DESCRIPTION OF THE LOPULCO SYSTEM OF FEEDING AND BURNING PULVERIZED FUEL IN SUSPENSION.

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A good many years have been spent in research work in the developement of the Lopulco System of feeding and burning of pulverized fuel in suspension.

The Lopulco System uses the Raymond mill and the Ruggles Coles dryer, but the dryer is eliminated unless the coal containg about 10 or 12 percent of moisture most of the time. As the pulverizing plant is purely a mechanical nature and long practice of this nature has brought forward many different means of drying, pulverizing the fuel, it hardly seems necessary to take time to describe a mechanical problem upon which so much information is at present available.

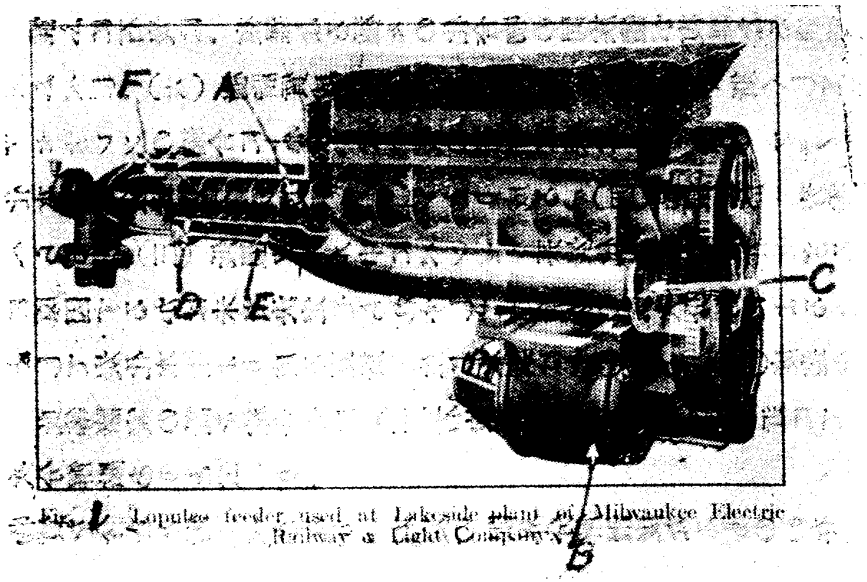

Fig. 1 Lopulco feeder used at Lakeside plant of Milwaukee Electric Railway & Light Company.

FEEDERS

The Lopulco feeder shown in figure 1 is a heavy cast iron hopper which forms the bottom of the bin. In the bottom of the hopper is a cast iron screw "A" driven by a varable speed motor "B", or in the case or a duplex feeder by the means of the Reeves varable speed drive. The air enters at "C" and is used for transporting the coal from the feeder to the burner. The screw brings the coal to its end which is coincident with the end of a sleeve "D" tightly surrounding it and forming the inner wall of an annular orifice "E" through which air is brought for the purpose of transporting the coal to the burner. The coal and air arriving at this point, are united and further agitated or commingled by four paddles "F" revolving with the screw. The fuel and air are

qus thoroughly combined and the finely divided coal is aerated so thoroughl ly that the ensuing mixture might be considered a heavy, mechanical gas and may be used and handled as such. Only about 15 percent of the air required for combustion is used for conveying the coal from the feeder to the burner therefore it is impossible to get a backfire or an explosion in the fuel pipe such as happens with other methods of feeding the coal.

