Feb. 6, 1962 R. L. F. MAURAND 3,019,835

ROTARY KILNS AND DRYERS OR OTHER LIKE APPARATUS

Filed July 8, 1957 5 Sheets-Sheet 1

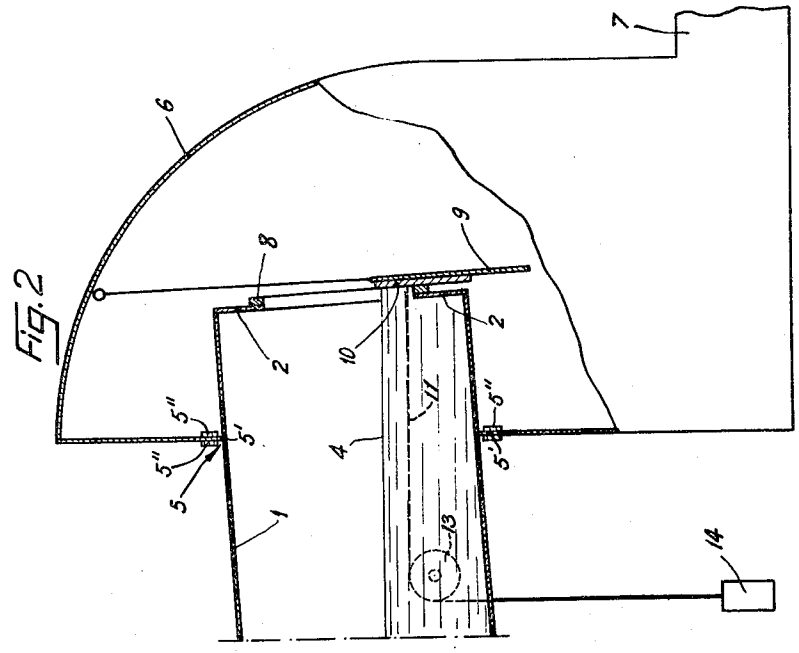


Fig. 2

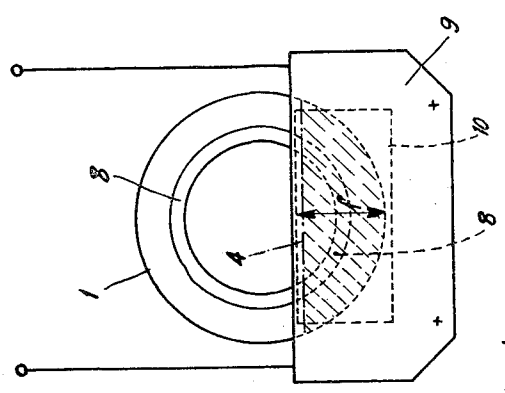


Fig. 3

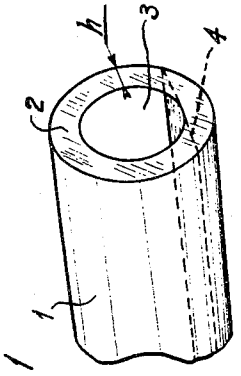


Fig. 1

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ROTARY KILNS AND DRYERS OR OTHER LIKE APPARATUS

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Fig. 4

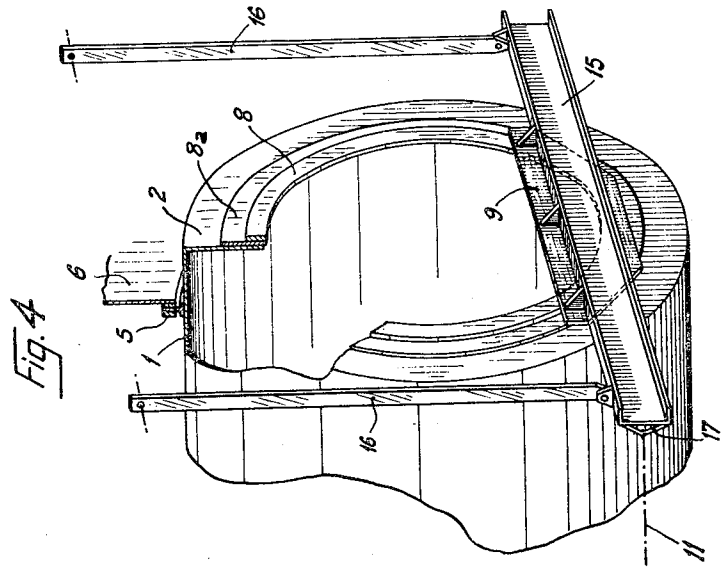
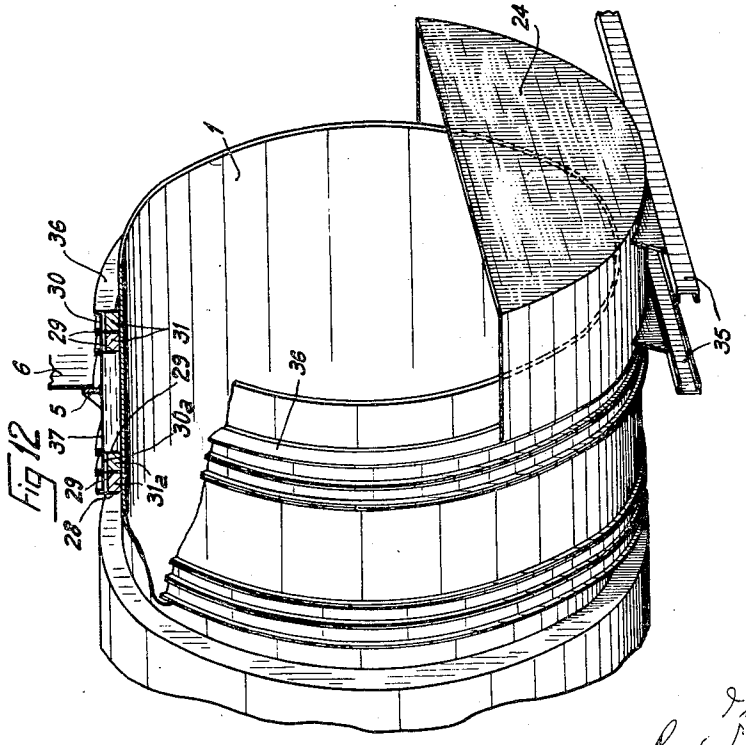


