

15" Gas Burner only
Engineering Sales
MANUFACTURERS OF
BLUE RIBBON PRODUCTS
STEAM TURBINES • BLOWERS • AIR FILTERS
SENTRY VALVES • GAS BURNERS



M. J. Simpson
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COPPUS
ENGINEERING CORPORATION

WORCESTER, MASSACHUSETTS 01610

October 27, 1965

Peerless Boiler & Engr
2015 N.E. Plak Place
Oklahoma City, Oklahoma
Attn: Tony Bennett Plt. Supt.

PLAINTIFF'S EXHIBIT

COP-5

Dear Sir:

Thank you for having noticed our advertisement in which we have brought to your attention the benefits to be gained by use of Coppus Fanmix gas and combination gas and oil burners.

Enclosed we are pleased to send you our Fanmix burner bulletin #410- wherein the operating principle of the unusual Fanmix burner is explained. The burners illustrated in this bulletin are either for horizontal operation or for vertical up firing.

You will observe that the Fanmix burner is radically different in design from conventional standard designs of burners in that we utilize the energy of fuel under pressure, on the reaction principle, which causes the burner driver arms to rotate, thus in turn driving the burner fan which provides the correct amount of air in relation to the fuel input. This is illustrated in figure 4, page 3 of the bulletin, and shows how we can operate with minimum excess air.

High efficiencies are possible with the Fanmix burner because of the violent mechanical mixing of the fuel and air by having the fuel discharged from the rotating orifices into the air stream at approximately 90 degree angles. This near perfect mixing insures short intense combustion patterns whether burning gas with our straight gas burner or gas and oil simultaneously with our combination gas-oil burner.

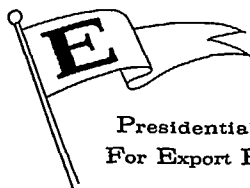
The Fanmix burner is a high pressure burner for pressures of from 5# - 25#. (Max. rating at 25#). The burner will turndown satisfactorily to as low as 1/2 psig.

We are enclosing a brief summarized tabulation of advantages of Coppus Fanmix burners. We feel you will find these of interest.

We also include a questionnaire listing information we would require to present a recommendation to you for conversion of any existing process furnaces to Fanmix burners.

Also enclosed is a questionnaire covering boilers.

- continued -



Presidential Award
For Export Expansion

COPPUS
ENGINEERING CORPORATION

NAME

DATE

SHEET NO.

Peerless Boiler & Engr.

October 27, 1965

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Conversion of existing process furnaces or boilers is in practically every case easy to accomplish. In general, Fanmix burners will fit into existing burner openings. In many cases, a smaller number of Fanmix burners will allow operation at considerably higher heat releases, without flame impingement and with increased efficiency due to much lower excess air. (Each 7% reduction in excess air will reduce fuel cost by approximately 1%.)

If you will fill in the enclosed questionnaires and provide us with detailed prints of your installation, we will be pleased to prepare for you, at no obligation, installation drawings showing how Fanmix burners would be applied.

Our district representatives have interesting case studies available of Fanmix burner installations giving details of how furnace throughputs have been increased, where flame impingement has been eliminated, combustion efficiency has been greatly improved resulting in fuel saving, etc.

In your area, we are represented by, Engineering Sales Company,
1931 So. Harvard, Tulsa 1, Oklahoma.

Sincerely yours,

COPPUS ENGINEERING CORPORATION

W. T. Rogers

W. T. Rogers

Chief Combustion Engineer

WTR:mkd
enc.Enrg.Sales

ADVANTAGES OF COPPUS FANMIX BURNERS

Coppus Fanmix burners offer you many advantages over conventional stationary type burners. Outstanding among these advantages are:

1). Fuel Saving

The ability of the Fanmix burner to operate at low excess air and retaining a short combustion pattern at any rating, assures reduction of the fuel bill. (See operating principle in Bulletin 410-8, page 4, and fuel-air ratio curve, fig. 4, page 5).

Approximately each 5% reduction in excess air results in a fuel saving of 1%.

2). Increased heat release in existing process furnaces or steam boilers.

This is accomplished without changes in stack height or I.D. fan capacity, or to the furnace other than changing to Fanmix burners.

3). Elimination of flame impingement at advanced ratings encountered with conventional stationary type burners.

The near perfect mixing and automatic control of fuel-air ratio by the Fanmix burner assures short combustion patterns irrespective of firing rate and without effecting the low controlled excess air.

4). Elaborate, expensive automatic control equipment (O₂ analyzers, etc) are not required with Fanmix burners.

5). Manual adjustment by operators of air control louvers with changing firing rates is eliminated.

The Fanmix burner automatically controls fuel-air ratio.

6). Cost of the physical installation of Fanmix burners is surprisingly low. In most cases where Fanmix burners replace other makes of burners, they are installed in the existing burner openings in the furnace wall or floor.

COPPUS ENGINEERING CORPORATION, 344 PARK AVE., WORCESTER, MASS. U.S.A.

PROCESS FURNACE QUESTIONNAIRE

Company Name _____

Plant Location _____

Furnace Designation (number or name) _____

A. Fuel

- 1). Are your furnaces fired with gas only? _____
- 2). Are your furnaces fired with oil only? _____
- 3). Are your furnaces fired by a combination of gas and oil? _____

- (a). If fired by gas:
Is it natural gas? _____ BTU/cu.ft. _____
Is it refinery gas? _____ BTU/cu.ft. _____
Is it a blend of gases? _____ BTU/cu.ft. variation _____
Specific gravity? _____
Fuel gas analysis (components % by volume) _____
_____ (list add. info. on back of page)
If refinery or blended gas, is it clean? _____ Ever sour
equivalent grains of sulphur per 100 cu. ft.)? _____
At what pressure is fuel gas available? _____
- (b). If fired by combination of gas and/or oil:
What percentage of time is gas only fired? _____
What percentage of time is oil only fired? _____
If combination gas-oil burners required, would or could some gas
(regardless of quantity) be fired at all times? _____
What type or grade of oil is fired? _____
Do you experience problems firing this oil with your present
combination burners? _____ If so, brief description _____

- (c). If oil is your major fuel fired:
Do you have certain critical furnaces fired by gas only? _____

- B. Do you have process furnaces (horizontal or vertical upfired) where your company would be benefited by firing with Coppus Fanmix Burners? _____
Please refer to Fanmix burner advantages.

