Oct. 13, 1931. H. VANDERWERP 1,826,847

APPARATUS FOR MAKING CEMENT

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Fig. 1

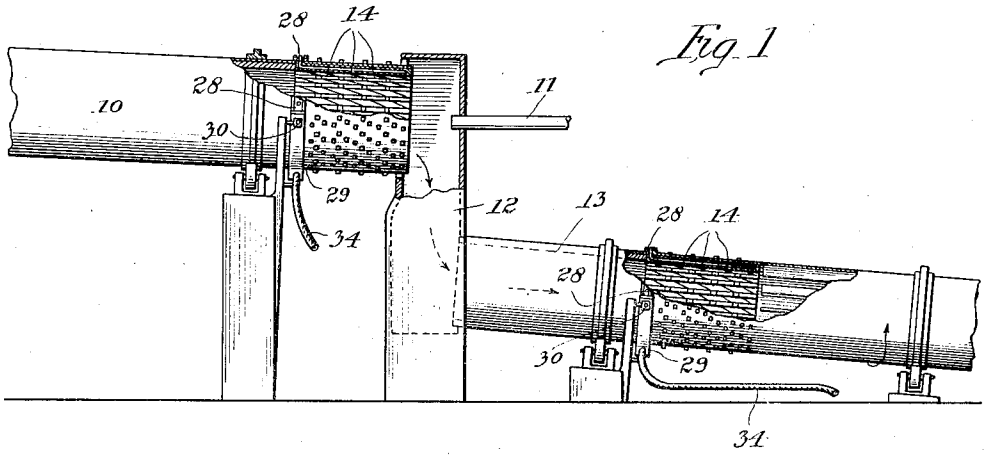
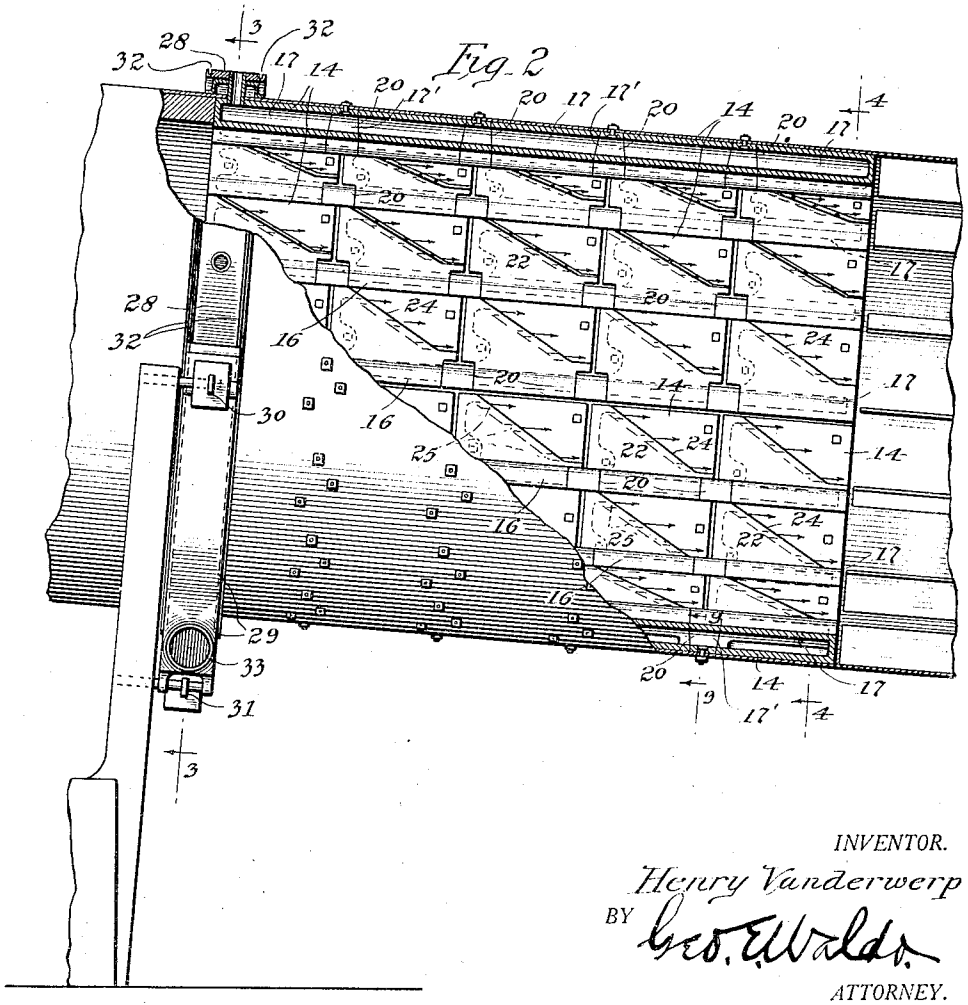