Fig. 12



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ROTARY KILNS AND DRYERS OR OTHER LIKE APPARATUS

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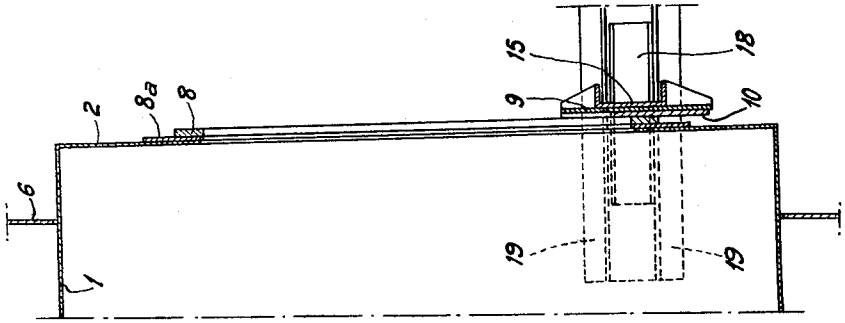


Fig.6

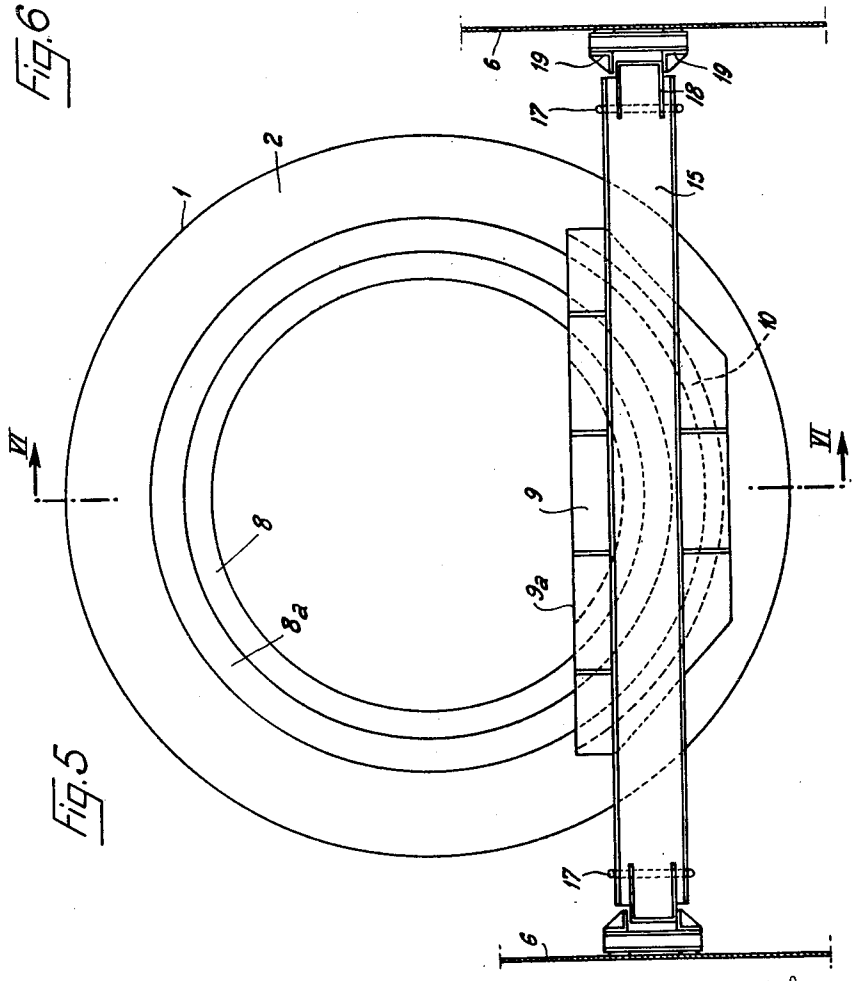


Fig.5

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ROTARY KILNS AND DRYERS OR OTHER LIKE APPARATUS

Filed July 8, 1957 5 Sheets-Sheet 4

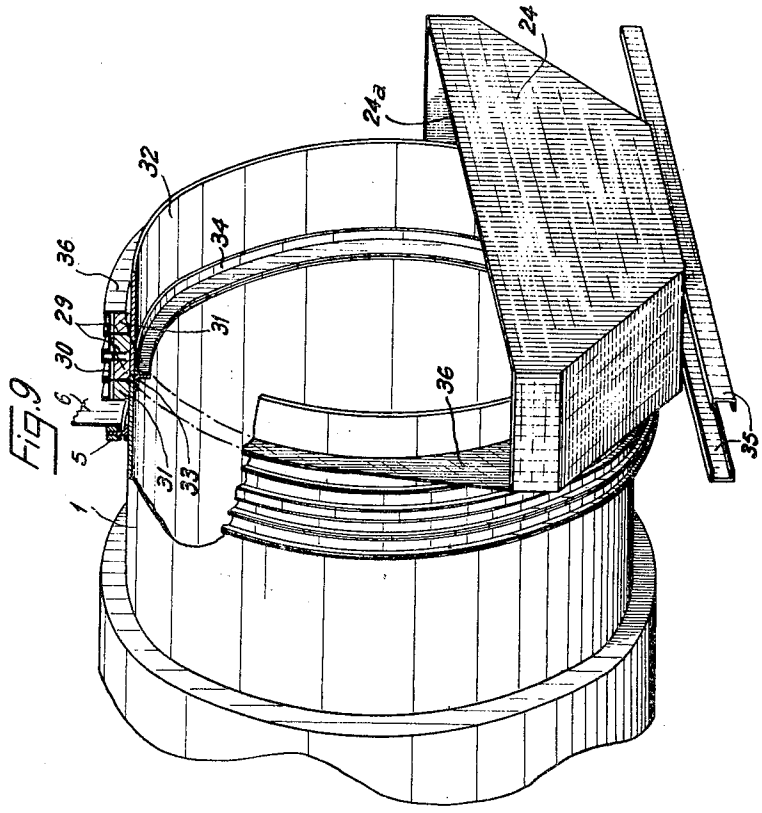


Fig. 9

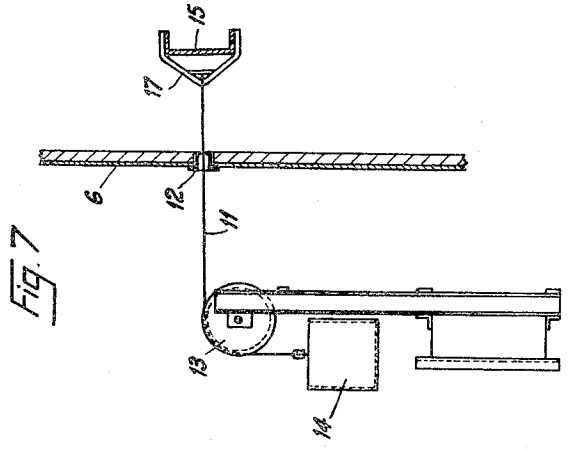


Fig. 7

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ROTARY KILNS AND DRYERS OR OTHER LIKE APPARATUS

