Jan. 23, 1940. C. T. WEST ET AL 2,187,922

DEVICE FOR CURING AND COOLING BURNED MATERIALS IN ROTARY KILNS

Filed July 29, 1939 2 Sheets-Sheet 1

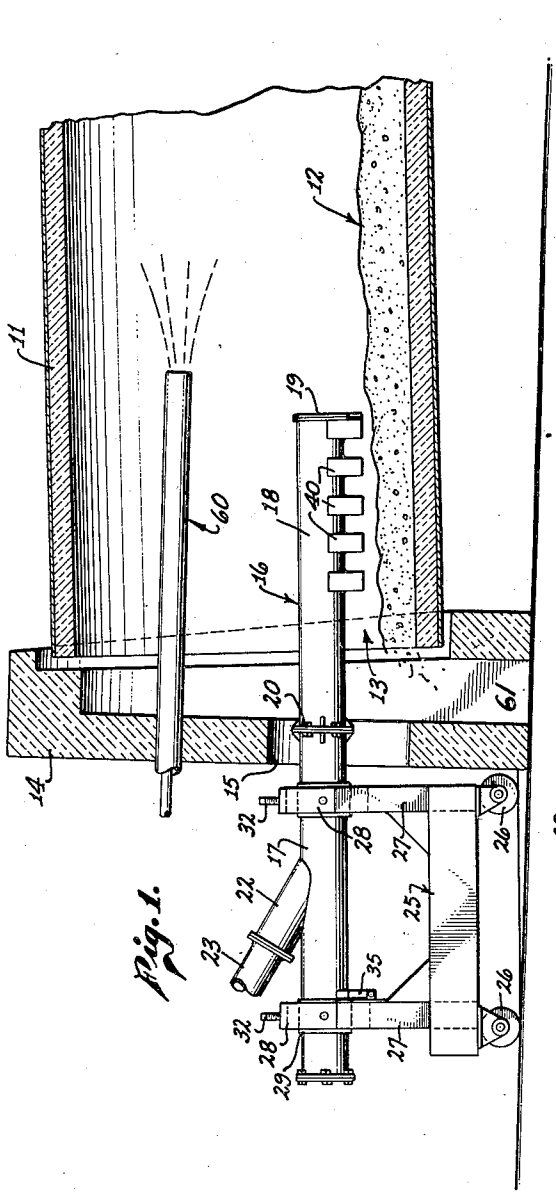

Fig. 1.

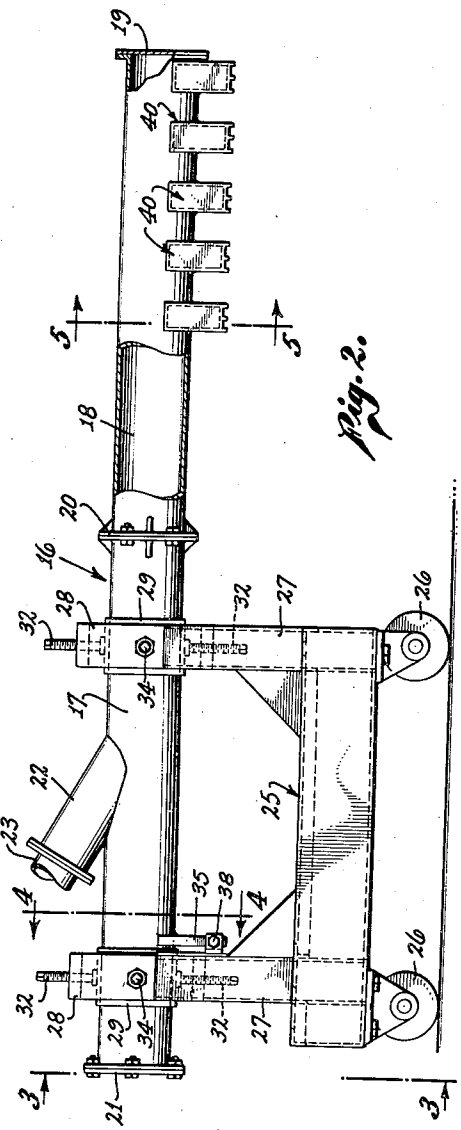

Fig. 2.