- 1) If so, information desired by Coppus Engineering Corporation:
 - (a) What is present heat release from existing burners _____ BTU/Hr?
 - (b) Is present operating excess air too high? _____
If so: What is present excess air? _____
What is desired minimum excess air? _____
 - (c) Do you now experience flame impingement at elevated firing rates or from other causes? _____
 - (d) Is present heat release adequate? _____
If not, what percentage increase would be desirable? _____
 - (e) Please send detailed prints of furnaces showing tube arrangement, refractories and installation arrangement of existing burners.

STEAM BOILER QUESTIONNAIRE

Company Name _____

Plant Location _____

Boiler Designation (number, etc.) _____

A. Type of Draft:

- 1) Are your boilers pressurized furnace type? _____
- 2) Are your boilers natural or I.D. fan draft type? _____
- 3) Are your boilers equipped with air preheaters? _____
If so, what is temperature of preheated air? _____

B. Fuel:

- 1) Are your steam boilers fired with gas only? _____
- 2) Are your steam boilers fired with oil only? _____
- 3) Are your steam boilers fired by a combination of gas and oil? _____
 - (a) If fired by gas:
Is it natural gas? _____ BTU/cu.ft. _____
Is it refinery gas? _____ BTU/cu.ft. _____
Is it a blend of gases? _____ BTU/cu.ft. variation _____
Specific gravity _____
Fuel gas analysis (components % by volume) _____
_____ (list add. info. on back of page)
If refinery or blended gas, is it clean? _____ Ever sour
(equivalent grains of sulphur per 100 cu.ft.)? _____
At what pressure is fuel gas available? _____
 - (b) If fired by combination of gas and/or oil:
What percentage of time is gas only fired? _____
What percentage of time is oil only fired? _____
If combination gas-oil burners are required, would or could some
gas (regardless of quantity) be fired at all times? _____
What type or grade of oil is fired? _____
Do you experience problems firing this oil with your present
combination burners? _____ If so, brief description _____

- (c) If oil is your major fuel fired:
Do you have certain boilers fired by gas only? _____

C. Do you have steam boilers where your company would be benefited by firing with Coppus Fanmix burners? (Please refer to Fanmix burner advantages).

- 1) If so, information desired by Coppus Engineering Corporation:
 - (a) What is present steam generation? _____ #/Hr.
 - (b) Steam pressure? _____ psig.
 - (c) Total steam temperature? _____ °F.
 - (d) Feedwater temperature? _____ °F.
 - (e) Is present steam generation adequate? _____
If not, what percentage increase would be desirable? _____
 - (f) Please send detailed prints of boilers showing tube arrangement,
baffles, refractories, and installation arrangement of existing burners

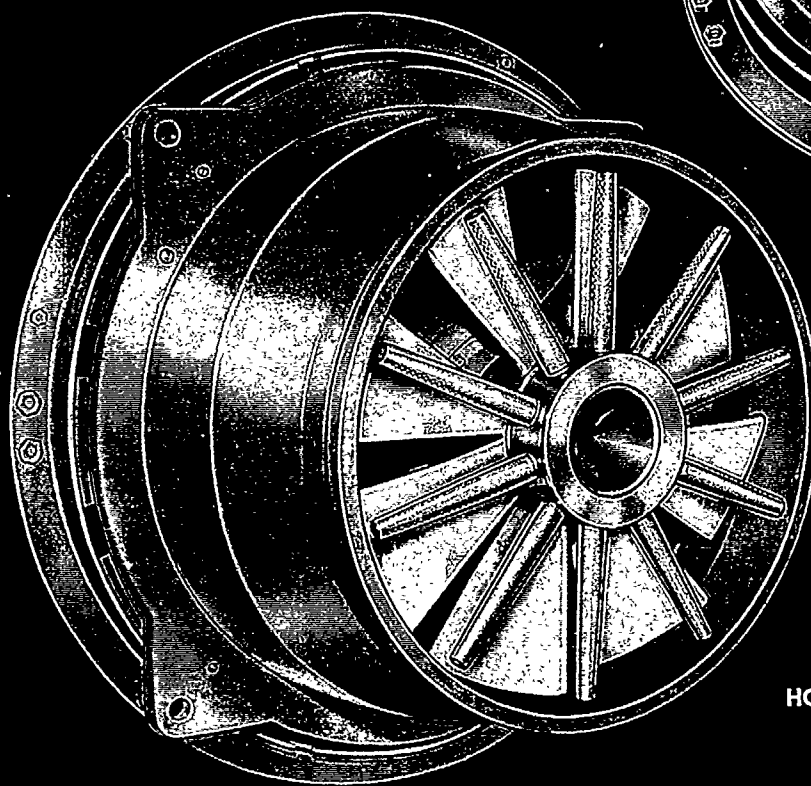
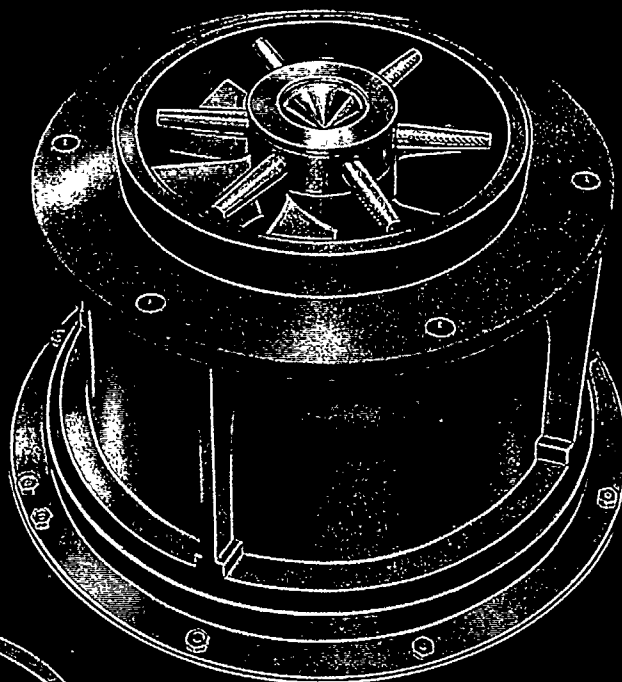
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COPPUS



BLUE RIBBON PRODUCTS

VERTICAL FIRING



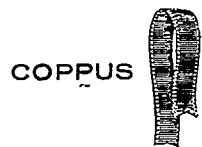
HORIZONTAL FIRING

SAVE FUEL... INCREASE HEAT RELEASE... ELIMINATE FLAME IMPINGEMENT

COPPUS FANMIX[®] BURNERS

GAS AND COMBINATION GAS-OIL

COPPUS ENGINEERING
CORPORATION
WORCESTER, MASS.