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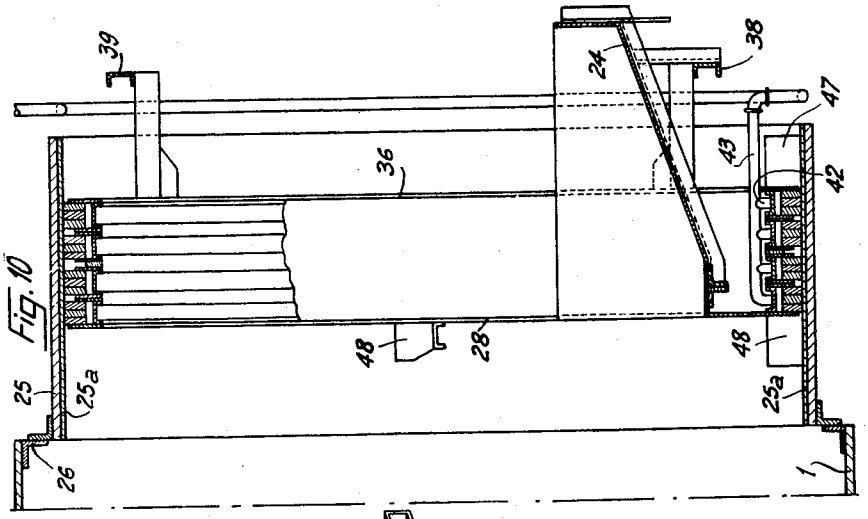


Fig. 10

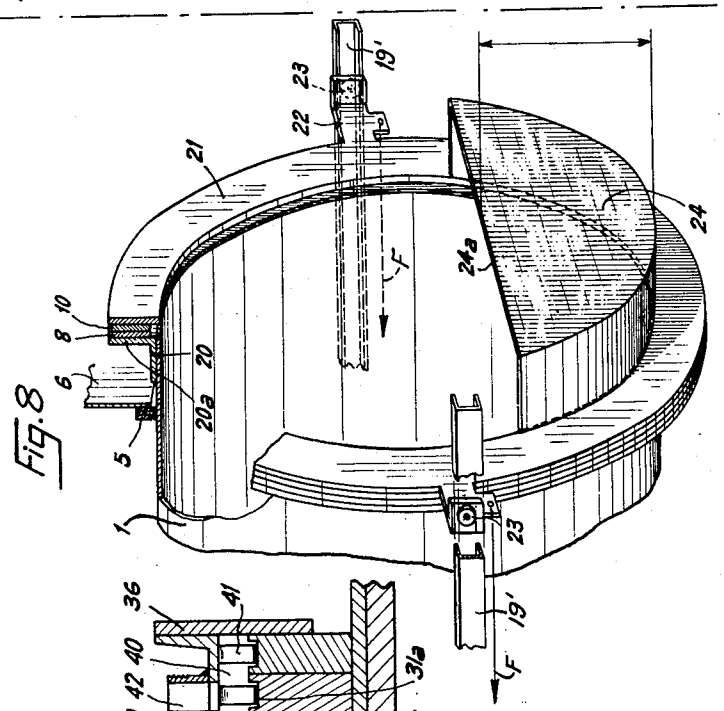


Fig. 8

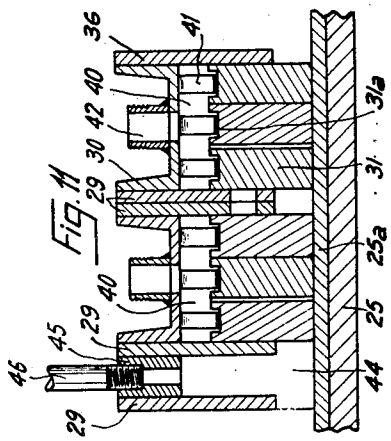


Fig. 11

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United States Patent Office

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ROTARY KILNS AND DRYERS OR OTHER LIKE APPARATUS

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Claims priority, application France July 15, 1956
11 Claims. (Cl. 159—9)

