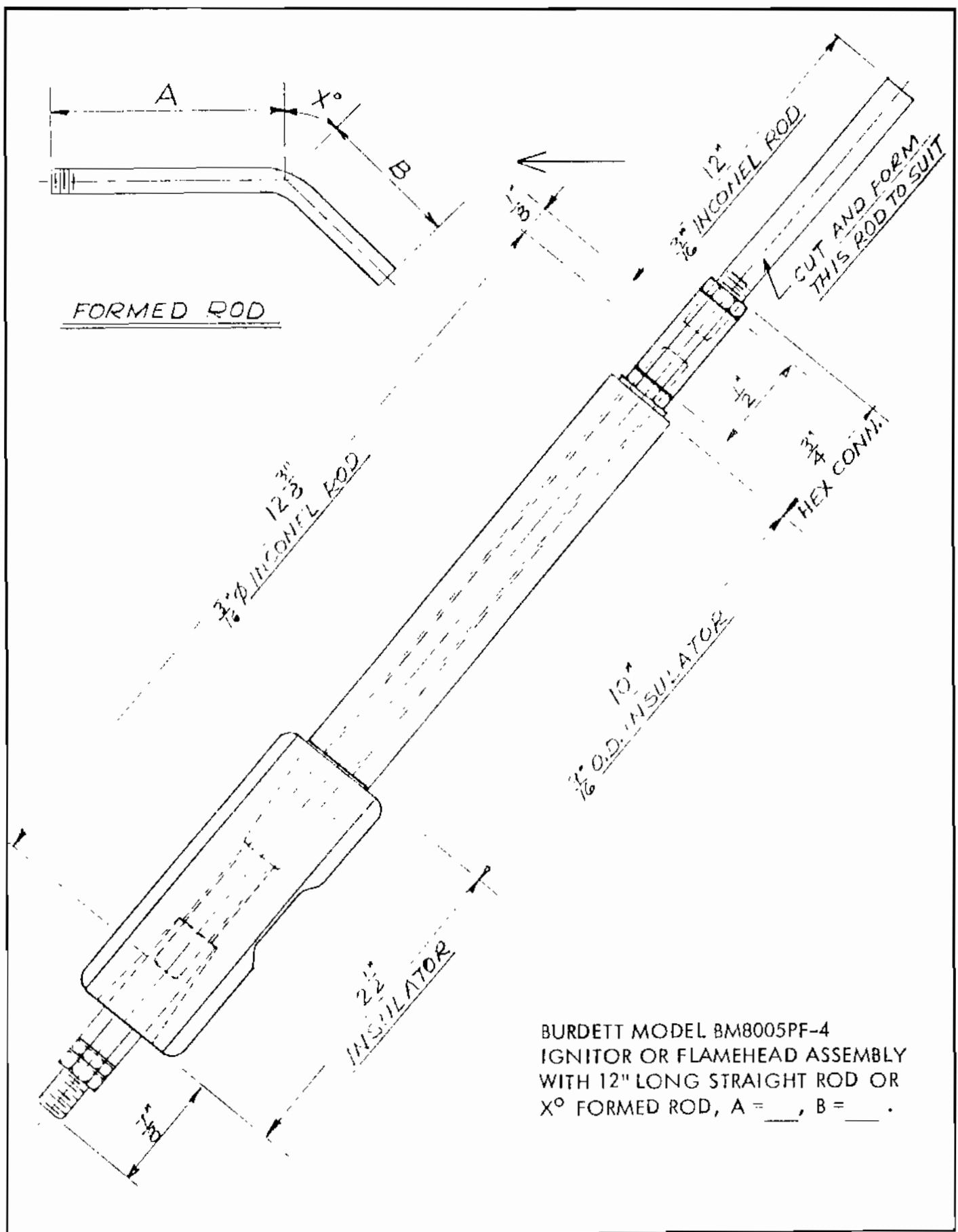


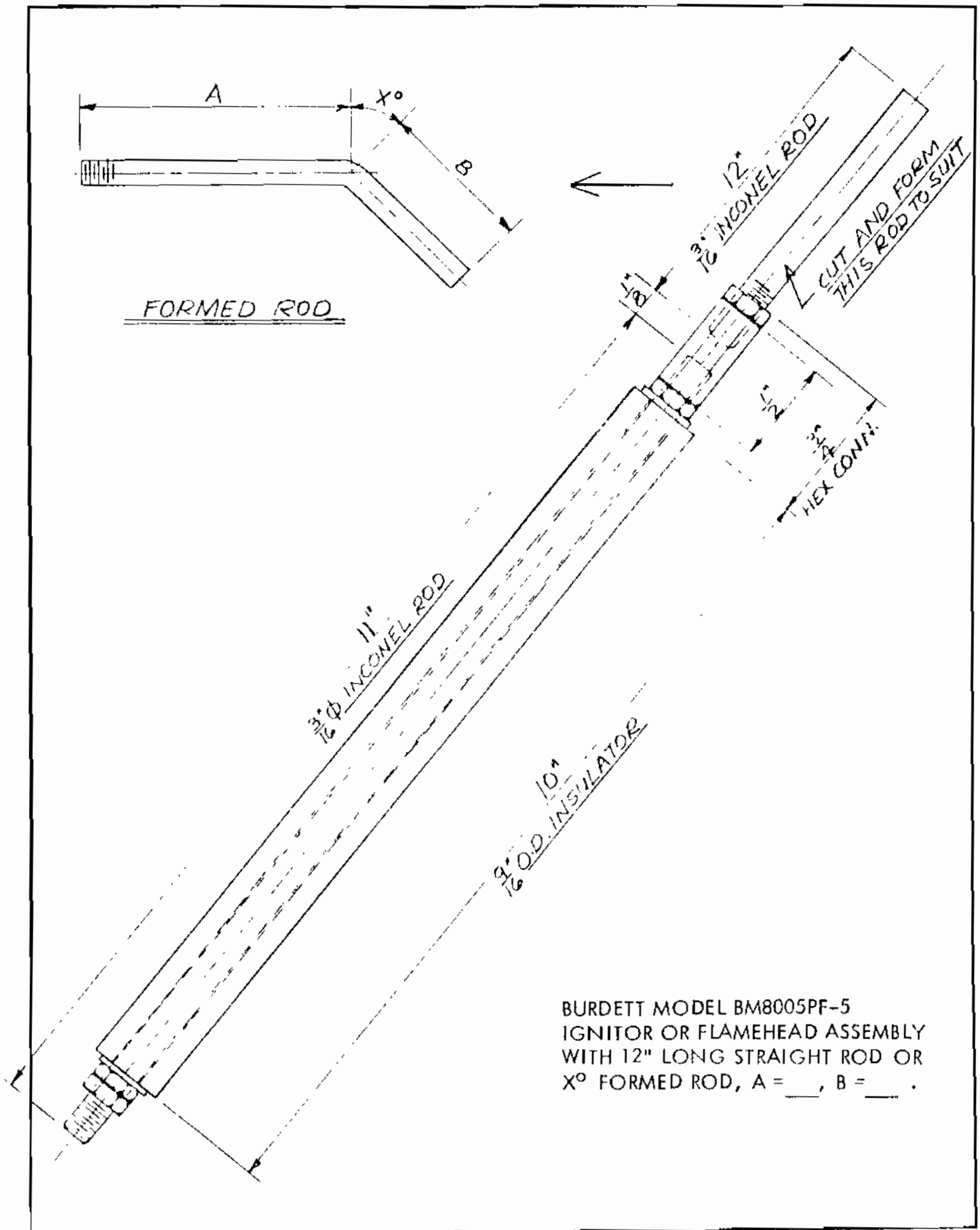


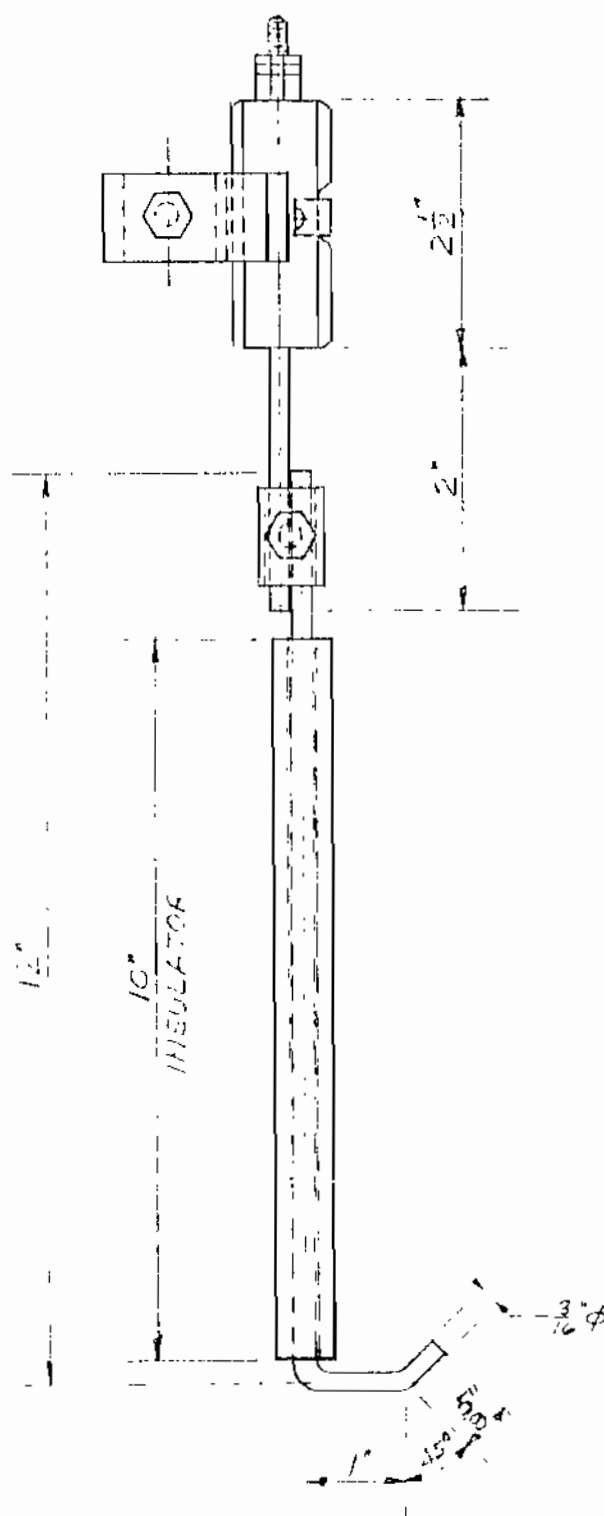
BURDETT Model BM8005PF-2 2 Piece Ignitor or Flame Head Assembly.



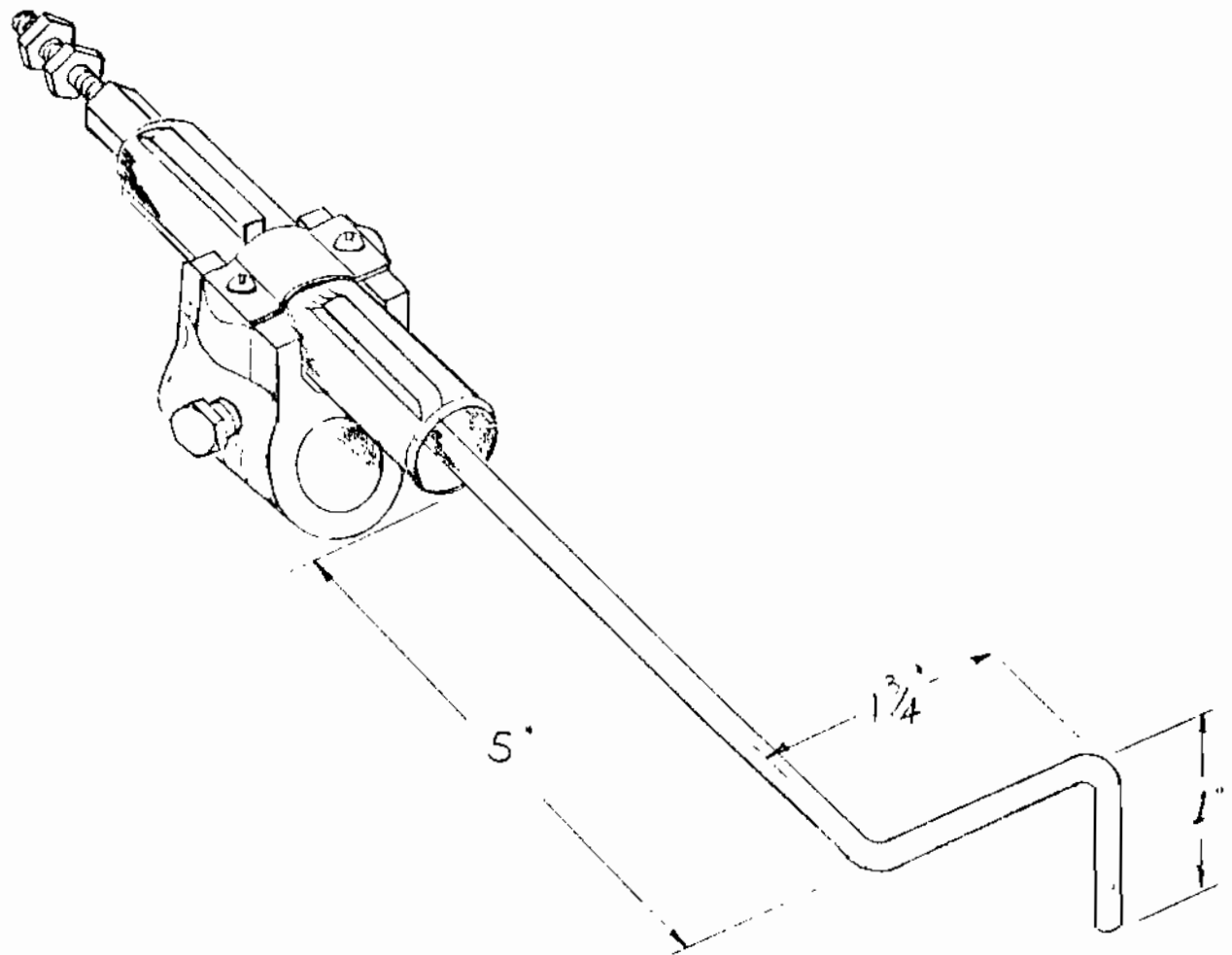
BURDETT Model BM8005PF-1 Ignitor Assembly for Nos. 21, 30 & 32 Burners.







BURDETT MODEL BM 8005PF-6  
IGNITOR OR FLAMEHEAD ASSEMBLY



BURDETT Model BM8005FH-10L-RH Flame Head Assembly For Model 10L Burners.  
Right Hand Mount Shown.

Note: For Left Hand Mount, Specify Model BM8005FH-10L-LH Flame Head Assembly.



# BURDETT ENGINEERING DATA SHEET No. 10L-2

## Instructions for Setting BURDETT Model BM 8005FH-10L-LH and RH Flameheads

Ref: BURDETT drawing No. A-345

### General

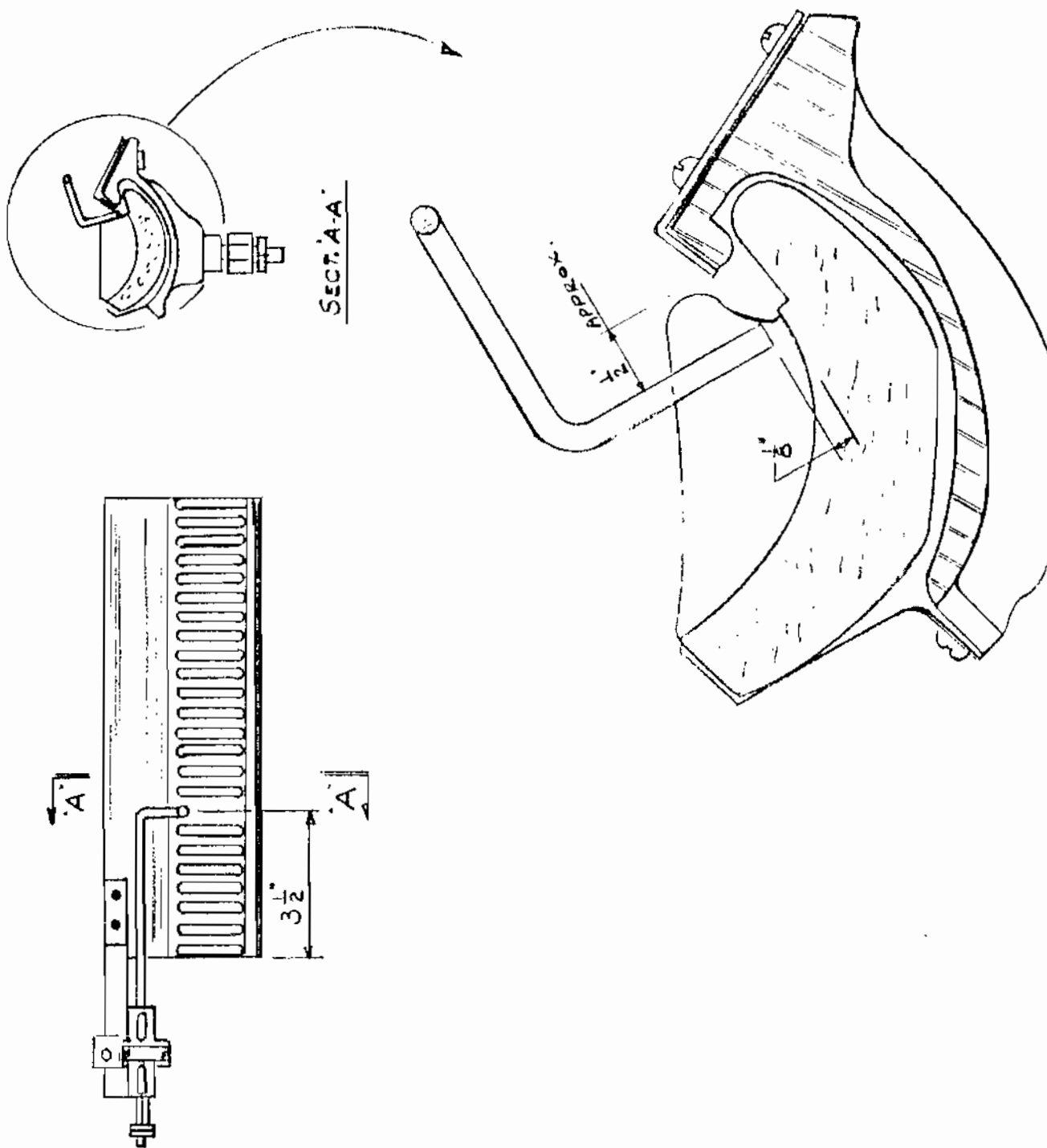
The flamerod must be positioned so that it is in the burner flame both at high and at low fire. In addition, it must be so positioned that it cannot touch the burner refractory. This is because, although the refractory is a good electrical insulator when cold, when hot (face temperature can reach 2,000°F), it is sufficiently conductive to ground out the flame signal, causing nuisance shutdown of the burners. In this regard it is important to note that there is insufficient room between the ribs of the refractory of BURDETT model 10L burners for the flamerod. While the rod might not touch the ribs when cold, when it is hot, expansion of the flamerod material will cause it to touch the hot refractory, causing loss of flame signal and shutdown.