BLUE RIBBON PRODUCTS

The Coppus Fanmix[®] Burner

...Bunsen's dream, today's reality

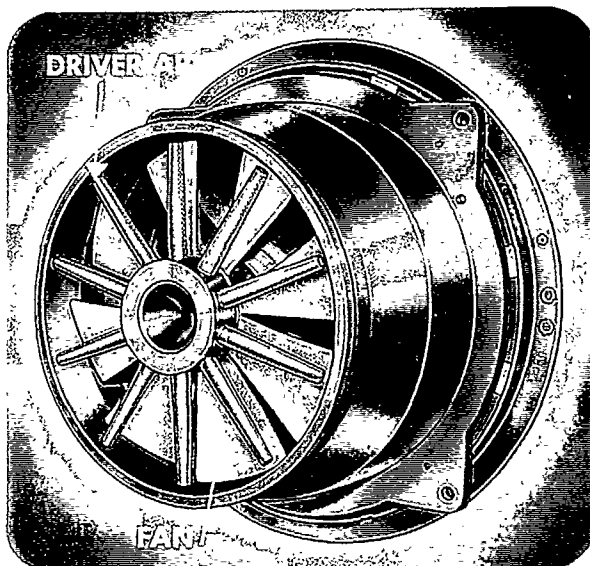


Fig. 1 Coppus FANMIX Gas Burner The ideal gas burner envisioned by the famous scientist was "... one in which there would be an infinite number of gas orifices interposed across a given air stream." Combustion engineers have long agreed that such a burner would be the most highly efficient possible. Today, Bunsen's theory of combustion is approached as nearly as possible by the Coppus FANMIX Burner — Bunsen's dream a near reality.

The FANMIX Principle

The effect of "... an infinite number of gas orifices interposed across the air stream" is produced by the Coppus FANMIX Burner by rotating driver arms with multiple orifices discharging gas at an angle to the air stream. In addition, the FANMIX Burner utilizes the kinetic energy of gas under pressure to produce, by the reaction principle, sufficient mechanical work to rotate a built-in fan (see fig. 1). The speed of this fan varies according to the fuel pressure and the

amount of gas discharged. The fan is so designed that it automatically delivers the correct amount of air in relation to gas flow to assure proper combustion. (See air delivery — gas flow curve, fig. 4). This combined action of rotating orifices and fan creates violent mechanical mixing of gas and air so that the FANMIX Burner actually develops a "sheet" of gas across the air stream — in contrast to jets of raw gas discharged into the air stream by conventional stationary burners.



Fig. 2 Photograph shows FANMIX Burner discharging gas from multiple orifices in driver arms, with driver assembly and fan held stationary. (Smaller number of orifices than normally drilled and steam used instead of gas for photogenic reasons.)

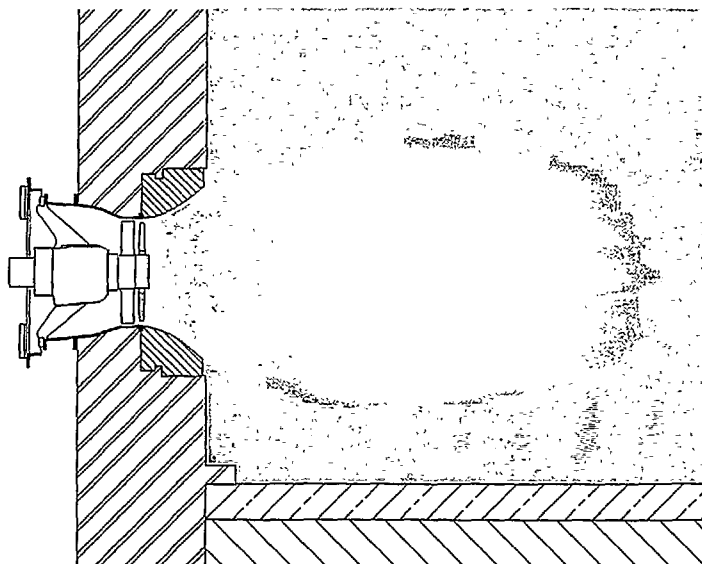
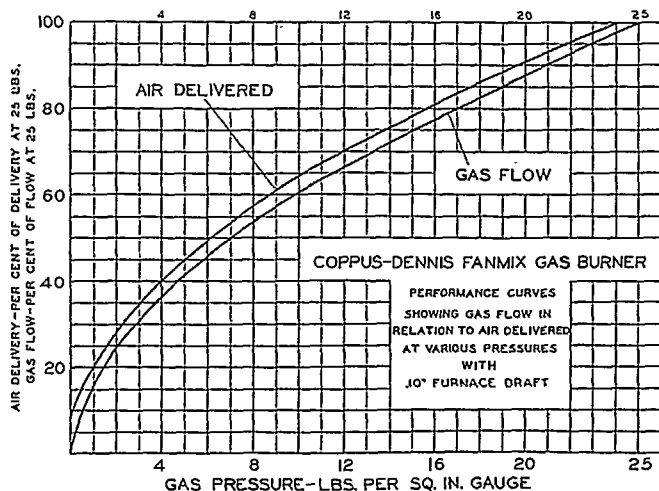


Fig. 3 Thorough mixing of gas and air produces the flame pattern shown . . . short and radiant . . . combustion completed within a few feet from burner tile . . . no flaring out of flame, regardless of firing rate . . . no flame impingement.

Fig. 4 Air Delivery-Gas Flow Curve



ADVANTAGES OF THE FANMIX BURNER

The outstanding feature of the FANMIX Burner is its ability to thoroughly mix mechanically a combination of gas and air in near-perfect proportions. The following are some of the important results:

Fuel Savings

Low excess air assures reduction of the fuel bill since each 7% reduction (approximately) in excess air results in a fuel saving of 1%.

Increased Heat Release

This can be accomplished in existing process heaters or steam generators without changing stack height or without increase in furnace draft. The power driven rotating fan overcomes the draft loss across the burner at any rating. Actually the FANMIX Burner can be considered a "forced draft" burner, without forced draft fans, expensive duct work or elaborate controls.