In industry, it is frequently necessary to dry more or less fluid pulp or slurry in order to obtain the material or materials which they contain, in a solid form. When rotary kilns or dryers are used for this purpose, comprising a long rotating cylinder, slightly inclined to the horizontal, through which pass hot gases circulating in counter-flow with a flow of liquid slurry introduced at the higher extremity or input side of the cylinder, some difficulties are encountered reducing the production of the apparatus mainly as a result of the overflowing of the slurry on the upstream side of the cylinder, and of the necessity of ensuring a sufficient outlet passage for the gases.

In these rotary kilns, in order to maintain a sufficient quantity of fluid slurry to be treated, it is known to provide a retaining ring or collar at the upstream side of the cylinder, the radial height of the collar controlling the overflow level of the slurry. A collar of this kind enables only a relatively small height of slurry to be maintained in the rotating cylinder of the drying apparatus, since it reduces simultaneously at the outlet the section of passage for the hot gases required for drying and in some cases for burning the pulp or slurry.

This invention overcomes the drawbacks referred to above and enables a high level of fluid slurry to be maintained in the rotating cylinder, slightly inclined to the horizontal, of a kiln or dryer, without simultaneously further reducing, at its upper extremity with respect to the common structures, the section of the cylinder available for the passage of the hot gases, by reason of the elimination or substantial reduction of the usual collar.

According to the invention, a rotary inclined kiln intended for treating a fluid slurry, and especially for drying the same, comprises in combination with a rotating cylinder slightly inclined to the horizontal, a dam-forming member such as a trough or a plate, extending over a part only of the radial height of the cylinder, mounted at the upper extremity of the kiln in such manner as to be maintained against rotation but to allow relative movements of the cylinder in the axial and circumferential directions, and a fluid-tight joint interposed between the said dam-forming member and the cylinder, the said joint being so arranged as to permit the said displacements.

The fluid-tight joint may be formed by wearing parts, metallic or otherwise, secured respectively to the rotating cylinder and to the dam-forming member, and pressed one against the other in any appropriate manner. Alternatively, it may be formed by fluid-tight segments sliding on the dam-forming member or on the cylinder, and mounted between rings rigidly fixed to the cylinder or to the dam-forming member respectively.

The following description made with reference to the accompanying drawings (which are given by way of example only and not in any sense by way of limitation) will make it quite clear how the invention may be carried into effect.

FIGURE 1 is a diagram showing the known arrangement of a retaining collar for the pulp at the upper part of a rotary cement kiln.

FIGURE 2 is a diagrammatic longitudinal cross-section

of the upper part of a rotary kiln or dryer equipped with the retaining device according to the present invention.

FIGURE 3 is an end view corresponding to FIGURE 2, looking from the right-hand side of this figure, the stationary hood being removed.

FIGURE 4 is a view in perspective of the upper extremity of a kiln equipped with the device shown in FIGURE 2.

FIGURE 5 is a view in elevation of an alternative form of construction of the device for preventing overflow of the slurry.

FIGURE 6 is a vertical cross-section passing through the line VI—VI of FIGURE 5.

FIGURE 7 is a vertical diagrammatic cross-section of a mechanism which can be used with the devices of FIGURES 4 and 5 to apply the dam-forming member against the extremity of the rotating cylinder.

FIGURE 8 is a view in perspective with cross-section and parts broken away, of a method of carrying the invention into effect which provides a large outlet section.

FIGURE 9 is a perspective view of a form of embodiment in which the fluid-tightness at the upper part of the kiln is obtained by fluid-tight segments.

FIGURE 10 is a diametral cross-section of an alternative form of construction of the device shown in FIGURE 9.

FIGURE 11 is a partial cross-section on a larger scale of the fluid-tight seal used in the devices of FIGURES 9 and 10.

FIGURE 12 is a view in perspective with cross-section and parts broken away, of an alternative form of construction of the device shown in FIGURE 9.

The invention will be explained hereinunder in its application to rotary kilns used for the manufacture of cement, in which it can be employed with advantage, but it will be clearly understood that the device can be applied to all kilns and dryers comprising a rotating cylinder slightly inclined to the horizontal, in which a relatively fluid slurry is introduced at the upper extremity.

The slurry employed for the manufacture of cement is a viscous liquid formed of a mixture of water, limestone and clay elements, intimately mixed. This slurry is introduced at the upper extremity of a rotary kiln heated by a burner axially disposed at the lower extremity. The slurry is first of all dried in the upper part of the kiln by the combustion gases, the solid elements obtained being then brought up to a sufficiently high temperature, in a lower portion, to cause the formation of clinker which is extracted from the lower part of the kiln.

During its drying, the slurry becomes more and more viscous and, for a certain content of water, it can no longer spread out like a liquid at an appreciable speed, but it is still not sufficiently dry to form a bank of pulverulent material moving downwards on account of the kiln rotation. In this semi-solid state, the downward flow of the slurry is only effected at a very low speed under the mechanical action of internal members (chains or the like). An accumulation of material thus results in the corresponding zone of the kiln, producing a choking effect and the formation of a pool of liquid slurry on the upstream side of this obstruction.