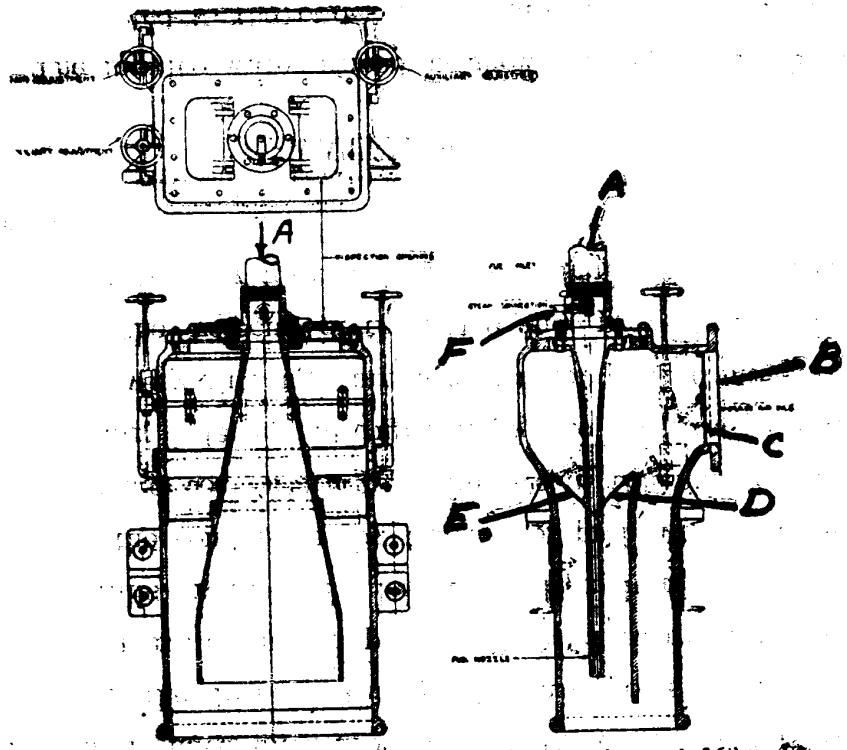

Fig 3 –Lopulco burner as installed at Lakeside plant of Milwaukee Electric Railway & Light Company

The feeders are so designed as to give a positive and uniform of coal widely varable as to capacity, with range immediately responsive to operating demands.

BURNERS

There are several types of Lopulco burners designed for different conditions. The latest one now in use for boiler work is the Fantail burner shown in figure 3. The fuel enters at "A", part of the air for combustion enters at "B" and is regulated by the dampers "C, D & E" to suit the grade of coal being burnt. The steam siphon "F" is used for conveying the coal to the burner in case the air pressure should fail—thereby always insuring continuous operation.

FURNACE

Figure 4 shows the general arrangement of the Lopulco combustion chamber. The coal enters at "A" through the vertical burner, from zero to 20 percent of the air required for combustion enters at "B" and the rest of the

air required for combustion enters at "C" follows the hollow furnace wall around the furnace and enters the front of the furnace through the air ports "D". This arrangement cools and protects the brickwork of the furnace walls, reduces the loss through radiation, and improves the combustion by the use of preheated air. By the air and coal entering the furnace in this manner, that is the air entering at right angles to the flow of coal, gives a very thorough mixture and complete combustion, reduces the velocity of the flame and prevents any impinging or blow torch action of the flame on the brickwork.

WATER SCREEN

The lopulco water screen is shown in figure 4. This is connected to the boiles in the same manner and place as the lower row of boiler tubes, which allows circulation of the boiler water through the screen at all times. The direction of flow of water through the screen is shown by the arrows. The object of this screen is to prevent slag from forming on the bottom of the furnace thereby increasnig the efficiency and rating and insuring continuous operation. Above the screen is the combustion zone, and the particles of ash falling from the high temperature combustion zone are cooled below the fusing point of the ash, below the water-screen thereby preventing slag and allowing the ash to be easily removed.

ADVANTAGES

Powdered fuel firing has the following advantages to offer for stationary boilers.

1—The capital investment will be no greater than for any usual type of plant with stokers.

2—The cost of firing from coal car to ash car will be less with pulverized fuel firing than with stokers.

3—The maintenance of the furnace and boiler will be less when using pulverized fuel than when using stokers.

4—High efficiency and high rating may be obtained no matter what the character of the fuel received.

5—The problem of plant operation will be much less complicated.

6—The load can be followed very closely.

7—There will be a very considerable saving of coal under any condition.