Elimination of Flame Impingement

The near-perfect mixing of fuel and air with the properly maintained ratio of fuel and air assure short combustion patterns regardless of firing rate. Flame impingement encountered with conventional stationary burners at advanced ratings is eliminated. The end products of combustion are produced within approximately five feet of the FANMIX Burner, regardless of rating.

Uniform Heat

The short intense flame pattern disperses the radiant heat uniformly at all furnace levels or depths.

Improved Heat Release Location

The short flame pattern of the high heat release FANMIX Burner provides maximum heat release at start of radiant section with even heat gradient to entrance of convection section. This assures proper heat absorption ratio between radiant and convection sections, and lower stack temperatures.

Fewer Burners

A smaller number of higher heat release FANMIX Burners with their short flame pattern and even radiant heat can replace a larger number of conventional stationary design burners on existing process heaters or steam boilers. On new heaters or boilers, many economies are possible in the initial selection with a smaller number of FANMIX Burners.

Simplified Control Equipment

Only the fuel pressure required is to be controlled. The air delivered by the integrally mounted fan delivers the correct amount of air in direct relation to the amount of fuel being released. Adjustment of air shutters is only necessary in cases where there is more available draft than is required by the FANMIX Burner (there is no draft loss across the FANMIX!).

In addition, installation costs are surprisingly low since in most cases when FANMIX Burners replace other types of conventional stationary burners, they are installed in the existing burner openings in the furnace wall or floor.



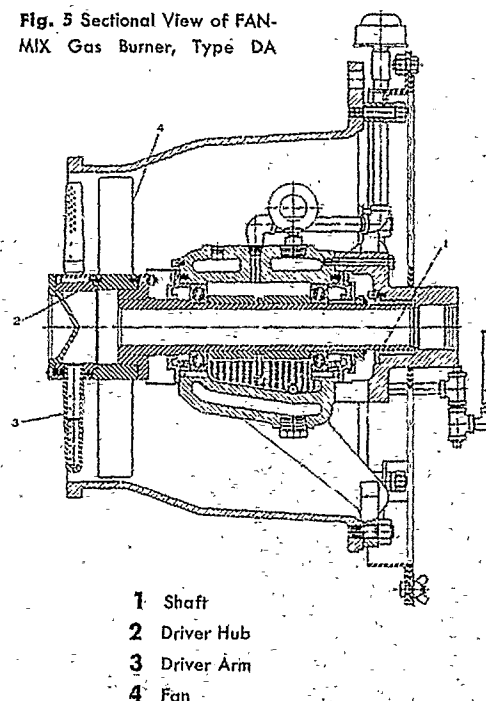
Operation of the FANMIX Type DA Gas Burner

Referring to Fig. 5, the gas passes through a hollow shaft (1) into the driver hub (2) and into the driver arms (3), discharging through multiple orifices in these arms drilled at proper angles to the air stream to assure the desired combustion pattern. The fan (4), which is bolted to the driver hub, is so designed that its power requirement equals the power developed by the reaction force of the gas discharging under pressure through the orifices in the driver arms.

As fuel pressure and amount of gas discharged are increased, fan speed is also increased. Thus, the correct amount of air for proper combustion is delivered automatically. This near-perfect air/fuel ratio is maintained whether the FANMIX Burner is operating at 4 psig at 1/3 of rating or at 25 psig at full rating.

Since bearing size is determined by shaft size to allow the large quantity of gas to pass through the shaft for the high heat release of FANMIX burners, the two ball bearings which carry the hollow burner shaft are much larger than needed to carry the load. This, plus the fact the cold gas passing through the shaft cools the bearings, assures long bearing life. The large volume of air passing at high velocity around the bearing housing and through the fan and across the driver arms gives additional thorough cooling to all rotating parts.

Fig. 5 Sectional View of FANMIX Gas Burner, Type DA



- 1 Shaft
- 2 Driver Hub
- 3 Driver Arm
- 4 Fan

Vertical Firing

Coppus FANMIX Burners for vertically fired process heaters (see Fig. 6) offer all the advantages of horizontal FANMIX Burners. The short combustion pattern precludes flame impingement and prevents burning out of the cone in cylindrically up-fired type heaters. More heat is absorbed in the radiant section and there is no danger of burning of tubes in the convection section. On box type vertically fired heaters, a smaller number of FANMIX Burners will give even furnace temperatures and higher heat release, without flame impingement. Lubrication of type DAU (vertical straight gas burners) is normally by use of permanently lubricated grease sealed bearings or if preferred, an alternate is provided by oil mist (see Fig. 17). Types DGU and DBU (vertical combination gas and oil burners) require oil mist lubrication (see Fig. 17).

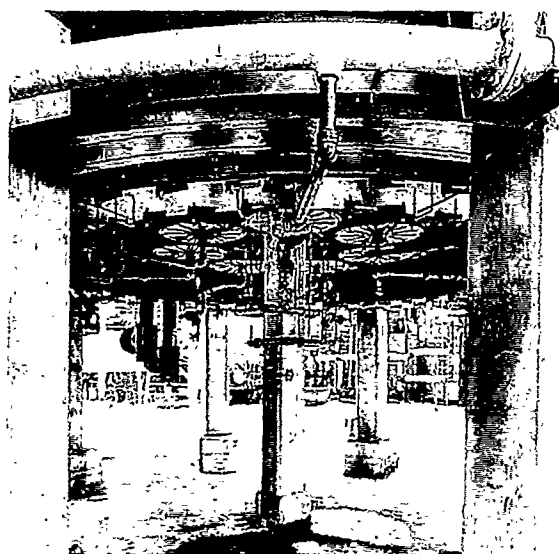


Fig. 6 Seven FANMIX type DAU burners on vertical crude oil heater

The Fanmix Type DG Combination Gas-Oil Burner

The basic FANMIX principle is applied in the combination gas-oil burner, Type DG (Fig. 7). Gas is discharged from rotating driver arms, exerting sufficient force on the fan to deliver the proper amount of air in relation to fuel gas rate. A separate set of driver arms is provided for discharge of steam-atomized oil to give the reaction power required for the fan to deliver the correct amount of air in relation to the fuel oil rate.

