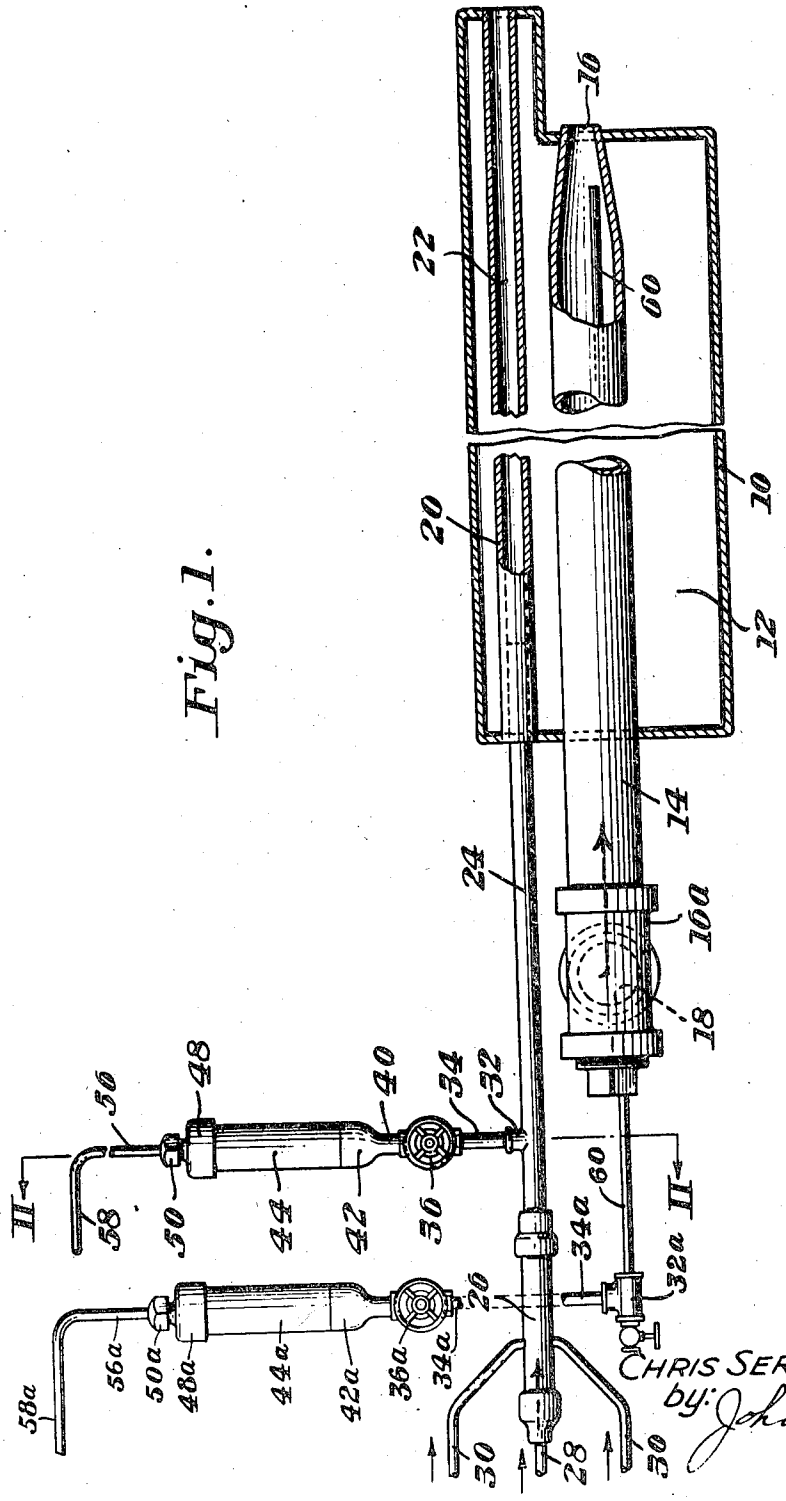
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METHOD AND MEANS OF CLEANING BURNERS

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Fig. 1.




