

May 15, 1945.

F. C. SWARTZ

2,376,099

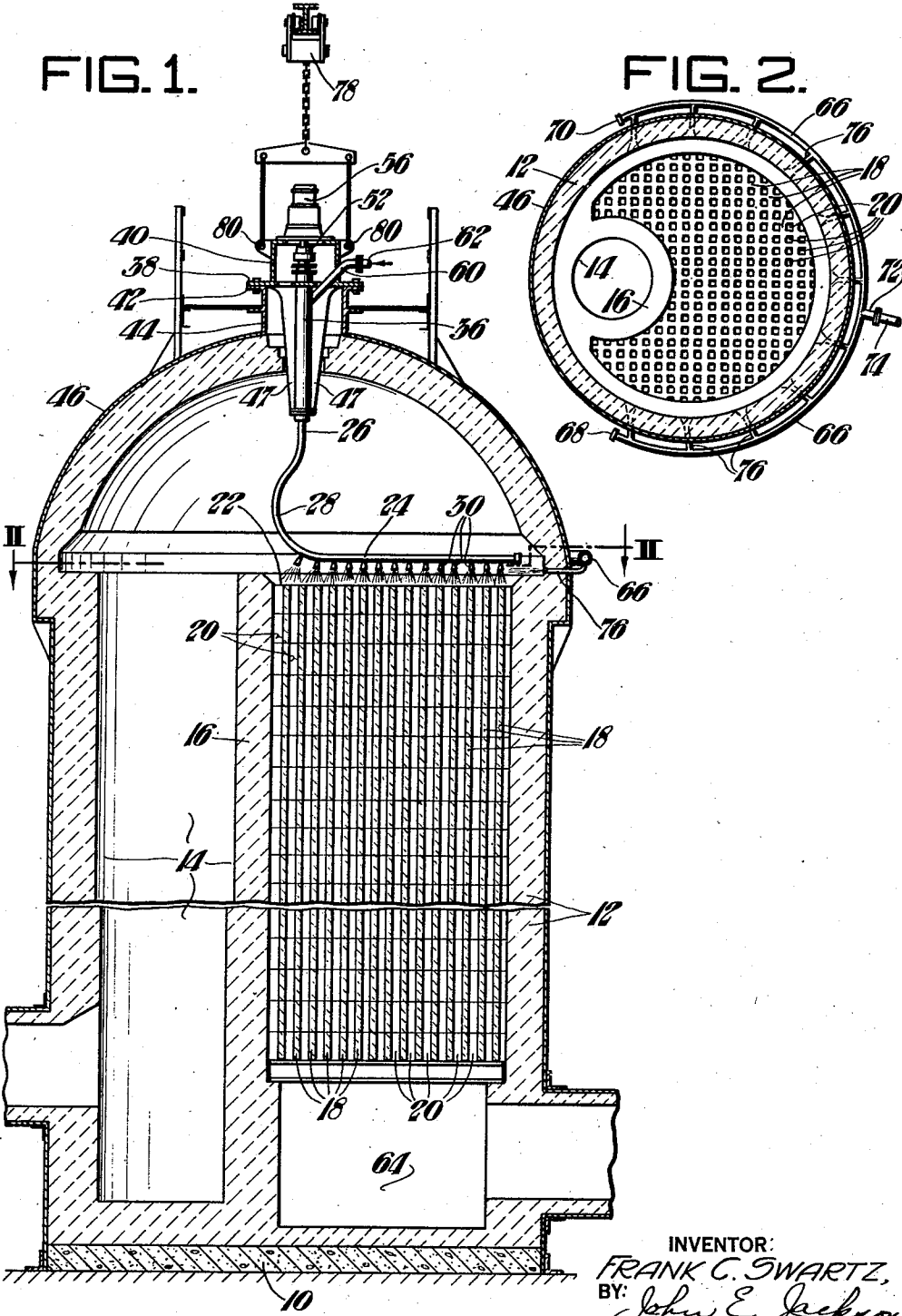
HOT BLAST STOVE

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2 Sheets-Sheet 1

FIG. 1.

FIG. 2.