Fig. 2



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APPARATUS FOR MAKING CEMENT

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Fig. 3

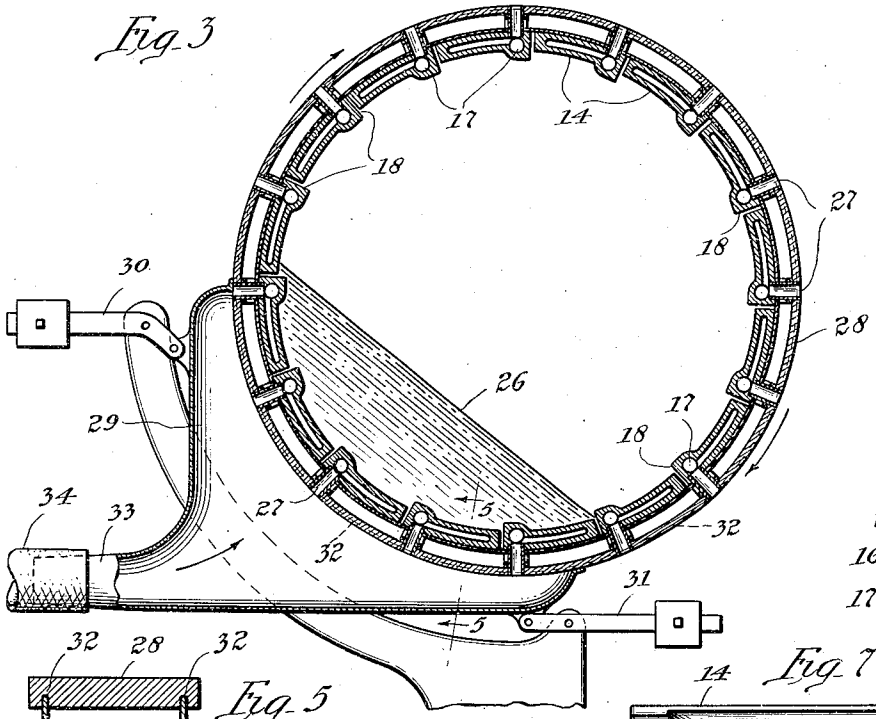


Fig. 6

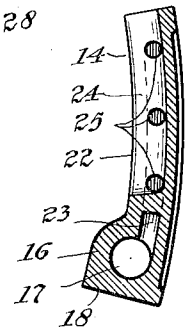


Fig. 5

Fig. 7

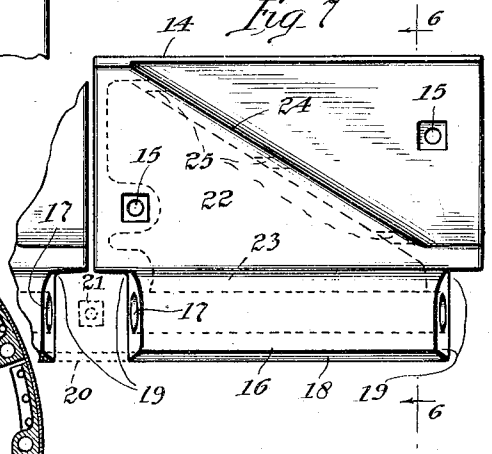


Fig. 4

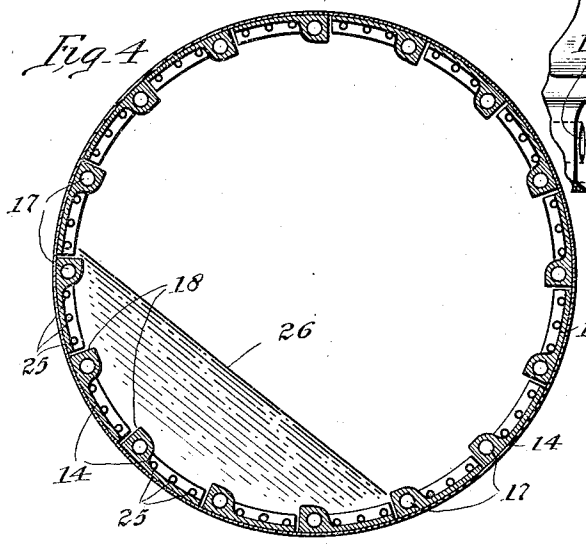


Fig. 8

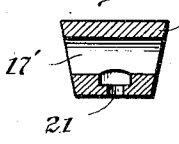
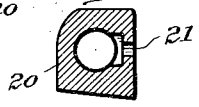