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Fig. 2.

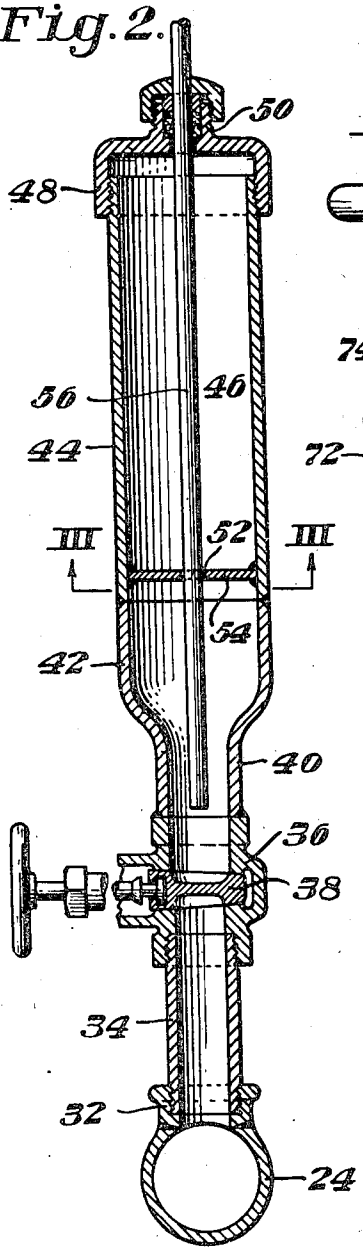



Fig. 4.

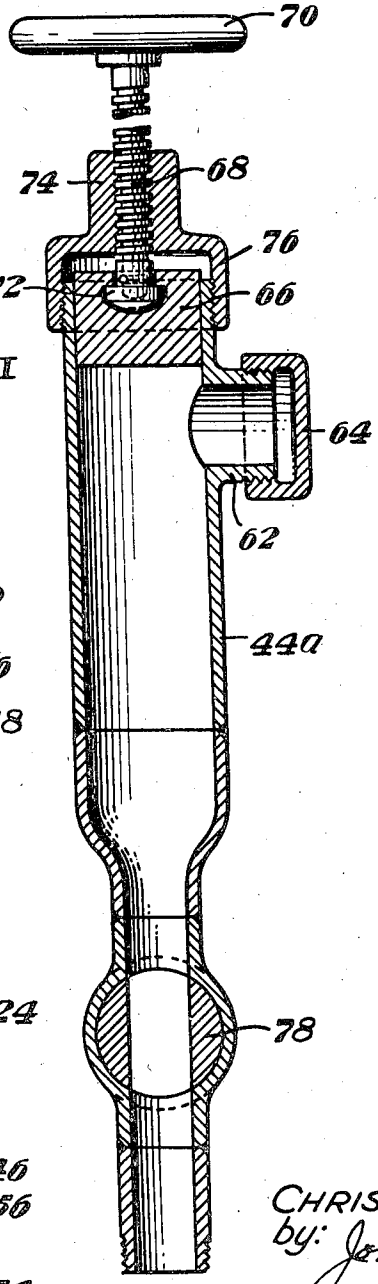



Fig. 5.

