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RUBBISH INCINERATOR

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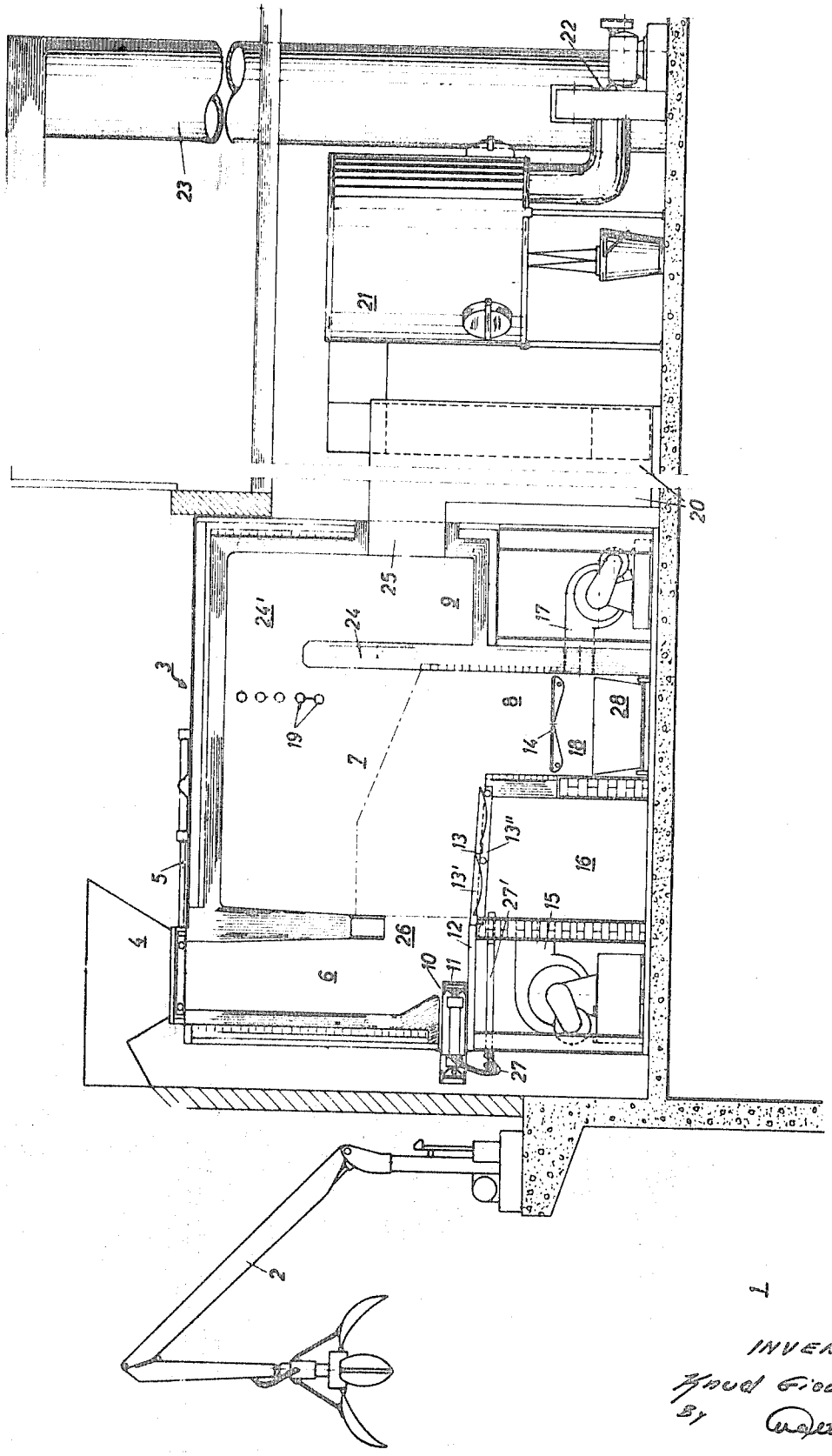

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RUBBISH INCINERATOR

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ABSTRACT OF THE DISCLOSURE

An incinerator for rubbish and the like, in which a substantially box-shaped stoker plunger or pusher extends tight-fitting through the side of a shaft opposite the stoker opening of the fire box at the bottom of the shaft so as to be capable of sliding backwards and forwards along the bottom of the shaft while similar to a plunger pushing the fuel before the end surface of the plunger towards the inlet opening and in on the grate, the height of the plunger being smaller, primarily considerably smaller than the height of the inlet opening of the fire box.