Fig. 9



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Patented Oct. 13, 1931 1,826,847

UNITED STATES PATENT OFFICE

HENRY VANDERWERP, OF MANITOWOC, WISCONSIN, ASSIGNOR TO ROTARY PRESSURE COOLER COMPANY, OF MANITOWOC, WISCONSIN, A CORPORATION OF WISCONSIN

APPARATUS FOR MAKING CEMENT

Application filed April 4, 1928. Serial No. 267,351.

The invention relates to an improved method and apparatus for making cement, the primary object of the invention being to provide a method and apparatus of the class described by means of which cement may be manufactured with improved efficiency.

Another object of the invention is the provision of means whereby fuel may be economized in the manufacture of cement.

Another object of the invention is the prolongation of the life of the apparatus employed in making cement.

Other objects will appear hereinafter.

The invention consists in the method and apparatus hereinafter described and claimed.

The invention will be best understood by reference to the accompanying drawings forming part of this specification and in which—

Fig. 1 is a partial longitudinal elevation, with portions broken away and shown in section, of the improved apparatus adapted for use in the improved method;

Fig. 2, an enlarged partial longitudinal section through a portion of the cooling chamber employed in the apparatus;

Fig. 3, a transverse section taken substantially on line 3—3 of Fig. 2;

Fig. 4, a transverse section taken substantially on line 4—4 of Fig. 2;

Fig. 5, a section taken substantially on line 5—5 of Fig. 3;

Fig. 6, a section taken substantially on line 6—6 of Fig. 7;

Fig. 7, an interior partial plan view of tuyère blocks employed in the apparatus;

Fig. 8, a section of a juncture block employed in the apparatus; and

Fig. 9, a view at right angles to Fig. 8.

The preferred form of construction as illustrated in the drawings comprises a revolving kiln 10 arranged to be supplied with fuel through a fuel pipe 11. The kiln 10 communicates with the upper portion of a chamber or housing 12 and a revolving cooling chamber 13 communicates with the lower portion of said housing. The revolving kiln 10, the fuel pipe 11, the housing 12 and the cooling chamber 13 are the usual members of a usual form of cement making apparatus combined and operating together in the usual way, the present invention being in the nature of improvements and additions to the kiln 10 and cooling chamber 13.

Secured to the inner surface of a portion of both the kiln 10 and the cooling chamber 13 are linings *a* consisting of a plurality of tuyère blocks 14, arranged in series both circumferentially and longitudinally of said kiln and cooling chamber, respectively. As shown, the lining for the kiln 10 is applied to the end thereof immediately adjacent the housing 12, as shown in Fig. 1, while the lining for the cooling chamber 13 is applied to a portion thereof intermediate its ends, also as shown in Fig. 1.

Each of the tuyère blocks 14 is secured in place on the inner periphery of the corresponding chamber by means of bolts 15 passing through the shell of the chamber, as shown.

Formed on the advancing edge of each tuyère block 14 is an enlargement or boss 16 provided with an air passage-way 17 and shaped to form a radially disposed surface or ledge 18 for lifting the material in the chamber as said chamber rotates, as will be readily understood by those skilled in the art. The air passages 17 of tuyère blocks 14 in each longitudinal series are in open communication with one another, the passages in intermediate blocks extending entirely through the same from end to end, but the remote ends of the extreme tuyère blocks of each series being preferably closed.

In the preferable construction shown, the tuyère blocks 14 are also secured to the shells of the kiln 10 and cooling chamber 13 by key blocks 20 which engage notches 19 formed in the tuyère blocks 14 at the ends of the enlargements or bosses 16, and which are secured to the shells of said kiln and cooling chamber, said key blocks 20 being provided with inclined surfaces which interlock with reversely inclined surfaces on the tuyère blocks, the relation being such that said blocks 20 will form keys which will secure said tuyère blocks to the shells of the kiln and cooling chamber. As best shown, Figs. 2 and

7 to 9 of the drawings, the key blocks 20 are secured to said shells by bolts which engage bolt holes and recesses 21 formed in said key blocks in register with corresponding holes in said shells, having nuts threaded to their projecting ends, said bolts and nuts being shown at 21′, Fig. 2.