As seen in the sectional drawing (Fig. 8), the shaft has three concentric passages: the outside one conducts gas to the gas driver arms; the middle passage conducts steam; and the center passage conducts oil. Steam and oil come together at right angles in the atomizer located in the hub of the driver arm assembly. The completely steam-atomized oil flows under pressure into the oil arms, from which it is discharged essentially transverse to the air stream.

Since the FANMIX Type DG Burner is equipped with separate gas and oil arms (each fuel providing its share of the reaction force to the fan) this burner is a *true* combination gas-oil burner. The two fuels may be fired simultaneously in any ratio. The flame pattern of the oil when firing in combination remains short and firm as opposed to the lazy, drifting oil flame pattern from conventional burners firing a combination of both fuels. With the FANMIX Type DG Burner it is possible to operate with a minimum of excess air regardless of the ratio of the two fuels burned.

When gas fuel only is used, the bypass valve and scavenging valve are left open so that the oil arms then perform as gas arms. When oil is the main fuel, it is advisable to use not less than 10% gas in order to keep the gas orifices clean and cool. The thorough mixing of the atomized oil and gas with the proper amount of air delivered by the fan assures a short combustion pattern, similar to the gas flame pattern shown on Fig. 3.

The FANMIX Type DG Burner — the only major improvement in combination gas-oil burners that has taken place in many years — can be furnished in the horizontal design as well as for vertical up firing.