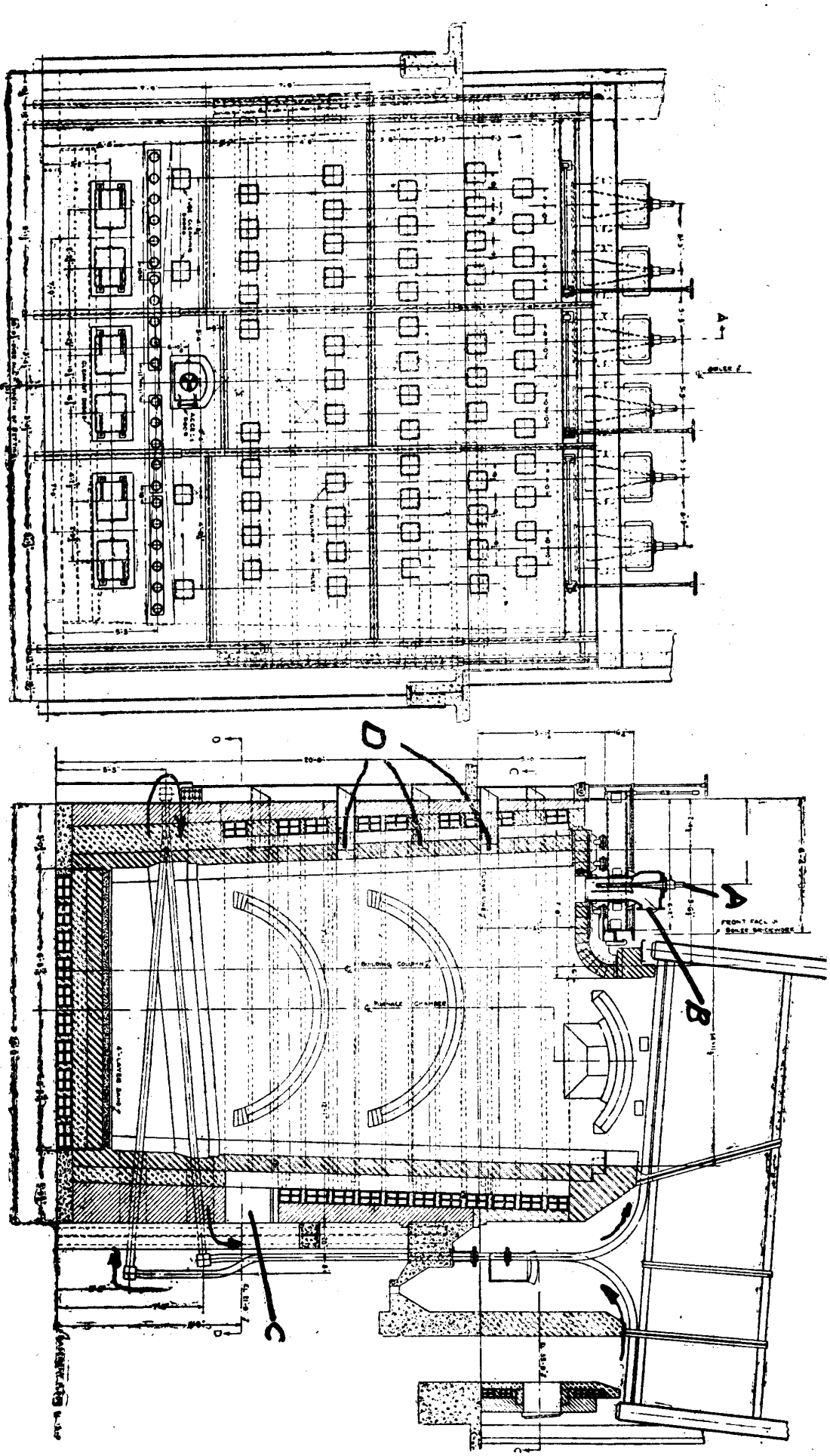

Fig. 4 —General arrangement of combustion chamber with water screen at Lakeside plant of Milwaukee Electric Railway & Light Company

8—Smokeless operation.

9—Standby losses during banking periods reduced to a minimum.

10—Clean boiler room.

11—Gas or oil can be used in the same furnace with pulverized coal.

INSTALLATION

The following list shows the principal Lopulco installations in the U. S. A.

COMPANY	UNTIS	KIND OF FUEL
The Milwaukee Elec. Ry and Light Co.	5-468 HP Edge Moor Bollers	Illinois Indiana Kentucky Youghionghey
*The Milwaukee Electric Railway & Light Co.	8-1308 HP Edge Moor Boilers	As above
*Lima Locomotive Works.	1-500 HP waste heat Wicks Boiler 1-Forge billet heating—furnace	Ohio Indian Screenings
*Lima Locomotive Works	6-400 HP Wicks boilers 1-500 HP Heine boiler	As above
Allegheny Steal Co.	2-Bullet heating furnaces.	Pittsburg coal
*Allegheny Steel Co. *" " " *" " " *" " " *" " "	1-333 HP Wicks boiler 7-333 " " " 1-400 HP Erie City boiler 1-333 HP Wicks boiler 2-600 HP stirling boilders	As above
Morris and Company.	5-500 HP Edge Moor boilers 2-300 HP Edge Moor boilers	Lignite McAlester & Heinrietta Scseenings Fuel Oil & Natural Gas
St. Joseph Lead Company.	2-768 HP Stirling boilers	Illinois
Ford Motor Company.	2-768 HP Ladd boilers	Illinois & Kentucky Screenings & Blast Furnace gas and Tar
Duquesne Light Co.	1-822 HP Stirling boiler (under bonstruction)	
West Penn. Power Co.	(Under construction)	

(*Repeat Orders.)

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