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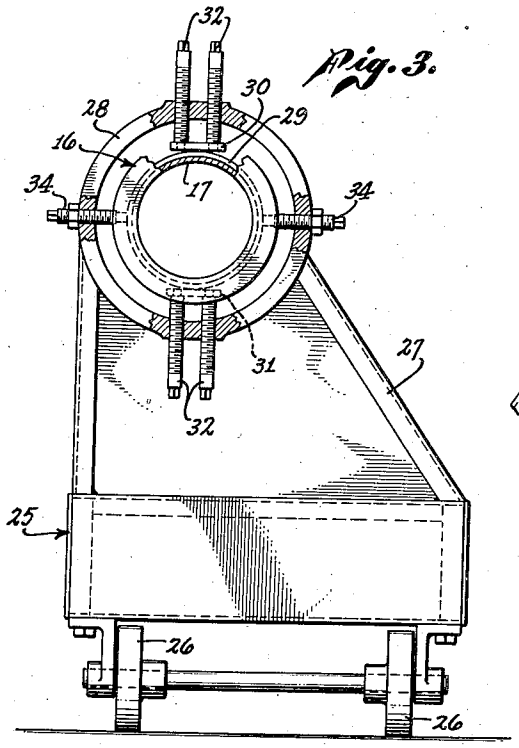
Fig. 3.



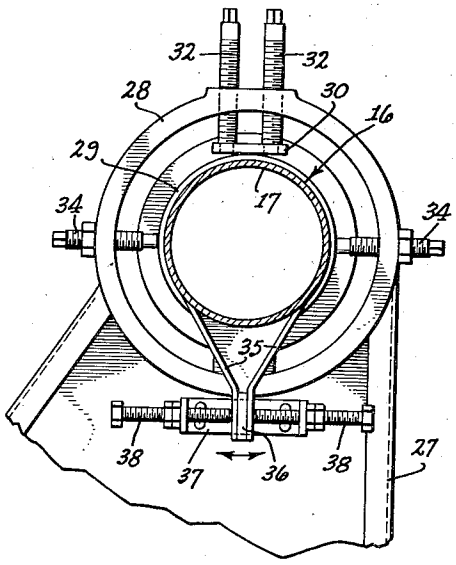


Fig. 4.

Fig. 5.

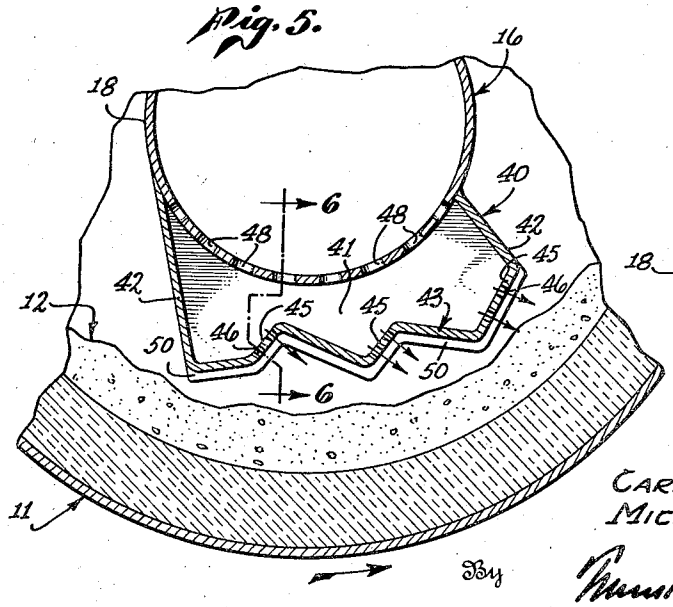
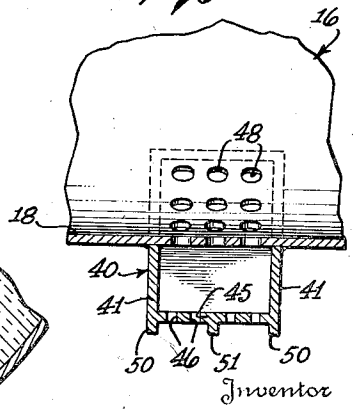


Fig. 6.