In order to maintain in the kiln a sufficient quantity of slurry and to avoid overflowing on the upstream side, there is usually fixed on the extreme upper edge of the shell **1** (see FIG. 1) forming the outer metal casing of the kiln, a ring or collar of sheet steel **2**, the central opening **3** of which is intended to provide a passage for the hot gases flowing through the kiln and passing into the stack. The maximum height which the pool of slurry **4** can reach at the upper part of the kiln, is thus determined by the internal diameter of the collar **2**.

When it is desired to increase the output of a kiln, the tendency is to increase the height "h" of the collar so as to increase the quantity of slurry retained, but in so doing the section of the outlet orifice 3 for the gases is simultaneously reduced, whilst the volume of these gases increases with the output. In order to overcome this difficulty, the invention provides for the elimination of the collar or to reduce its height to a small value, and to provide a fixed dam member suitably placed with respect to the upper extremity of the kiln, in order to retain the slurry in the bottom portion of its section, but leaving for the passage of the gases all the upper portion of the circular ring which would be closed if the usual type of collar was employed. By this arrangement, the section of passage available for the gases may attain three times that which would be left by a standard type of collar which has the height of the circular segment. With the device in accordance with this invention, there may thus be provided a dam part or member which maintains a pool of slurry of considerable height whilst preserving acceptable possibilities of draught.

FIGS. 2 and 3 show in diagrammatic form the device according to the invention. In these figures, the upper cylindrical extremity of the kiln 1 rotates in a stationary hood 6, which is connected to the stack by a conduit 7, with the interposition of a known fluid-tight joint 5 avoiding that fumes may escape out of the hood while permitting longitudinal and radial expansion of the kiln. Said joint 5 may be, for instance, of the type comprising an asbestos packing-gasket 5' located between a pair of annular metallic discs 5'' secured on the sheet-metal of hood 6 around the opening provided therein for the passage of said kiln, said gasket being in rubbing contact with the outer surface of the shell of kiln 1. The usual collar 2 is reduced in radial dimension to the value just necessary to enable an annular wearing sliding member 8 to be fixed to it. In the hood 6 is suspended a dam plate 9, the upper horizontal edge of which is at a level a little above the level 4 to be maintained for the pool of slurry. On the face of this plate 9 which is directed towards the kiln is fixed a further wearing sliding member 10 of sufficient size to overlap the circular segment which represents in cross-section the pool of slurry, and so as to bear against the wearing sliding member 8 over the entire circular part of this segment. On either side of the dam-plate 9, and along a line crossing the aforementioned segment, is fixed a pair of cables 11 passing through the hood 6 which pass around a pair of pulleys 13 and carry weights 14. The pulleys 13 are so located as to maintain the strands of the cables which are secured to the plate 9, substantially parallel to the axis of the kiln. Thus, the wearing members 8 and 10 are kept applied against each other by the action of the weights 14 which, through the cables 11, apply on said dam-plate forces acting in a direction substantially parallel to the rotary kiln, so that said members form one with another a fluid-tight rotary seal (which may be lubricated, if required), so that it is possible to maintain in the kiln a height of slurry equal to the rise *f* of the circular segment defined by the upper straight edge of the wearing member 10. By virtue of the weights 14, the wearing members are kept in contact in any position of the kiln on the supporting rollers and whatever may be the amount of its variation in length due to the expansion of the shell during working.

FIG. 4 shows a form of practical embodiment of the invention shown diagrammatically in FIGS. 2 and 3. In FIG. 4, the annual wearing sliding member 8 is fixed, for reasons of construction, on a further ring 8*a* which is secured by any suitable means to the collar 2 of the kiln. The non-rotating wearing sliding member of the fluid tight seal (not shown in FIG. 4) is similar to the member 10 of FIG. 2, and forms a rectangular plate, the lower corners of which are removed, said plate being secured by any appropriate means against a supporting dam plate 9. The plate 9 is itself welded or otherwise secured to a bar 15 pivoted at its two extremities to a pair of suspension rods 16 in turn pivoted to a pair of immovable brackets (not shown) secured, for instance, to the wall of the stationary hood. At each extremity of the supporting bar 15 is provided a stirrup 17 to which may be connected the cable 11 of FIG. 2.

The relative movement between the dam member 9 and the rotating fluid-tight member 8 may be permitted by other means than the pivotal suspension of the member 9.

In FIGS. 5 and 6 there has been shown a form of embodiment comprising a sliding guide. The fluid-tight wearing member 8, similar to that shown in FIG. 4, is secured as in the previous case to a ring 8*a* which is in turn secured to the collar 2 of the kiln. The dam plate 9, to which is attached the fixed wearing member 10 is carried by a bar 15 to which are secured two stirrups 17. At each extremity of the bar 15 is provided a carrying and guiding shoe 18, which in the case of the example described, is of U-section. The two shoes each slide in a slide-track parallel to the axis of the kiln, formed by two angle irons 19 suitably supported on the lateral wall of the stationary hood 6. The application of the fixed wearing sliding member 10 against the rotating ring 8 and consequently the fluid-tight seal of the lower segment of the kiln limited to the upper edge 9*a* of the plate 9, is obtained by the action of two weights 14 (see FIG. 7) acting respectively at both extremities of the bar 15 on the stirrups 17, to which are connected the suspension cables 11 for the weights, the cables passing round the pulleys 13. A packing gland 12 is provided for the passage of each cable 11 through the wall of the hood 6 in order to avoid intakes of air which would adversely affect the draught.

