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FEED SYSTEM FOR SHAFT FURNACES

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Fig. 1

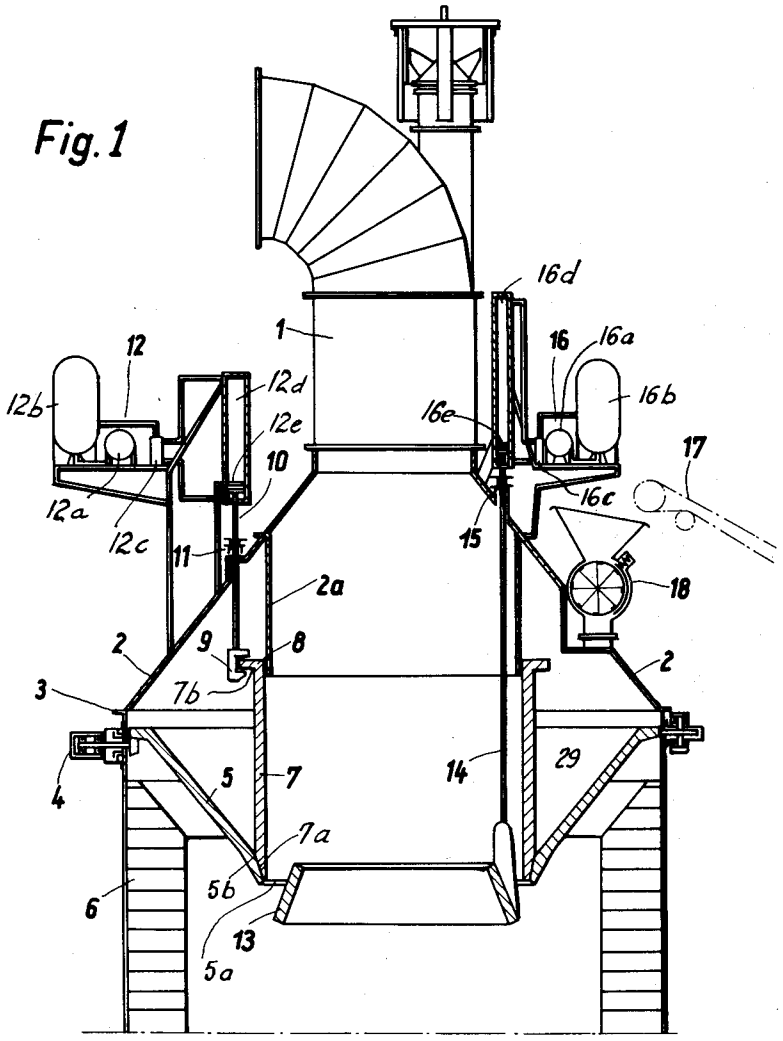

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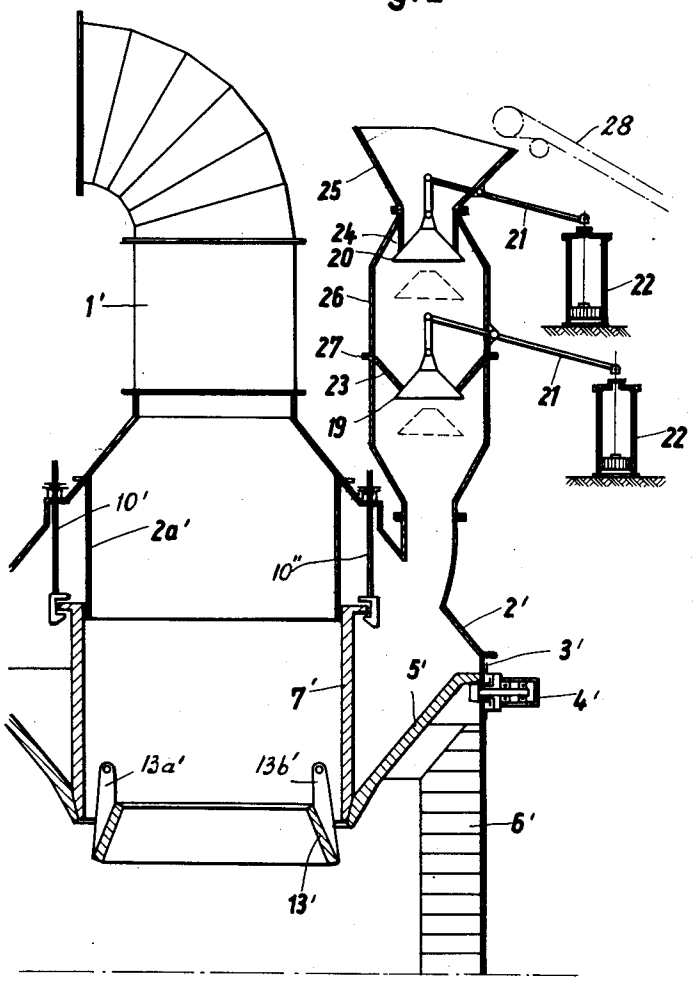
Fig. 2