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Oct. 10, 1939. J. Q. SHERMAN 2,175,222

MANIFOLD MATERIAL PACK

Original Filed Sept. 28, 1931 3 Sheets-Sheet 3

Fig. 7

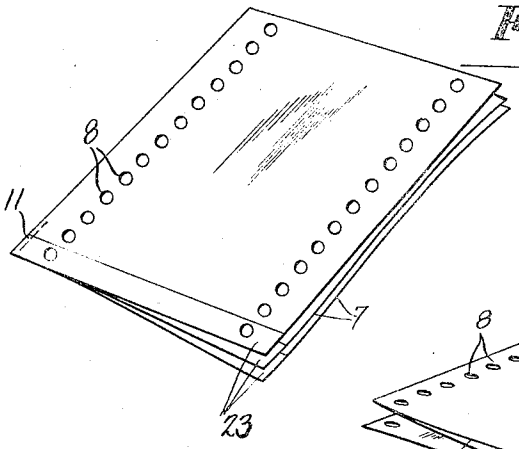


Fig. 1

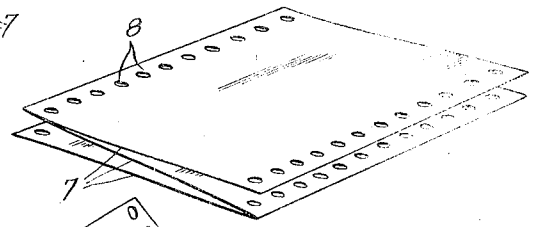
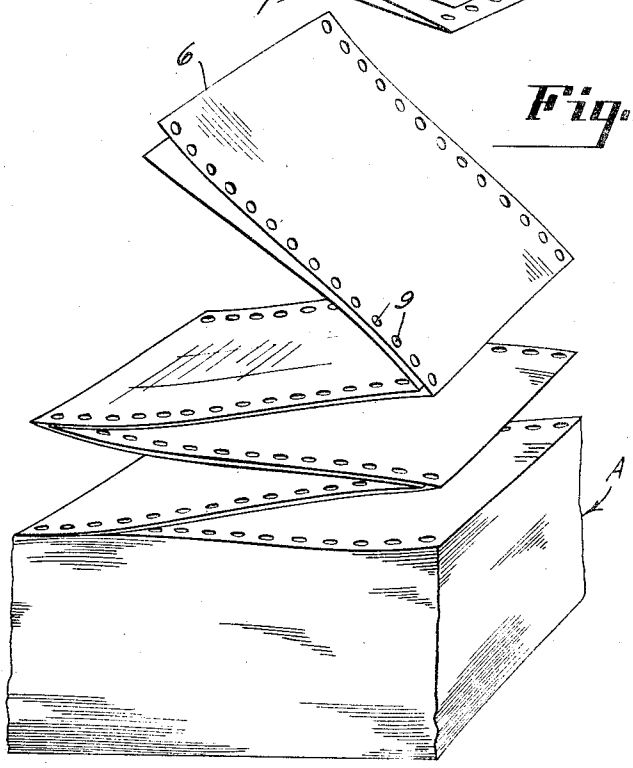


Fig. 10



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Patented Jan. 23, 1940 2,187,922

UNITED STATES PATENT OFFICE

2,187,922

DEVICE FOR CURING AND COOLING BURNED MATERIALS IN ROTARY KILNS

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Application July 29, 1939, Serial No. 287,318

7 Claims. (Cl. 263—33)

The present invention relates to the curing or cooling of cement clinker or other burned products of a similar nature in rotary kilns before they have been discharged from the kiln.

In present devices of this character it has been common practice to build into the walls of the kiln air ducts or passages through which cool air is discharged into the kiln during the revolving of the kiln. In devices of this kind the air is discharged inwardly through the clinkers resulting in blowing into the kiln fine particles of burned material. Another disadvantage of such common practice is that the clinker in that part of the kiln being cooled is exposed to the heat from the walls of the upper part of the kiln thereby retarding the cooling operation and resulting in a discharge of the clinker at an undesirable high temperature.

It is an object of the present invention to provide a device by means of which cool air or gases may be directed onto the surface of the clinker in the kiln and in accomplishing this object a portable blower is provided which is inserted into the open discharge end of the kiln and so arranged that it may be readily adjusted in angular position with respect to the kiln and rotatably adjusted so that the direction of discharge of the air or gases may be directed at the particular portion of the clinker in which the most desirable action of the air or gases on the clinker may be had. We have found that the best results are obtained by directing the air or gases against the clinker as it is carried upwardly on the inner wall or surface of the upwardly moving side of the kiln and upon which the clinker falls back or rolls back to the bottom of the kiln.