Each key block 20 is provided with an air passageway 17′ arranged and adapted to register with the air passages 17 in adjacent tuyère blocks 14, thereby placing all of the tuyère blocks of each longitudinal series in open communication with each other.

Each tuyère block 14 comprises a hollow portion 22 adjacent the enlargement or boss 16, the chamber 23 in which communicates with the passageway 17 in said enlargement or boss, and a relatively thin solid portion 22′, said portions 22 and 22′ being separated by a wall 24 formed in which are jet orifices 25 which communicate with the chamber 23 in the hollow portion 22 of the tuyère block and are directed over and across the surface of the relatively thin portion 22′ thereof, exposed within the kiln 10 and cooling chamber 13, respectively. Also, as said blocks are installed for use, the shoulders 24 face away from the direction of rotation of said kiln and cooling chamber, thus effectively obviating any tendency of the granular material undergoing treatment falling by gravity into the jet orifices 25 and clogging the same. As shown, the wall 24 extends diagonally from the point of juncture of the portion 22 adjacent one end of the block with the enlargement or boss 16, to a point in the side of said tuyère block remote from said enlargement or boss and adjacent the opposite end of said block.

The pile of cement clinker being treated in each of the chambers is indicated at 26 and it will be noted that by the arrangement described a portion of the tuyère blocks 14 will be always under or covered by this pile of material. As the chamber revolves, a certain portion of this material will be lifted and elevated by the lifting action of the surfaces 18 in conjunction with the forms of the blocks 14 until such an inclination is assumed by the surfaces 18 as to cause said material to fall therefrom, thereby performing the function of the ordinary and usual lifting blades in this form of apparatus.

The arrangement is such that air is passed through the tuyère blocks covered by the pile of material 26 and discharged through the orifices 25 longitudinally into the material, whereby it will have prolonged and intimate contact therewith. Also, clogging of the orifices 25 by material falling into the same by gravity is prevented.

As a means of supplying air to the tuyère blocks, each tuyère block in one circumferential band or series is provided with a radially extending nipple or pipe section 27 extending through the shell of the corresponding chamber and also through a circumferential reinforcing ring 28 as shown.

An air housing 29 is arranged to contact with the ring 28 substantially throughout the area of the chamber covered by the pile of material 26. The housing 29 is yieldingly mounted on two weighted levers 30 and 31 so as to be yieldingly pressed against the ring 28 as the same revolves.

To prevent undue escape of air from the housing 29, the ring 28 is provided with circumferential grooves 32 into which the edges of the housing 29 fit as indicated in Fig. 5. The housing 29 is provided with a nipple 33 connected by an air hose 34 with a source of supply of air under pressure, not shown, by means of which air under pressure may be supplied to the housing 29 and through it to the tuyère blocks 14 during the normal operation of the apparatus.

In the normal operation of the apparatus, the usual slurry dry raw material is fed to the kiln 10 in the usual way, said kiln being also supplied with fuel through the fuel pipe 11 and combustion being promoted in said kiln in the usual way.

To further augment and promote combustion, fuel may be mixed with the cement ingredients within the kiln and before introduction thereinto. As the material in the kiln proceeds in the usual way therethrough, it ultimately passes through the portion thereof lined with the tuyère blocks 14 just before discharge into the housing 12. Here the clinker which has been transformed partially into cement in the kiln 10 is first subjected to further and complete combustion of any fuel remaining therein by the passage of the air through the corresponding tuyère blocks. After this combustion has been completed, the passage of the air through the lowermost tuyère blocks has a tendency to start the cooling of the cement clinker.

It will also be noted that the passage of the air through the tuyère blocks has a tendency to cool said tuyère blocks and thus prevent injury thereto from the intense heat to which they are subjected.

As the clinker proceeds through the cooling chamber 13 in the normal operation of the apparatus, it is again subjected and, more intensely, to the cooling action of the air passing through the tuyère blocks in the cooling chamber. The incoming air, as it cools the clinker, is itself heated thereby, and, as there is normally a general upward draft or passage of air from the cooling chamber 13 into and through the kiln 10, this preheated air tends to promote combustion in the kiln and thereby economizes fuel.

