Dec. 1, 1942. D. E. LEMSTER ET AL 2,303,648

BURNER

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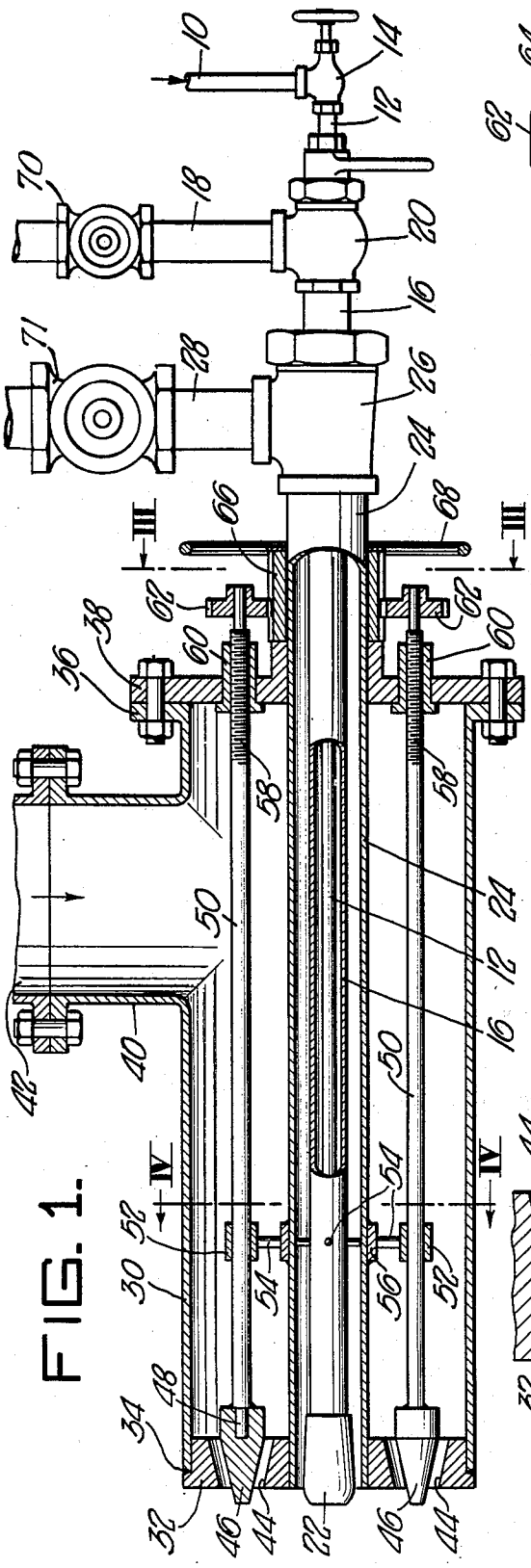


FIG. 1.

