April 27, 1965 J. OBERNDORFER 3,180,501

FEEDING APPARATUS FOR ROTARY FURNACES

Filed Sept. 9, 1963 3 Sheets-Sheet 1

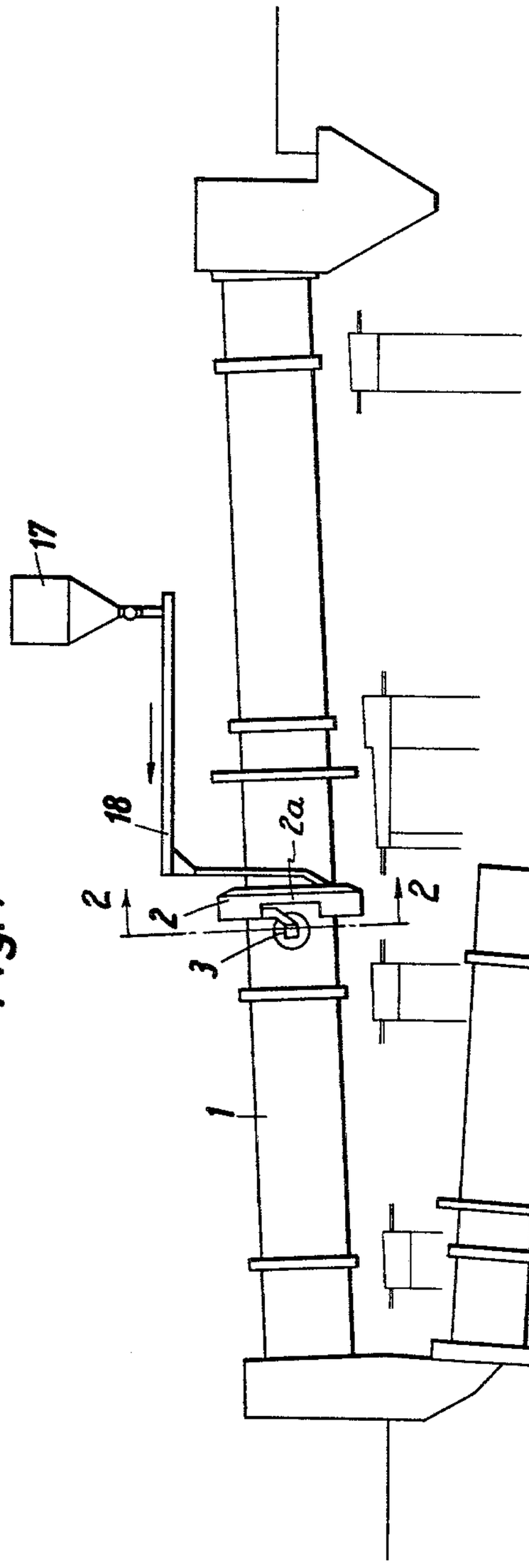