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FEED SYSTEM FOR SHAFT FURNACES

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6 Claims. (Cl. 214—35)

This invention relates to a system for feeding solid fuel or other solid charge to a shaft furnace having a central gas outlet, especially to a shaft furnace operating at relatively high pressure, such as a high pressure blast furnace. In particular the invention is concerned with a system for such furnaces having a rotating distributor plate and an annular, vertically movable, locking member.

Shaft furnaces having central gas outlets and rotatable plates for distributing the fuel or charge are well known. The system by means of which the fuel is fed to such furnaces is normally arranged above the furnace and generally consists of two hollow cylindrical locking members, the so-called Langen bells, which are mounted one above the other and may be moved up and down. The lower bell forms a lock with the distributor plate and the dome-like upper bell prevents gas from leaving the furnace.

These prior systems have several shortcomings which discourage their application to modern blast furnaces. One disadvantage is that a water seal is used with the movable bells to prevent loss of gas, and this water seal is not effective with the higher gas pressures being used in modern blast furnaces.

In accordance with the invention a system is provided for supplying and distributing fuel or other charge to and within shaft furnaces which is capable of preventing loss of gas even under the conditions of high pressure encountered in modern blast furnaces.

The system of the invention is adapted for use with a shaft furnace having an upper rim and a central gas offtake pipe. It comprises a cap, joining the rim with the offtake pipe, a distributing plate rotatably mounted within the furnace and having a central aperture, a hollow, cylindrical, vertically movable, locking member, at least the lower part of which is within the upper part of the furnace, said locking member providing conduit means leading from the furnace toward the outlet and defining with said cap and distributing plate an outer charge receiving space, means for vertically moving said locking member, thereby to provide a passage from said space to the furnace and means for supplying a solid charge to said space.

Preferably the distributor plate is rotatably mounted at the upper rim of the furnace and the driving means for the distributing plate are fixed outside of the rim of the furnace.

There is further preferably provided an inner skirt extending downwardly from the inside of the cap to form, with the locking member, a sealable central passage from the furnace to the offtake pipe.

A charging device is located on the cap and may be constructed in various ways. Thus, for example, it may comprise a sealed bucket wheel or a double cone seal whose two cones or bells may be raised or lowered independently.

The invention will be further described with reference to the accompanying drawings in which:

FIG. 1 shows a preferred construction in which a bucket wheel is used as a feeding device.

FIG. 2 shows an alternate construction in which a double cone type feeder is employed.

Referring now to FIG. 1, a system according to the

invention is shown used with a blast furnace **6**, only the upper portion of which is shown, for simplicity. A central gas offtake pipe **1** is provided for carrying off gases from the furnace and is connected with the upper rim **3** of the furnace by means of a cap **2**.

Arranged inside the cap **2** and in the upper part of the furnace **6** is a rotatable distributor plate **5**. This plate is tapered downwardly inwardly and has a central opening **5***a*. It is rotated by a drive **4** which may be powered by any convenient prime mover (not shown) and which is mounted on the outside of the cap **2**. In cap **2** and extending well down into the upper part of the furnace is a hollow cylindrically formed locking member **7**. As will appear from the drawing the lower edge **7***a* of this member is bevelled to engage with a bevelled surface **5***b* on the lower edge of the distributor plate. The relationship of the locking member **7** and the distributor plate **5** is such as to define an annular space **29** for receiving fuel or charge. The locking member **7** provides gas conduit means leading from the furnace **6** toward the offtake pipe **1**.

The upper rim **7***b* of the locking member **7** is provided with a flange **8**, which is engaged with a yoke **9** attached to a lifting shaft **10**.

