Nov. 3, 1942. V. J. AZBE 2,300,860

KILN DRAWING MEANS

Filed April 21, 1941 3 Sheets-Sheet 1

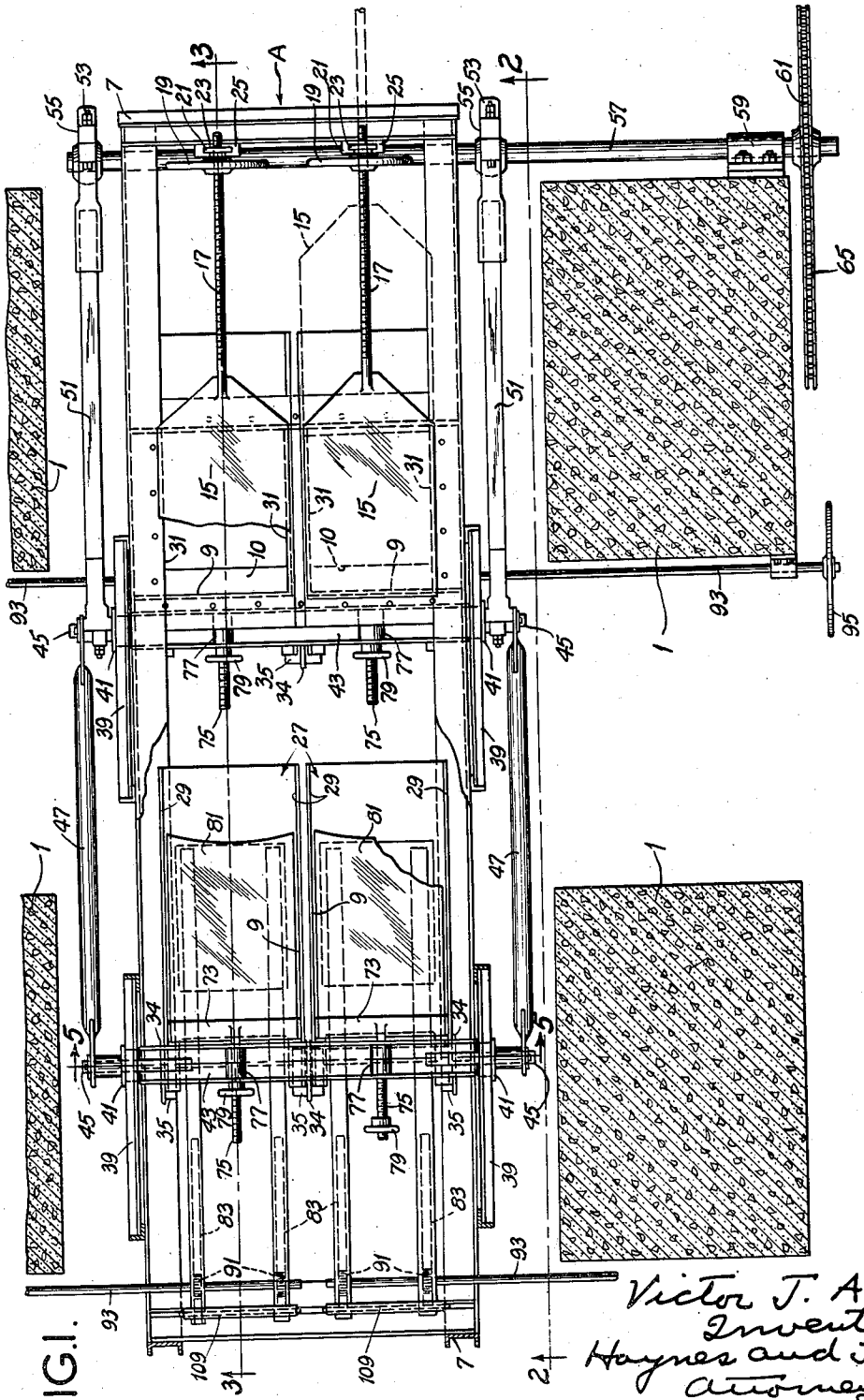


FIG. 1.