Fig. 1

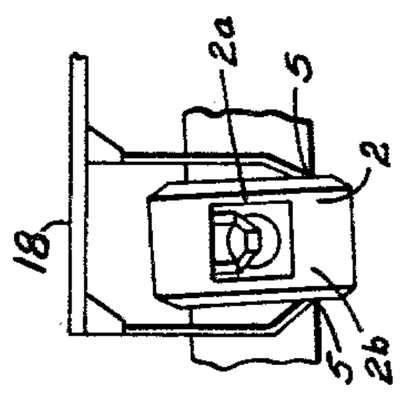

Fig. 1a

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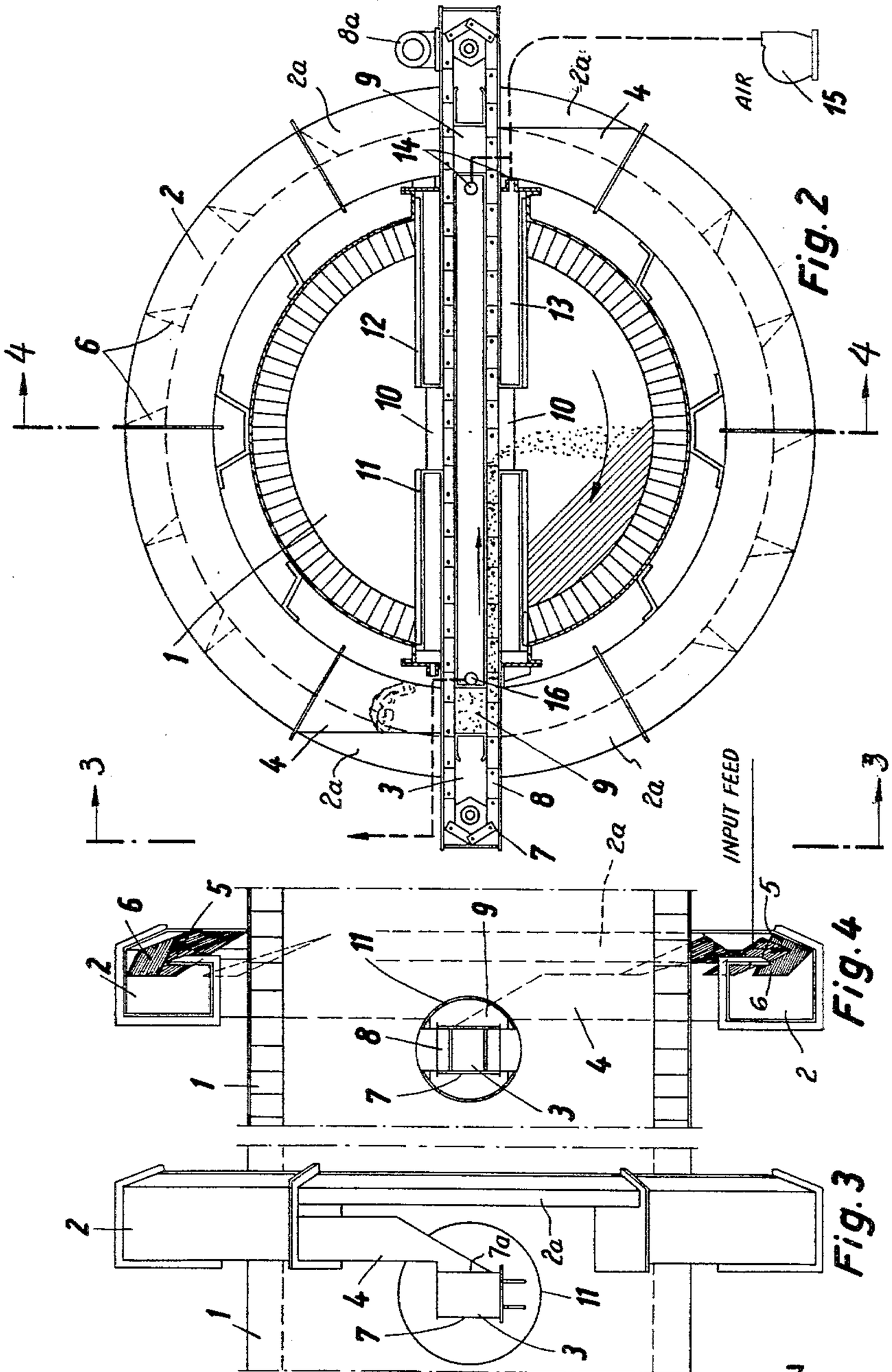