The invention relates to a furnace for incineration of rubbish or similar fuel. The furnace consists of a fire box provided with a vent opening and ending at the bottom in a rigid incinerator grate, along which the fuel is conveyed from one end to the other, and provided after the incinerator grate with a burn-up grate arranged, for instance, as a dump grate for periodically dumping of slag and similar unburnt material. The grates are supplied from below with combustion air under pressure from air chambers beneath the grates. Fuel is fed into the furnace from a shaft arranged opposite the inlet end of the incinerator grate and outside the fire-box. The shaft is open at the top and provided with a feed hopper or magazine. The bottom of the shaft is on a level with the grate. The shaft is provided with an inlet opening in the side facing the fire-box. The opening extends from the bottom of the shaft up to approximately the upper level of the desired thickness of the fuel layer. The width of the opening is adapted to the width of the grate.

In the furnaces of the said type known to the art the fuel slides by gravitation on to the grate from the shaft, which is filled to a level above the upper edge of the side opening. The fuel arranges itself with its surface running continuously according to the natural declivity or sloping descent of the material from the upper edge of the opening towards the discharge end of the grate. Thus the thickness of the fuel layer decreases heavily towards the discharge end in a manner that is detrimental to a uniform incineration and the regulation of supply of air through the grate. Furthermore, the incineration capacity of the furnace is reduced. Further the rubbish usually contains parts of highly varying sizes, some of them very large, which impedes the formation of a natural declivity and is even likely to cause partial blocking up of the inlet opening for the fuel.

It is the object of this invention to provide a furnace of the above-mentioned type in which the said disadvantages are avoided.

According to the invention a principally hydraulically operated box-shaped stoker plunger or "pusher," which is capable of sliding backwards and forwards, is carried tight-fitting through the side of the shaft opposite the inlet opening of the fire-box at the bottom of the shaft. The plunger is capable of sliding along the bottom of the shaft and, like a plunger piston, pushing the fuel before the end surface of the stoker plunger towards the inlet opening and on to the grate. The height dimension of the plunger

is smaller, principally considerably smaller, than the height of the inlet opening of the fire-box.

Irrespective of the sizes of the pieces of fuel, a forced feeding of fuel into the lowermost part of the quantity of fuel resting on the grate is achieved through this arrangement, resulting in the surface of the fuel becoming far more level than the natural declivity of the material, so that the thickness of the fuel layer becomes considerably more uniform.

Besides overcoming possible mechanical difficulties in connection with the feeding of the fuel into the fire-box, the invention results in the achievement of better conditions of efficient combustion, for which reason, among other things, the furnace can be made shorter and consequently cheaper and so as to require less space than would otherwise have been the case. The invention further results in the advantage that it will be possible to empty the shaft entirely of its contents of fuel, for which purpose certain of the subsequent supplementary arrangements according to the invention have principally been made in order to avoid false draught or blowback of smoke gases through the fuel shaft.

According to the invention the stoker plunger may be hollow and connected with a source of compressed air and further provided with openings, principally in its end surface, for injection of fresh air into the quantity of fuel present in the lower part of the shaft.

In this way a preliminary drying of the fuel or the rubbish is achieved, according to the character of the fuel or rubbish, thereby increasing the efficiency of the furnace.

According to invention, in cases where the cross section of the shaft is quadratic or rectangular, the inlet opening of the fire-box being an essentially rectangular opening over the whole width of the shaft, the width of the stoker plunger may also correspond to the width of the shaft, so that in its forward position the plunger will fill the cross section of the bottom of the shaft.

In this way the optimal uniform feed of fuel over the whole width of the grate is achieved, and the above-mentioned possible emptying of the shaft becomes complete.

The incinerator grate is arranged with a suitable declivity so as to facilitate the conveyance of the fuel along it to the burn-up grate, which is usually arranged at a lower level. Since great variations are likely in the composition of the fuel or the rubbish, and consequently also in its natural declivity, it is expedient for the declivity of the incinerator grate to be adjustable. For this purpose, according to the invention, the incinerator grate may be supported by straightforward means, resting rigidly at its inlet end on a solid support and having its outlet end sliding on a support adjustable in height. As a result of this sliding support of its outlet end, the grate is allowed to expand and shrink freely in connection with temperature changes.

On account of this open connection between the fire-box and the shaft, and especially if fresh air is supplied through the injection apertures in the stoker plunger, there is a risk of part of the smoke gases escaping to the open up through the fuel shaft instead of through the chimney, and of a combustion taking place up through the fuel or rubbish in the shaft.