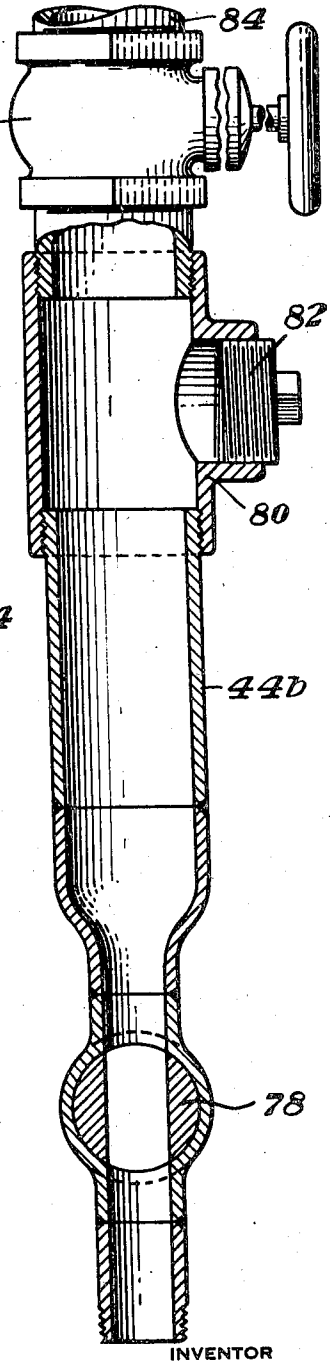
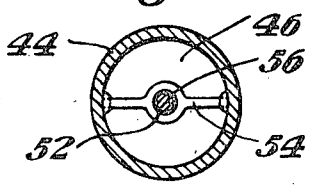



Fig. 3.




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## METHOD AND MEANS OF CLEANING BURNERS

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Application February 28, 1945, Serial No. 580,239

3 Claims. (Cl. 51—8)

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The present invention relates to an improved method and means for loosening accumulated deposits of foreign matter from the walls of fuel passageways and expelling such foreign matter from a burner.

Among the objects of the invention, are to provide a method and means for loosening and expelling accumulated deposits of foreign matter from the fuel passageways of burners, to keep burners operating at a high efficiency, to accomplish the cleaning of burner passageways without interrupting the operation of the burner, to maintain the fuel passageways of burners in a cleaned and polished condition, to eliminate the messy job heretofore necessary to clean prior art types of burners, to provide a method and means for cleaning burner passageways without requiring the disconnecting or removal of the burner, and to provide a method and means for easily and quickly cleaning burner passageways.

The method and means for making available the above, as well as other objects of the invention, will be fully apparent from a consideration of the following detailed disclosure, the accompanying drawings, and the appended claims.

In the drawings:

Figure 1 is a side elevation of a somewhat conventional form of burner showing the application of my invention thereto.

Figure 2 is an enlarged vertical sectional view on the line II—II of Figure 1 and showing an abrasive containing magazine operatively connected with the burner.

Figure 3 is a horizontal section taken on the line III—III of Figure 2.

Figure 4 is a vertical section illustrating an alternative form of abrasive containing magazine adapted to be substituted for the magazine shown in Figures 1 and 2.

Figure 5 is a view similar to Figure 4 illustrating another alternative type of magazine.

It is well known to those versed in the operation of open hearth furnaces that the burners employed are usually positioned at the opposite ends of the furnace. Normally, one burner at the ingoing end of the furnace directs the flame through the furnace toward the burner at the outgoing end, which, at that time of the cycle of operations, is idle. Periodically this condition is reversed and the operating burner becomes idle while formerly inactive burner operates to direct the flame through the furnace in the reverse direction.

During the time each burner is idle, dirt, slag, or other foreign matter accumulates in the burner

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passageways, such as in the atomized fuel passageway or in the gaseous fuel passageway, since the flame traveling toward the inactive burner throws dirt directly into the nozzle of the idle burner and the intense heat tends to carburize oil, tar, or other liquid fuel which may and frequently does accumulate in the liquid fuel passageway and gaseous fuel passageway.

Prior to my invention, cleaning of burner passageways has been a disagreeable, inefficient and time consuming job which operators have a tendency to neglect as long as possible, with a resultant over all inefficiency of the burner. Heretofore, in the use of prior art types of burners, it has usually been necessary to not only uncouple the burner, but also to remove it from the furnace. Makeshift cleaning arrangements, such as scraper rods and files have been used for cleaning the burner passageways but their use is objectionable since they scratch the surface of the burner passageway and create a condition whereby more dirt and foreign matter quickly adhere, thus aggravating the condition and accelerating of the rate of accumulation of the foreign matter. The accumulations in the burner passageways are particularly obnoxious in the liquid fuel passageways of burners as they tend to reduce the rate of fuel flow and frequently build up to such an extent that they deflect and misdirect the flame through the furnace. As such accumulations of foreign matter continue in growth, they aggravate this detrimental condition and progressively reduce the efficiency of the burner as time goes on. My herein claimed invention provides a relatively simple method and apparatus for overcoming the shortcomings of prior art above referred to.