### Specific Instructions

- 1) Measure in  $3\frac{1}{2}$ " from whichever end flamehead is mounted on. Break out refractory rib closest to this location and chisel the broken rib down to the same curvature as the grooves between the ribs.
- 2) Loosen setscrew in flamehead bracket and install flamehead on mounting bar as shown (left hand mounting shown, opposite side for right hand mounting).
- 3) Lightly hand tighten setscrew and position flamerod tip directly over the broken out rib and as shown in the cross section drawing.
- 4) Tighten setscrew. Test flamerod position by pushing tip of rod against refractory with finger. When released, the rod should spring back so that the tip is  $1/8$ " off refractory.
- 5) If flamerod tip remains against refractory when released, loosen setscrew and readjust. Repeat steps 4 and 5 until flamerod springs back to correct position when released.
- 6) Tighten setscrew securely and recheck both for correct position and spring back after pressing against refractory.

When the BM 8005FH-10L flamehead is set and adjusted as described above, it should give a minimum signal of 2  $\mu$ a when used with a model RA890F flame safeguard.

NOTE: For application temperatures in excess of 400 to 450°F, flamerod insulators can break down causing loss of signal and nuisance shutdown. If this occurs, contact BURDETT for alternative flamerod suggestions or conversion to ultra-violet flame sensing.



Ref: Burdett Engineering Data Sheet No. 10L-2

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# REVISIONS

**BURDETT MFG. CO. CHICAGO, ILL.**

Installation of Burdett Model

BM 8005FH-10L Flamehead on Burdett

Model 10L Burner

CUST. ORD. -

SCALE -

JOB NO. -

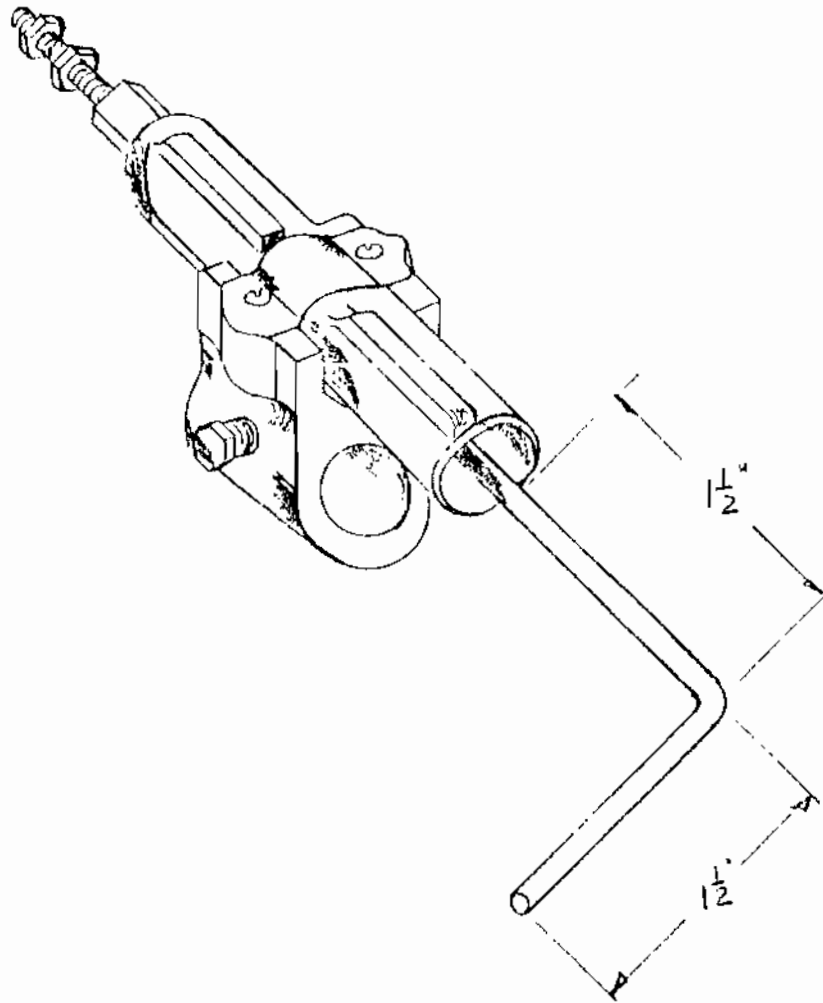
DRAWING NO.

DATE 9/15/82

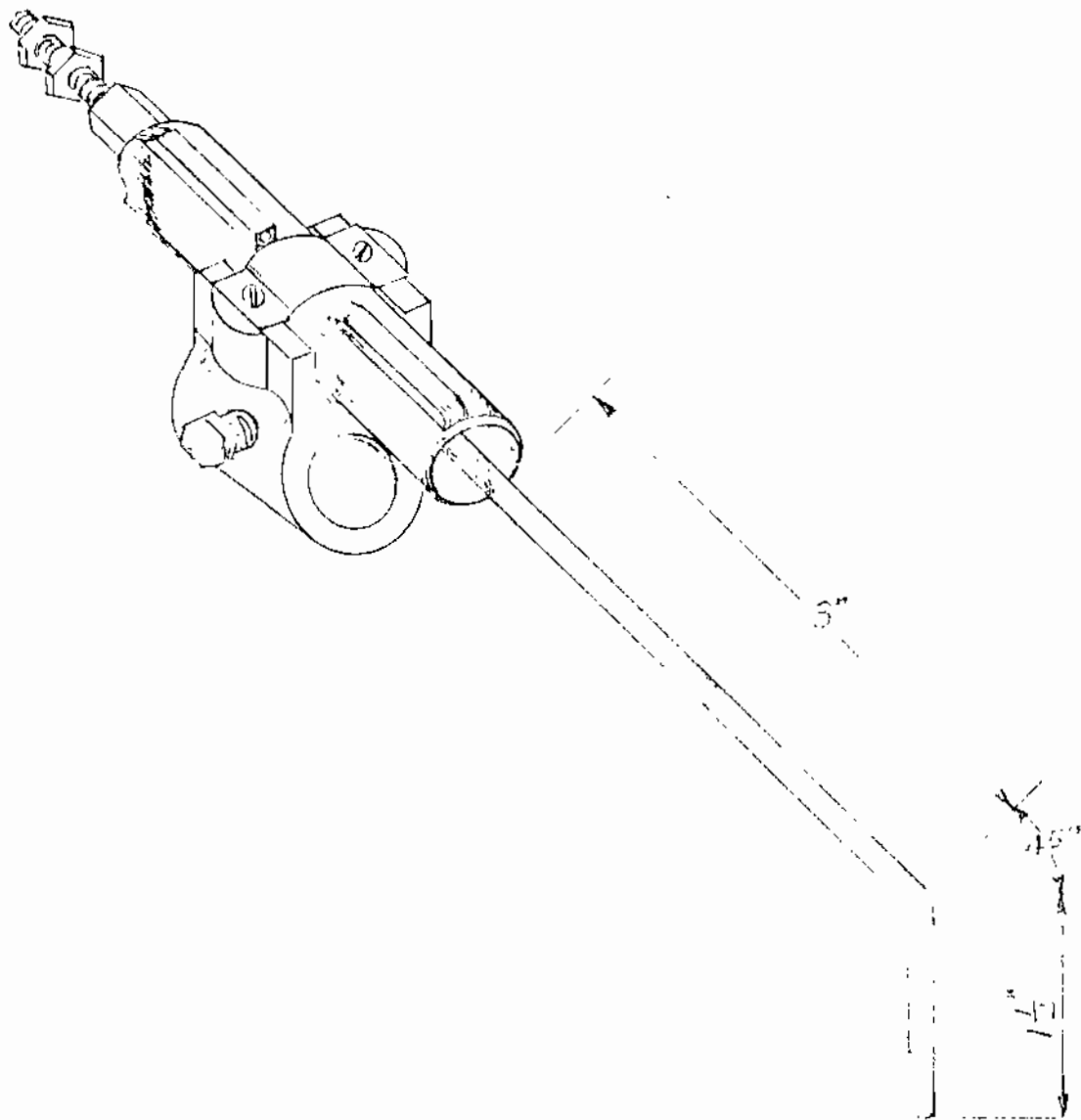
DRAWN BY JP

A-345

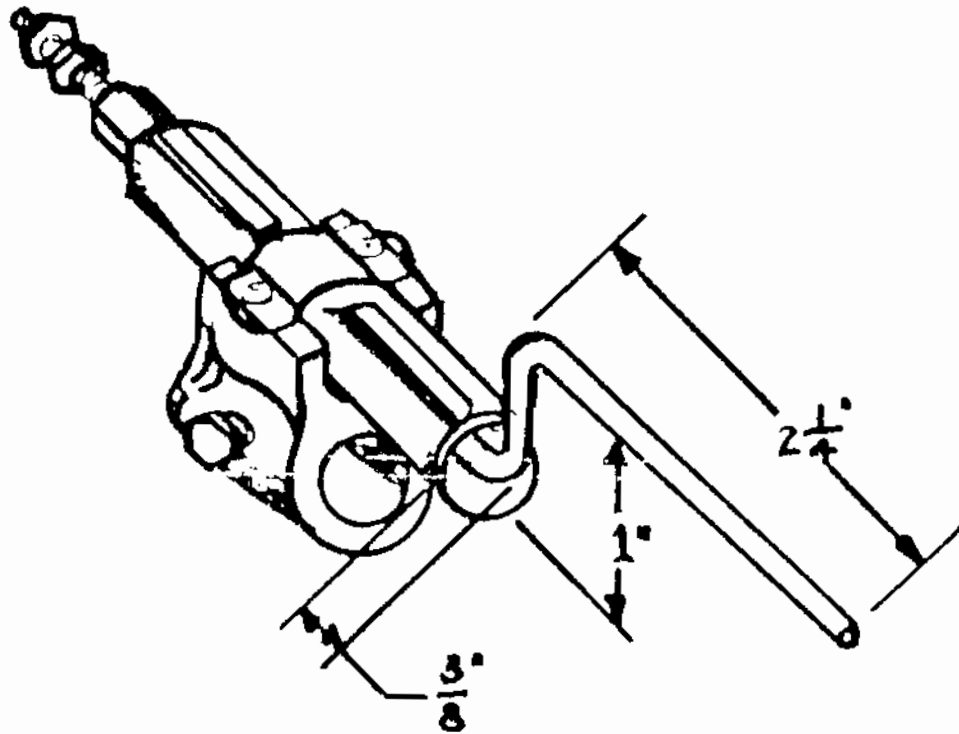




BURDETT Model BM8005FH-BT Flamehead Assembly for Pilot Blast Tip on #10L Burners



BURDETT Model BM8005PF-3 Flamehead Assembly for Nos. 21, 30 & 32 Burners.



BURDETT Model BM8005FH-10L-A Flamehead Assembly for 10L Burners



## BURDETT ENGINEERING DATA SHEET No. A-346

### New BURDETT Model BM8005FH-10L-A Flamehead - Instructions for Setting

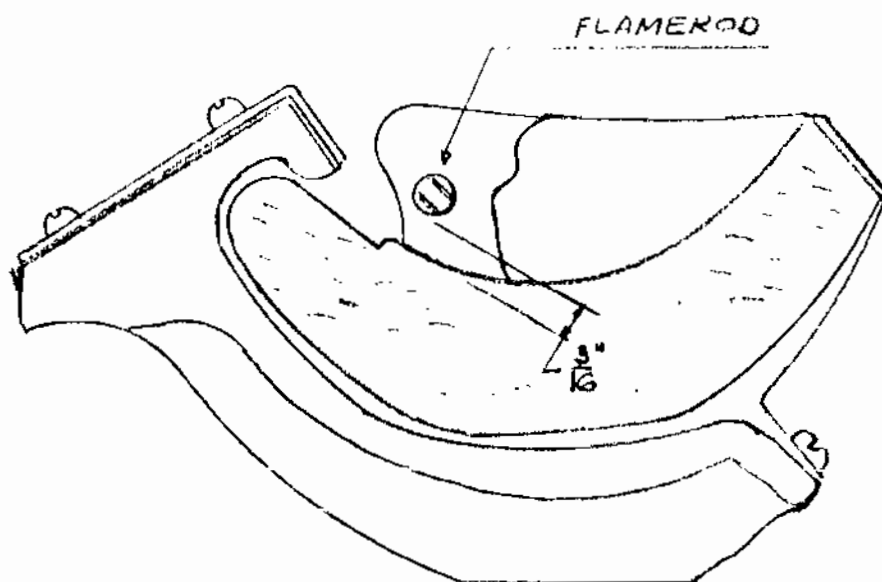
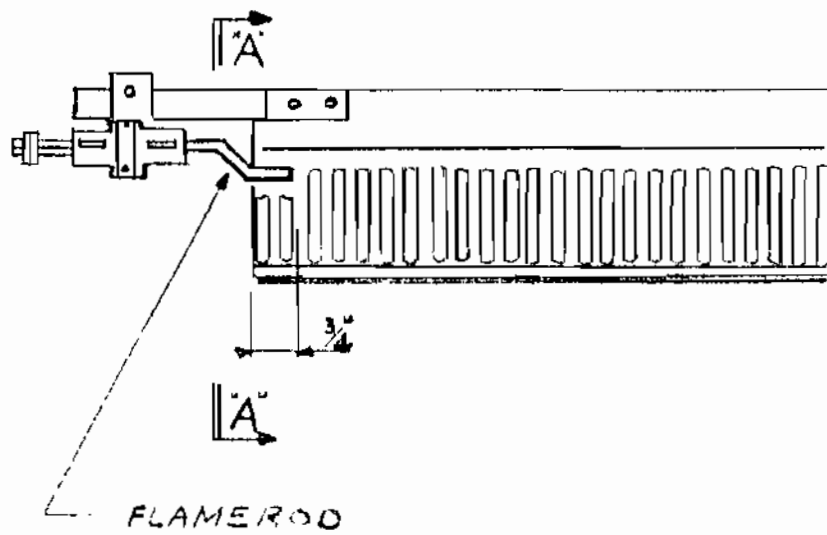
BURDETT has recently developed a new style flamehead for use with our model 10L gas fired infra red burners. The new flamehead gives a much stronger signal than the old style at low firing rates, and allows routine firing of 10L burners at a mixture pressure of  $1/2$ " w.c. In addition, the new flamehead does not have a "hand" and can be mounted on either side of the burner. As with the old style flameheads, care must be taken during installation that the flamerod does not touch the burner refractory at any point, or the signal will be lost and a nuisance shutdown will occur.

### Specific Instructions

- 1) As shown on the accompanying drawing No. A-346, break off a portion of the first two refractory ribs at the flamehead end of the burner. Then chisel the broken ribs to the same curvature as the grooves between the ribs for a distance of about 1" from the slot orifice of the burner.
- 2) Loosen the setscrew in the flamehead bracket and install the flamehead on the mounting bar as shown.
- 3) Position the flamerod as shown, with about  $3/4$ " extending over the end of the burner, and with the rod about  $3/16$ " above the chiseled out portion of the burner refractory.
- 4) Tighten the setscrew and recheck the flamerod position. If it moved during tightening, loosen setscrew and readjust for correct position.
- 5) Make electrical connection to flamehead.

When the BM8005FH-10L-A flamehead is set in accordance with the above instructions, it should give a minimum signal of  $2 \mu a$  when used with a model RA890F flame safeguard on high fire, and at least  $1\frac{1}{2} \mu a$  at a firing rate of  $\frac{1}{2}$ " w.c.

NOTE: For application temperatures in excess of 400 to 450°F, flamerod insulators can break down causing loss of signal and nuisance shutdown. If this occurs, contact BURDETT for alternative flamerod suggestions or conversion to ultra-violet flame sensing.



SECTION A-A

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REVISIONS

BURDETT MFG. CO. CHICAGO, ILL.

Installation of BURDETT Model  
BM8005FH-10L-A Flamehead

on  
BURDETT Model 10L Burner

CUST ORD.

SCALE

JOB NO.

DRAWING NO.

DATE 7-19-83

DRAWN BY JP

A-346



Instructions For Setting New Burdett Model  
BM-AUB-10L-PF Flamehead/Ignitor

---

Ref: Burdett drawing No. A-348

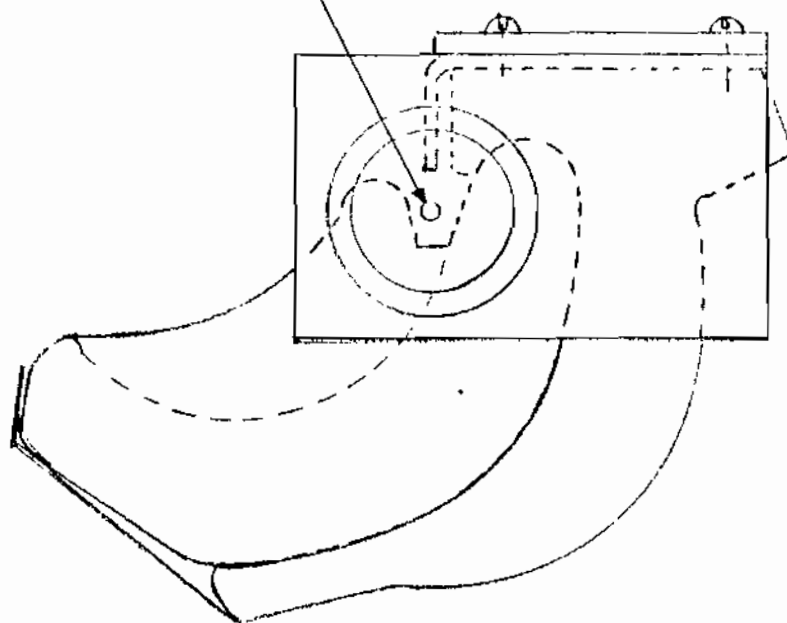
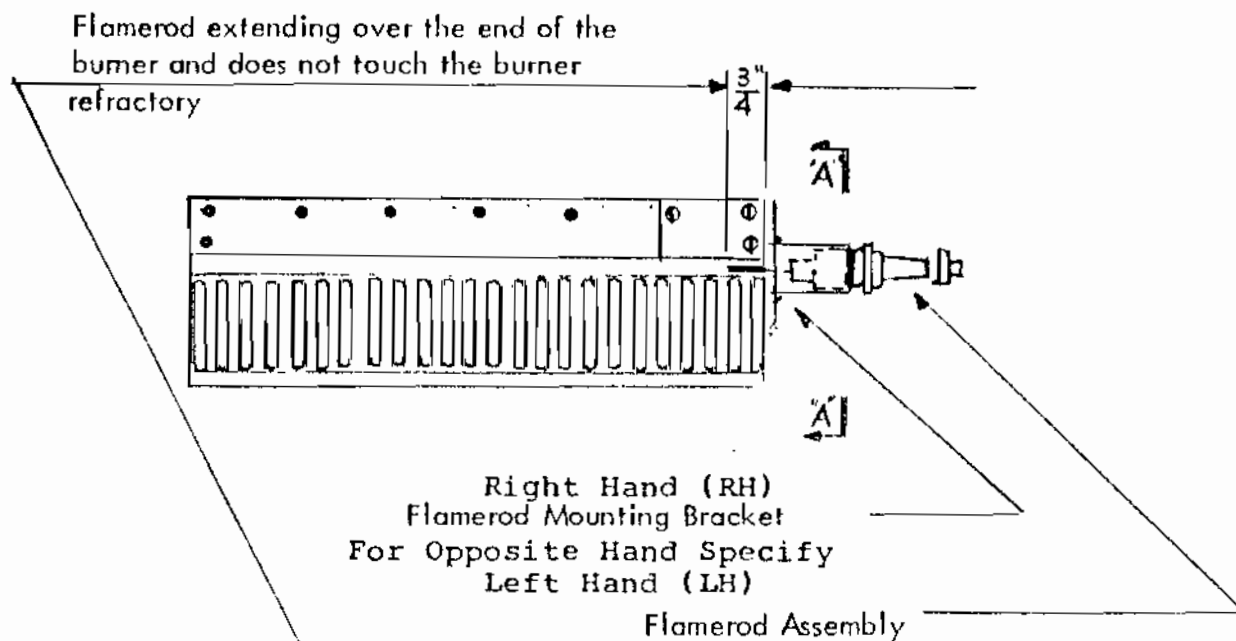
This new style flamehead/ignitor, a product of Burdett's continuing efforts to improve quality, is very easy to position, and once set, will not move out of position as would sometimes happen with our older model flameheads. It will give consistently strong flame signals over the full range of firing rates of our model 10L infra red burners, and over a wide range of air-gas mixture ratios.