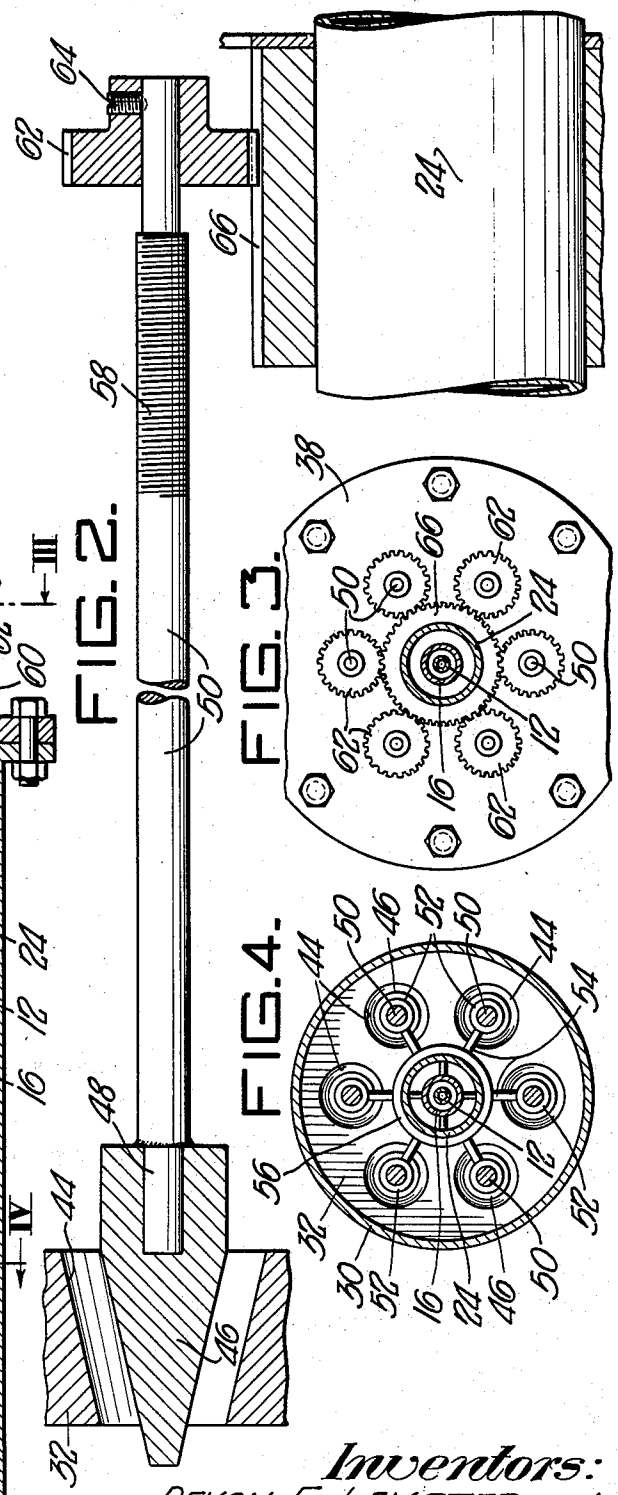


FIG. 2.

FIG. 3.

FIG. 4.

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BURNER

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2 Claims. (Cl. 158—11)

The present invention relates to a type of burner which, while not limited thereto, is peculiarly well suited for use in connection with hot sheet mill pack furnaces.

Such furnaces as heretofore constructed are efficient only so long as the steel being heated was within the confined limits of type size and weight for which given burners were designed. Heretofore efficient heating of the product was dependent upon maintaining a high flame velocity and furnace atmosphere which was recirculated through the heating and combustion chambers of the furnace. When the burner rating was reduced in order to prevent overheating of a light product, flame velocity dropped; thus the heating was not uniform and was inefficient. Likewise, when a heavy product was being heated in the furnaces for which low capacity burners were provided, the furnace output was correspondingly very low. To meet this condition each time it was desired to change the capacity of the furnace it was necessary to alter the burners, which was a wasteful practice resulting in considerable nonproductive time and expense.

The burners heretofore used were equipped with air outlet orifices in the nozzle of fixed size, and in order to increase the burner capacity the burner had to be removed and the total area of the air nozzle orifices increased. On the other hand, to lower the burner capacity it was necessary to remove the burner and replace the air nozzle with one containing orifices of a smaller area. These changes and alterations entailed shutting down of the furnace and thus putting it out of production for a consequential time interval and also involved the labor and expense of reconstructing the burners.

The burner of the present invention aims to overcome the above and other objectionable features of prior art burners. To this end the burner of our invention is designed to maintain constant flame velocity through the complete range of capacities required by a wide variety of products to be heated. This increases the flexibility of the furnaces in which the burners are used and eliminates lost time due to shut downs heretofore necessary in order to change the air nozzles in conventional burners.

The present invention consists of the particular combination of coacting elements, all of which are combined and coordinated in the manner herein shown, described and specifically claimed.

For a full and complete understanding of the characteristics of the present improvement, reference is to be made to the following description, the accompanying drawings and the appended claims.

In the drawings:

Figure 1 is a longitudinal vertical section through the burner of the present invention;

Figure 2 is an enlarged detail of parts shown in Figure 1;

Figure 3 is a fragmentary detail view partly in section on line III—III of Figure 1 of certain essential elements of the invention; and

Figure 4 is a detail section on line IV—IV of Figure 1.

Referring in detail to the drawing, the numeral **10** represents an oil supply pipe which connects with a liquid fuel burner pipe **12**, the supply of liquid fuel being under control of a valve **14**. Surrounding the pipe **12** there is a pipe **16** which is supplied with atomizing steam through the fitting **20** by the supply pipe **18** under control of a valve **70**. The atomized liquid fuel is discharged from a burner tip **22** in a manner well known to those skilled in the art.

Surrounding the pipe **16** there is a fuel pipe **24** which is connected to a fitting **26** which in turn communicates with a gaseous fuel supply pipe **28**. A valve **71** controls the supply of gaseous fuel.

The foregoing liquid and gaeous fuel supplies are of conventional form and are not herein claimed per se apart from the combination.