In common practice the air supply structure being built into the walls of the kiln, in the event that such structure becomes out of order it is necessary to temporarily stop the kiln until repairs can be made and it is the further object of this invention to provide a device for supplying air or gas to the clinker which may be readily removed from the kiln in the event repair is necessary without stopping the kiln.

A further object of the invention is to provide a cooling device for rotary kilns so arranged that such device forms a shield for the cooling zone from the hot walls of the kiln.

Other objects and advantages will appear hereinafter from the following description and drawings. Referring to the drawings, which are for illustrative purposes only;

Fig. 1 is a diagrammatic view partly in section showing a form of cooling device embodying our invention with the discharge end of the device extending into the discharge end of a rotary kiln;

Fig. 2 is an enlarged elevation of the cooling device shown in Fig. 1, a portion of the air conduit being broken away;

Fig. 3 is an enlarged end view of the device shown in Fig. 2 looking in the direction of the arrows shown in that figure;

Fig. 4 is an enlarged sectional view on line 4—4 of Fig. 2;

Fig. 5 is an enlarged sectional view on line 5—5 of Fig. 2; and

Fig. 6 is a sectional view on line 6—6 of Fig. 5.

Referring more particularly to the drawings, 11 designates the discharge end of a rotary kiln of common form mounted in any suitable manner to rotate; the kiln being tilted so that the clinker diagrammatically illustrated at 12, moves through the kiln and is discharged from the open discharge end designated at 13. The discharge end of the kiln is enclosed by a wall 14 provided with an opening 15 through which a tubular air supply member or conduit generally indicated at 16 is inserted into the discharge end of the kiln as shown in Fig. 1. The tubular member 16 is preferably formed of two pipe sections 17 and 18, the section 18 consisting preferably of a heat resistant steel having a closure plate 19 at the discharge end of such section. The sections 17 and 18 at their adjacent ends are preferably flanged, such flanges being bolted or otherwise secured together as indicated at 20. The other end of the section 17 is also closed by a plate 21 bolted to the flanged end of such section. The plate 21 may be removed for inspection and cleaning purposes. 22 designates a branch formed on the section 17 to which is secured the end of an air pipe or hose, indicated at 23 in Figure 1, through which air is supplied under pressure to the tubular member 16. The tubular member 16 is mounted upon a car diagrammatically shown at 25 provided with wheels 26. Extending upwardly from the car 25 are two standards 27 each provided at their upper ends with a ring 28. The tubular member 16 extends through the rings 28 and is adjustably supported therein in the following manner: The portion of the tubular member 16 within the rings 28 is provided with sleeves 29 welded or otherwise secured thereto which reinforce the tubular member at such points for engagement of supporting devices mounted upon the rings 28. These supporting devices consist of plates 30 and 31 which engage respectively the upper and lower surface of the sleeves 29, such plates being mounted on the ends of threaded bolts 32 mounted in threaded engagement with the rings 28. By this arrangement the tubular member is supported in the rings 28 so that by proper adjustment of the bolts the discharge end of the tubular member may be raised or lowered as desired. Engaging the opposite sides of the sleeves 29 are bolts 34 which are mounted in threaded

engagement with the rings 28 and by means of which the hollow member may be swung laterally into adjusted position. For the purpose of rotatively adjusting the hollow member, arms or straps indicated at 35 are welded or otherwise secured to the hollow member as shown in Figure 4. The lower ends of the straps 35 extend downwardly and are joined by a block 36. 37 designates a bracket secured in any suitable manner to the standard 27 at the rear end of the car. Mounted in threaded engagement with the bracket 37 are bolts 38, the inner ends of which engage the lower ends of the straps 35 so that by relative adjustment of the bolts 38 the lower ends of the straps 35 may be moved laterally with the resultant rotative movement of the hollow member 16.