Specific Instructions

- 1) This flamerod/ignitor and bracket will mount only on Burdett's new style model 10L burner with flat stainless steel burner top. It cannot be mounted on the old style model 10L burners with rounded cast iron burner top. If you have the old style burners, only the flamehead and/or ignitor burners need to be changed to the new style burner.
- 2) Mount the flamerod/ignitor mounting bracket under the three endmost stainless steel screws that hold down the burner top as shown on the drawing.
- 3) Screw the flamerod/ignitor into the bracket as shown. Measure exposed portion of the flamerod. If it is too long, mark it at 3/4" of exposed section, remove it from the bracket and cut it to the proper length.
- 4) Screw the flamerod/ignitor back into the bracket hand tight only, do not use a wrench, make electrical connection to flamerod/ignitor.
- 5) Check to be sure the flamerod/ignitor is not touching either the burner refractory or the metal burner body. If it is, reposition the mounting bracket so the flamerod is free and retighten the bracket.
- 6) Start your burners - that's it!

Part Numbers

BM-AUB-10L-PF	Flamerod/Ignitor only	
BM-AUB-10L-F-RH	Right hand mounting bracket	(shown)
BM-AUB-10L-F-LH	Left hand mounting bracket	



VIEW "A-A"

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REVISIONS

Rev. 12-6-88

BURDETT MFG. CO. CHICAGO, ILL.

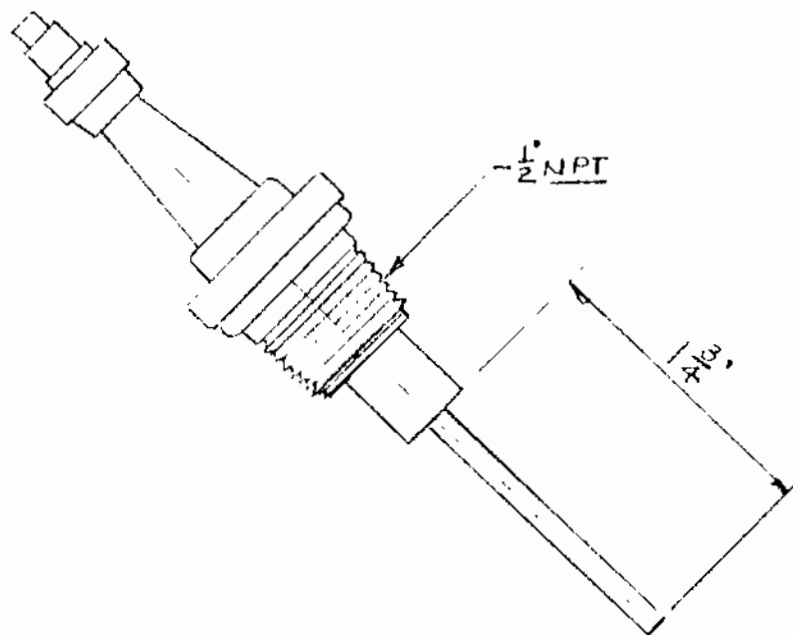
Installation of Burdett  
Model AUB-10L-PF Flamerod  
on  
Burdett Model No. 10L Burner

CUST. ORD.  
DATE 6-22-88

SCALE  
DRAWN BY

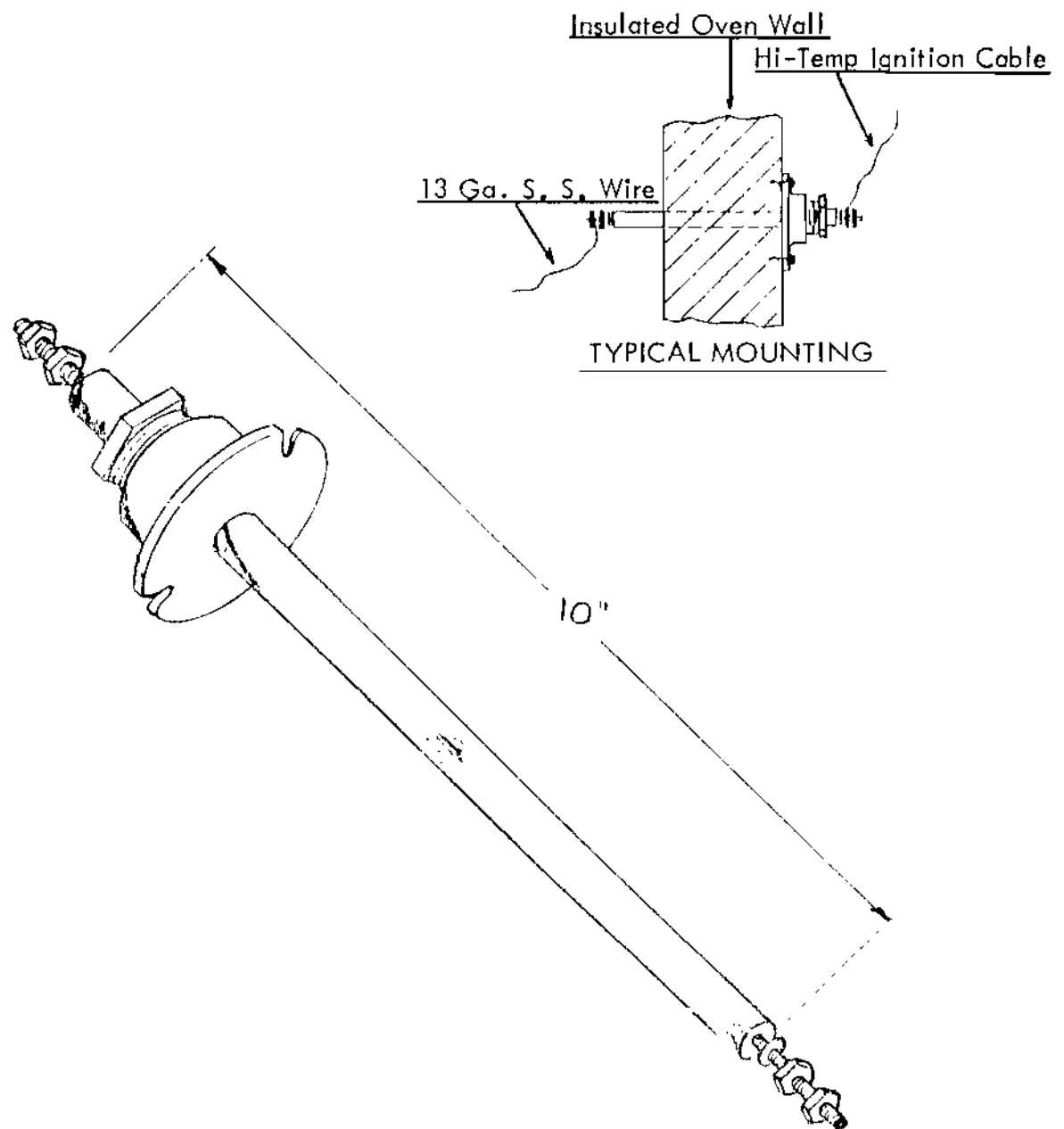
JOB NO.

DRAWING NO.  
A-348



BURDETT MODEL 8M-AUB-10L-PF IGNITOR OR FLAMEHEAD

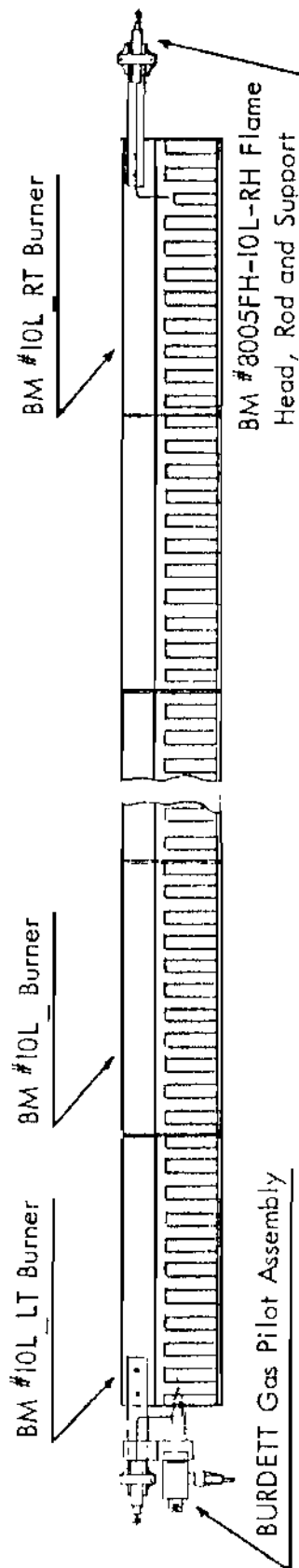




BURDETT Model BM8002 Oven Wall Insulator, Rod And Flange Assembly.

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# REVISIONS



## BURDETT Standing Pilot System For F.I.A. Systems

The BURDETT standing pilot system has been developed to meet the Factory Insurance Association safety requirement that all main burners have a standing pilot. To meet F.I.A. requirements, it is satisfactory to supervise either the pilot burner or the main burner row, but the pilot burner must be lit and proven before bringing on the main gas. BURDETT does not consider it sufficient to supervise only the pilot. Therefore we recommend the above burner and pilot system. The flamerod of the pilot burner and the flamerod of the main burner row are connected to the same combustion safeguard through the contacts of a time delay relay. Upon initial light-off, the flamerod of the pilot burner is connected to the flame safeguard, and the pilot gas is brought on together with the pilot spark ignitor. When the pilot burner has been lit, it will pull in the combustion safeguard by means of its flamerod. This will simultaneously bring on the main gas and start the time delay relay timing out. After a suitable period of time to assure stable main burner flame (typically 10 seconds), the time delay relay will switch over to the flamerod on the main burner row, and from that time on the combustion safeguard will supervise the main burner row, although the pilot burner remains on. This satisfies the F.I.A. requirement that the pilot burner be lit and proven prior to bringing on the main gas, and also the requirement that the pilot remain on at all times. However, in addition to these requirements, this system assures that the flame has travelled the full length of the main infra red burner row. This system has been approved by the Factory Insurance Association.

**BURDETT MFG. CO. CHICAGO, ILL.**

BURDETT Standing Pilot System for F.I.A. Systems

CUST. ORD.

SCALE - -

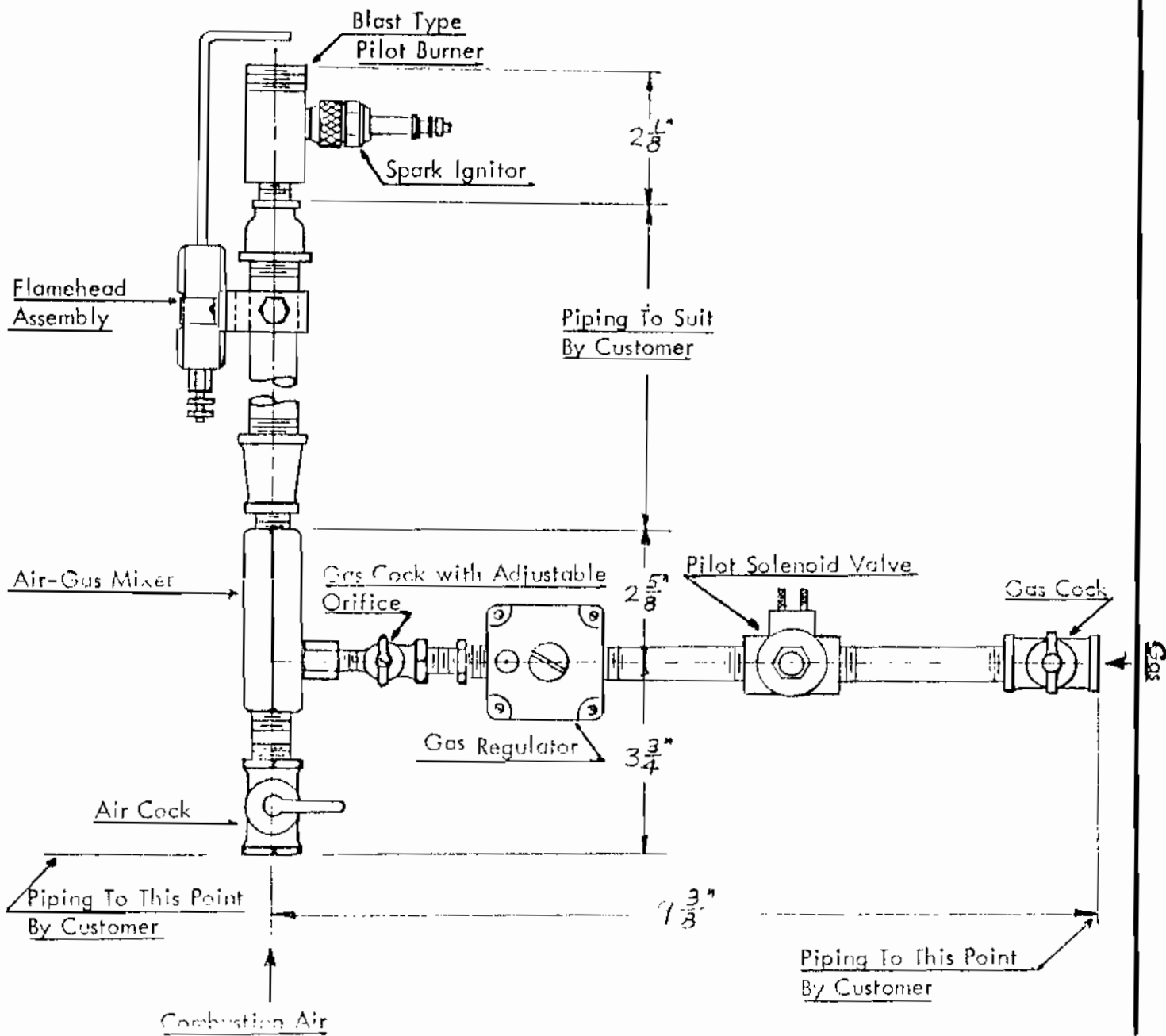
JOB NO.

DRAWING NO.

DATE 7/9/75

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SP-1



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REVISIONS

REVISED 11/14/77

BURDETT MFG. CO. CHICAGO, ILL.

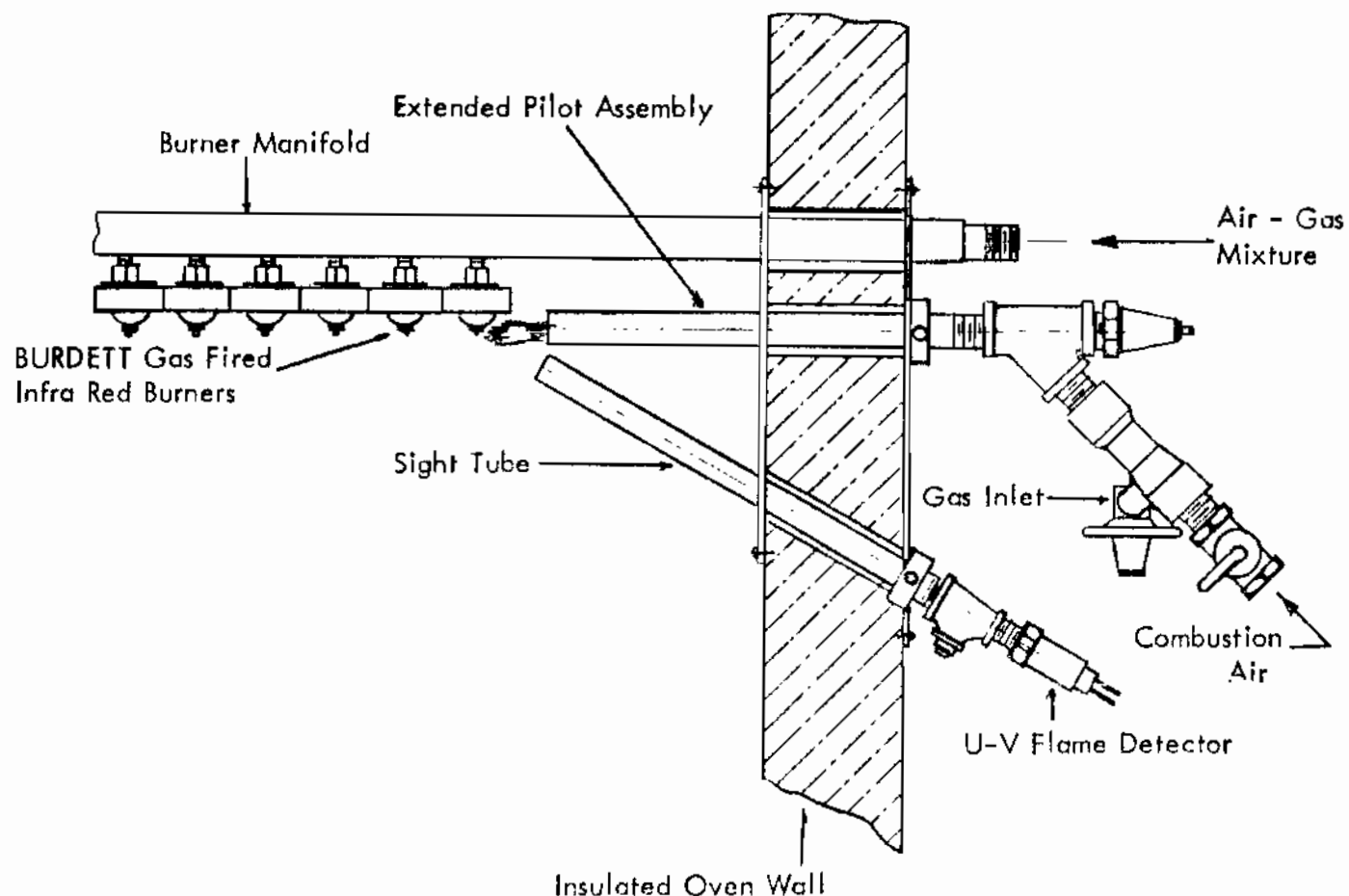
BURDETT Gas Pilot Assembly

CUST. ORD.  
DATE 5/27/75

SCALE  
DRAWN BY ip

JOB NO.

DRAWING NO.  
BP - 1



The BURDETT extended pilot assembly provides a safe, reliable burner ignition system. When used with an ultra-violet flame detector as shown, the entire system may be serviced from outside the oven if necessary.

Prices Available Upon Request

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# REVISIONS

**BURDETT MFG. CO. CHICAGO, ILL.**

**BURDETT Extended Pilot Assembly  
With Ultra-Violet Flame Detector**

CUST. ORD.