Fig. 2

Fig. 4

Fig. 3

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Fig. 6

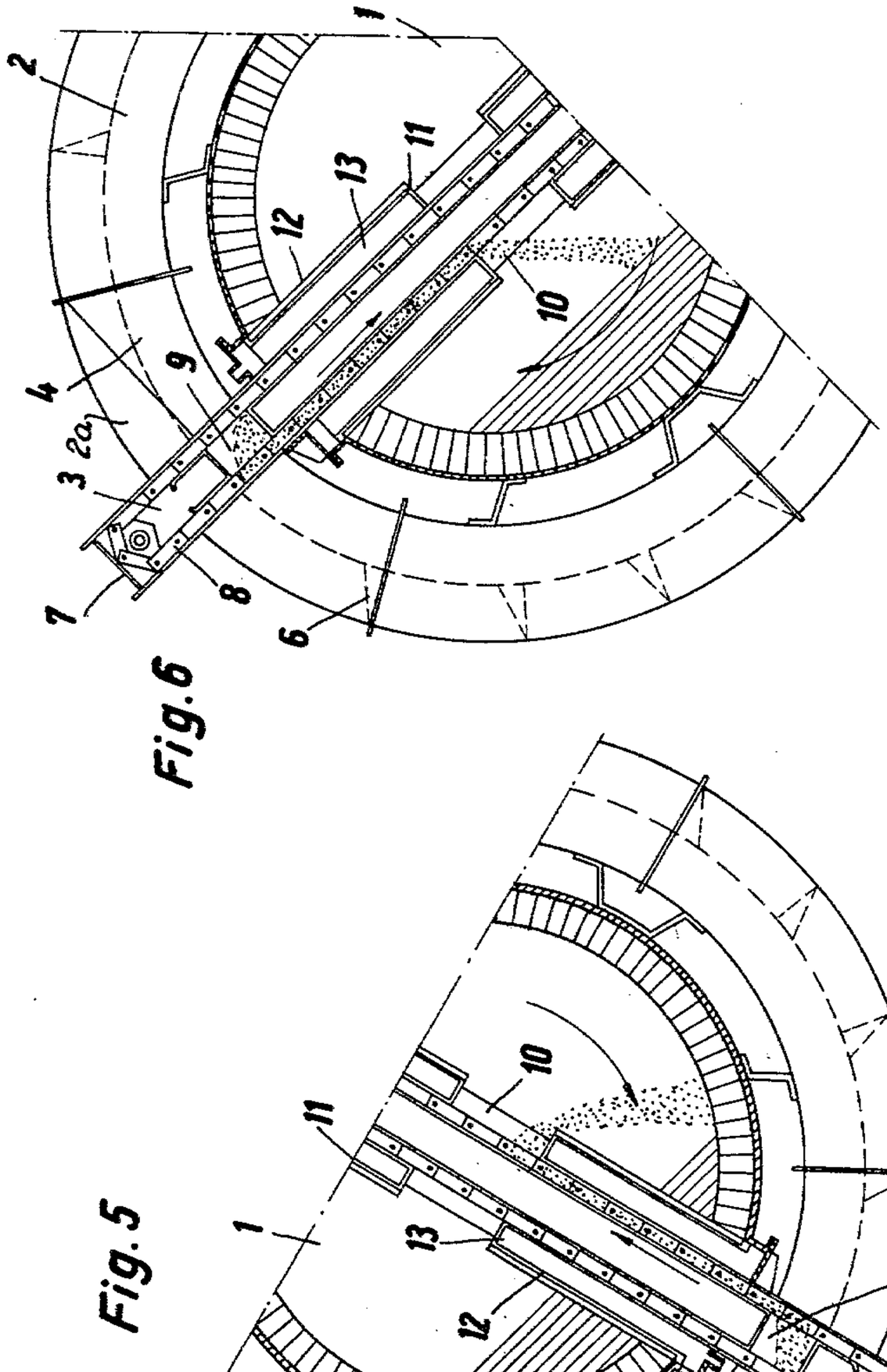
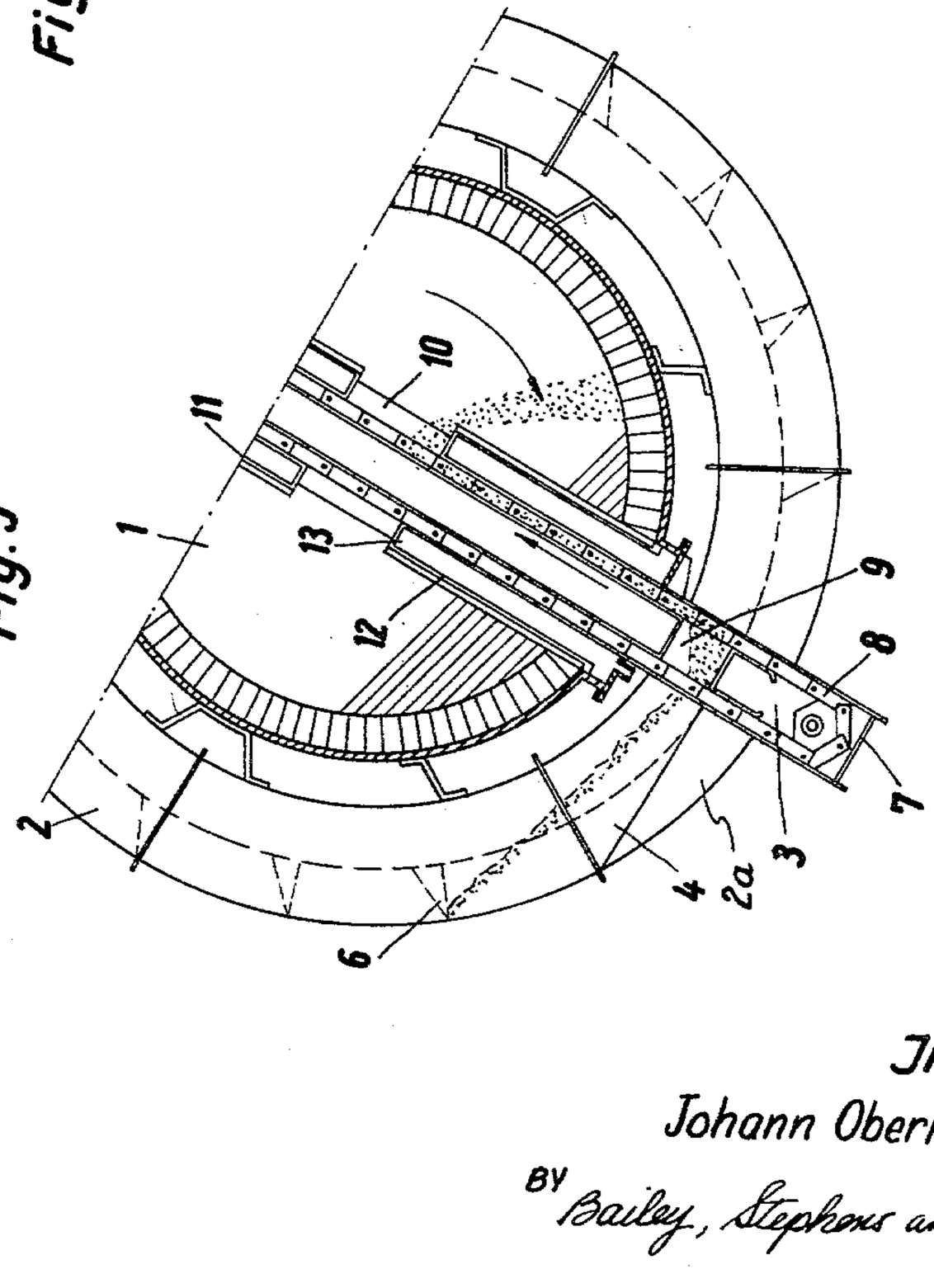