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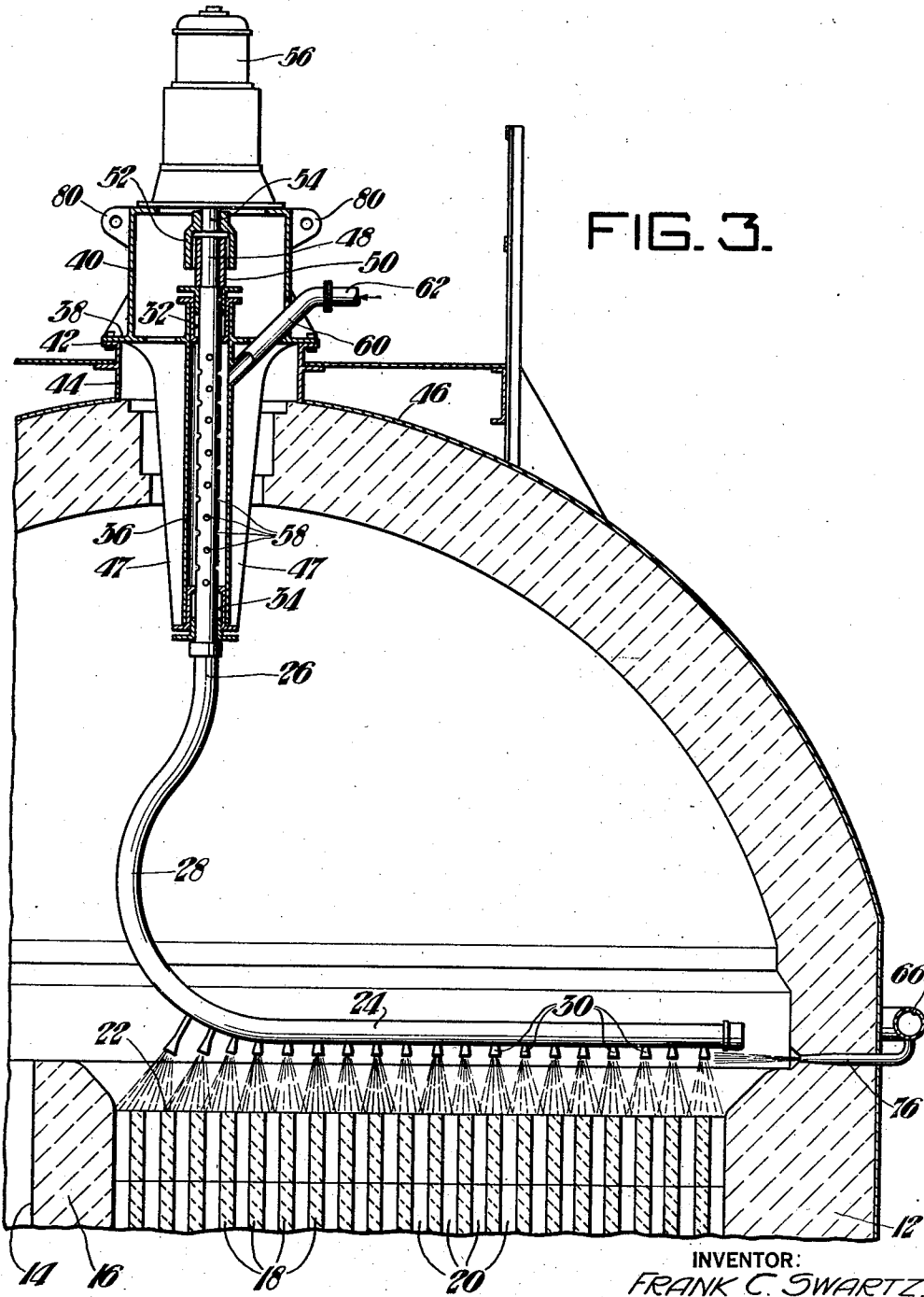
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UNITED STATES PATENT OFFICE

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HOT-BLAST STOVE

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Application May 6, 1942, Serial No. 441,999

2 Claims. (Cl. 263—19)

The present invention relates to improvements in hot blast stoves such as used for preheating the combustion air supplied to the bustle pipe of conventional blast furnaces.

As is well known to those skilled in the art, modern blast furnaces are usually served by a plurality of hot blast stoves. These stoves are of great height, and are of extremely large diameter and they contain a multiplicity of flues formed by checkerwork brick.

Blast furnace gas is passed to the stove and burned therein, and the combustion products are led through the checkerwork flues of the stove at one stage of operation so as to heat said checkerwork, and at another stage, air to be preheated is passed through the same checkerwork flues. In the normal operation of such hot blast stoves it is well known to those skilled in the art that flue dust carried over from the blast furnace collects to an objectionable extent on top of the walls which define the flues of the checkerwork and such dust frequently enters the flues. In course of time the accumulation of dust requires that the stove be temporarily taken out of service to permit cleaning thereof and repairs to the checkerwork. This is an arduous task and materially affects the operating costs of the normal blast furnace practice. This inherent condition has led to the almost universal practice of providing several stoves to serve each blast furnace so as to permit the occasional shut-down of each stove to permit the checkerwork flues to be cleaned and repaired.

