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E. DIEPSCHLAG

APPARATUS FOR DRYING CHARGES FOR SHAFT FURNACES

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Fig. 1

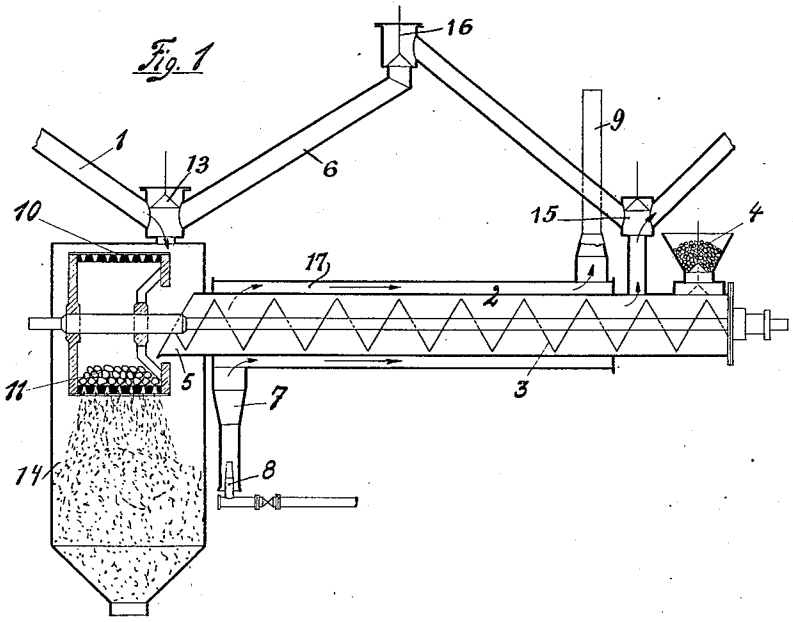
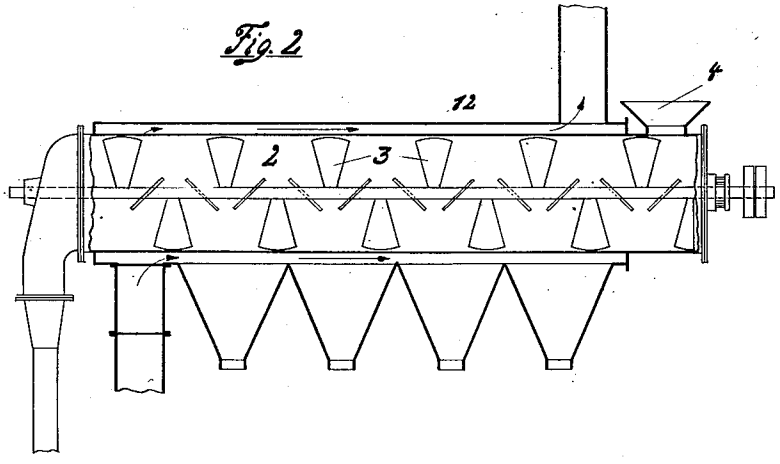


Fig. 2



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APPARATUS FOR DRYING CHARGES FOR SHAFT FURNACES.

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To all whom it may concern:

Be it known that I, ERNST DIEPSCHLAG, a citizen of the German State, residing at 25 Borsigstrasse, Breslau, Germany, have invented certain new and useful Improvements Relating to the Apparatus for Drying Charges for Shaft Furnaces, of which the following is a specification.

It is known that smelting charges and fuel that are intended to be fed directly into the smelting or combustion zones of shaft furnaces (blast furnaces, gas producers) should be first prepared, for example, by drying.

Experience has demonstrated that for this purpose, it is unnecessary to provide special sources of heat, if, according to the invention, the preparatory drying of the material to be introduced be effected by means of the heat of the furnace gases, assisted where convenient by the direct or indirect action of some additional source of heat outside the furnace.

In using the heat of the furnace gases at the mouth of the furnace, the material to be dried, consisting of fuel and ore in the case of blast and like furnaces, or of fuel only in the case of gas generators or producers, is introduced as part of the ordinary charge through feeding devices from above into the mouth of the furnace in the usual way. Thereupon the coarser and finer particles of the charge are separated. The finer particles are carried forward by the waste gases of the furnace through the waste gas outlet and flues and settle in the dust collectors provided for the cleansing of these gases. During their passage into the mouth of the furnace and away with the furnace gases, the fine particles are rendered completely dry while in suspension in the current of heated furnace gases, so that they are thus in a suitable condition to be fed into the smelting or combustion zone of the furnace.

By charging the furnace with the material to be dried in the manner described, the furnace or waste gases are cooled in taking up the moisture of the said material and their subsequent cleansing is thereby facilitated.

If there should be any risk of disturbing the furnace by the charging of the finely grained smelting charge and fuel by reason of the presence of moisture therein, it is advisable to introduce this material into the furnace or waste gas flues. There they will be completely dried by the heat of the waste gases.