Fig. 5



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FEEDING APPARATUS FOR ROTARY FURNACES

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6 Claims. (Cl. 214—21)

This invention relates to a rotary furnace and, in particular, to an apparatus for feeding material into the furnace.

In rotary furnaces, material, such as dust-like material, and fuel are, in many processes, fed into the furnace at various points along the entire length of the furnace, and this material is fed through the furnace wall. These feeding points must be positioned so that the introduced material has sufficient time, that is a sufficient length of travel in the furnace, so that the material is able to react with the material already in the furnace before it leaves the furnace. Therefore, these feeding points are often positioned in the hottest zones of the furnace. Also, these feeding points must be closed relatively airtight with regard to the outside atmosphere so that no false air enters the furnace which could cause undesirable re-oxidation and also so that furnace gases cannot escape into the atmosphere and pollute the air.

Existing apparatuses are provided with a spiral-like feed conduit mounted on the exterior wall of the furnace so that this spiral when rotated with the furnace effects a forward movement of the material being fed into the furnace and the material acts as a seal.

Such an arrangement has several practical disadvantages. For example, the actual seal is very bad when little or no material is present in the spiral. It is also difficult to clean the spiral and the feeding of the material into the furnace is jerky and intermittent. Furthermore, when such spirals are used to feed material into the hottest furnace zones, there is danger of stoppage due to the formation of scale or crustation.

A feeding apparatus in the form of a screw conveyor is also known in which the screw conveyor is mounted on the outer wall of the furnace and rotates with it. Such an apparatus also has the disadvantage of making a bad seal against gases. Furthermore, the installation of the screw conveyor on the side of the furnace, especially adjacent hot furnace zones, is very difficult and often impossible. In addition, the feeding of the material to the screw conveyor is very complicated.

The object of this invention is to produce a means for feding material into a furnace which avoids the above disadvantages, produces a good gas seal and an even flow of material into the furnace.

In general, these objects are obtained by employing a feeding structure which is rigidly connected to and surrounds the outer wall of the furnace so as to be rotatable with the furnace. It serves as a means for introducing the material through the wall of the furnace by a conveyor. This conveyor extends diametrically through the interior of the furnace. This conveyor is positioned adjacent and parallel to the circular feeding means. This feeding structure is in the form of a ring channel and has an annular feeding opening in one side wall adjacent its circumference. Material can be introduced at any point around this wall. Baffles adjacent this annular opening direct the material into the interior of the ring channel where it drops into chutes and from the chutes flows onto the conveyor. This conveyor is a chain conveyor mounted in a closed housing. This housing communicates with the chutes and has discharge openings in the interior of the

furnace. Also, the portion of the housing inside the furnace is enclosed within an insulating jacket having discharge openings aligned with those of the housing. This jacket is composed of high heat resistant steel and has an exterior lining of fireproof material in order to protect it against the high temperature and atmosphere of the furnace. The jacket is spaced from the housing so that a cooling medium can be introduced in the space. The chain conveyor moves the material along the lower reach of the chain into the furnace and through the discharge openings. As soon as the lower reach of the chain becomes vertical due to the rotation of the furnace, it changes over into an upper reach, and the former upper reach now becomes the lower reach for moving the material fed to the conveyor and into the furnace. For practical purposes, this gives a substantially continuous flow of the material into the furnace.

This invention has substantail advantages over the apparatuses heretofore used. For example, the narrow opening between the chute and the conveyor is filled with material which provides a very good seal against the outside atmosphere and the chain conveying the material offers an additional seal. These two together produce a substantially absolute seal against gases entering or leaving the furnace. Also material is fed very evenly into the furnace. The mechanical transportation of the material by the conveyor and the cooling which can be adjusted prevents the material from agglomerating or caking. Also, the conveyor is easily accessible, which facilitates cleaning and repair.

The means by which the objects of the invention are obtained are described more fully with reference to the accompanying drawings in which:

FIGURE 1 is a side elevational view of the invention applied to a rotary furnace;

FIGURE 1*a* is a view similar to a portion of FIGURE 1 and showing a modified form of the invention;

FIGURE 2 is a cross-sectional view taken on the line 2—2 of FIGURE 1;

FIGURE 3 is a side view of FIGURE 2 as indicated by the line 3—3;

FIGURE 4 is a cross-sectional view taken on the line 4—4 of FIGURE 2;

FIGURE 5 is a partial view of FIGURE 2 showing the furnace rotated to a position shortly after one-half of the chute is filled; and

FIGURE 6 is a similar view showing the furnace rotated to a position halfway through the cycle.