An object of the present invention is to provide means whereby accumulated dust on top of the checker flue walls can be readily displaced or blown through the flues at a point where it can be readily removed without causing serious interference with the normal operation of the stove. An object of the invention is to provide a hot blast stove with built-in equipment whereby fluid can be expelled under pressure so as to dislodge accumulated flue dust while the stove is hot and in use and to force the dust to a point where it can be readily removed without taking the stove out of service.

Another object of the invention is to provide a member with a movable portion rotatable about a vertical axis so that a fluid medium can be introduced at a central point of rotation and distributed to a multiplicity of moving radial discharge points.

The above and further features of the invention will be fully apparent from the following detailed disclosure and the appended claims when read in connection with the accompanying drawings.

In the drawings:

Figure 1 is a vertical longitudinal section through a hot blast stove embodying the present invention;

Figure 2 is a horizontal section on line II—II of Figure 1; and

Figure 3 is an enlarged detail view of the upper portion of the stove shown in Figure 1.

Referring in detail to the drawings, the numeral 10 represents the base or foundation of the stove, 12 the usual upright cylindrical stack-like wall thereof of great height, and 14 the combustion chamber. This combustion chamber is bounded on one side by the outer annular wall 12 and on the other side by an interior wall 16. Between the wall 16 and the portion of the wall 12 opposite the combustion chamber 14 a multiplicity of flue walls 18 are provided forming a great number of flues 20. The flue walls 18 are of conventional checkerwork construction and it is these flues which normally require cleaning out because of the flue dust which accumulates therein.

A particular feature of the invention herein claimed concerns the provision of improved means for easily and quickly effecting the removal of flue dust which accumulates on the ledges at the top 22 of the walls 18. In the embodiment of the invention illustrated, I provide a substantially L-shaped pressure discharge member including a substantially horizontal tubular distributor arm 24 and a vertical trunnion arm 26 connected thereto by the curved portion 28. The horizontal arm is equipped with a plurality of nozzles 30 which may conventionally be spaced apart a distance equal to the space between adjacent flue walls 18 so that fluid such as steam, water or compressed air ejected from the nozzles will be forcibly impinged upon any dust or other foreign matter which has become lodged on the top of the walls. The vertical arm 26 of the device is rotatably mounted and power means are preferably provided for swinging the arm 24 about the axis thereof so that the radial series of nozzles in the arm 24 can be made to serve any desired part of the area of the stove. For rotatably supporting the trunnion arm 26 I provide bearings 32 and 34 at the upper and lower portions of a sleeve-like housing 36 which depends from the base plate 38 of a casing 40, which base plate rests on the flanged extremity 42 formed on the upright central portion 44 of the dome shell 46. A plurality of ribs 47 depending from the plate 38 serve as centering reinforcements for the housing sleeve 36.

The extremity of the arm 26 is plugged by a short piece of shafting 48 which is keyed to a coupling member 50 which engages a complementary coupling member 52 keyed to the armature shaft 54 of a suitable drive motor 56.

The arms 24 and 26 are of tubular construction and that portion of the arm 26 located between the bearings 32 and 34 is formed with a plurality of perforations 58.

Communicating with the housing 36 there is

a branch pipe 60 adapted to be connected to a supply pipe 62 leading to a source of steam or compressed air or water. As thus arranged it is apparent that steam, compressed air, water or other fluid may be introduced into the chamber surrounding the perforated portion of the pipe 26 and that said fluid will enter through the many perforations 58 and will be expelled through the multiplicity of nozzles 30 to thus dislodge any accumulated soot or foreign matter resting on the top surfaces 22 of the flue walls. The fluid may be discharged at such a high velocity that it will force the dust or foreign matter downwardly through the many flues 20 so that the same will accumulate in the bottom chamber 64 below the base of the flues. Access can be had to the chamber 64 through the usual clean-out openings provided in hot blast stoves of this character. The arm 24 can be caused to slowly and continuously rotate a complete revolution while the stove is in normal operation. Thus dust may be continually removed without making it necessary to shut down the stove and cool it off, as heretofore required.