In the example of construction shown in FIG. 8, the section of passage available to the gases at the upper part of the kiln is increased to the maximum extent. The shell 1 of the kiln again enters the hood 6 for a certain distance, the fluid-tightness at its entry being effected by means of the usual seal 5. The usual collar 2 (see FIG. 1), retained with a reduced height in the previous embodiment, is in this case completely eliminated and is replaced by a ring 20 formed in the case of the example described, by a bent angle-iron mounted on the outward side of the shell 1, so as to form an external radial flange 20*a*. On this flange, the wearing sliding member 8 is secured by any suitable means. An external ring 21, having an internal diameter equal to that of the shell 1, is provided laterally with two lugs 22 folded back at right angles and each carrying a roller 23. On the face of the ring 21 which is directed towards the kiln, is fixed the wearing sliding member 10 formed by a further ring of suitable material. On the side of the ring 21 opposite to that which carries the member 10 is welded a trough 24, the upper straight edge 24*a* of which is horizontal, and is located from the bottom of the trough, which is aligned with the inner surface of the shell 1, at a height equal to the maximum height *h* provided for the lake of slurry in the kiln. The assembly formed by the ring 21, the wearing sliding member 10 and the trough 24 is supported by means of rollers 23 on two longitudinal rails 19' parallel to the axis of the kiln and arranged in the hood 6. The fixed wearing sliding member 10 is applied against the rotating wearing member 8 by means of weights acting in the direction of the arrows F, on the two lugs 22 in a manner similar to the arrangement already described with reference to FIG. 7. The slurry poured into the trough 24 flows into the kiln, and, as a result of the existence of the fluid-tight rotary seal formed by the members 8 to 10, the level of this slurry may rise up to the edge 24*a* of the trough without overflowing and without causing any leakages. It can be seen that, in this example, all the upper section of the kiln, with the exception of the circular segment occupied by the slurry

and corresponding to the trough 24, is wholly available for the passage of the gases.

In the previous examples, fluid-tightness between the fixed dam-forming member retaining the slurry at the upper part of the kiln and the rotating extremity of the latter is obtained by a rotary seal comprising two wearing sliding members held applied one against the other by means of weights. It is possible to obtain the fluid-tightness necessary for liquids by other means, for example by means of segmet seals, and some examples of construction comprising seals of this kind will be described later.

In the example shown in FIG. 9, the upper extremity of the kiln is not provided with a collar, but is extended a little by a shell 32 having the same diameters as the casing 1 in order not to hinder the passage of the gases. In FIG. 9, the shell 32 is fixed to the casing 1 from which it extends by means of two rings of angle-iron 33 and 34, respectively fixed to the casing 1 and to the shell 32 and connected to each other. The dam member serving to retain the slurry is formed by a trough 34 carried by a support 35 fixed in the stationary hood 6 in such manner that its upper edge 24*a* is at the maximum retaining level provided for the slurry in the kiln. The shell 32 penetrates in the trough through its rear face which is extended upwards so as to form a ring 36 surrounding the shell 32 with a certain clearance therebetween. The fluid-tight segmental seal 31, for example of the type which will be described with reference to FIG. 11, is mounted between the ring 36 and the shell 32. It extends from the ring 36 in the direction of the kiln itself and may in certain cases surround a portion of the casing 1. The rings 29 which define the successive chambers of the joint are kept parallel by the U-shaped rings 30 which serve also to secure them to the ring 36 rigidly fixed to the rear wall of the trough.

In the device shown in longitudinal cross-section in FIG. 10, the casing 1 of the kiln is extended towards the upstream side by a shell 25 which is coaxially secured to it by means of a double flange 26 formed by a pair of angle-iron rings assembled one to the other. The shell 25, the diameter of which differs only slightly from that of the casing 1 of the kiln, is provided with a wearing lining 25*a* secured to it in any suitable manner. The fixed part of the device comprises a trough 24 passing into the shell 25 and two rings 28 and 36 forming the laterial outer walls of the fluid-tight seal shown partly on a larger scale in FIG. 11.

The trough 24 is open at its extremity located in the shell 25, its base and its side walls being welded to the ring 28. As has been shown in the drawing, it may be located at a certain height above the lower generator line of the shell 25. A metallic frame comprising in particular a cross-member 38 supports the trough 24 and the lower part of the ring 36, and a further frame comprising the cross-member 39 carries the upper part of the same ring 36.

As can be seen from FIG. 11, which shows only the lower half of the seal, the space included between the two rings 28 and 36 is divided into four chambers 40 by further rings 29. The parallelism between the rings 29 and the rings 28 and 36 is ensured by rings of U-section acting as spacers. The assembly of the rings 28, 29 and 36 forms a casing which leaves radially a clearance with the shell 25. Three rows of packing rings 31 are mounted in each chamber 40; each packing ring comprises a plurality of segments extending over a portion of the periphery of the shell 25 which segments are applied against the wearing surface 25a by blade springs 41 supported at their both extremities against one segment of a packing ring 31, with their central portions bearing against the adjacent ring 30. Suitable grooves 31*a* are provided for centering the springs 41. The joints between segments of the same packing ring are arranged radially and a certain peripheral clearance is provided between successive segments in order to allow for expansion. The joints between successive packing rings are of course angularly displaced in order to increase the path which must be followed by the slurry in order to pass between adjacent segments.

At one or several points on the periphery of the rings 30 are provided tubes 42 which are connected to a greasing distributor 43 enabling an appropriate lubricant to be forced into the chambers 40, the lubricant being at a suitable pressure, so as to reduce the friction and the wear of the segments 31 against the lining 25*a* of the shell 25.

Half-way along its axial length, the fluid-tight seal comprises a cooling chamber 44 obtained by spacing apart the rings 29 delimiting the adjacent chamber 40, by means of an annular spacer-ring 45 forming part of the casing of the seal and in which are screwed one or a number of water-circulation tubes 46. In addition to its cooling action, which reduces the risk of seizure of the fluid-tight packing rings, the water admitted into the chamber 44 balances the hydrostatic pressure applied by the slurry to the joint and in consequence assists in obtaining satisfactory fluid-tightness.