The passage of the air through the tuyère blocks in the cooling chamber 13 also tends to cool said blocks and prevent injury thereto from the intense heat.

By means of the apparatus described cement may be produced with great efficiency and economy of fuel and the life of the working parts greatly prolonged.

While I have illustrated and described the preferred apparatus and method of procedure for carrying on the invention, these may be varied without departing from the spirit of the invention.

I therefore do not wish to be limited to the precise details set forth, but desire to avail myself of such variations and modifications as fall within the scope of the appended claims.

I claim:

1. Apparatus for the purpose specified comprising a rotatable shell, and a lining therefor consisting of hollow tuyère blocks each provided with a passage-way which communicates with the chamber therein, said tuyère blocks being arranged in series with the passage-ways of blocks of each series in communication with one another, means for securing said tuyère blocks to said shell, and means for supplying air under pressure to said tuyère blocks, said block being provided with discharge orifices which communicate with the chambers therein, respectively.

2. Apparatus for the purpose specified, comprising a rotatable shell, and a lining therefor consisting of hollow tuyère blocks each comprising an enlargement shaped to form a lifting ledge, said enlargement being provided with a passage-way which communicates with the chamber in said tuyère blocks, said tuyère blocks being arranged in series with the passage-ways of blocks of the same series in communication with one another, means for securing said tuyère blocks to said shell, and means for supplying air under pressure to said tuyère blocks, said tuyère blocks being provided with discharge orifices which communicate with the chambers therein, respectively.

3. Apparatus for the purpose specified, comprising a rotatable shell and a lining therefor consisting of tuyère blocks, each comprising a hollow portion, a relatively thin solid portion, and an enlargement shaped to form a lifting ledge, provided with a passage-way which communicates with the chamber in the hollow portion thereof, said blocks being arranged in series with the passage-ways of blocks of the same series in communication with one another and the remote ends of the passage-ways in the extreme blocks of each series being closed, said tuyère blocks, respectively, being provided with jet orifices which communicate with the chambers therein.

4. Apparatus as specified in claim 1, in which the remote ends of the passage-ways in the extreme tuyère blocks of each series are closed.

5. Apparatus as specified in claim 1, in which the means for supplying air to the tuyère blocks is operative only in that circumferential portion of the surface of the shell which, in operation, is positioned in a predetermined sector of the circular path of movement of said shell.

6. Apparatus as specified in claim 1, in which key blocks are secured to the inner surface of the shell which interlock with correspondingly shaped recesses formed in adjacent ends of adjacent tuyère blocks.

7. Apparatus as specified in claim 1, in which key blocks are secured to the inner surface of the shell which interlock with correspondingly shaped recesses formed in adjacent ends of adjacent tuyère blocks in line with the communicating passage-ways in said series of tuyère blocks, respectively, and which are provided with passage-ways which register with the passage-ways in adjacent tuyère blocks.

8. Apparatus as specified in claim 2, in which key blocks are secured to the inner surface of the shell which interlock with correspondingly shaped recesses formed in adjacent ends of the bosses of adjacent tuyère blocks, and which are provided with passage-ways which communicate with and connect the passage-ways in the bosses of said tuyère blocks.

9. Apparatus for the purpose specified comprising a rotatable shell and a lining therefor consisting of tuyère blocks provided with passage-ways, said tuyère blocks being arranged in series with the passage-ways of blocks of the same series in communication with one another, means for securing said tuyère blocks to said shell, and means for supplying air under pressure to said tuyère blocks, each of said tuyère blocks comprising a hollow portion the chamber in which communicates with the air supply passage-way therein, and a relatively thin solid portion, said hollow and solid portions being separated by a shoulder provided with jet orifices which communicate with the chamber in said hollow portion and which are directed along the surfaces of said relatively thin portion exposed within said shell.

10. Apparatus as specified in claim 9, in which the tuyère blocks are installed for use with the shoulders separating the hollow and solid portions thereof facing rearwardly relative to the contemplated direction of rotation of the shell in operation.

11. Apparatus as specified in claim 9, in which the shoulders which separate the surfaces of the hollow and solid portions of said tuyère blocks exposed within said shell when installed for use extend diagonally of said blocks.

In witness that I claim the foregoing as my invention, I affix my signature this 31st day of March, 1928.

HENRY VANDERWERP.