Commercial grades of fuel oil are supplied at from 10 to 50 pounds pressure and are atomized by steam at from 15 to 50 pounds pressure. When natural gas is used, the same is supplied at a pressure of 1 to 10 pounds. In some cases a combination of both natural gas and atomized liquid fuel may be used.

Heretofore the amount of air supplied to support combustion has been controlled by the combined area of a series of apertures formed in a nozzle portion of the burner and in order to change the rating of the burner it has been necessary to either substitute a burner with different size air outlet ports or to reconstruct the burner by substituting a part containing air outlet ports of requisite size. The present invention overcomes this costly and cumbersome time-consuming practice. To this end we provide a shell **30** which surrounds the fuel pipe **24**. At its discharge end the burner of our invention is provided with a disc **32** which is secured by a weld seam **34** to the inner extremity of said shell **30**. At its outer extremity the shell **30** has a ring **36** welded thereto to which there is bolted or otherwise secured an end closure plate **38**. The

shell is formed with a laterally extended branch **40** leading to an air supply pipe **42** which is connected with a suitable fan or blower.

The disc **32** has a plurality of circularly arranged outlet ports **44** formed therein which are preferably tapered. Projecting through each outlet port there is a tapered tip member **46** preferably formed of stainless steel. The disc **32** is also preferably formed of stainless steel, this material being desirable since it resists rust and corrosion and prevents clogging of the orifices by corrosive action of furnace gases.

Each tip **46** is welded or otherwise secured to a shank **48** of reduced diameter formed on the inner extremity of a rod **50**. The several rods **50** are mounted with freedom for limited longitudinal movement in guides **52** carried by spider arms **54** radiating from a spider hub **56** welded or otherwise secured to the fuel pipe **24**.

Each of the rods **50** is screw threaded as indicated at **58** for coaction with correspondingly threaded feed nuts **60** fixedly secured to the plate **38**. A pinion **62** is fixedly secured by a set screw **64** or the like to the outer extremity of each rod **50**. The several pinions **62** mesh with a common operating gear **66** which has a hand wheel **68** secured thereto, the gear and the hand wheel being rotatable in unison about the axis of the fuel pipe **24**.

With the parts as above constructed and arranged, all that is required to change the capacity of the improved burner is to operate the hand wheel **68** to turn the gear **66**. This will simultaneously rotate all of the pinions **62** and thus either advance or retract the adjusting rods **50** because of the coaction of the threaded portions **58** of the rods with the feed nuts **60**. This will either advance or retract the tapered tips **46** which project into the tapered air ports **44**. This will result in either decreasing or increasing the total area of the ports in the nozzle portion of the burner, depending, of course, upon whether the rods are retracted from the disc **32** or advanced toward it. Thus the flame velocity and furnace atmosphere recirculation are held constant by compensating for changed air volumes by increasing or decreasing the total area of the air ports in the nozzle portion of the burner. The increased effectiveness of the burner shown and described is made available whether using either gas or oil as fuel or whether using a combination of gas and oil. The parts as shown and described are of simple design and of sturdy construction. Thus the burners are inexpensive to build and maintain and have a relatively long life.

While we have described quite specifically the burner herein illustrated, it is to be understood that various modifications and changes may be made and that the appended claims are to be construed as broadly as is consistent with the prior state of the art.

We claim:

1. A burner of the character described comprising a longitudinally extending fuel pipe, a nozzle disc secured to the discharge end thereof, a plate spaced from the latter and secured to said pipe, a shell surrounding said pipe and closed at its opposite ends by said disc and said plate, said shell having an air inlet connection, said disc having a plurality of air outlet ports therein, tapered members projecting into said ports, means supporting said members with freedom for longitudinal adjustment relative to said disc, and means for simultaneously imparting a longitudinal adjusting movement to all said tapered members so as to vary the effective outlet area of all said air ports.

2. A burner of the character described comprising a longitudinally extending fuel pipe, a nozzle disc secured to the discharge end thereof, a plate spaced from the latter and secured to said pipe, a shell surrounding said pipe and closed at its opposite ends by said disc and said plate, said shell having an air inlet branch extending laterally therefrom, said disc having a plurality of circularly spaced air ports therein, respective tapered tips projecting into said ports, circularly spaced rods paralleling said fuel pipe for supporting said tips, a spider secured to the fuel pipe having guides formed therein for said rods, each rod being provided with a screw threaded portion, respective feed nuts coacting with said threaded portions and secured to said plate, respective pinions secured to said rods, and a gear rotatable about the axis of the fuel pipe engaging said pinions to simultaneously move all said tips relative to said ports to thus simultaneously vary the effective air outlet areas thereof.

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