The cap **2** is provided with a downwardly extending skirt **2***a* which, as shown, fits inside the locking member **7** and with the member **7** provides a sealed central passage from the furnace **6** to the offtake pipe **1**.

The locking member **7** rotates with the distributor plate **5**. The lifting shaft **10** passes through a sealed opening **11** in the cap **2** and is operated by a mechanism **12** located outside the cap **2**. This mechanism **12** may be hydraulic and, as shown, may comprise a pump **12***a*, a reservoir **12***b*, a valve **12***c*, a cylinder **12***d* and a piston **12***e*, attached to the shaft **10**. It will be obvious that other types of mechanism, e.g., electric or pneumatic may equally well be used.

Below the distributor plate **7** there is a deflector **13** which is also capable of being raised and lowered. To effect the raising and lowering of the deflector **13** there is provided a rod **14** which leads through a sealed opening **15** to an operating mechanism **16** which, like the mechanism **12**, may be hydraulic, comprising a pump **16***a*, reservoir **16***b*, valve **16***c*, cylinder **16***c* and piston **16***e*.

In the apparatus shown in FIG. 1 charge is continuously supplied to the space **28** via the feeder **18** which, as shown, has a bucket wheel type construction and is sealed against the escape of gas.

As desired, the locking member **7** may be raised by mechanism **12** to dump charge from space **29** into the furnace **6**. As shown in the drawing the deflector **13** will cause charge sliding along the upper surface of distributor **5** to be diverted toward the outer portion of the furnace. If desired, however, the deflector may be raised to a greater or lesser extent by mechanism **16** to feed charge to a point nearer the center of the furnace.

In the embodiment of the invention shown in FIG. 2, all parts of the apparatus are similar to those shown in FIG. 1 except for the feed device. Thus the furnace **6'** is fitted with a cap **2'** joining it to an offtake pipe **1'**. A distributor plate **5'**, like that of FIG. 1, is provided. The locking member **7'** cooperates with the skirt **2***a'*, again as shown in FIG. 1. In FIG. 2, two lifting shafts **10'** and **10''** are shown yoked to the locking member **7'**. Likewise two ears **13***a'* and **13***b'* are shown attached to the deflector **13'** for receiving deflector lifting shafts (not shown). However, the use of two rather than one lifting shaft is of no functional significance.

For simplicity the operating mechanisms for lifting the locking member **7'** and the deflector **13'** have not been shown.

The feed device shown in FIG. 2 comprises two equally

sized bells or cones 19 and 20 which are arranged one above the other and which by means of levers 21 and weights or devices 22 (which are indicated schematically and may be pneumatic, hydraulic or electrical), are operated independently of one another so that only one cone may be opened at a time.

The charge material may be brought to the feeding hopper 25 by means of a conveyor belt indicated at 28 or by any similar conventional device.

The housing 26 of the feeder is divided by means of a flange 27 to facilitate changing of parts or even the entire lock assembly with a minimum loss of time. Because the feeder just describe requires little space and is substantially smaller than conventional feeders, two may be arranged side by side in the cap of the apparatus.

What is claimed is:

1. A system for feeding a solid charge, with minimal loss of gas, to a shaft furnace having an upper rim, and a central gas offtake pipe, said system comprising a cap joining the upper rim to the offtake pipe, a distributing plate rotatably mounted within the furnace and having a central aperture, a hollow, cylindrical, vertically movable locking member, at least the lower part of which is within the upper part of the furnace, said locking member providing conduit means leading from the furnace toward the outlet and defining with said cap and said distributing plate an outer charge receiving space, means

for vertically moving said locking member thereby to provide a passage from said space to the furnace and means for supplying a solid charge to said space.

2. The system claimed in claim 1 wherein the distributing member is rotatably mounted at the upper rim of the furnace.

3. The system claimed in claim 1 and comprising drive means for the distributing plate fixed to the outside of the upper rim of the furnace.

4. The system claimed in claim 1 and comprising a skirt extending downwardly from the inside of the cap to form with the locking member a sealable central passage from the furnace to the outlet.

5. The system claimed in claim 1 wherein the locking member is supported by vertically movable rods extending through seals in the cap.

6. The system claimed in claim 1 and comprising a deflector positioned within the aperture of said distributing member, and means extending through seals in the cap for supporting and vertically moving said deflector.

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