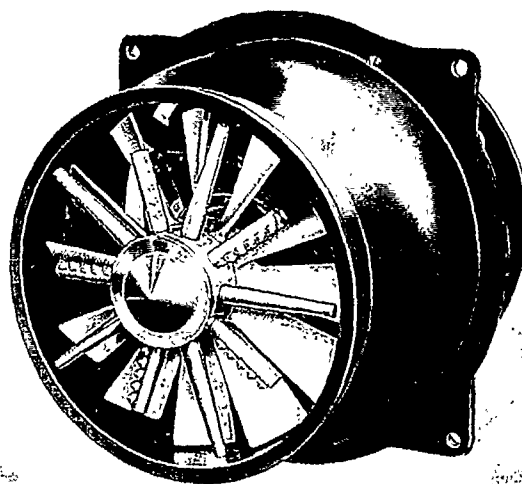


Fig. 7 Coppus FANMIX Type DG Combination Gas-Oil Burner

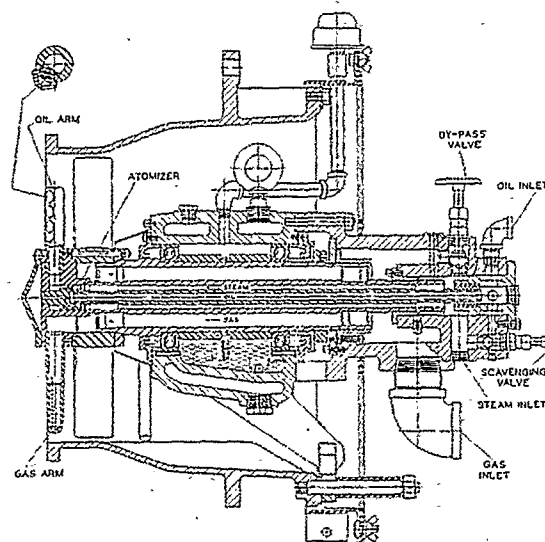


Fig. 8 Sectional View of FANMIX Type DG Gas-Oil Burner

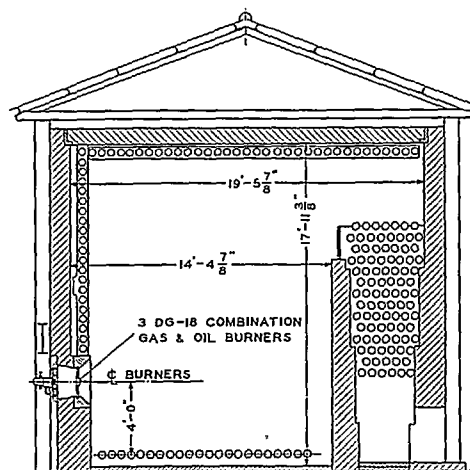


Fig. 9 Typical FANMIX Installation on a Tube Still

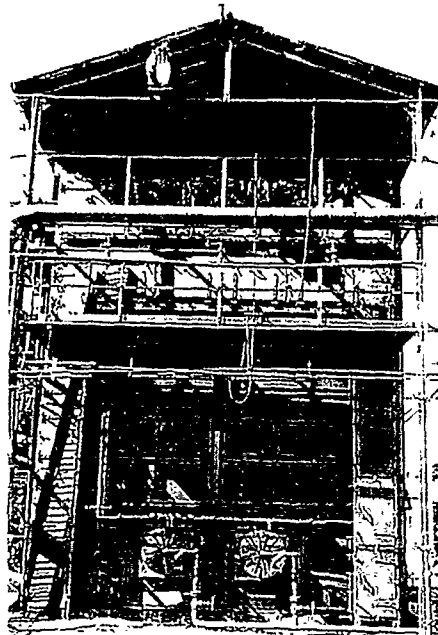


Fig. 10 Four FANMIX Burners (two on each end) on Topping Furnace

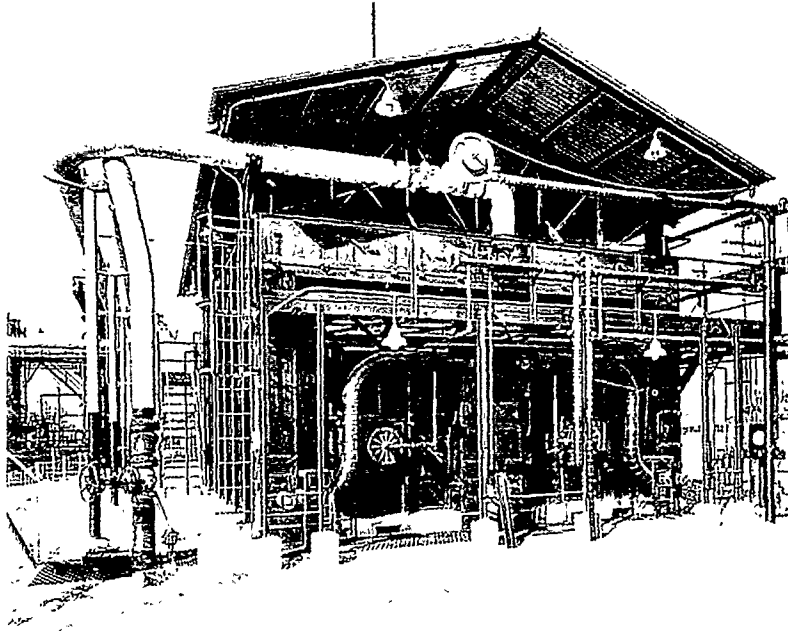


Fig. 11 FANMIX Burner Installation on a Large Oil Heater

The Type DB Combination Gas-Oil Burner with Gun Type Oil Burner

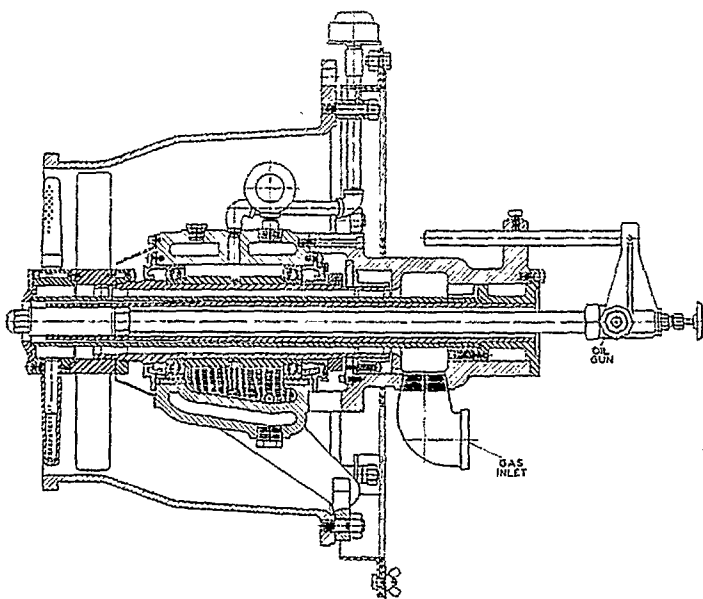


Fig. 12 Sectional View of Type DB Combination Gas-Oil Burner

In addition to the exclusive FANMIX Type DG Combination Gas-Oil Burner, we also offer the Type DB Burner. This burner has a conventional steam atomizing oil gun inserted through the hollow shaft of the burner (see Fig. 12). The Type DB Burner does not have the advantages of the Type DG FANMIX Burner when firing oil, but it has some useful applications where oil is used strictly as a standby fuel. In that case, the air necessary for combustion is obtained by using low-pressure saturated steam instead of gas in the gas arms as the reaction force to rotate the fan.

The Type DB Burner is also used when a combination gas and oil burner is required for use with preheated air on large steam generators equipped with air preheaters and separate forced draft fans. The oil gun can be either the steam atomizing or the mechanical atomizing type.

The Type DB Burner is also advantageous for special applications by replacing the oil gun with a gas gun to supply gas for delayed combustion or to obtain a long flame pattern such as required on rotary kilns (see Fig. 19).

Burner Sizes

The FANMIX Type DA Gas Burner is available in nine sizes. FANMIX Combination Gas-Oil Burners, Types DG and DB, are made in five sizes. Their capacities based on 1000 BTU gas and 25 psig operating pressure are shown in Fig. 13. When gas is other than 1000 BTU per cubic foot or pressure is other than 25 psig, the heat release for any size burner is obtainable by applying the percentage factor given on curve, Fig. 14. When burning oil in combination gas-oil burners, Type DG, the heat release shown in Fig. 13 is based on 85 psig oil pressure and a corresponding steam atomizing pressure of 100 psig saturated.

For installations using gas with a varying heating value, please refer to the nearest Coppus district sales office for the selection of burners.

Though Fanmix burners will operate satisfactorily with pressure as low as $\frac{1}{2}$ psig at partial ratings, it is advisable when making burner selections to have at least 5 psig operating pressure available in order to obtain a satisfactory turndown ratio. The most economical selection of burners can be made when approximately 25 psig gas pressure is available.

Heat Release of FANMIX Burners in BTU/Hour at 100 Percent Rating, based on 1000 BTU Gas, 25# Pressure and with .10" Furnace Draft.					
SIZE	BTU/HR.	SIZE	BTU/HR.	SIZE	BTU/HR.
DA-5	1,500,000	DG-11	8,000,000	DB-13	21,000,000
DA-8	4,500,000	DG-13	15,000,000	DB-15	28,000,000
DA-10	9,000,000	DG-15	20,000,000	DB-18	35,000,000
DA-11	13,000,000	DG-18	28,000,000	DB-21	57,000,000
DA-13	23,000,000	DG-21	42,000,000	DB-26	71,000,000
DA-15	30,000,000				
DA-18	38,000,000				
DA-21	60,000,000				
DA-26	75,000,000				

Fig. 13

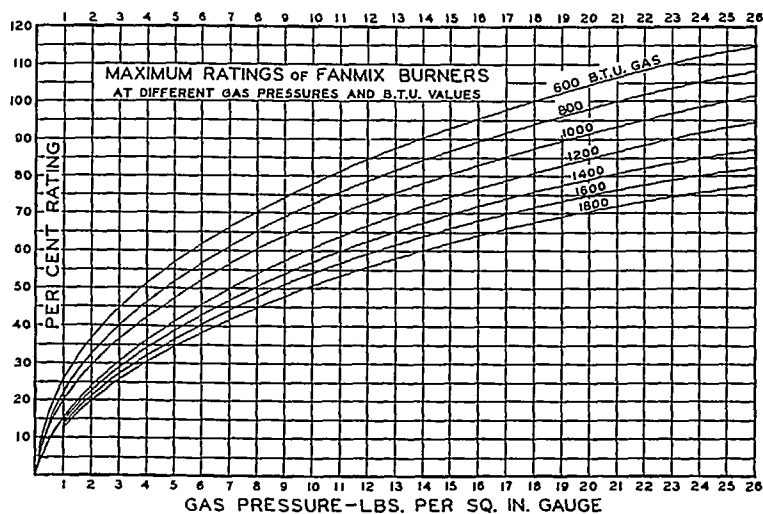
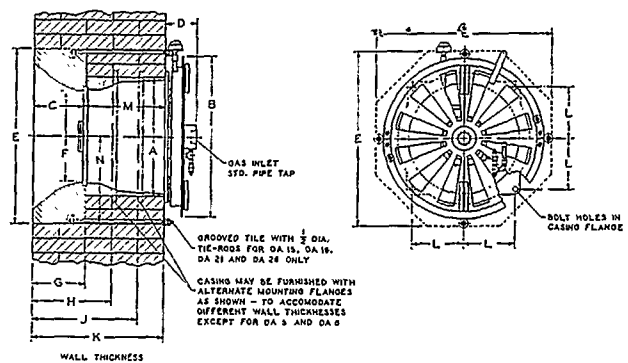
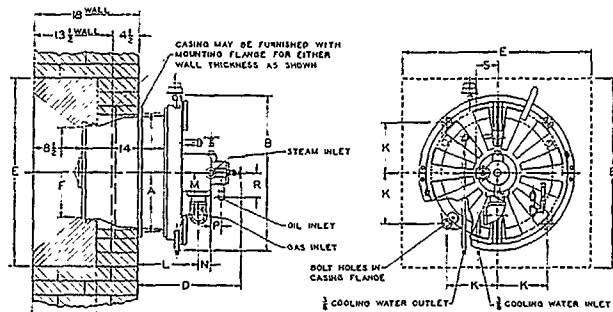