While the invention probably has its greatest utility in connection with open hearth burner operation, it is not necessarily limited thereto. For purpose of illustration, however, the invention will be described with particular relation to open hearth burners adapted to burn a combination of liquid fuel, such as oil or tar and a gaseous fuel, such as coke oven gas or a natural gas. As will be more fully apparent from the following detailed description, in its broadest aspects, the invention provides a novel method and means for introducing an abrasive material into a fuel passageway of a burner in order to propel such an abrasive material through the passageway so as to forcibly impinge the abrasive substance on the incrustations of foreign matter accumulating on the walls of the fuel passageway, fluid pressure being used to forcibly expel the foreign matter from the burner along with the abrasive.

While not limited to any particular form of abrasive, practice in connection with open hearth furnaces has shown that a very effective abrasive may comprise a batch or mixture containing iron filings, fluorspar, or rice-size particles of dolomite. Experience shows that after the interior of the fuel passageway of the burner has been cleansed a few times by such an abrasive, the surface acquires a high polish after which time it is only necessary to use a milder abrasive such as dolomite in order to maintain absolute cleanliness in the burner passageways.

Referring in detail to the embodiment of the invention illustrated, 10 represents the outer casing of a somewhat conventional form of burner which encloses a chamber 12 adapted to have a water or other suitable coolant circulated therethrough. A gaseous fuel pipe 14 extends through the casing 10 and terminates at the extremity of the burner in an outlet nozzle portion 16 which may be regarded as the outlet extremity of a coke oven gas fuel passageway. This gas pipe 14 has a fitting 16*a* at its outer end which connects with a supply pipe 18 leading to a suitable source of coke oven gas or other gaseous fuel.

Located adjacent the gaseous fuel pipe 14 there is a liquid fuel pipe 20, the walls of which define a liquid fuel passageway 22. The present invention can be utilized to maintain the passageway of either the gaseous fuel pipe 14 of the liquid fuel pipe 20 free of accumulations of dirt or other foreign matter. For the purpose of illustration, but not limitation, I have chosen to show the invention as applied to the liquid fuel pipe. As clearly shown in the drawings, connected to the rear end of the liquid fuel pipe 20 there is an extension 24 which communicates with a liquid spray atomizer casing 26. Liquid fuel, such as oil or tar, is adapted to be supplied to the casing 26 by a liquid fuel supply pipe 28 leading to a suitable supply source. Also connected with the casing 26 are a pair of pipes 30 which supply steam to the chamber 26 for the purpose of atomizing the liquid fuel.

Welded or otherwise secured to the liquid fuel pipe 24 is a branch coupling 32 into which is screwed a nipple 34 which also connects with the threaded body 36 of a gate valve including a manually operable gate 38. Welded or otherwise secured to the other end of the valve body 36 is a reduced throat portion 40 of a fitting 42, whose upper end is welded or otherwise secured to the hollow casing 44. The casing 44 and the fitting 42 jointly constitute a magazine defining a storage chamber 46 adapted to contain a supply of abrasive material such as a mixture of iron filings and fluorspar, or particles of dolomite. A cap 48 is screwed, threaded, or otherwise removably secured to the upper extremity of the casing 44, this cap carrying a suitable stuffing box 50. Extending through the stuffing box 50 and also through an aperture 52 in a guide spider 54, welded or otherwise secured near the lower end of casing 44, there is a plunger rod 56 having a handle portion adapted to be manually reciprocated.