Rotary furnace 1 is surrounded by a ring channel 2 for the purpose of feeding material to a chain conveyor 3 which extends diametrically across the interior of the furnace. For an angle of 30° in advance of conveyor 3, channel 2 opens into a pair of chutes 4 and narrow ring channels 2*a*. For an angle of 30° behind the conveyor these ring channels 2*a* open into ring channel 2 located on opposite sides of the furnace.

As shown in the modification of FIGURE 1*a*, a similar but oppositely faced ring channel 2*b* is joined on the other side of conveyor 3.

One wall of ring channel 2 has an annular slot 5 for the introduction of material and baffles 6. These baffles are omitted adjacent the opening into the narrow ring channel 2*a*. Baffles 6 are mounted perpendicular to the bottom of channel 2 and extend from the outside wall of slot 5 diagonally into the interior of channel 2 and backwardly with respect to the direction of rotation of furnace 1. These baffles direct the material from the open slot 5 into the inside of channel 2. Without the baffles, the material would for the most part simply slide down in the open slot 5 and pile up and fall out of the lowest part of the slot. Conveyor 3 is composed of a housing 7 con-

taining chain conveyor 8 and this housing communicates with chutes 4 through the opening 9 in the joint 7*a* between the chute 4 and housing 7. Housing 7 has material discharge opening 10 inside the furnace. Chain conveyor 8 is driven by a motor 8*a* which also rotates with furnace 1. Housing 7 is surrounded by a spaced protective jacket 11 which has its exterior surface lined with fire bricks 12. Cooling air from blower 15 is forced through the chamber space 13 between jacket 11 and housing 7 and the air discharged from the opening 16. Jacket 11 has discharge openings aligned with the openings 10 in housing 7.

The material being fed to the furnace is transferred from hopper 17 by conveyor 18 into the circumferential opening 5 in channel 2 and is pushed by the baffles 6 into the chutes 4. The material which flows through the circumferential opening 5 into the narrow ring channels 2*a* flows up to the next baffles 6 in ring channel 2 by which it is transferred into the interior of ring channel 2.

From the chute 4, the material flows through the opening 9 onto the lower reach of conveyor 8 and is then transferred into the interior of the furnace through the discharge opening 10. The conveyor 8 starts moving the material into the furnace shortly before the furnace is rotated to the position shown in FIGURE 5, the rotation being in the direction shown by the arrow. In the position of FIGURE 5, the material on the conveyor 8 comes from the most recently filled chute 4. In the position shown in FIGURE 6, that chute has been emptied and the rest of the material conveyed by conveyor 8. At the same time, the chute 4 on the opposite side of the furnace is being filled and the material therein fed to conveyor 8. This process is repeated on every revolution of the furnace.

Ring channel 2 can be provided with annular feed openings 5 on both side walls of the channel. This modification is especially useful for the simultaneous introduction of different material into the furnace.

Having now described the means by which the objects of the invention are obtained,

I claim:

1. An apparatus for introducing material into a rotary furnace intermediate the loading and discharge ends of said furnace comprising a hollow ring member fixed to and surrounding said furnace, a feed slot opening concentric with said furnace and in one side of said ring member, chutes communicating with the interior of said ring member, baffle means in said ring member for guiding material from said feed slot opening to said chutes, conveyor means extending diametrically through said furnace for receiving material from said chutes and discharging it into said furnace, and housing means for enclosing the exteriorly exposed ends of said conveyor means.

2. An apparatus as in claim 1, said conveyor means comprising an endless chain conveyor.

3. An apparatus as in claim 2, further comprising a protective jacket means enclosing at least a portion of said conveyor in said furnace for insulation against the heat in said furnace.

4. An apparatus as in claim 3, further comprising a firebrick cover enclosing and spaced from said jacket.

5. An apparatus as in claim 4, further comprising means for flowing cooling air through the space between said jacket and said cover.

6. An apparatus as in claim 5, further comprising a feed slot opening and baffle means in each opposite side of said hollow ring member.

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