Fig. 14



SIZE	GAS INLET	A	B	C	D	E	F	G	H	J	K	L	M	N	BOLT HOLES
DA-5	$\frac{1}{2}$	$6\frac{1}{2}$	$7\frac{3}{4}$	4	4	$12\frac{1}{2}$	$5\frac{3}{8}$	$4\frac{1}{2}$	—	—	9	$3\frac{3}{8}$	5	—	$4-\frac{1}{2}$
DA-8	1	$10\frac{1}{2}$	12	4	$4\frac{1}{2}$	$17\frac{1}{2}$	$8\frac{3}{8}$	$4\frac{1}{2}$	—	—	$13\frac{1}{2}$	$4\frac{1}{2}$	$9\frac{1}{2}$	—	$4-\frac{1}{2}$
DA-10	$1\frac{1}{4}$	13	18	$8\frac{1}{2}$	$4\frac{1}{2}$	20	$9\frac{1}{2}$	9	—	$13\frac{1}{2}$	18	$5\frac{3}{8}$	$9\frac{1}{2}$	—	$4-\frac{5}{8}$
DA-11	$1\frac{1}{2}$	$16\frac{1}{8}$	23	$8\frac{1}{2}$	$4\frac{1}{2}$	25	$11\frac{1}{2}$	9	$13\frac{1}{2}$	18	22	$7\frac{3}{8}$	14	—	$4-\frac{3}{4}$
DA-13	2	$20\frac{3}{8}$	$27\frac{1}{2}$	$8\frac{1}{2}$	$5\frac{1}{2}$	$27\frac{1}{2}$	$13\frac{1}{2}$	9	$13\frac{1}{2}$	18	22	$8\frac{3}{4}$	14	—	$4-\frac{7}{8}$
DA-15	2	$20\frac{3}{8}$	$27\frac{1}{2}$	$8\frac{1}{2}$	$5\frac{1}{2}$	30	$15\frac{1}{2}$	9	$13\frac{1}{2}$	18	22	$8\frac{3}{4}$	14	$14\frac{1}{2}$	$4-\frac{7}{8}$
DA-18	$2\frac{1}{2}$	$23\frac{1}{2}$	$31\frac{1}{2}$	$8\frac{1}{2}$	$5\frac{1}{2}$	$32\frac{1}{2}$	$18\frac{1}{2}$	9	$13\frac{1}{2}$	18	22	$10\frac{1}{4}$	14	$15\frac{3}{4}$	$4-\frac{7}{8}$
DA-21	3	$27\frac{1}{2}$	36	$8\frac{1}{2}$	7	35	$21\frac{1}{2}$	9	$13\frac{1}{2}$	18	22	12	14	17	$4-1$
DA-26	4	33	42	13	$7\frac{1}{2}$	$41\frac{1}{2}$	$26\frac{1}{2}$	$13\frac{1}{2}$	18	22	27	14	14	20	$4-1\frac{1}{8}$

Fig. 15 Dimension Drawing of FANMIX Gas Burner, Type DA



SIZE	GAS INLET	STEAM INLET	OIL INLET	A	B	D	E	F	K	L	M	N	P	R	S	BOLT HOLES
11	$1\frac{1}{2}$	$\frac{1}{2}$	$\frac{3}{8}$	$16\frac{1}{8}$	$22\frac{1}{2}$	$16\frac{1}{2}$	$27\frac{1}{2}$	$11\frac{1}{2}$	$7\frac{1}{2}$	9	$6\frac{1}{2}$	$2\frac{1}{2}$	$1\frac{1}{8}$	$3\frac{1}{2}$	$3\frac{1}{2}$	$4-2\frac{1}{2}$
13	$1\frac{1}{2}$	$\frac{3}{4}$	$\frac{1}{2}$	$20\frac{3}{8}$	$26\frac{3}{4}$	$16\frac{3}{4}$	30	$13\frac{1}{2}$	$8\frac{1}{2}$	$9\frac{1}{2}$	$6\frac{1}{2}$	$2\frac{1}{2}$	$1\frac{1}{8}$	$3\frac{1}{2}$	$3\frac{1}{2}$	$4\frac{1}{8}$
15	$2\frac{1}{2}$	$\frac{3}{4}$	$\frac{1}{2}$	$20\frac{3}{8}$	$26\frac{3}{4}$	18	$32\frac{1}{2}$	$15\frac{1}{2}$	$8\frac{1}{2}$	$10\frac{1}{2}$	$7\frac{1}{2}$	$2\frac{1}{2}$	$1\frac{1}{8}$	$3\frac{1}{2}$	$3\frac{1}{2}$	$4\frac{1}{8}$
18	$2\frac{1}{2}$	$\frac{3}{4}$	$\frac{1}{2}$	$23\frac{1}{2}$	$30\frac{1}{2}$	18	35	$18\frac{1}{2}$	$10\frac{1}{2}$	$10\frac{1}{2}$	$7\frac{1}{2}$	$2\frac{1}{2}$	$1\frac{1}{8}$	$3\frac{1}{2}$	$3\frac{1}{2}$	$4-\frac{1}{8}$
21	3	1	$\frac{1}{2}$	$27\frac{1}{2}$	$34\frac{1}{2}$	$18\frac{1}{2}$	40	$21\frac{1}{2}$	12	$11\frac{1}{2}$	8	$2\frac{1}{4}$	$1\frac{1}{4}$	$3\frac{1}{2}$	$3\frac{1}{2}$	$4-1$