If, for any reason, the object aimed at, namely, that of preparing the fuel and the ore which are to be directly charged into the smelting or combustion zone of the furnace, is not attained or cannot be effected by charging the material into the furnace or by the action of the furnace or waste gases in the manner hereinbefore described, then the preparation of the material may be assisted or effected by the use of some outside source of heat or of waste-heat. Heat, for instance, may be obtained by supplying to a heating or drying apparatus into which the material to be dried is introduced, air that has been preheated in air-heaters or other heat accumulators, or by directing upon the material a heated blast or current of air. Further additional sources of heat which may be considered for this purpose are the waste gases from air-heaters, from steam boilers, gas engines and metallurgical furnaces (such as cupola-furnaces and Martin furnaces or the like). These waste gases have at the same time the advantage that, owing to their deficiency in oxygen, all oxidising effects on the material are avoided. The heated waste gases may be withdrawn from the flues by fans or similar devices, in the event of the heating and drying plant for the material to be dried not being arranged directly between the furnaces or the like and the corresponding chimneys or outlets.

In the case of furnaces supplied with compressed gas or compressed air, as, for instance, cupola furnaces, and also in the case of air heaters operated with compressed air, exhausters and chimneys may be dispensed with.

These various means of effecting the drying of the material may be applied both separately, or simultaneously together. In drying the material other than by passing it into the furnace mouth with the charge as hereinbefore described, the material may be heated and dried either directly by causing the heated gases to flow, in drum driers or the like, over it or by conducting it, in a finely divided current and in vertically disposed pipes, in a direction contrary to that of the current of waste or furnace gases, or the operation may be carried out, indirectly, in apparatus heated externally.

In the accompanying diagrammatic draw-

ings two possible forms of drying apparatus adapted for carrying out the invention are diagrammatically represented, and in both of these constructions, the heat from the furnace or waste gas is used for pre-heating the material to be introduced into the smelting or combustion zone of the furnace.

Figure 1 is a sectional elevation of a construction of drying apparatus in which the heated waste gases pass directly in contact with the material to be dried.

Figure 2 is a similar sectional elevation of a construction of dryer in which the heated gases do not contact with the material to be dried.

In the apparatus illustrated in Fig. 1, the furnace or waste gases flow through the pipe 1, and pass by way of the valve 13 into a casing 14 into which projects the drying cylinder 2 provided with a rotating screw conveyor 3. The gases pass through the cylinder 2 and escape by way of the valve 15. The materials to be dried are introduced into the cylinder 2 at 4 and are carried forward by the conveyor 3 until they finally pass out of the drying cylinder at 5, where they are collected in the casing 14, the lower part of which is formed as a hopper, and are thence introduced into the smelting or combustion zone of the furnace.

The pipe 6 serves as a by-pass, its purpose being to render it possible to cut out the drying cylinder 2 and the conveyor 3, for example, in the case of repairs, by closure of the valves 13, 15 and the opening of the valve 16. It is obviously of no importance that dust coming from the furnace should settle in the drying cylinder 2, as it returns with the charge to the furnace.

In the event of the heat in the gases proving insufficient, or if a further stage in the process of preparing the material should be required, for example, if a partial reduction is intended, it may be convenient to increase the temperature from an external source of heat.

Such an external source of heat is indicated in the apparatus represented in Fig. 1. The cylinder 2 is surrounded by a concentric casing 17 having a supply conduit 7 for the combustion gases evolved by a burner 8. The said gases traverse the casing 17 in the direction indicated by the arrows and escape again through an outlet pipe 9.

In order to prevent the formation of lumps of the material during drying, it is advisable to fit a disintegrating device at the outlet from the drying cylinder and in such manner that it is advantageously disposed in the current of gas, so that it too should be heated, for otherwise the material may easily cake. This device consists of the cylindrical grid 10 and grinding balls 11. The removal of the dust from drying drums is usually known to cause difficulties, but the presence of dust in the present case is of no account, and does not constitute a nuisance for the reason hereinbefore described. Dust is carried forward by the furnace gases, and is separated out in the operation of cleansing of the gases and is thus recovered.

The heat of the furnace or waste gases can also be utilized indirectly without actual contact between the material and the gases.

Figure 2 illustrates an example of drying apparatus for this purpose. A drying cylinder 2 with screw conveyor 3 is built into the tubular casing 12 fitted with dust receptacles, and the furnace gases are led through the said casing, dust in suspension being deposited in the said receptacles. The charging material to be dried is fed in at 4.

The method of operation in this case is substantially the same as that hereinbefore described with reference to Figure 1.

I claim:

Apparatus for preparing fuel for introduction into the smelting zone of shaft furnaces comprising a chamber, a drying cylinder extending into the chamber, a conveyor in the drying cylinder for feeding forward the material, a disintegrator positioned in the chamber to receive the fuel from the drying cylinder and discharging the same into the chamber, and means for passing furnace waste gases through the chamber and drying cylinder to dry the fuel and heat the disintegrator.

ERNST DIEPSCHLAG.