In the device of FIG. 10, fixed scrapers 47 and 48 are provided on the upstream and on the downstream side of the seal in order to detach from the wall of the shell 25 the half-dried slurry adhering to it.

The general arrangement of the form of embodiment shown in FIG. 12 is similar to that shown in FIG. 10; in this case however, the normal casing of the kiln is not extended by any shell, and the fluid-tight seal is mounted directly on the outer surface of the casing. As in one of the previous examples, a trough 24 carried by a support 35 comprises a rear wall which is extended upwards so as to form a ring 36 surrounding with a certain clearance the metallic outer casing 1 of the kiln. In this case, the orifice pierced in the stationary hood 6 for the passage of the upper extremity of the kiln is slightly enlarged and the seal normally provided for the passage of the kiln into the hood is incorporated in the device, as will be described later. In the figure, the fluid-tight seal which extends from the ring 36 to the ring 28 is similar to that described with reference to FIG. 11, although it is mounted on the outside of the casing of the kiln 1. The main difference resides in the fact that the cooling chamber 44 is much larger and for that purpose, the annular spacer 45 which separates the two halves of the seal is replaced by a shell 37 with edges bent back outwards at its two extremities so as to form flanges on which are fixed respectively the two rings 29 which define the two halves of the seal. Air-tightness at the passage into the hood can easily be obtained since the shell 37 is stationary, the seal 5 can then be formed simply by a member fixed to this shell 37 and supported directly against the wall of the hood.

It will of course be understood that modifications may be made to the forms of embodiment which have just been described above in particular by the substitution of equivalent technical means, without thereby departing from the spirit or from the scope of the present invention. In particular, in the devices comprising a rotary seal consisting of two wearing sliding members applied one against the other, it is possible to provide more than two weights for ensuring the contact, or the weights may be replaced by suitably arranged springs, or by other means. In the same way, the methods of suspension and guiding of the part of the device which does not turn but which may in certain case be axially displaceable so as to provide for expansion and longitudinal movement of the kiln may be other than those which have been described with reference to the drawings. In the case of the segmental seals, it is also possible, instead of providing packing rings formed of segments pressed by springs against a rotary member, to make use of elastic rings operating by their own elasticity against a wearing member which can be easily replaced.

It should be observed that if the total elimination of the

collar of a cement kiln or of a similar member in a rotary kiln or dryer is advantageous from the point of view of the passage of the gases and the draught, it may not be desirable to eliminate it completely, since particles of damp slurry stuck to the wall could for this reason be carried away by the flow of gas into the stationary hood. The device according to the invention, constructed in the manner shown in FIGS. 4 to 6 or 10, or in any similar manner, does not have this drawback and nevertheless enables the height of the pool of slurry in the upper part of the kiln to be substantially increased while still making available a large outlet section for the hot gases.

What I claim is:

1. In a rotary kiln or dryer of the upwardly-inclined type, through which passes a rising flow of gas intended to treat a fluid paste, pulp or slurry, means for maintaining in the lower portion of the higher end of said kiln a high level of said fluid slurry; said means comprising, in combination with the rotary shell of the kiln, a dam-forming member located adjacent said higher end of said kiln and extending at least over a segment of a circle forming the lower portion of the cross-section of said shell and at least up to the level to be maintained for the fluid slurry in said kiln; a fluid-tight seal interposed between said dam-forming member and said shell to prevent the outflow of said slurry from said kiln; means for simultaneously applying said fluid-tight seal in sealing engagement with said dam-forming member and said shell; and means for maintaining said dam-forming member against the rotation of said shell that tends to be imparted thereto through said fluid-tight seal.

2. A rotary kiln or dryer as claimed in claim 1, in which the said dam-forming member is constituted by a trough partially encircling said shell and closed at its extremities by a front and a rear wall, the edge of said front wall rising at least up to the level to be maintained for the fluid paste in said kiln, and said rear wall being formed with an aperture through which passes the upper end of the said shell, said fluid-tight seal being mounted between said shell and said rear wall of said trough.

3. A kiln or dryer as claimed in claim 1, in which said dam-forming member is constituted by a trough entering in the upper end of the kiln and open at its extremity located in said kiln; said trough being secured to a drum internally disposed in said kiln and forming the inner portion of said fluid tight seal; said trough and said drum being both supported in a fixed position by at least one metallic frame.

4. A kiln or dryer as claimed in claim 3, in which the fluid-tight seal is of the labyrinth type and comprises a casing formed by parallel radial rings joined together in spaced relationship by spaced annuli forming with said radial rings a plurality of chambers locating fluid-tight, packing rings resiliently urged against the rotary shell of the kiln for providing paste-tightness.

5. A kiln or dryer as claimed in claim 4, in which the said fluid-tight seal is divided into two portions axially separated by a chamber in which no fluid-tight packing rings are provided but connected with inlet and outlet pipe couplings for circulating cooling water therethrough.

6. In a rotary kiln or dryer of the upwardly inclined type, through which passes a rising flow of gas for drying a fluid pulp or slurry fed at the upper end of said kiln, said kiln being provided with an outer cylindrical shell having an external radial flange, the provision of means for maintaining in the lower portion of the higher end of said kiln a high level of fluid slurry, said means comprising, a first wearing annulus secured to the outer side of said flange directed towards the upper end of said kiln; an external ring facing said external flange adjacent the outer face thereof, said ring being provided laterally with a pair of lugs diametrally disposed and folded back at right angles, said lugs carrying each a roller whose axis is at right angles with the axis of said kiln; a trough fluid tightly secured on the outer face and on the lower portion of said ring with its upper straight edge at a level at least as high as the level to be maintained for the fluid slurry in said kiln; a second wearing annulus cooperating with the first wearing annulus secured on the side of said ring facing said radial flange; track rails parallel to the axis of said kiln on either side thereof for supporting said rollers, and means for permanently applying said second wearing annulus against said first wearing annulus.