Fig. 16 Dimension Drawing of FANMIX Gas-Oil Burner, Type DG

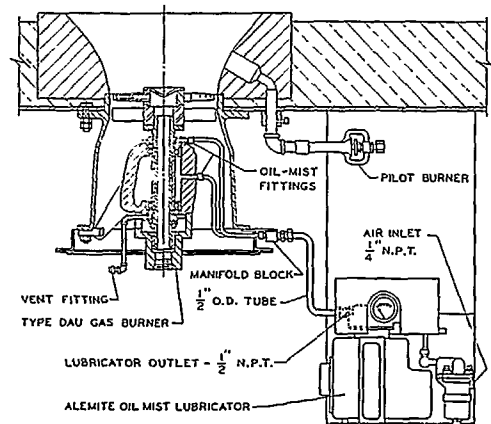


Fig. 17 Oil Mist Lubrication System for vertical FANMIX Burners, where required. (Alternate for Type DAU straight gas burners — normally equipped with grease sealed bearings — but required for types DGU and DBU. Please refer to Vertical Firing Page 4.) A standard oil mist lubricator supplies an atomized mist of oil to the two ball bearings. One oil mist lubricator will supply up to 15 FANMIX Burners.

Special Designs and Applications

For certain applications, such as on process heaters with convection sections, more than a minimum of excess air may be desirable. In such cases FANMIX Burners can be modified — by changing the number of orifices in the driving arms, and their location, or the driving angle — to provide additional air. For, with the additional driving force more air will be delivered by the fan than normally would be required.

It is also possible to secure delayed combustion, if such is desirable, by drilling some of the orifices at a larger angle to the plane of rotation than normal. The result is a longer flame pattern.

On installations where there is an excessive draft condition (this may happen when a FANMIX Burner is used with other fuel burning equipment) — “reverse-drive” orifices can be furnished to reduce the power output of the fan of the FANMIX Burner. Thus, we have control over the rotating power for various operating conditions.

Other applications where FANMIX Burners have greatly improved performance includes: rotary kilns, bauxite and calcining kilns, cement kilns, alfalfa and grain dryers, gypsum kettles, reverberatory furnaces, annealing furnaces and stress-relieving furnaces. (See Fig. 18 and Fig. 19.)

FANMIX Burners are used successfully on boilers equipped with coal stokers for burning gas during the summer months when gas rates are lower (or combination firing of coal and gas). (See Fig. 20.) They are also ideal for firing boilers in combination with other fuels such as bagasse, hogged fuel and blast-furnace gas because FANMIX Burners supply their own air and mix their own fuel independent of the combustion conditions caused by other fuels.

Pilot Burners, Flame Failure Protection

The Coppus Pilot Burner is fully adjustable to provide any type flame from yellow to blue and is available either for manual ignition or in a spark-ignited model. The burner tile is equipped with a pocket in the tile to direct the pilot flame across the burner flame. A typical installation of a Coppus Pilot Burner for manual ignition is shown in Fig. 17.

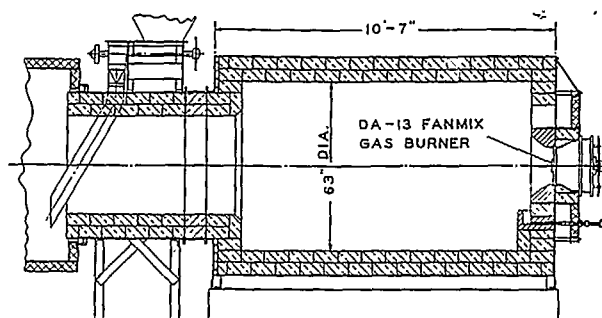


Fig. 18 Air Heater. Drawing shows installation of FANMIX Burners in furnace of typical dehydrator, air heater or aggregate dryer.

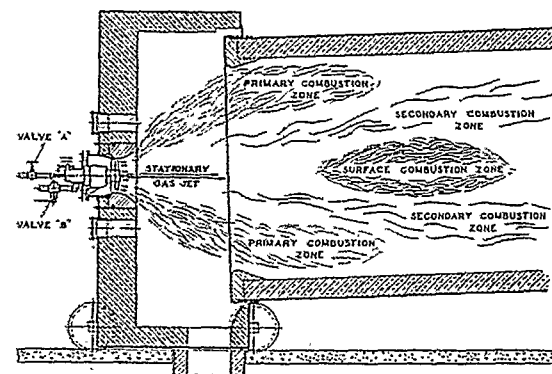


Fig. 19 Rotary Kiln. Typical installation of special rotary kiln burner, Type DB. Separate control of gas (Valve A) on the center gas gun and on the driver arms (Valve B) provides maximum flexibility of flame patterns.

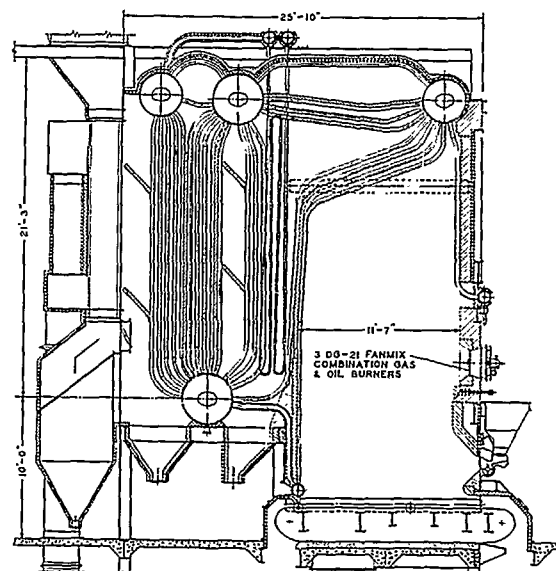


Fig. 20 Drawing shows typical installation of FANMIX Burners on boiler equipped with coal stoker.

Further information about FANMIX Burners is contained in three booklets entitled “New Developments in Burners and Their Applications”, “Economics of Combustion” and “Modern Methods for Gas Firing of Lime Kilns”. For any additional data, please contact the nearest Coppus district sales office or write directly to Coppus Engineering Corporation, 344 Park Avenue, Worcester, Massachusetts.