In the embodiment of the invention of Figures 1 to 3, inclusive, when it is desired to cleanse the burner passage of precipitated dirt or other foreign incrustations, the gate 38 of the valve 36 is manually opened, the operator then reciprocates the plunger 56 for a few strokes so as to force some of the abrasive from the magazine through the nipple 34 into the passageway of liquid fuel pipe extension 24. Thereupon the pressure of the



atomizing steam will forcibly propel the abrasive through the passageway defined by the liquid fuel pipe 20 and thus dislodge any incrustations of foreign matter and blow them out of the end of the burner, thereby thoroughly cleansing the burner passageway and maintaining it in optimum operating condition.

While in the foregoing disclosure we have set forth in detail the manner in which the abrasive substance may be injected through the passageway defined by the liquid fuel pipe of the burner, it will be clear to those skilled in the art that, when found necessary or desirable, such abrasive could be introduced into the gaseous fuel passageway defined by the pipe 14 by discharging such abrasive from the inner end of a steam pipe 60 extended rearwardly through the pipe 14, in which case, I will provide a nipple 34*a* at the lower extremity of the magazine or chamber 44*a* which will be connected by means of a suitable fitting 32*a* with said steam pipe 60 as shown at the left end of Figure 1. The other parts of the magazine 44*a* and the related elements thereof are similar to the parts previously described and are therefore designated by like numerals with *a* added.

In the modification illustrated in Figure 4, the magazine casing 44*a* is formed with a lateral branch 62 forming a charging hole which is adapted to be closed by a removable cap 64. In this modification, instead of using a plunger rod such as shown at 56 in Figure 2, I employ a piston 66 propelled by a feed screw 68 having a hand wheel 70 secured to the upper end thereof, the lower end of the feed screw having a head 72 revolvably coupled to the plunger 66, the feed screw working in a nut portion 74, formed integrally on the hub extension at the top of the closure fitting 76. In this modification, instead of having a gate valve such as shown at 38 in Figure 2, there is illustrated at 78 a conventional form of rotatable plug valve.

In the modification of Figure 5, the abrasive magazine 44*b* carries a T or other pipe fitting 80 near its upper end which is closed by a screw plug 82. In this modification, instead of expelling the abrasive substance from the magazine by utilization of a plunger or piston as in Figures 1 and 4, I use steam or other fluid pressure supplied by way of pipe 84 under control of manually operable valve 86.

While I have shown and described quite specifically certain preferred arrangements for giving effect to the herein claimed invention, it is to be understood that the drawings and descriptive matter are to be interpreted in an illustrative rather than a limited sense, since various modifications may be resorted to by those skilled in the art without departure from the invention as defined in the following claims.

I claim:

1. A method of expelling accumulations of foreign matter which accumulates on and adheres to a wall of a passageway of a steel furnace burner, comprising blowing a mixture containing iron filings and a basic material such as fluorspar or dolomite through said passageway to loosen and expel said foreign matter.

2. A fuel burner such as used in open hearth steel furnaces, including structure forming a fuel passageway and means operatively connected with said passageway effective to force a quantity of abrasive material through the fuel passageway so as to loosen and expel adherent deposits of foreign matter on the wall of the pas-

sageway, said means including a magazine for storage of a quantity of said abrasive material, and a manually operable plunger axially movable in said magazine for feeding such material from the magazine to the passageway.

3. In combination with a steel furnace burner including structure defining a fuel passageway, means for ridding the passageway of incrustations of foreign matter accumulated thereon comprising a magazine adapted to retain a supply of abrasive material, means providing an avenue of communication between the magazine and the fuel passageway of the burner, a valve controlling the flow of said abrasive material from said magazine to said fuel passageway and a manually operable plunger axially movable in said magazine for forcing the abrasive material from the magazine via said valve to said passageway,



and means for supplying a stream of fluid under pressure to said fuel passageway effective to carry the abrasive material through the passageway and impinge it upon accumulated deposits of foreign matter and expell such foreign matter from the burner.

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