SCALE

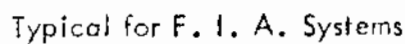
JOB NO.

DRAWING NO.

DATE 5/29/75

DRAWN BY ip

BP - 2



## REVISIONS

Typical Combustion System for Multiple  
Manifold System With BURDETT IR Burners  
and Gas-Electric Pilot

DRAWING NO.

CS - 3

## **BURDETT STANDARD RADIANT BOOSTERS**

Burdett standard radiant boosters are a simple method of increasing the capabilities of an existing hot air re-circulating or convection oven. They will increase the temperature capability, the production capability, or both. The cost of the booster is low and installation is very simple, requiring virtually no oven rework.

A standard booster consists of a line of gas fired infra red burners that is installed right in the oven work chamber. Each booster includes a small prewired auxiliary control panel with means provided to interlock it with the existing oven controls. The existing oven convection burner remains in use and is used to achieve oven temperature control in the same way it was before installation of the booster. The firing rate of the infra red burners is manually adjusted to suit the process at the time of installation. The booster then fires at a constant rate to provide the needed temperature of production capacity increase.

Burdett boosters can be used in almost any single or multiple pass conveyORIZED oven. The additional heat available from the gas fired infra red burners will increase the maximum temperature the oven can reach. Furthermore, because heat is transferred to the parts by direct infra red radiation from the burners in addition to the convection heating already there, the product will reach the desired process temperature more rapidly. For this reason, the booster provide maximum benefit when used near the entrance of the oven and for about the first third of the conveyor travel through the oven.

Some of the proven uses of Burdett radiant boosters that take advantage of the higher temperature or faster product heating that can be achieved include:

- Improved curing of solvent or high solids paints
- Improved drying performance in dry-off ovens
- Faster curing of water borne coatings
- Conversion of existing liquid paint bake ovens to curing powder coatings
- Line speed acceleration of up to 33%

The accompanying drawings show a few typical installation of Burdett radiant boosters. Sheets No. B-10, B-60, B-70



# BURDETT ENGINEERING DATA SHEET No. B-54 1/31/89

## BURDETT STANDARD RADIANT BOOSTERS

### Price List

Ref. - Drawings Nos. B-51, B-52 and B-53

#### FM Type:

---

Includes prepiped gas and air trains containing main gas manual shut off cock, gas pressure regulator, high/low gas pressure switches, motorized gas valve, manual gas cock with 1/8" checking cock, gas adjuster, combustion air blower, manual butterfly valve, Burdett special air-gas mixer, Burdett burner manifold, Burdett model 10LB gas fired infra red burners, Burdett spark ignitor, Burdett flamerod, two Burdett oven wall insulators, ignition transformer, stainless steel wire and high temperature ignition wire.

Also includes control panel with blower motor starter, pushbuttons, signal lights, Honeywell flame safeguard and relay to interlock with existing oven controls.

Each package comes with a combustion diagram with bill of materials, a wiring diagram with bill of materials and start-up and trouble shooting instructions.

#### IRI Type:

---

Same as FM type but includes a second motorized gas valve, a vent solenoid valve and relay contacts to interlock with existing IRI repurge relay.

### Burdett Standard Radiant Booster Prices

Model No.	FM Type Package	IRI Type Package
10L-10		
10L-20		
10L-30		
10L-40		

All prices are FOB factory, Bridgeview, Illinois.  
Please allow approximately 6 weeks for delivery.



# BURDETT ENGINEERING DATA SHEET No. B-54 p. 2 3/10/89

## BURDETT STANDARD RADIANT BOOSTERS

Two Manifold Type

Price List

Ref. - Drawings Nos. B-52, B-53 and B-56

### FM Type:

Includes prepiped gas and air trains containing main gas manual shut off cock, gas pressure regulator, high/low gas pressure switches, motorized gas valve, manual gas cock with 1/8" checking cock, gas adjuster, combustion air blower, manual butterfly valve, Burdett special air-gas mixer, two Burdett burner manifolds, Burdett model 10LB gas fired infra red burners, two Burdett spark ignitors, two Burdett flamerods, four Burdett oven wall insulators, two ignition transformers, stainless steel wire and high temperature ignition wire.

Also includes prewired control panel with blower motor starter, pushbuttons, signal lights, two Honeywell flame safeguards and relay to interlock with existing oven controls.

Each package comes complete with combustion and wiring diagrams with bill of materials and start-up and trouble shooting instructions.

### IRI Type:

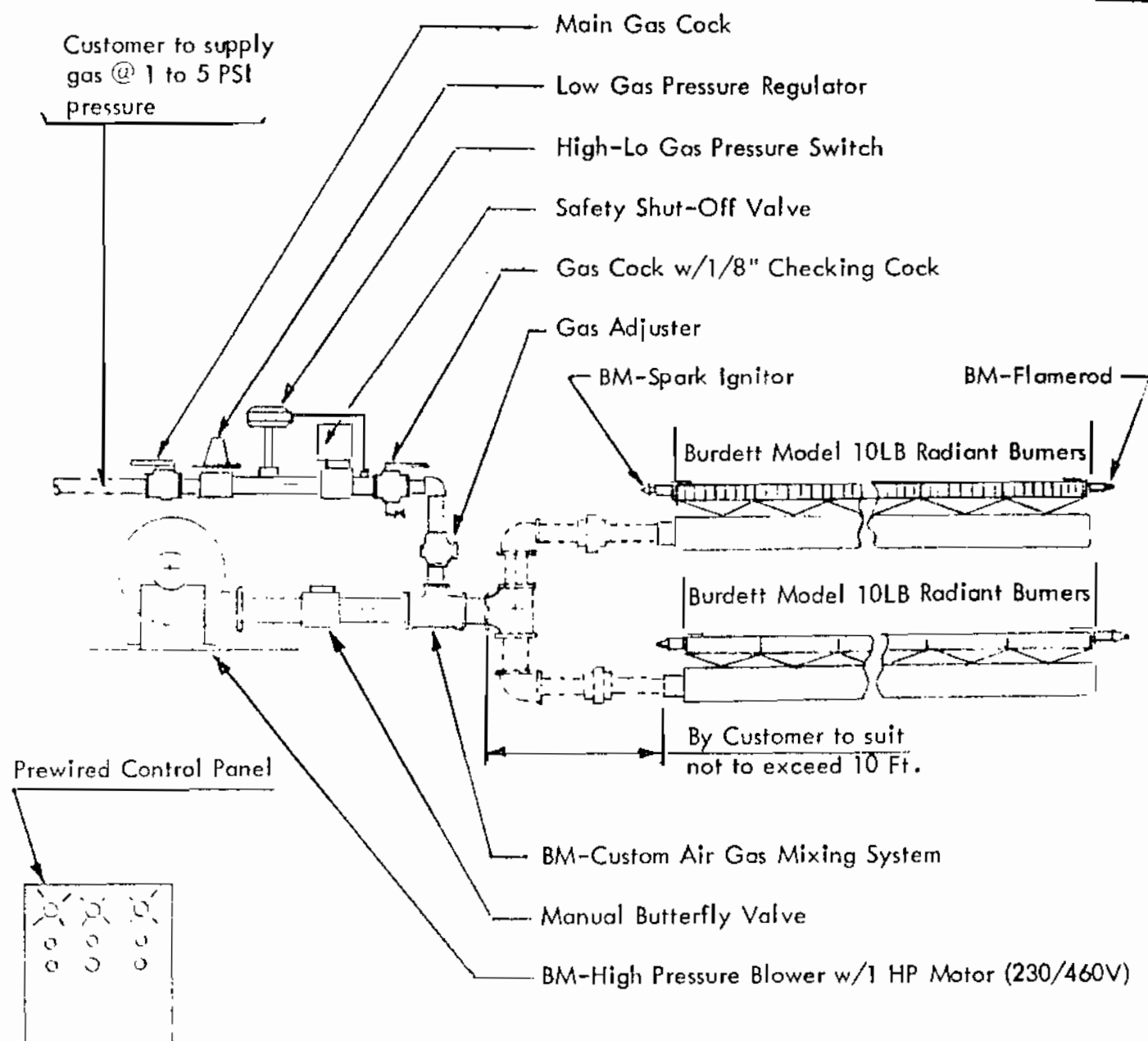
Same as FM type but includes a second motorized gas valve, a vent solenoid valve and relay contacts to interlock with existing repurge relay.

### Burdett Two Manifold Standard Radiant Booster Prices

Model No.	FM Type Package	IRI Type Package
10L-10-2		
10L-20-2		
10L-30-2		
10L-40-2		

All prices are FOB factory, Bridgeview, Illinois. Please allow approximately 6 weeks for delivery.





Model No.	Bumer Length (Ft.)	Gas Pipe Size	Bumer Feed Size	Min. BTU/Hr	Max. BTU/Hr
10L - 10-2	2 @ 10'	1-1/4"	2"	200,000	600,000
10L - 20-2	2 @ 20'	1-1/2"	2-1/2"	400,000	1,200,000
10L - 30-2	2 @ 30'	2"	3"	600,000	1,800,000
10L - 40-2	2 @ 40'	2"	3"	800,000	2,400,000

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REVISIONS

**BURDETT MFG. CO. CHICAGO, ILL.**

**Burdett Standard Radiant Booster Package  
Two-Manifold**

CUST. ORD.

SCALE

JOB NO.

DRAWING NO.

DATE 2-27-89

DRAWN BY jp

B-56



HIGH INTENSITY  
RADIANT-CONVECTION (HIR-C) OVENS

---

The design of HIR-C ovens combines the benefits of high intensity gas infra red with those of high volume forced air convection heating. This design provides:

- Very Rapid Temperature Rise -

In some applications where it is not desirable to put heat into the body of the product, but only to heat the surface, such as wood panelling, acoustical tile, etc., it is possible to reach surface temperatures of 300 deg. F or higher in as little as 7-1/2 seconds with these ovens.

In other applications such as metal coating, glass decorating, etc., it is possible to reach like temperatures in as little as 25 to 30 seconds.

The short temperature rise times attainable with HIR-C ovens allow very high production rates with relatively little use of floor space.

- Precise Process Temperature Control -

Very uniform product temperatures can be achieved in these ovens by:

- 1) Controlling the firing rate of the IR burners
- 2) Controlling the conveyor speed
- 3) Controlling the product exposure time

Under some conditions, the product temperature can be controlled as closely as plus or minus 2 deg. F. Plus or minus 5 deg. F is routine.

This means that every product coming off the line will be the same as the one before it and the one after it. Such uniformity eliminates rejects and reduces quality control costs. Frequently this will allow the use of processes previously considered "too exotic" or "too difficult" to use at standard production speeds.

- Low Operating Costs

HIR-C ovens offer significant cost savings over both conventional forced air gas ovens and high intensity electric infra red ovens. Data Sheet No. B-61 shows comparisons of operating costs and floor space requirements for various types of ovens.

- Adaptability to meet your specific needs -

In addition to the advantages of HIR-C ovens already mentioned, their flexible design offers adaptability to meet specific needs for:

#### Different Processes

- Preheating
- Drying
- Curing
- Baking
- Post heating
- and many more

#### Different Coating Materials

- Solvent borne paints
- Water borne paints
- High solids paints
- Powder coatings
- PTFE coatings
- Plastic coatings
- and many more

#### Different Products

- Wood panelling
- Acoustical tile
- Glass
- Metal
- and many more

#### Different Configurations

- Belt and similar conveyors
- Overhead conveyors
- Spindle conveyors
- Single and multiple pass conveyors
- and many more

To help you determine how HIR-C ovens can meet your specific needs, call us at (708) 598-7600 and ask for

John Papierz. Burdett has test facilities to test various products to show how an HIR-C oven can work for your customers.



# BURDETT ENGINEERING DATA SHEET No. B-61 12/29/89

## COST SAVINGS USING HIGH INTENSITY RADIANT-CONVECTION (HIR-C) OVENS

The tables below clearly show some of the major advantages of HIR-C ovens.

### Comparison of Length and Operating Costs for Various Types of Ovens\*

Oven type	Oven length	Operating cost	Space overuse	Cost overrun
HIR-C	25 ft.	\$10.60/Hr.	-	-
Convection	100 ft.	\$19.01/Hr.	75 ft.	\$ 8.41
Hi. Intens. Elec. IR	33 ft.	\$98.88/Hr.	8 ft.	\$88.28

In this comparison all three ovens are designed to heat the surface of a non heat absorbing material (wood panelling) to 300 deg. F at a linespeed of 200 fpm.

### Comparison of Valuable Floor Space Requirements for Various Types of Ovens\*

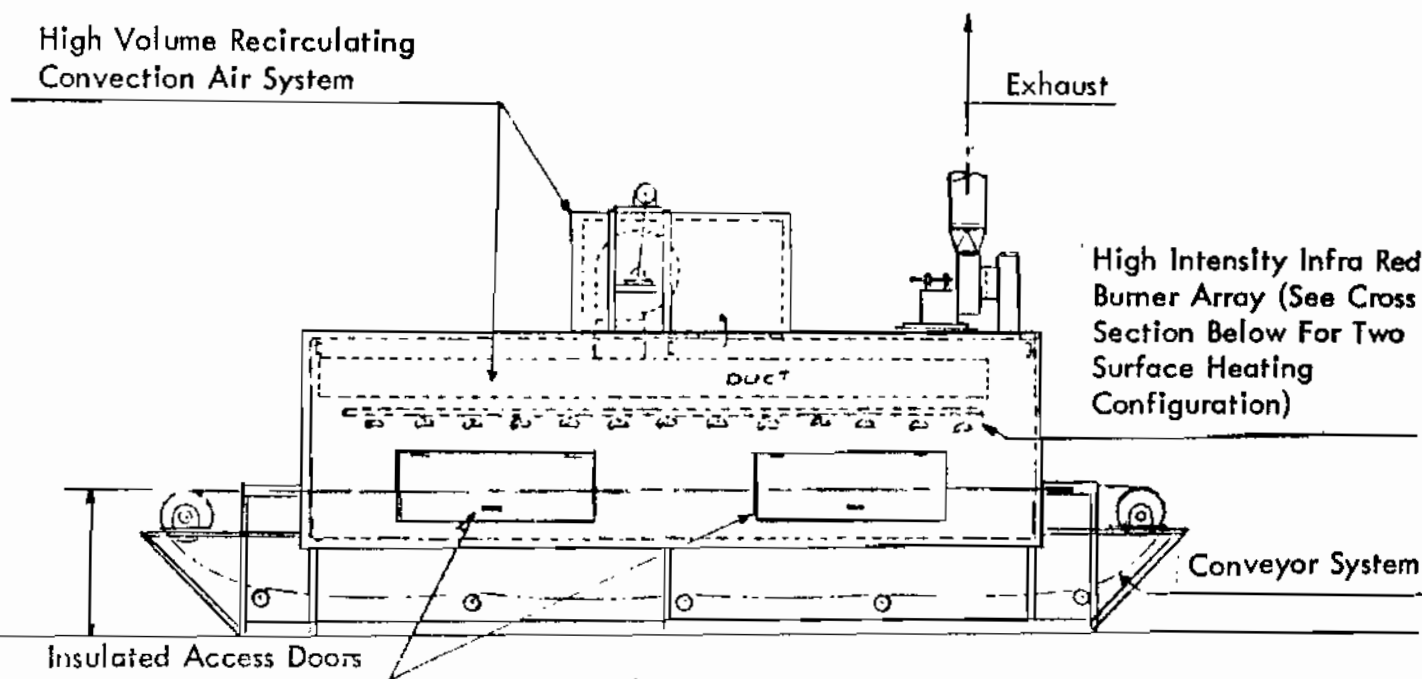
Conveyor speed-fpm	Time in oven-minutes			Oven length-feet		
	Convection	Hi Int. El. IR	HIR-C	Conv.	Hi Int. El. IR	HIR-C
10**	20	1.6	1.5	200	16	15
20**	20	1.6	1.5	400	32	30
40**	20	1.6	1.5	800	64	60
60***	0.5	0.15	0.125	30	9	7.5
120***	0.5	0.15	0.125	60	18	15
200***	0.5	0.15	0.125	100	30	25
400***	0.5	0.15	0.125	200	60	50
600***	0.5	0.15	0.125	300	90	75

\* Values in tables are approximate as commonly used for design purposes. Actual values may vary slightly.

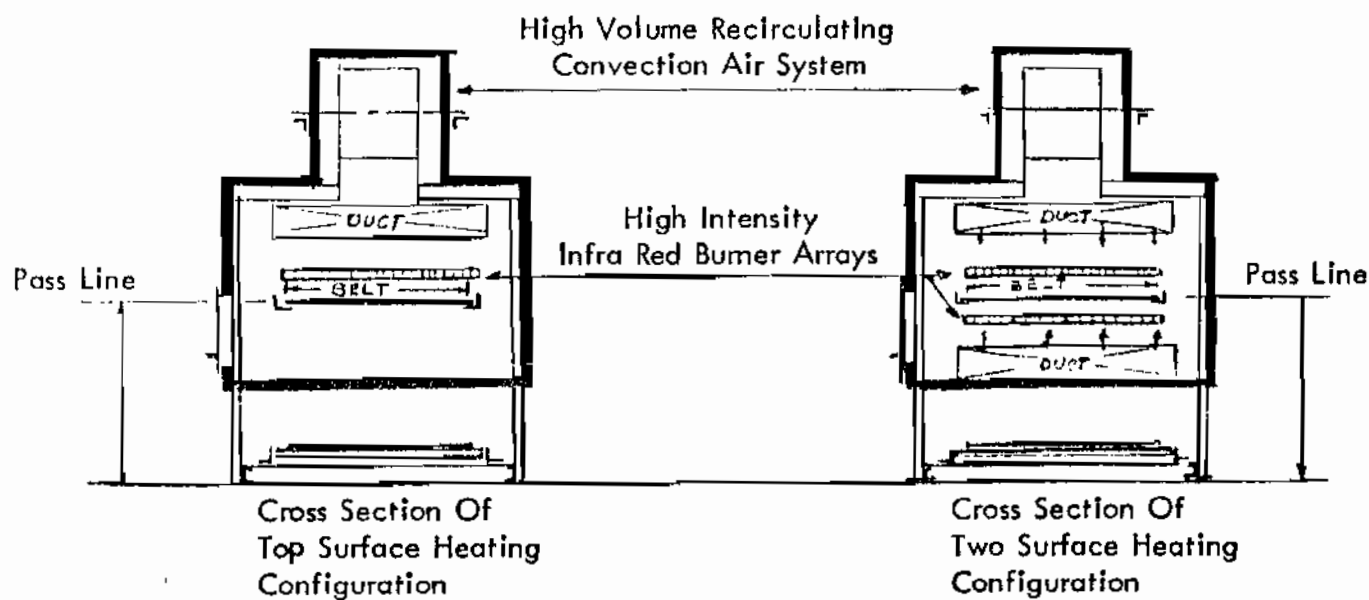
\*\* Comparison for overhead monorail conveyor curing paint on a heat absorbing product such as metal.

\*\*\* Comparison for belt conveyor heating the surface of a non heat absorbing material such as wood panelling.

High Volume Recirculating  
Convection Air System



Elevation  
(Top Surface Heating Configuration Shown)



Note for other applications:

See Data Sheet B-63 For Overhead Conveyors

See Data Sheet B-64 For Spindle Conveyors

Contact "Burdett" For Other Special Applications To Fit Your Needs

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REVISIONS

**BURDETT MFG. CO. CHICAGO, ILL.**

High Intensity  
Radiant-Convection Oven  
For Flat Belt Or Similar Conveyors

CUST. ORD.