Welded or otherwise secured to the inner end of the tubular member 16 are a series of nozzles or air discharge boxes 40. Each of the nozzles 40 comprise side walls 41, end walls 42 and multi angular bottom walls indicated at 43. Certain of the walls of such bottom as indicated at 45 are provided with air discharge openings 46 which are so arranged as to direct the air discharged therefrom against the clinker as it falls back upon the upwardly moving inside surface of the rotary kiln. Air is introduced into the nozzles 40 through perforations or openings 48 formed in the tubular member 16. For the purpose of assisting in breaking up the clinker should large lump of clinker be formed, the side walls 41 extend downwardly beyond the bottom of the nozzles as indicated at 50 forming flanges which upon engagement with the clinker tends to break the same. A similar flange 51 is formed on the nozzles intermediate the side walls for the same purpose.

60 designates the burner for the kiln which may be of any suitable type for burning gas or other fuel.

It will be easily recognized from the above description that a tubular air duct or member mounted as above described may be moved by means of the car so that the discharge end of the hollow member is extending into the kiln to the desired position, as shown in Figure 1. Air supplied through the pipe connection 23 is discharged from the nozzles against the clinker when the same is rolling back or at the bottom of the kiln. By the adjustment of the position of the hollow member as heretofore described it is apparent that the nozzle may be brought in position to discharge air or gas against the clinker on such portions of the kiln as may be deemed advisable for the best results. Further, the projection of the hollow member into the kiln over the portion of the clinker being cooled forms a barrier or obstruction between the cooling zone and the heated upper walls of the kiln. The clinker after passing under the nozzles is discharged from the end of the kiln into a pit designated at 61 from which it is removed in the usual manner to the grinding mill.

While we have particularly described our invention as applied to the use of air in cooling clinker it is apparent that the same is particularly adaptable for the purpose of introducing various gases for the chemical treatment of the clinker, as for instance, the introduction of natural gas to combine with the oxygen in the clinker thereby producing a substantially lighter colored clinker. In such cases other cooling means are necessary.

What we claim is:

1. In combination with a rotary kiln, means for introducing air into the discharge end of the kiln comprising a conduit having its discharge end extending into the kiln, discharge nozzles on said conduit, and means for mounting said conduit for rotative and angular adjustment.

2. In combination with a rotary kiln, means for introducing air into the interior of the kiln at its discharge end comprising: a conduit extending longitudinally into the discharge end of the kiln and nozzles on said conduit, said nozzles having angular faces with discharge openings in said angular faces.

3. In combination with a rotary kiln, means for introducing air into the interior of the kiln at its discharge end comprising: a portable air conduit extending longitudinally into the discharge end of the kiln, said conduit having air discharge openings near its inner end, a car, and means on the car for supporting said conduit.

4. In combination with a rotary kiln, means for introducing air into the interior of the kiln at its discharge end comprising: a portable air conduit extending longitudinally into the discharge end of the kiln, said conduit having air discharge openings near its inner end, a car; means on the car for supporting said conduit, said supporting means comprising standards on said car, hollow receiving members for said conduit on said standards; and adjustable means mounted on said hollow members engageable with and supporting said conduit.

5. In combination with a rotary kiln, means for introducing air into the interior of the kiln at its discharge end comprising: a portable air conduit extending longitudinally into the discharge end of the kiln, said conduit having air discharge openings near its inner end, a car; means on the car for supporting said conduit; said supporting means comprising, standards on said car, rings supported on said standards through which said conduit is extended, adjustable means on said rings engageable with the upper and lower portions of said conduit and adjustable means on said rings engageable with the sides of said conduit.

6. In combination with a rotary kiln, means for introducing air into the interior of the kiln at its discharge end comprising: a portable air conduit extending longitudinally into the discharge end of the kiln, said conduit having air discharge openings near its inner end, a car; means on the car for supporting said conduit, said supporting means comprising standards on said car; rings supported on said standards through which said conduit is extended, adjustable means on said rings engageable with the upper and lower portions of said conduit; adjustable means on said rings engageable with the sides of said conduit; arms on said conduit extending downwardly therefrom, a bracket on one standard, and adjustable means mounted on said bracket engageable with opposite sides of said arms.

7. In combination with a rotary kiln; means for introducing gas into the kiln comprising: a conduit extending into the discharge end of the kiln; and a series of gas discharge members on said conduit comprising boxes having multi angular outer walls with discharge openings therein, said conduit having discharge openings into said boxes.

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