7. In a rotary kiln or dryer of the upwardly inclined type, through which passes a rising flow of gas for drying a fluid pulp or slurry fed at the upper end of said kiln, said kiln being provided with an outer rotary shell, the provision of means for maintaining in the lower portion of the higher end of said kiln a high level of said fluid slurry comprising, in combination with the rotary shell of the kiln, a dam-plate located adjacent said higher end of said kiln and extending radially beyond and in overlapping relationship at least over a segment of a circle forming the lower portion of the cross section of said shell and at least up to the level to be maintained for the fluid slurry in said kiln; means for urging said plate towards said edge of the input end of said shell forming an abutment thereof; a fluid-tight seal interposed between said plate and said shell arranged and adapted for preventing the outflow of said slurry from said kiln; and means for maintaining said plate against the rotation of said shell that tends to be imparted thereto through said fluid-tight seal.

8. In a rotary kiln or dryer of the upwardly inclined type, through which passes a rising flow of gas for drying a fluid pulp or slurry fed at the upper end of said kiln, said kiln being provided with an outer rotary shell, the provision of means for maintaining in the lower portion of the higher end of said kiln a high level of said fluid slurry, comprising, in combination with the rotary shell of the kiln, a dam-plate located adjacent said higher end of said kiln and extending radially beyond and in overlapping relationship at least over a segment of a circle forming the lower portion of the cross section of said shell and at least up to the level to be maintained for the fluid slurry in said kiln; means for urging said plate towards said edge of the input end of said shell forming an abutment thereof; a fluid-tight rotary seal arranged and adapted for preventing the outflow of said slurry from said kiln comprising a pair of wearing detachable sliding members respectively secured to said shell and to said dam-plate on the opposing faces thereof; and means for preventing the rotation of said plate that tends to be imparted therto through said wearing sliding member secured to said shell.

9. In a rotary kiln or dryer of the upwardly inclined type, through which passes a rising flow of gas for drying a fluid pulp or slurry fed at the upper end of said kiln, said kiln being provided with an outer cylindrical shell having at least at its upper extremity a radial inner flange, the provision of means for maintaining in the higher end of said kiln a pool of fluid slurry having at its upper extremity a depth higher than the radial dimension of said flange, and comprising in combination with said flange, a wearing sliding annulus coaxial and secured to the outer side of said flange; a dam-plate located near the outer face of said wearing annulus, said dam-plate having a height greater than the radial dimension of said flange, extending at least up to the level of the pool of slurry to be mantained in said kiln, and a transverse dimension sufficient for bridging the opposite sides of said wearing annulus; means for urging said plate towards said wearing annulus; a wearing sliding member secured to said plate, interposed between said annulus and said plate and cooperating with said sliding annulus for forming a fluid-tight rotary seal preventing the outflow of said slurry from said pool; and means for preventing the rotation of said plate that tends to be

imparted thereto through the cooperating portions of said fluid-tight rotary seal.

10. In a rotary kiln or dryer of the upwardly inclined type, through which passes a rising flow of gas for drying a fluid pulp or slurry fed at the upper end of said kiln, said kiln being provided with an outer cylindrical shell having at least at its upper extremity a radial inner flange, the provision of means for maintaining in the higher end of said kiln a pool of fluid slurry having at its upper extremity a depth higher than the radial dimension of said flange, said means comprising, a wearing annulus coaxial and secured to the outer face of said flange; a dam-plate located near the outer face of said wearing annulus, said plate having dimensions and being placed in suitable relationship for overlapping the lower segment defined by the outer periphery of said wearing annulus and having a horizontal edge located at a level at least as high as the level of the pool of slurry to be maintained in the kiln; a wearing, sliding member secured to said plate on the side thereof facing said wearing annulus; a bar horizontally disposed opposite said segment and secured to said plate on the other side thereof, said bar being pivotally secured to the lower ends of suspension rods; immovable suspension means for pivotally securing the upper ends of said suspension rods; and a pair of cables connected respectively to both ends of said bar and carrying weights at their free ends, said cables passing round a pair of pulleys located so as to maintain the strands of the cables secured to said bar in a direction giving rise on both ends of said bar to components of forces substantially parallel to the axis of said kiln and directed towards said wearing annulus to press the wearing sliding member thereagainst.

11. In a rotary kiln or dryer of the upwardly inclined type, through which passes a rising flow of gas for drying a fluid pulp or slurry fed at the upper end of said kiln, said kiln being provided with an outer cylindrical shell having at least at its upper extremity a radial inner flange, the provision of means for maintaining in the higher end of said kiln a pool of fluid slurry having at its upper extremity a depth higher than the radial dimension of said flange, said means comprising a wearing annulus coaxial and secured to the outer face of said flange; a dam-plate located near the outer face of said wearing annulus, said plate having dimensions and being placed in suitable relationship for overlapping the lower segment defined by the outer periphery of said wearing annulus and having a horizontal edge located at a level at least as high as the level of the pool of slurry to be maintained in the kiln; a wearing sliding member secured to said plate on the side thereof facing said wearing annulus; a bar horizontally disposed opposite said segment and secured to said plate on the other side thereof; a pair of sliding shoes secured to both ends of said horizontal bar; slide tracks mounted parallel to the axis of said kiln for guiding said sliding shoes; and a pair of cables connected respectively to both ends of said bar and carrying weights at their free ends, said cables passing round a pair of pulleys located so as to maintain the strands of the cables secured to said bar in a direction giving rise on both ends of said bar to components of forces substantially parallel to the axis of said kiln and directed towards said wearing annulus to press the wearing sliding member thereagainst.

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