SCALE  $\frac{1}{2}$ " = 1'

JOB NO.

DRAWING NO.

DATE 12-5-88

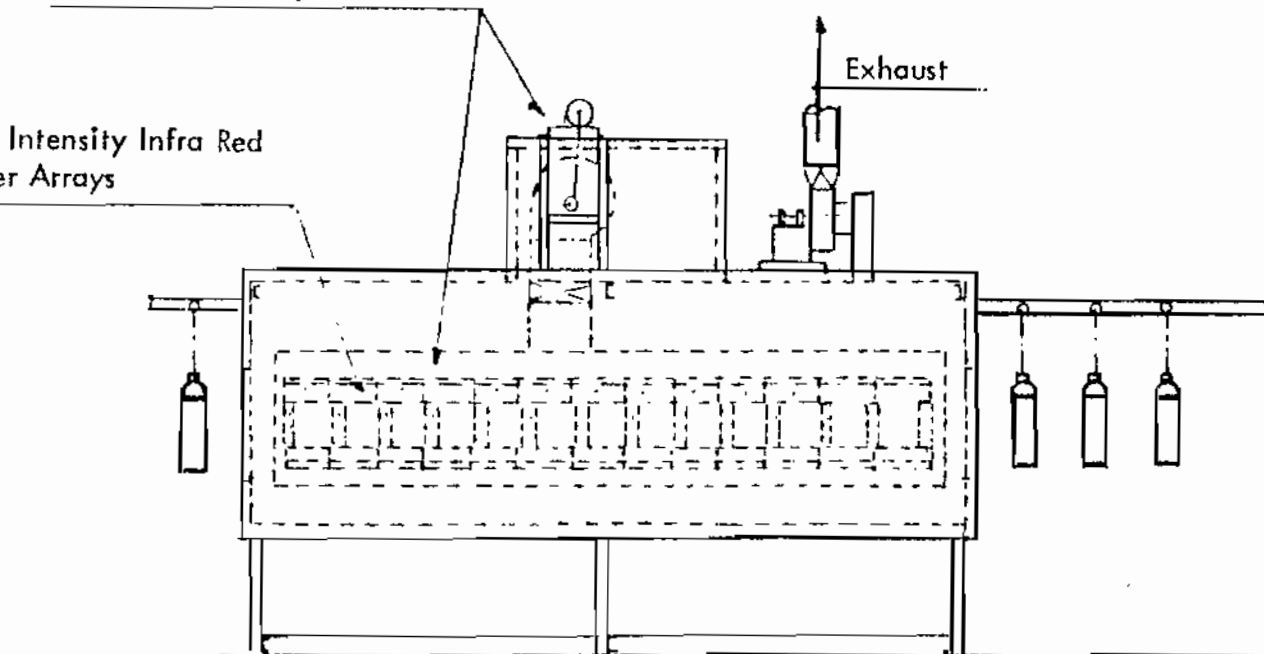
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B-62

High Volume Recirculating  
Convection Air System

High Intensity Infra Red  
Burner Arrays

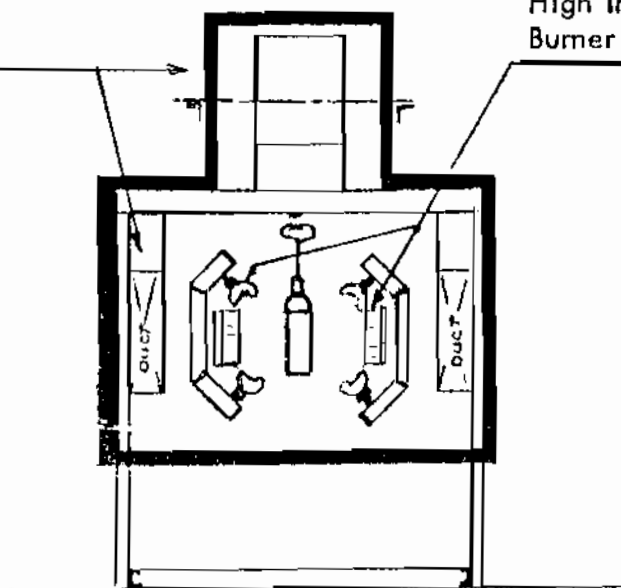
Exhaust



Elevation

High Volume Recirculating  
Convection Air System

High Intensity Infra Red  
Burner Arrays



Cross Section

Note for other applications:

See Data Sheet B-62 For Flat Belt or Similar Conveyors

See Data Sheet B-64 For Spindle Conveyors

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REVISIONS

BURDETT MFG. CO. CHICAGO, ILL.

High Intensity  
Radiant-Convection Oven  
For Overhead Conveyors

CUST. ORD.

SCALE 2x

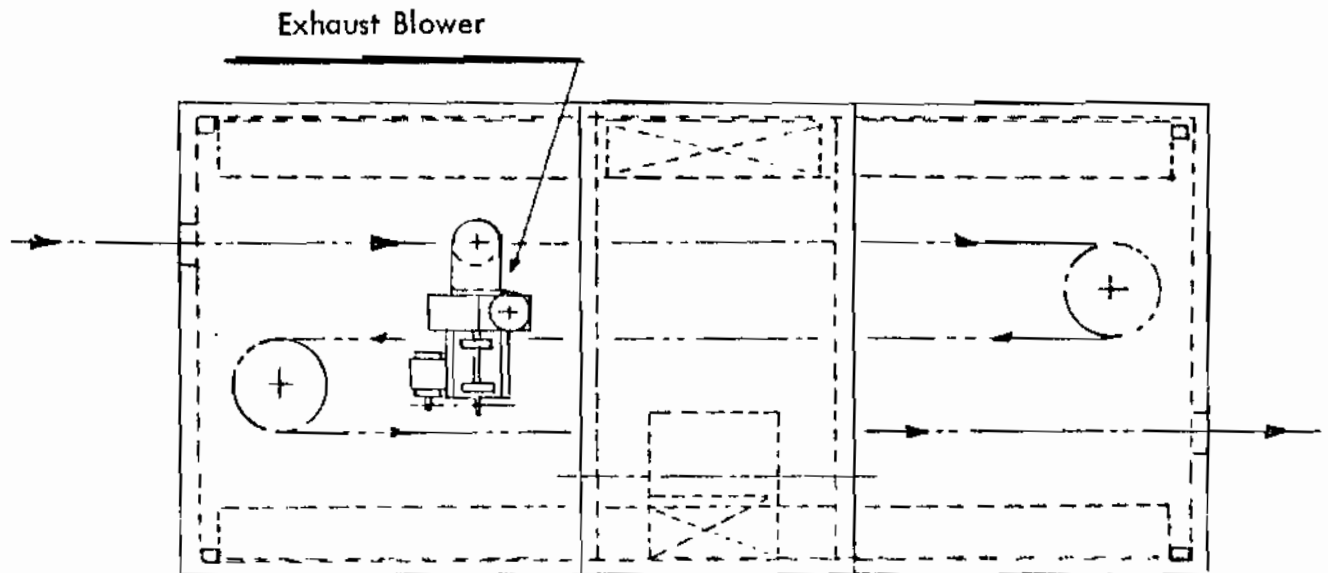
JOB NO.

DRAWING NO.

DATE 12-5-88

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B-63



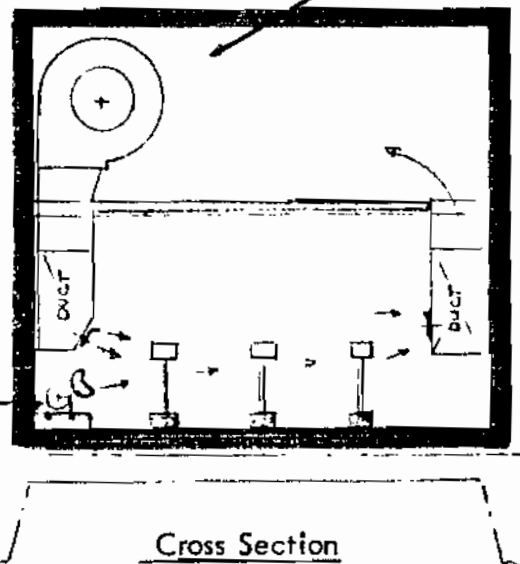
Planview

High Volume Recirculating  
Convection Air System

Note:

For Higher Temperature Applications, conveyor is below insulated floor and extended spindle traveling through a slot in the floor supports the product

High Intensity  
Infra Red Bumer Arrays



Cross Section

Note for other applications:

See Data Sheet B-62 For Flat Belt or Similar Conveyors

See Data Sheet B-63 For Overhead Conveyors

Contact Burdett for other special applications to fit your needs

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REVISIONS

**BURDETT MFG. CO. CHICAGO, ILL.**

**HIGH INTENSITY  
RADIANT CONVECTION OVEN  
FOR SPINDLE CONVEYORS**

CUST. ORD.

SCALE *1/4"*

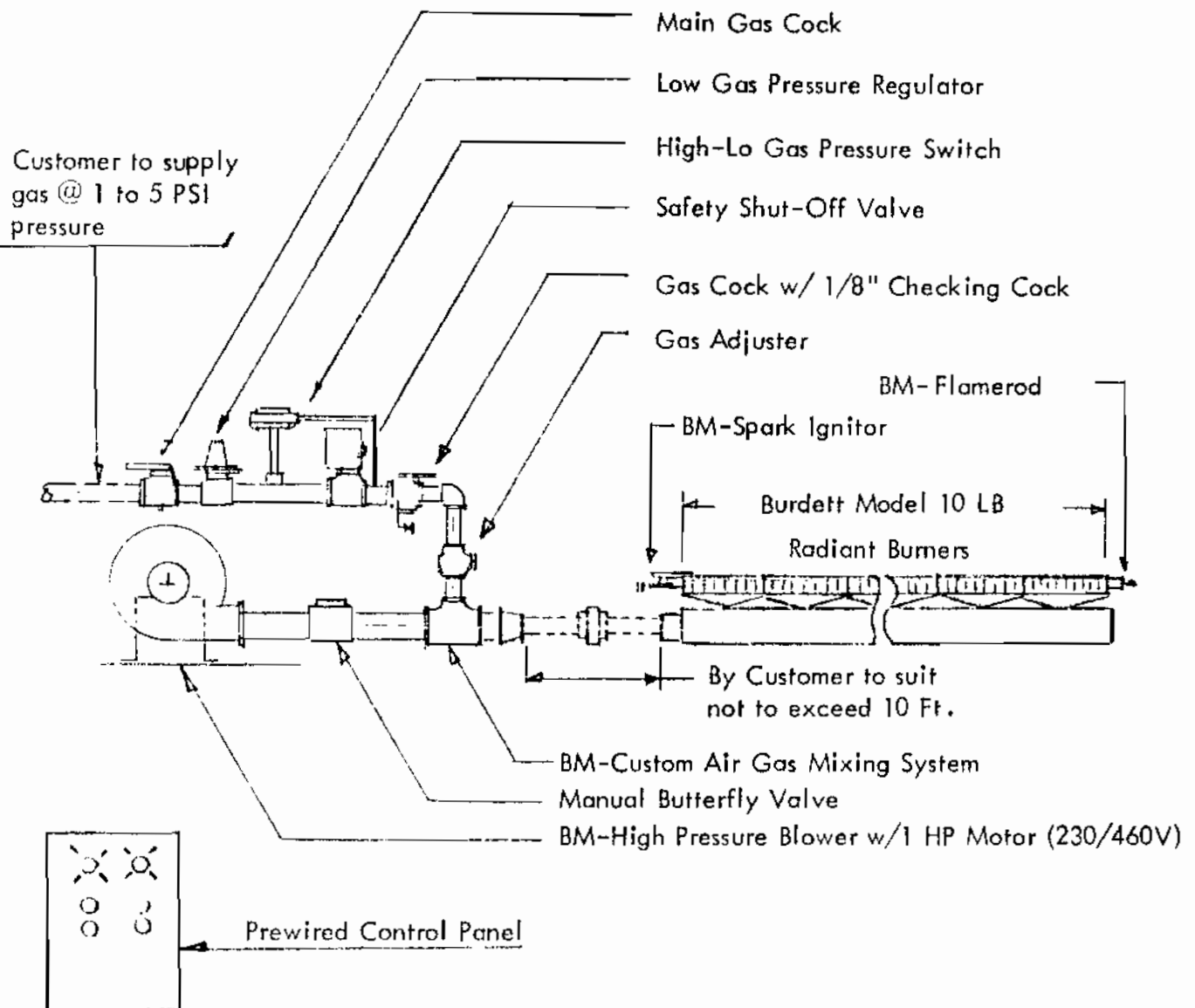
JOB NO.

DRAWING NO.

DATE *12-16-88*

DRAWN BY *JP*

**B-64**



Model No.	Burner Length (Ft.)	Gas Pipe Size	Burner Feed Size	Min. BTU/Hr	Max. BTU/Hr
10L - 10	10'	1"	2"	100,000	300,000
10L - 20	20'	1-1/4"	2-1/2"	200,000	600,000
10L - 30	30'	1-1/2"	3"	300,000	900,000
10L - 40	40'	1-1/2"	3"	400,000	1,200,000

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REVISIONS

BURDETT MFG. CO. CHICAGO, ILL.

Burdett Standard  
Radiant Booster Packages

CUST. ORD.

SCALE -

JOB NO.

DRAWING NO.

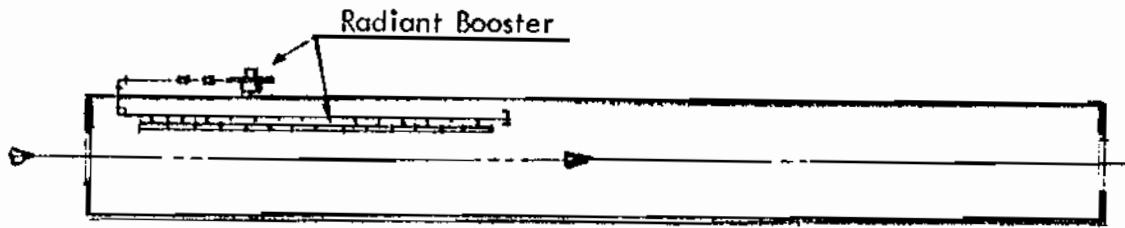
DATE 8-12-88

DRAWN BY JP

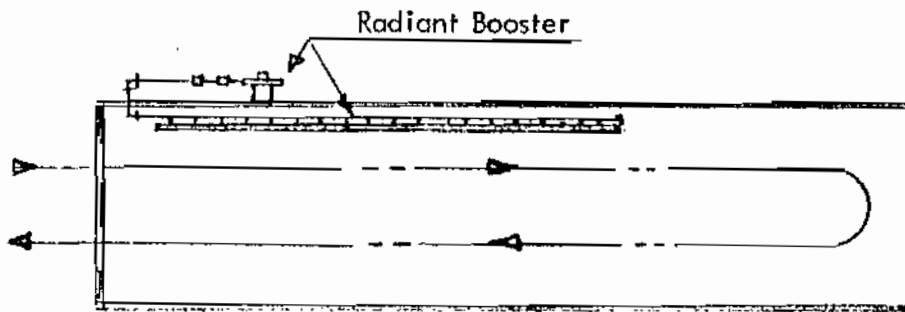
B-51



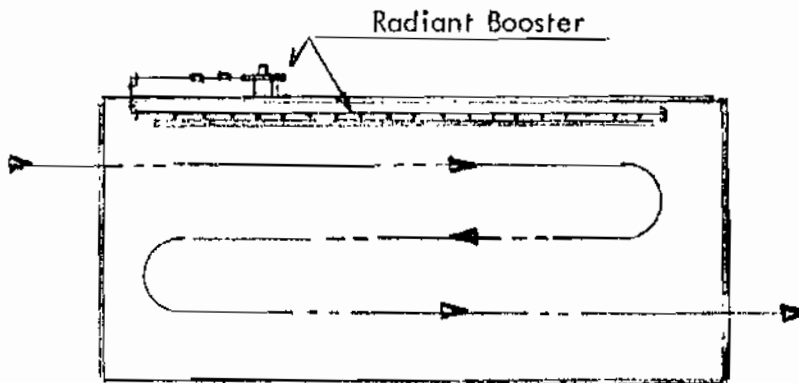
### Single Pass Oven



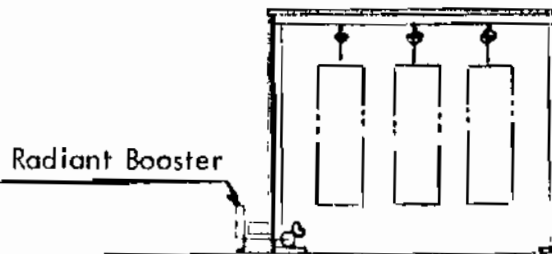
### Two Pass Oven



### Three Pass Oven



### Notes



Cross Section

- 1) Typical oven layouts with radiant boosters - contact us if your layout is different.
- 2) Booster located towards oven conveyor entrance.

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#### REVISIONS

**BURDETT MFG. CO. CHICAGO, ILL.**

Burdett Standard Radiant Boosters  
Typical Layouts

CUST. ORD.

SCALE None

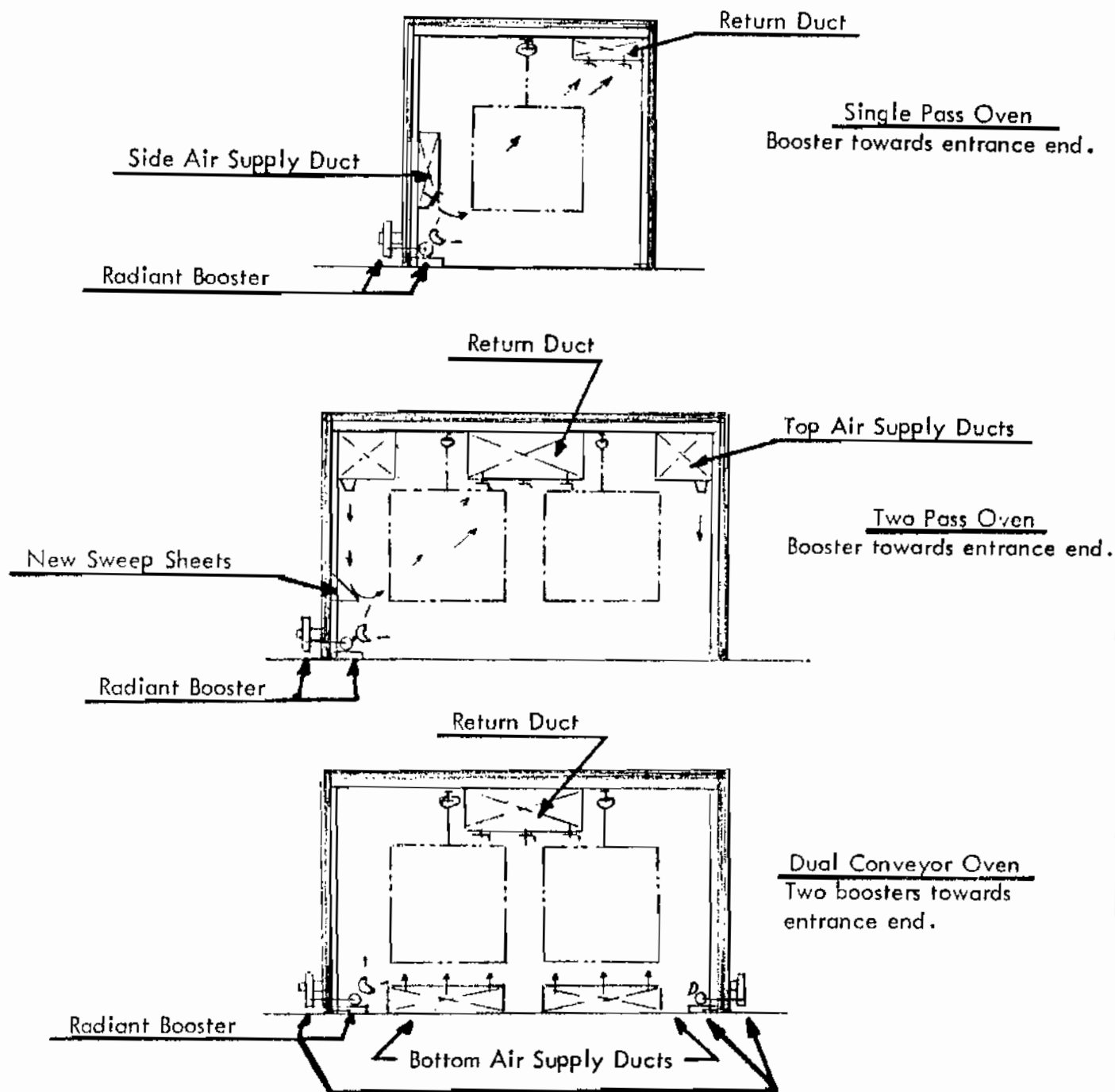
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DRAWING NO.