To avoid this risk an induced draught ventilator may be installed in a way actually known to the art in the vent pipe leading from the furnace to the chimney.

With the same object in view, a hydraulically operated sliding door may be provided according to the invention for an essentially airtight sealing of the top of the shaft between the fuel shaft and its feed hopper, the movement of the said sliding door being controlled by a loading device, for instance a crane, serving to fill fuel into the hopper.

Where the space under the grates is divided into several separate air chambers, the space beneath the incinerator grate may constitute one air chamber, and the space beneath the burn-up grate another air chamber, each of the said air chambers being supplied from its separate blower.

This comparatively simple division with a separate air chamber under each of the grates is rendered possible as a result of the achievement through the invention of the comparatively uniform thickness of the fuel layer resting on the individual grate, and also results in the flow resistance to the combustion air penetrating up through the grate becoming correspondingly uniform over the whole area of the grates.

When a hollow stoker plunger arranged for air injection is used, the said stoker plunger may suitably according to the invention be connected with the air chamber under the incinerator grate with a view to its supply with compressed air.

The invention will be explained in greater detail in connection with the embodiment of a furnace according to the invention complete with rubbish pit and boiler plant.

The single figure on the drawing represents a longitudinal sectional view through the plant.

In the drawing, which shows a longitudinal section of the plant, reference numeral **1** represents a rubbish pit and reference numeral **2** a slewing crane provided with a loading grab. The actual furnace is designated **3** collectively and consists of a block of brickwork or other known construction structure provided with the necessary fire-resistant lining, the ends being designed with a fuel shaft **6** open at the top and a fire-box **7**, which at the rear via a fire bridge **24** is connected with a secondary combustion chamber **9**, and through the latter with the furnace vent opening **25**. At the bottom, the firebox is bounded by a stationary incinerator grate **13** and a burn-up grate **14** designed as a double-leafed dump grate, which is arranged at a considerably lower level than the grate **13**, the part of the fire box located over the burn-up grate forming a kind of burn-up shaft.

Under the grate **13** a closed air chamber **16** is arranged, which is supplied with compressed air from a blower **15**, and under the grate **14** is a similar closed air chamber **18**, which is supplied with compressed air from a blower **17**, and which is arranged for accommodating a slag cart **28** or other means for disposing of unburnt material.

In the partition wall between the shaft **6** and the fire box **7** is arranged a connecting opening **26**, which is rectangular with a curved top edge, the lower edge of the said opening being flush with, respectively formed by the upper side of the grate **13** and the bottom of the shaft **6**, which is designed with a wear plate **12** of cast iron. The curved design of the upper edge of the opening serves to obtain a suitable spread in lateral direction of the fuel fed on to the grate.

In an opening in the side of the shaft opposite the opening **26** is installed an electrically controlled hydraulically sliding stoker plunger or "pusher" designed as a hollow box, which is capable of sliding backwards and forwards along the wear plate **12**, its end surface being provided with exhaust nozzles **11** for compressed air, which is supplied to the plunger through a hose **27** and a tube **27'** from the air chamber **16**. The fuel rubbish in the shaft, which is fed into the shaft by means of the crane **2** through a feed hopper **4** mounted on the top of the shaft passes through the opening **26** into the fire-box **7**. By means of the reciprocating movement of the plunger **10**, which may be automatically controlled, further fuel is pushed on to the incinerator grate **13** along the surface of the latter, thus forming a fuel layer of comparatively uniform thickness as far as towards the end of the said grate. The greater part of the incineration takes place on the grate **13**, after which the fuel falls down on burn-up grate **14** for final incineration. During the final incineration process, the material more or less filling the burn-up shaft **8** gradually subsides and in a completely burnt-up condition passes through the grate interspacings in the grate **14** or is dumped into the slag cart **28** by means of tipping the grate **14**.

The combustion gases pass through the opening **24** above the fire bridge **24'**, close to which air nozzles **19** are arranged in the side walls of the fire-box for injection of secondary air, and into the secondary combustion chamber **9**, where secondary combustion takes place by means of the secondary air injection. Further there is a precipitation of coarse fly ash particles, the chamber being dimensioned so as to make the rate of flow comparatively slow, and its bottom being depressed in relation to the vent opening **25** so as to constitute a pit from which the ash precipitation can be removed through a door not shown.