In some cases I contemplate incorporating in the stove structure an auxiliary cleaner comprising a curved pipe 66 constituting an arcuate manifold which is closed at both ends by plugs 68 and 70. At about the midportion, the manifold is provided with a fitting 72 which connects with a supply pipe 74 leading to a source of steam or compressed air. Extending inwardly from the manifold 66 there are a plurality of nozzles 76 adapted to discharge jets of fluid in any desired direction from the out portion of the stove inwardly thereof. The spacing and direction of the nozzles will be varied to suit the design, construction and size of the particular stove to which the invention is applied. If desired, the manifold 66 may be in the form of a complete circle and it may be made in sections and each section be provided with a separate inlet pipe.

Any desired cleaning media, such as pressured water, steam, air or a combination of these may be supplied through the inlet fitting 72 so as to deliver to the multiplicity of nozzles 76 a forceful spray which will sweep over the top of the checker flue walls and other ledges at the top of the stove. Since the nozzles 76 discharge their fluid jets in planes substantially normal to the direction in which the fluid jets emanate from the nozzles 30 carried by the distributor arm, it is apparent that a combined action may be secured by the joint operation of the jets from both sets of nozzles. Thus a forceful scouring and turbulent action can be effected by the joint cooperation of the fluid jets discharged from the downwardly deflected moving nozzles 30 and from the horizontally directed fixed nozzles 76. As a result of such combined action the turbulent fluid cleansing media will forcefully loosen and remove all the lodged soot, dust, or fines from the ledges or top of the checker flues or from other ledges at the top of the stove, and this accumulation will be given downward impetus so as to precipitate the objectionable foreign matter at the bottom of the stove, for example, in the chamber 64 where it can be easily and quickly removed without requiring the cooling off of the stove or the taking of the same out of service.

The cleansing operation may be readily accomplished by a continuous rotation of the distributor arm 24 at any rate of speed to suit conditions, by rotation through an arc of any desired magnitude and then reversed as in a condition

where only an arcuate portion is to be cleaned, or the cleaning action may be exerted on a desired increment or sector of a circle for a given time interval and then moved into successive segments forward and reverse until the required job is done over the complete surface area to be cleaned. The cleaning apparatus, if desired, may then be disconnected at the flange 42 and lifted clear of the stove structure by engaging tackle from an overhead trolley hoist 78 with the lifting ears 80 formed on the housing 40. The dome plug can be replaced and the dome clean-out cover bolted into position, whereupon the stove is ready to continue its usual service. The cleaning operation, it will thus be apparent, is a simple yet effective procedure and the cost is but a fraction of the tedious practices which have been tolerated by blast furnace operators for many years.

Thus the invention effects an important economic saving, as compared to prior practice, and at the same time it minimizes the damage to the checker chambers which frequently occurred in prior cleaning practices. The invention cuts down the loss of stove service and makes practical use of present day highly efficient checker-brick flue structures which in most cases have heretofore been open to the objection that they could only be cleaned by taking the stove out of operation for long periods at regular intervals.

While I have described quite precisely a preferred construction embodying the present invention, it is apparent that various changes and modifications may be made by those skilled in the art within the scope of the appended claims.

I claim:

1. In a blast furnace stove having a multiplicity of checkerwork flues therein, means for dislodging accumulated matter from the tops of said flues comprising a substantially horizontal tubular distributor arm rotatable over the top of the checker flues and having a plurality of nozzles therein and a vertically disposed tubular trunnion arm with a plurality of perforations therein, respective bearings at each end of the trunnion arm beyond the perforated portion thereof, a hollow casing surrounding the perforated portion of the trunnion arm and supporting said bearings, means for supplying a fluid to said casing, a supporting plate secured to the casing, means detachably securing said plate to the stove structure, a housing supported by said plate, and drive means secured to the housing and detachably coupled to said trunnion arm.

2. In a blast furnace stove having a multiplicity of checkerwork flues therein, means incorporated in the stove structure for discharging accumulations of matter from the top of the checker flue walls comprising a rotatable tubular fluid distributor arm having a plurality of fluid outlets therein adapted to direct streams of fluid downwardly toward the tops of the checker flue walls, a rotatable trunnion having a perforated portion communicating with and supporting the distributor arm, means for supplying fluid to the distributor arm through the perforated trunnion, and a plurality of horizontally disposed fixed nozzles for directing jets of fluid in a direction about normal to the jets discharged from the distributor arm whereby a combined turbulent jet action is secured so as to effectively dislodge accumulations of dust and the like from all ledges in the upper zone of the stove.

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