DATE 8/30/88

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B-52



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REVISIONS

**BURDETT MFG. CO. CHICAGO, ILL.**

**Burdett Standard Radiant Boosters**  
Some Typical Recirculation Systems Which  
Are Compatible With Burdett Radiant Boosters

CUST. ORD.

SCALE None

JOB NO.

DRAWING NO.

DATE 8-30-88

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B-53



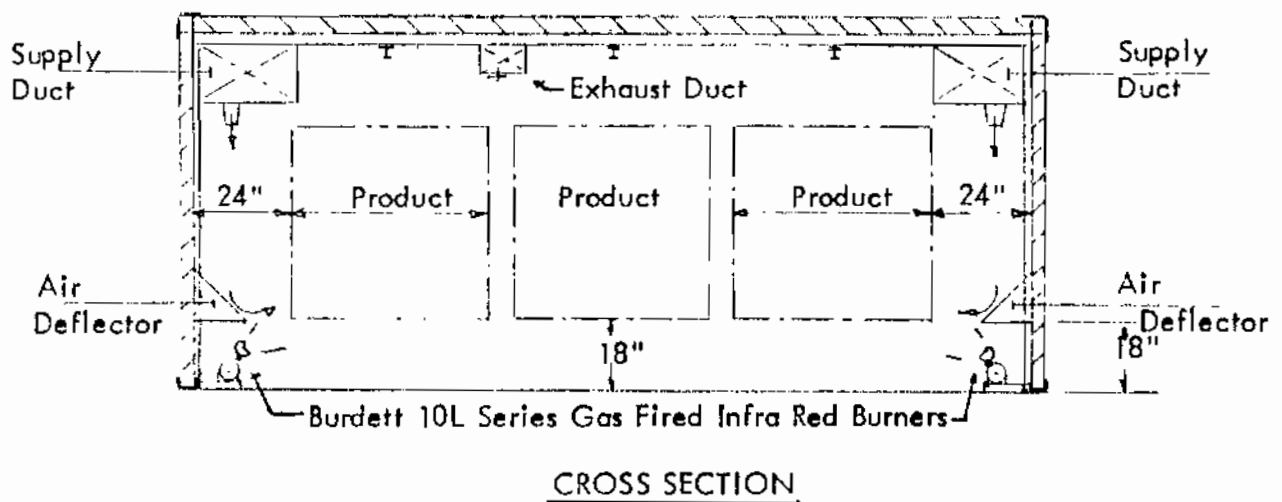
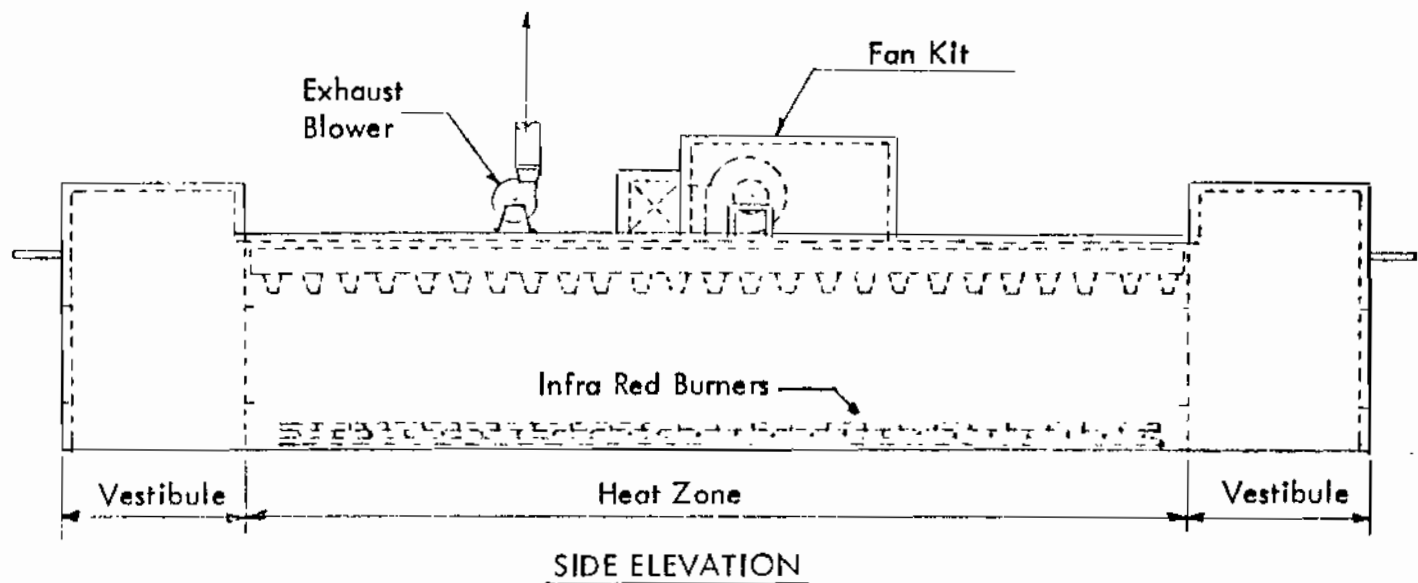
### RADIANT-CONVECTION OVENS

Radiant-Convection ovens represent the next generation of industrial ovens. Conceptually, the easiest way to picture a radiant-convection oven is that it is very similar to a forced air convection oven to which low to medium intensity infra red has been added in order to increase its speed and efficiency. The result of this happy marriage of two systems is an oven that, like an infra red oven, heats products fast and efficiently, and like a convection oven, heats even the most complex product configurations uniformly.

Radiant-convection ovens are suitable for either conveyORIZED or batch processes. In the optimum design the gas infra red burners are located along the bottom of each sidewall of the oven. The optimum burner choice for conveyORIZED ovens is the Burdett 10L series burners, while the best choice for batch ovens is the Burdett 21 series burners. Oven air is recirculated at relatively high volume, typically 5 to 6 turnovers of the complete oven volume each minute. Oven exhaust is sized to suit the process, as it would be for a convection oven. The firing rate of the Burdett infra red burners is modulated, using a Partlow or similar temperature controller, to control the oven temperature at the desired process temperature. Typical radiant-convection oven configurations are shown on some of the following pages.

Infra red burners are the most efficient type of gas burner available. Because of this, a radiant-convection oven uses between 20% to 30% less gas than the same size convection oven performing the same process. This means the end user has an operating cost advantage over the lifetime of the oven, typically 15 to 20 years. It also means there will be a reduction in emission of harmful greenhouse gases by the oven.

The advantage in product heat up time arises because the rate of heating by the infra red energy is added to the rate of heating by the forced air convection. As a result of this, radiant-convection ovens can bring products up to oven temperature in about 1/3 the time required by a convection oven. In applications such as industrial paint lines, this means that dry-off and curing ovens can be shorter, thus saving valuable floor space. The tables on the next page give clearcut examples of this savings.



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REVISIONS

BURDETT MFG. CO. CHICAGO, ILL.

Typical Three Pass  
Radiant-Convective Oven

CUST. ORD.

SCALE

JOB NO.

DRAWING NO.

DATE 1-3-90

DRAWN BY J P

B-74



PERFORMANCE IMPROVEMENT USING  
RADIANT-CONVECTION OVENS

The tables below clearly show some of the performance advantages of Radiant-Convection ovens.

Comparison of Measurements of Time to Reach Oven Set Point  
Temperature (400 deg. F) for Various Metal Thicknesses

Metal Thickness		Time to Reach 400 deg. F min.	
ga.	in.	Convection Oven	Rad.-Conv. Oven
20	.0359	6.4	2.2
16	.0598	7.4	2.5
14	.0747	8.2	2.75
11	.1196	12.4	4.2
1/8"	.125	13.6	4.6
1/4"	.25	20.5	7.0
3/8"	.375	28.0	9.5

In this table, cold rolled steel was used for 20 through 11 ga, and hot rolled steel for 1/8" to 3/8" plates.

Comparison of Valuable Floor Space Requirements  
For a Powder Curing Oven at 10 fpm

Metal ga.	Time in Oven-min.		Conveyor in Oven-ft.		% Saved w/ Rad.-Conv.
	Convec.	Rad.-Conv.	Convec.	Rad.-Conv.	
20	14.4	10.2	144	102	29.2
16	14.4	10.5	154	105	31.8
14	16.2	10.75	162	108	33.3
11	20.4	12.2	204	122	40.2
1/8"	21.6	12.6	216	126	41.7
1/4"	28.5	15.0	285	150	47.4
3/8"	36.0	17.5	360	175	51.4

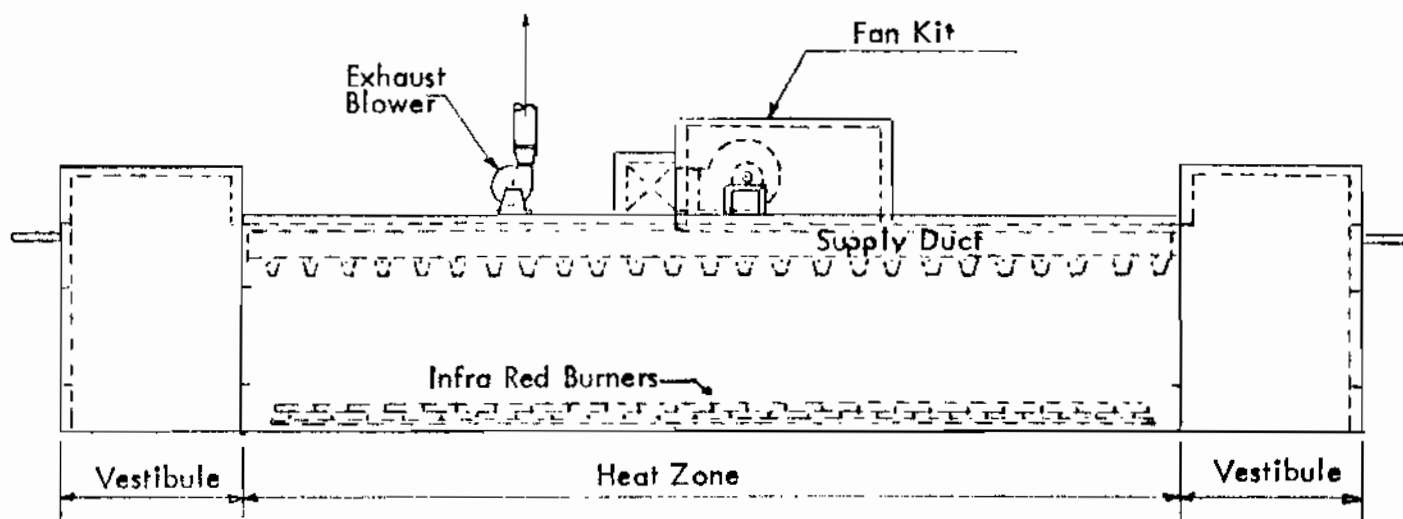
In this comparison, the time in the ovens is determined by adding a standard holding time at temperature of 8 minutes to the measured time to reach 400 deg. F. The length of conveyor travel in the ovens is determined by multiplying these times by the conveyor speed of 10 fpm.

OPTIMIZING RADIANT-CONVECTION OVENS

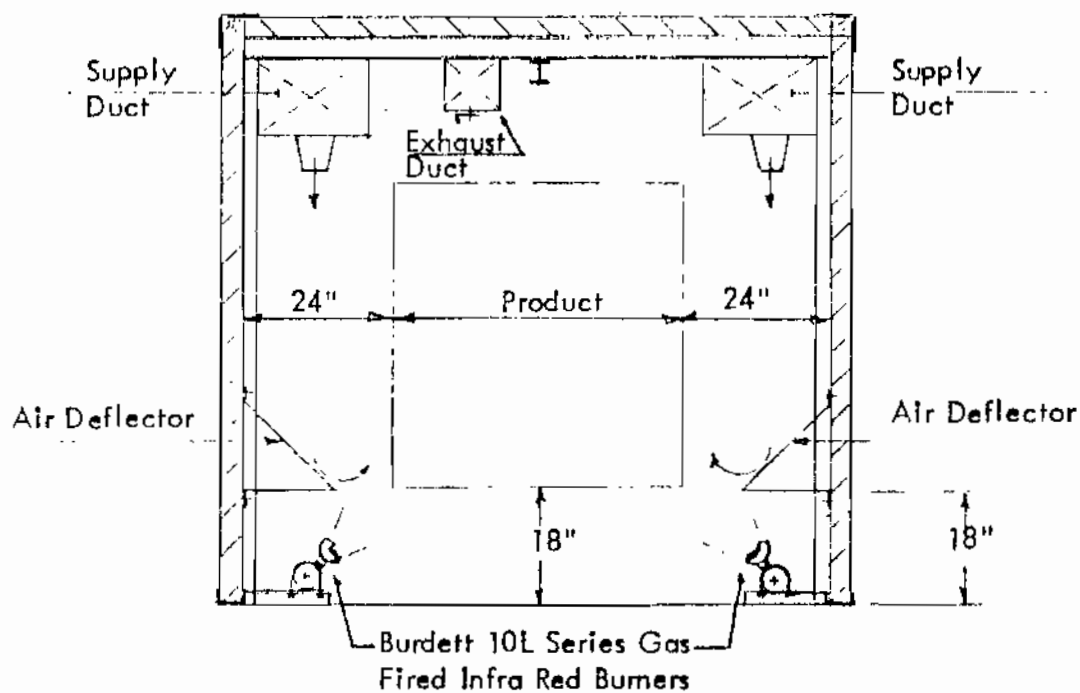
The tables on the previous page demonstrate the major advantage of radiant-convection ovens over conventional convection ovens, namely very fast bring up of product to temperature. This, coupled with the second advantage of the radiant-convection design, reduced gas consumption, suggest that the most efficient way to design a production oven is to use gas infra red burners as the sole heat source of the oven, with rows of infra red burners along the full length of the oven walls, and in fact this is correct.

In some cases, however, the extra cost of having infra red burners the full length of the oven could cause a pricing disadvantage. In such cases, much of the benefit of the radiant-convection design can be achieved by installing infra red burners only along the portion of the oven that is used to bring the product up to temperature. This portion can be determined by using the first table on the previous page which gives time to reach temperature. The remainder of the oven, which is required only to hold the product at temperature, can be of conventional convection oven design.

By using this method of hybrid design, the added cost of using infra red burners in the bring up zone is relatively modest. However, the reduction in oven size due to the hybrid design is substantial, and will more than offset the extra cost of the burners, yielding a competitive advantage over convection ovens. In many cases, this hybrid design with a radiant-convection bring-up section and a convection holding section will represent the optimum design for a production oven. In other words, it represents the best compromise between an oven designed for maximum efficiency and one designed for reduced equipment cost.



SIDE ELEVATION



CROSS SECTION

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REVISIONS

**BURDETT MFG. CO. CHICAGO, ILL.**

Typical Single Pass  
Radiant-Convection Oven

CUST. ORD.

SCALE

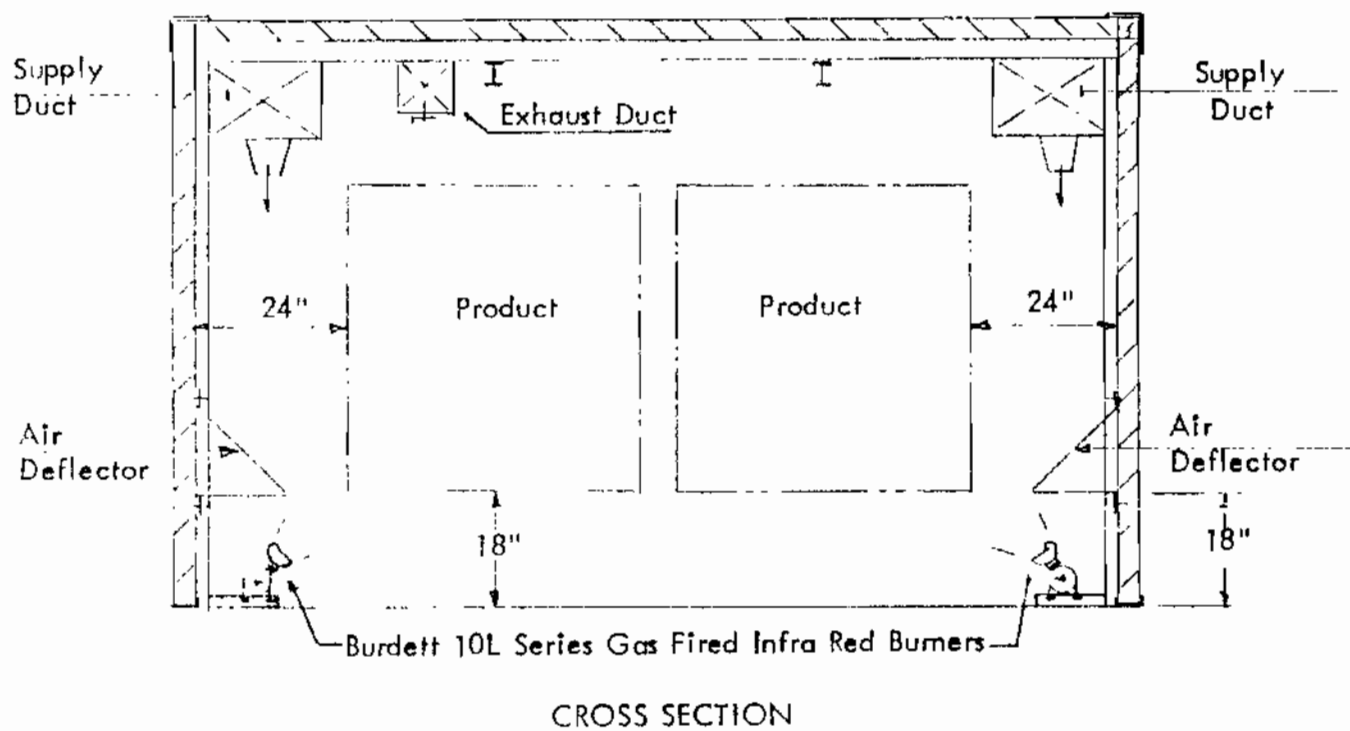
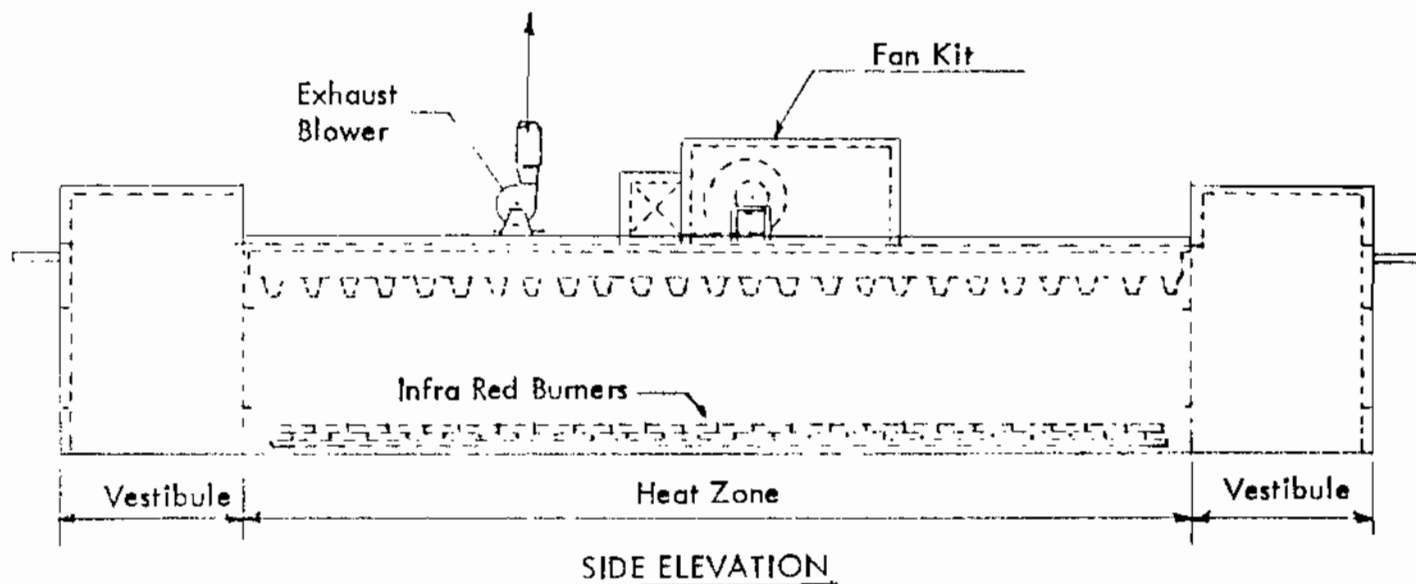
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B-72