From the vent opening **25** the smoke passes through a boiler **20** or other heat exchanger, which suitably is arranged with separate supplementary oil-fired heating, and from here through a cyclone **21** for further separation of fly ash and through an induced draught blower **22**, from which the smoke is sent out through the chimney **23** of the plant. At the top of the fuel shaft **6**, between the latter and the hopper, is located a horizontally sliding, hydraulically operated sliding door, which can seal off the shaft tightly, and which is controlled by the crane **2** in such a way as to expose the opening between the hopper **4** and the shaft **6** when the crane has swung its grab in over the hopper, while closing the opening at all other positions of the crane.

The grate **13** consists of grate bars or grate sections **13'** suspended on a frame **13''** by a rigid suspension on a steel section at one end and a sliding suspension on a tube at the other end. The frame is pivotally supported at the inlet end of the grate and supported for vertical sliding at the outlet end on an adjustable support not shown in detail. The suction side of the blowers **15** and **17** or either of them may be connected with the rubbish pit **1** so as to suck air from the latter, creating a certain partial vacuum, which will prevent spread of stench to the surroundings.

For the start of the incinerator, a gas burner, for instance for propane, is arranged in the side of the fire-box in a way known to the art.

The invention is not limited to the embodiment shown, seeing that within the scope of the invention, the furnace may be arranged in an essentially different manner, if only it provides for the stoker or pusher feed of the fuel or rubbish characteristic of the invention, with or without injection of air through the plunger. As will appear from the specification, the further characteristics stated in the following claims all serve to support the effect obtained through the arrangement of the pusher feed of the fuel or rubbish, respectively to remedy the drawbacks in connection with this arrangement.

What I claim is:

1. Furnace for incineration of rubbish or similar fuel, consisting of a fire-box, means forming a vent opening provided with said fire-box, a rigid incinerator grate located at the fire-box ending at the bottom and along which the fuel is conveyed from one end to the other, a burn-up grate provided after the incinerator grate and arranged for instance as a dump grate for periodical dumping of slag and similar unburnt material, means for air supply also forming air chambers arranged under said grates and from which said grates are supplied from below with combustion air under pressure, a shaft from which fuel is supplied and arranged opposite the inlet end of the incinerator grate and outside the fire-box, the said shaft being open at the top and provided with a feed hopper or magazine, the bottom of said shaft being on a level with the grate, and means forming an inlet opening with the said shaft and being provided in the side facing the fire-box, the said opening extending from the bottom of the shaft up to approximately the upper level of the desired thickness of the fuel layer, the width of the said inlet open-

ing being adapted to the width of the grate, characterized in that a principally box-shaped stoker plunger or "pusher" is carried tight-fitting through the side of the shaft opposite the stoke opening of the fire-box at the bottom of the shaft, so as to be capable of sliding backwards and forwards along the bottom of the shaft and, like a plunger piston, pushing the fuel before the end surface of the plunger towards the inlet opening and in on the grate, the height dimension of the plunger being smaller, principally considerably smaller than the height of the inlet opening of the fire-box, the stoker plunger or "pusher" being hollow and connected with a source of compressed air and provided with openings, principally in its end surface, for injection of fresh air in the quantity of fuel present in the lower part of the shaft.

2. Furnace according to claim 1 where means are provided dividing the space under the grate into several separate air chambers, the space beneath the incinerator grate constituting one air chamber, and the space beneath the burn-up grate another air chamber, each of which said air chambers is supplied from its separate blower.

3. Furnace according to claim 2, the hollow stoker plunger or "pusher" being connected with the air chamber under the incinerator grate for its supply with compressed air.

4. Furnace according to claim 8, wherein a quadrangular fuel shaft is provided at the top with a feed hopper with an interposed sliding seal controlled by a loading crane, the bottom of the said shaft being formed by a wear plate, along which wear plate a hydraulically sliding hollow stoker plunger or pusher built into the side of the shaft and provided with exhaust openings can be pushed towards an opening in the opposite side of the shaft and

into the fire-box of the furnace, the said fire-box ending to the rear in a fire bridge, which, while holding free an opening serves as a partition for a secondary combustion chamber, close to which said opening air nozzles are provided in the side walls of the fire-box for injection of secondary air, the fire-box ending at the bottom in a rigid incinerator grate with adjustable declivity, and a burn-up grate arranged as a dump grate, an air chamber, respectively and being provided under each of the said grates, the air chambers being supplied with compressed air from blowers, respectively and the chamber being connected through a piping with the plunger or pusher with a view to supplying the latter with compressed air, while the chamber is arranged for accommodating a slang conveyor cart or other means of conveyance, and further the secondary combustion chamber is connected to the chimney through the furnace vent opening and a boiler in which connection a cyclone and an induced draught ventilator are interposed.

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