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REVISIONS

**BURDETT MFG. CO. CHICAGO, ILL.**

Typical Two Pass  
Radiant-Convection Oven

CUST. ORD.

SCALE

JOB NO.

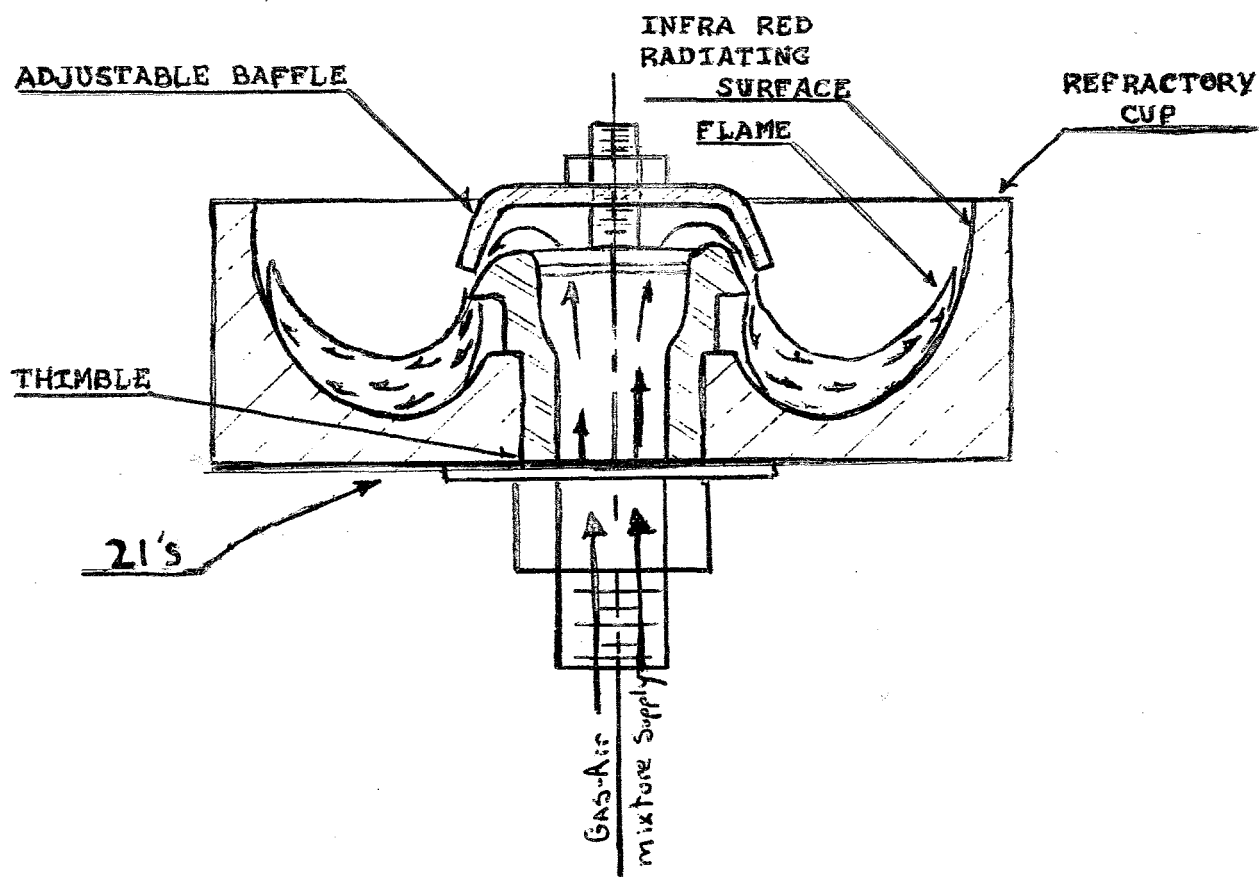
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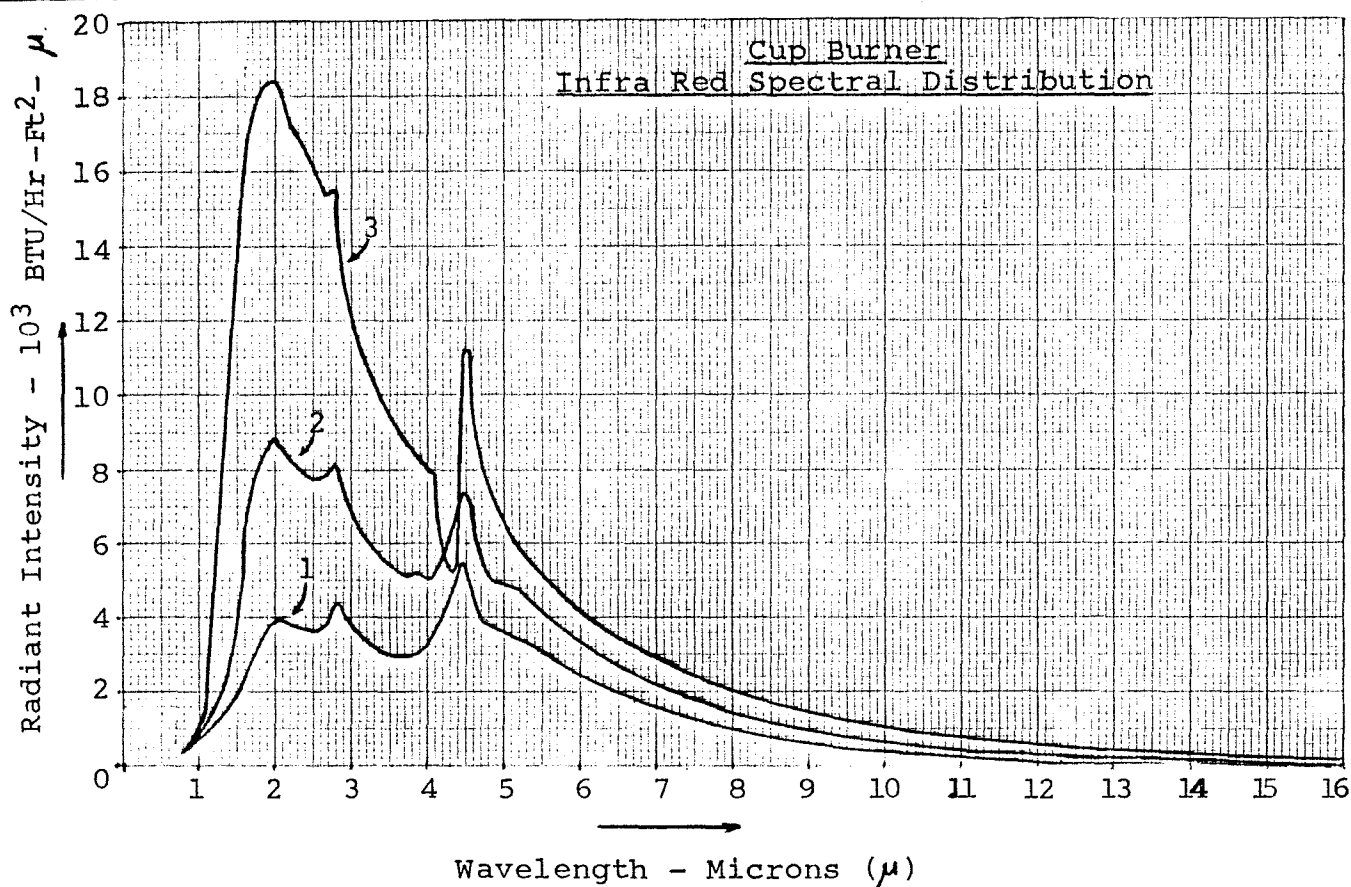
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B-73





Burdett Cup Burners  
21's & 45's

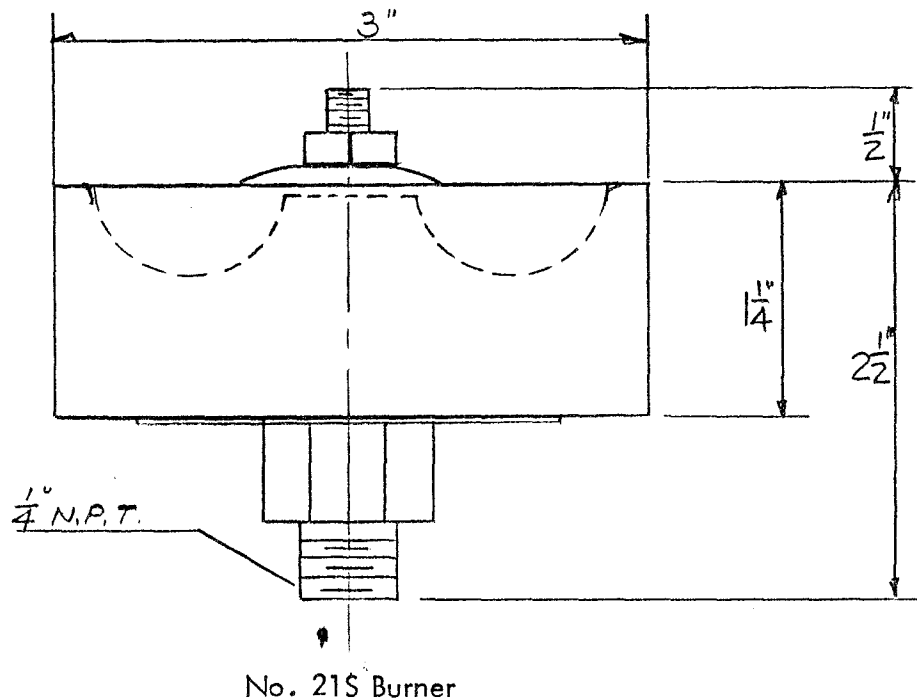
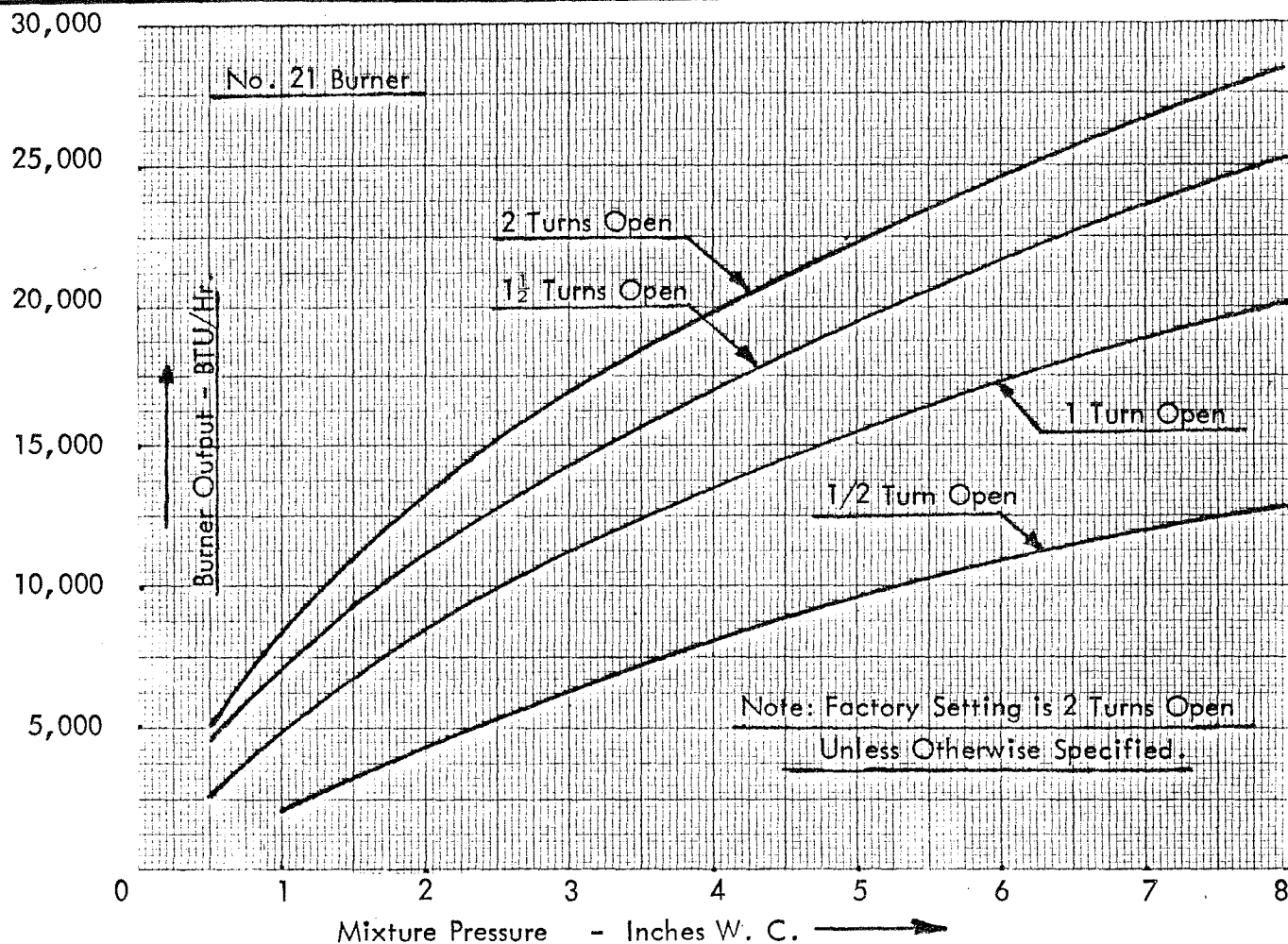


BURDETT CUP BURNERS - INFRA RED EMISSION

Curve	Red Brightness Temperature ( $^{\circ}$ F)	Total Normal Infra Red Radiation (BTU/Hr.-Ft <sup>2</sup> )	Effective Emissivity
1	1,600	21,650	0.69
2	1,800	34,600	0.77
3	2,000	58,000	0.91

Data Source: Tests conducted by the American Gas Association Laboratories, Cleveland, Ohio. Data published in A.G.A. Research Bulletin No. 92.

# BURDETT ENGINEERING DATA SHEET No. C-1

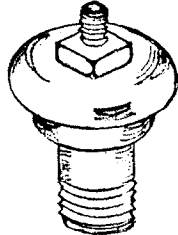


BURDETT MANUFACTURING COMPANY, [REDACTED] BRIDGEVIEW, IL

DATE ISSUED Rev'd. 6/12/81

## BURDETT NO. 21 BURNER PARTS

BM No. 21 Thimble Assembly



Note: Specify No. 21P Thimble Assembly for Pronged Baffle

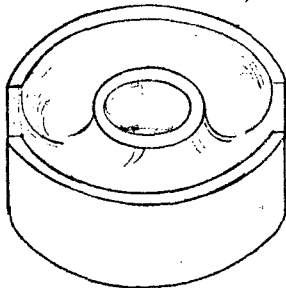
BM No. 21 Refractory  
(No. 21S Refractory Shown)

Specify:

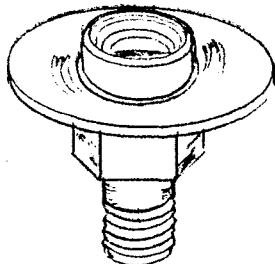
Straight - 21S

Corner - 21C

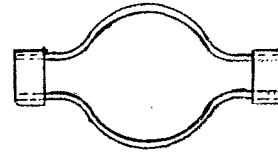
End - 21E



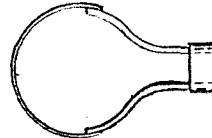
BM No. 21 Bottom Bushing Assembly



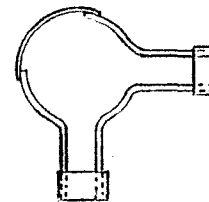
## Stainless Steel Burner Housings



BM No. 21SS Straight Housing and Clamps



BM No. 21SE End Housing and Clamp



BM No. 21SC Corner Housing and Clamps



BM No. **CIT 125**



Standard Length - 15"

BM8005 PF-1  
Spark Ignitor, Rod and Support

BM No. 21SE End Burner

BM No. 21SS Straight Burner

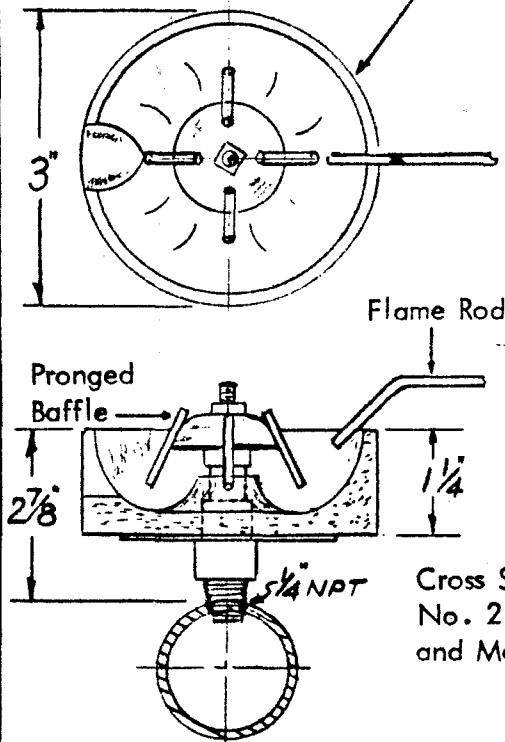
Burner Manifold

BM No. 21SC Corner Burner

BM No. 125 Ceramic Ignition Tube  
Recommended Maximum Length - 12"

BM No. 21SEP End Burner  
with Pronged Baffle

BM8005PF-1 Flame Head,  
Rod and Support



Cross Section Through  
No. 21SEP End Burner  
and Manifold.

Note: For Higher Capacity,  
Specify No. 30 Burners in  
Place of No. 21 Burners.

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REVISIONS

BURDETT MFG. CO. CHICAGO, ILL.

Typical BURDETT 21S Burner Pipe Manifold  
Arrangement

CUST. ORD.

SCALE

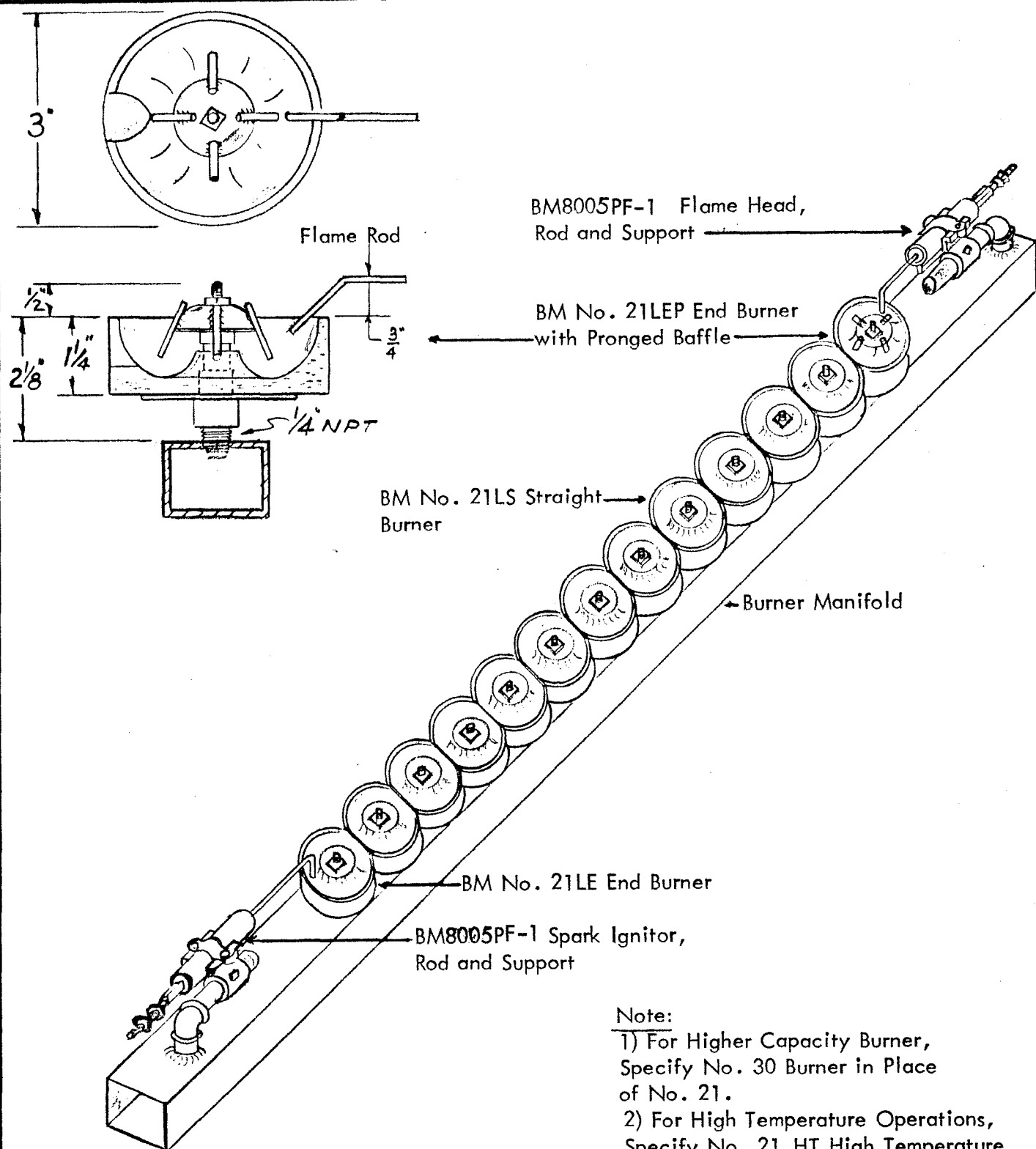
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# REVISIONS

BURDETT MFG. CO. CHICAGO, ILL.

Typical BURDETT 21L Burner Square Tube Manifold Arrangement

CUST. ORD.

SCALE

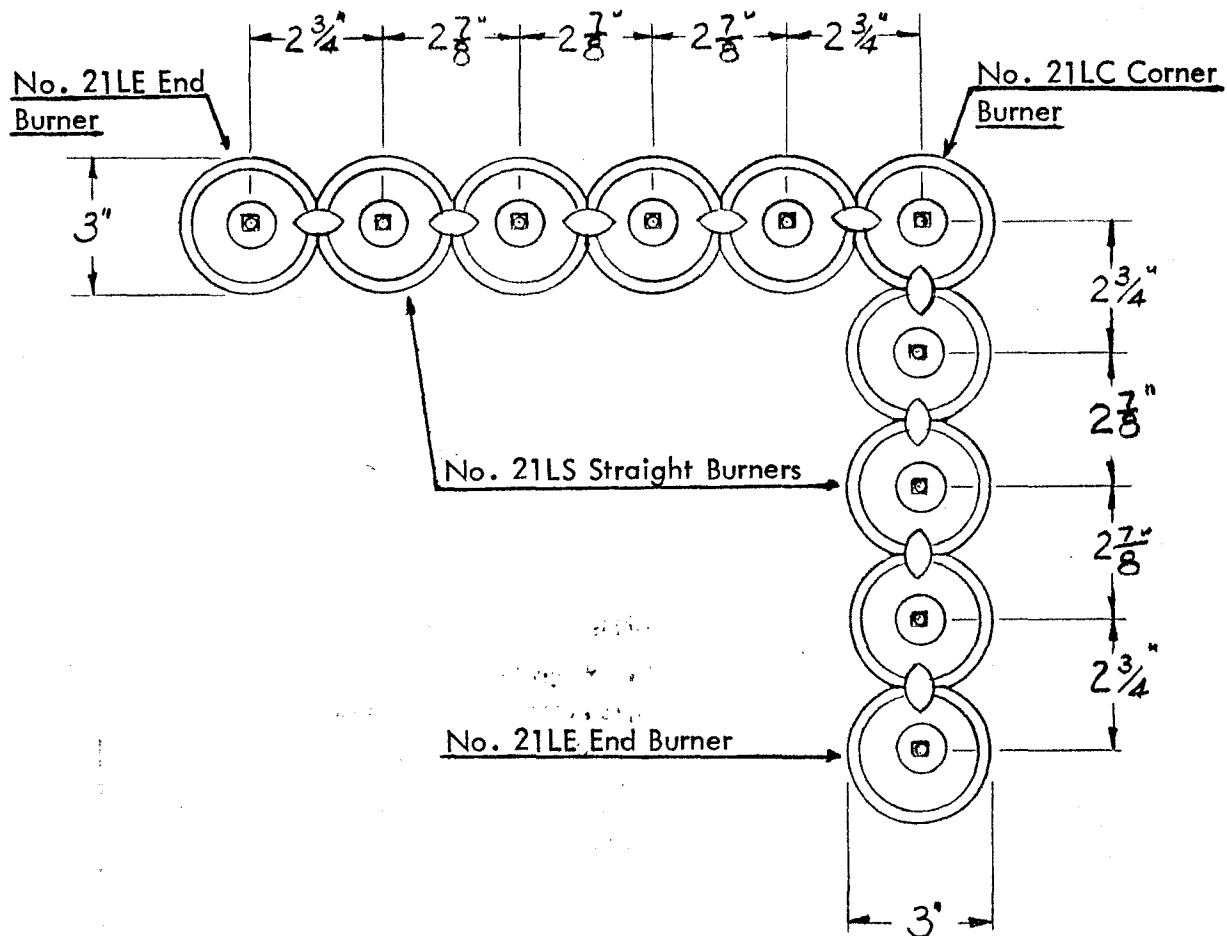
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M-21L



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REVISIONS

REVISED 11-11-88 ip

BURDETT MFG. CO. CHICAGO, ILL.

BURDETT No. 21L Burners In Line  
Arrangement

CUST. ORD.

SCALE

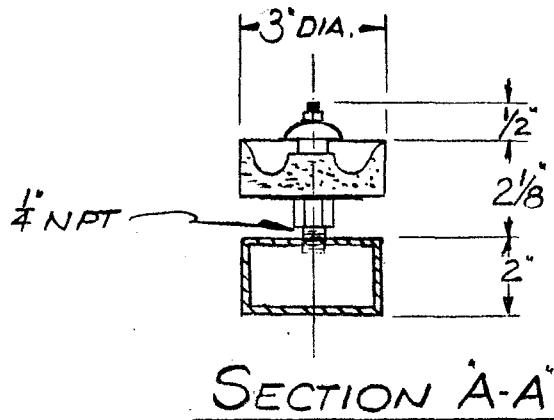
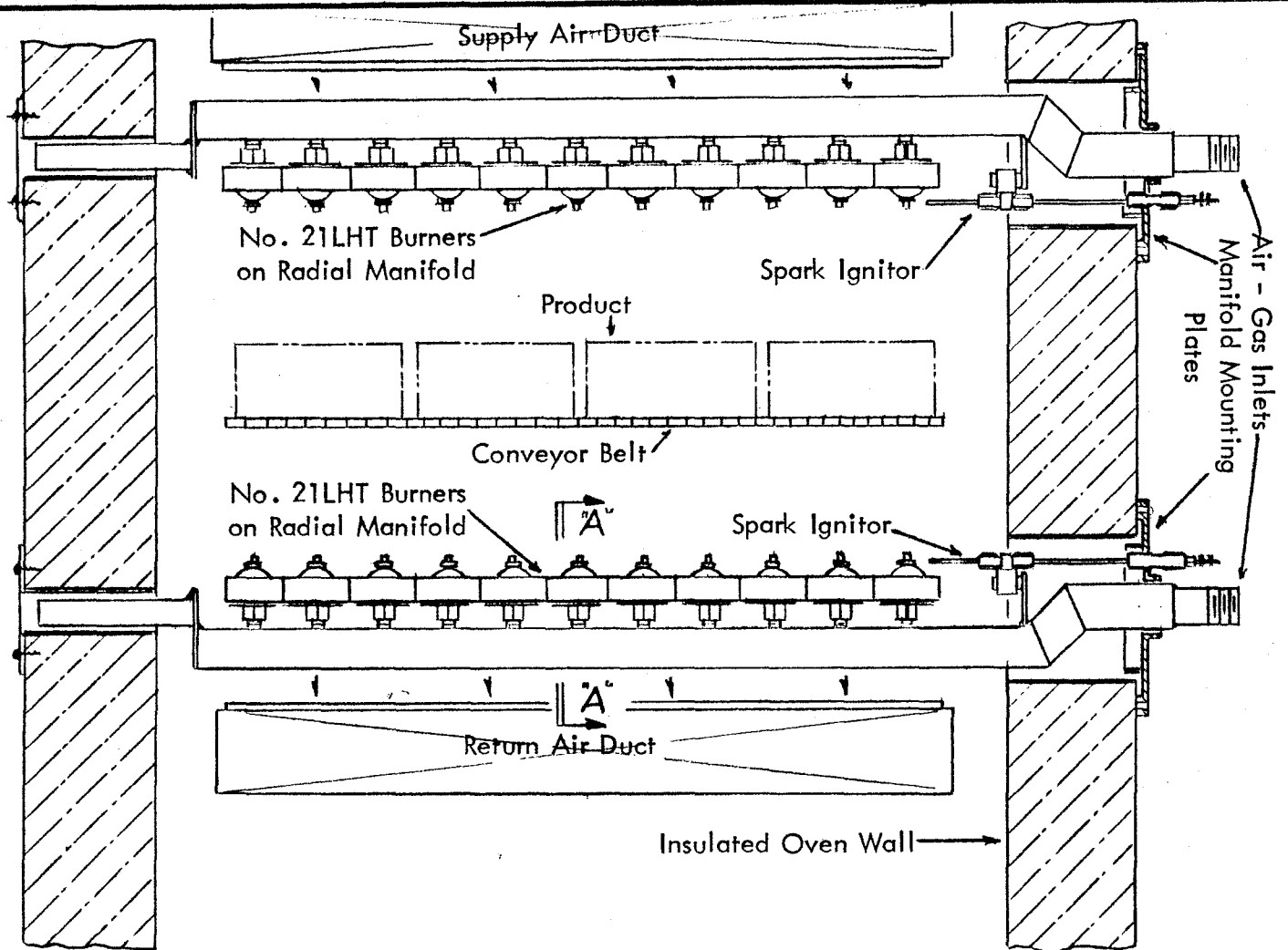
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# REVISIONS

BURDETT MFG. CO. CHICAGO, ILL.

Typical High Temperature Belt Conveyor  
Oven With BURDETT No. 21LHT Burners  
On Radial Manifold

CUST. ORD.

SCALE

JOB NO.

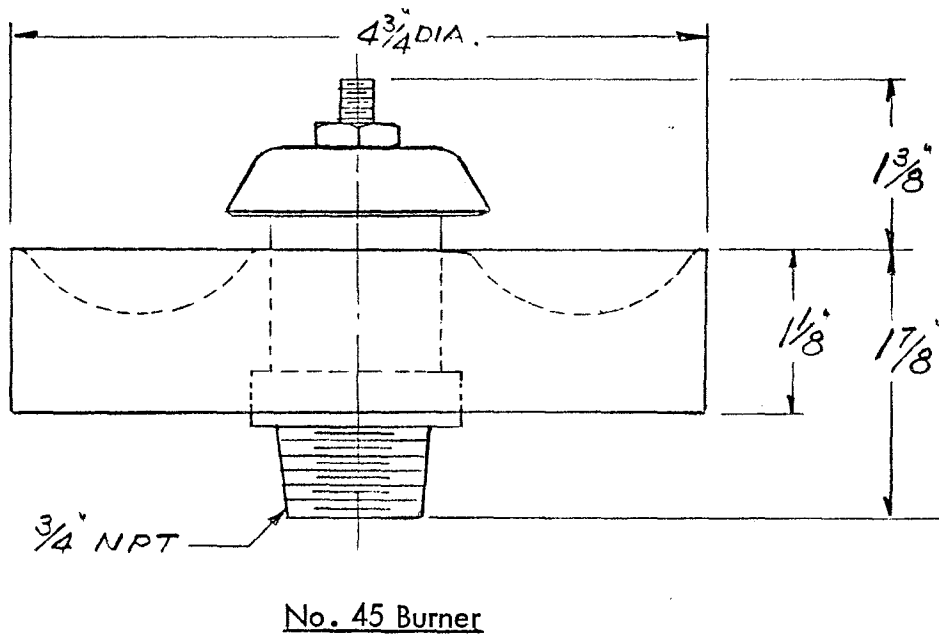
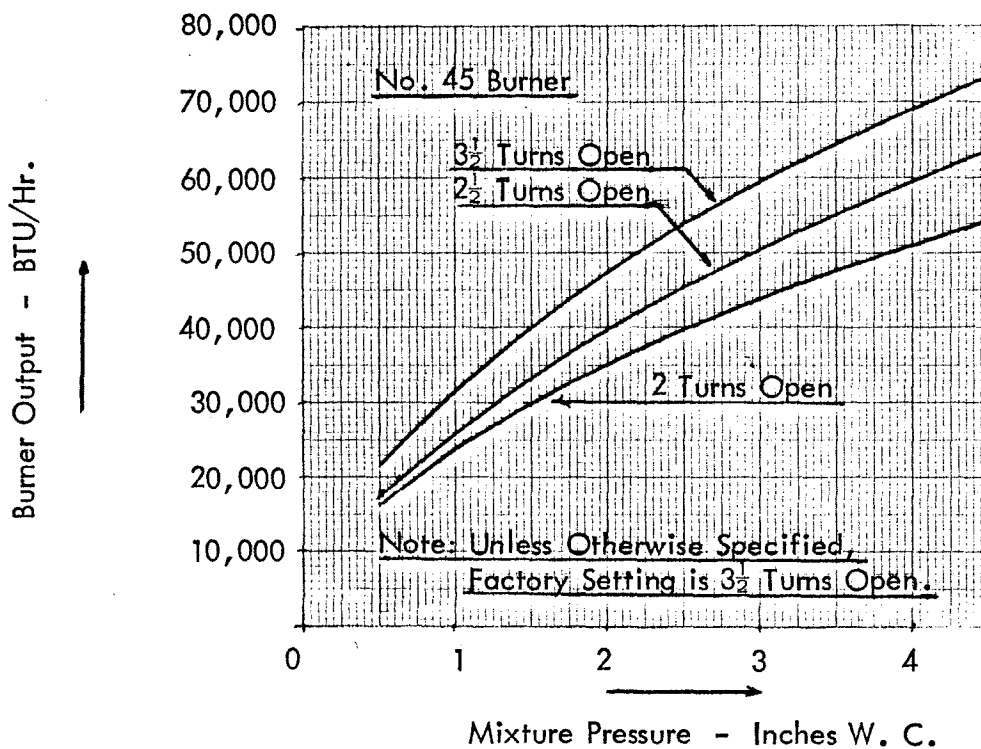
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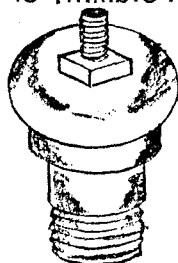
CO - 2



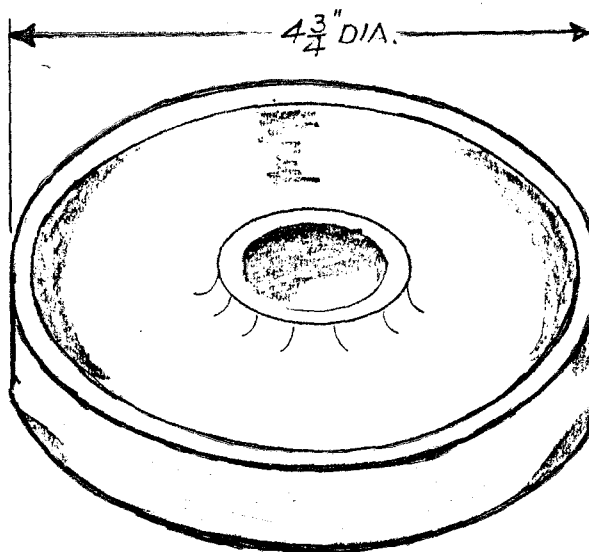


BURDETT No. 45 Burner Parts

BM No. 45 Thimble Assembly



BM No. 45 Refractory



BM No. 45 Bottom Bushing