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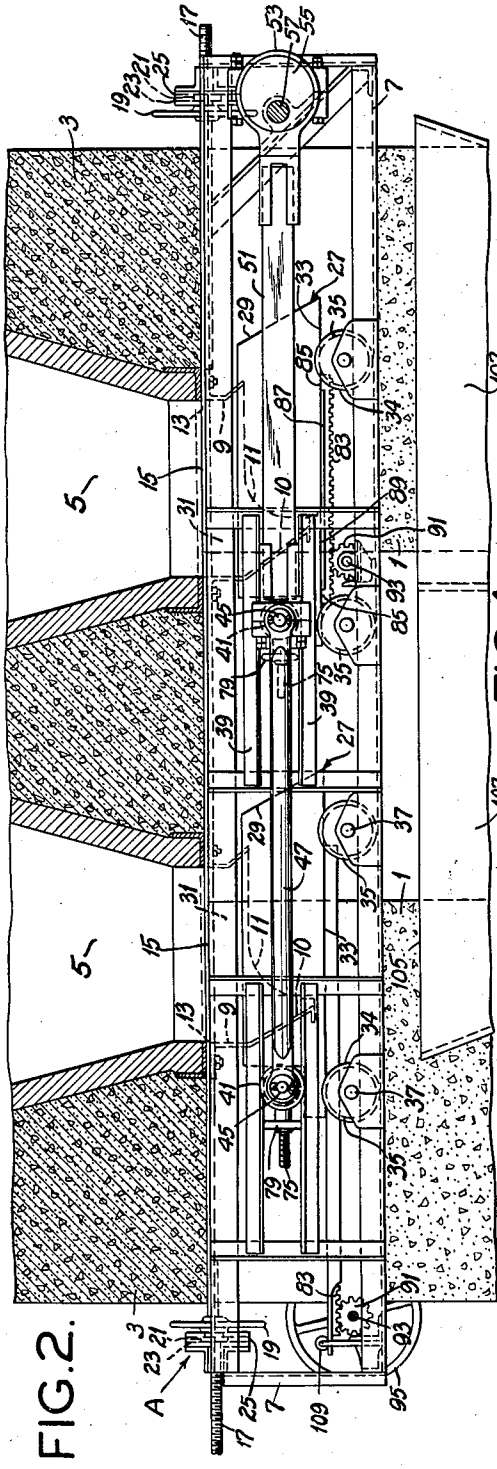


FIG. 2.

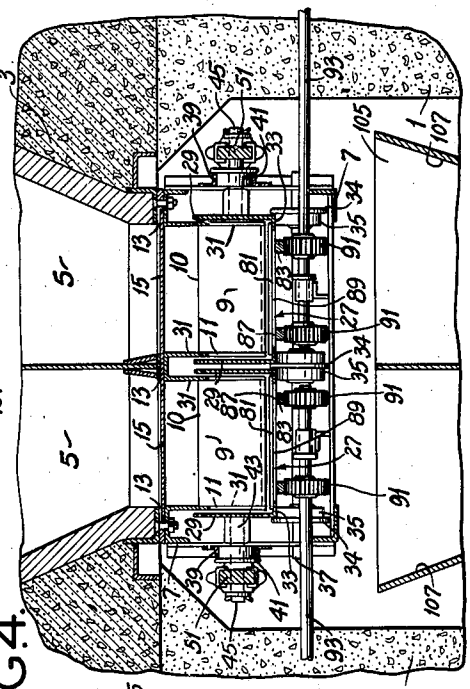


FIG. 4.

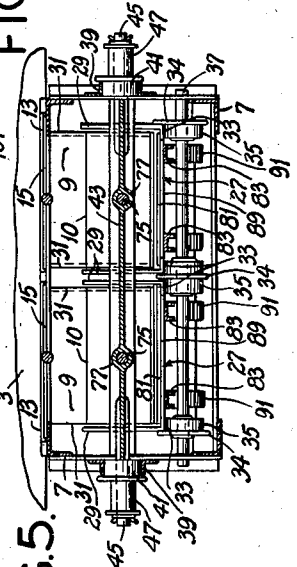


FIG. 5.

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KILN DRAWING MEANS

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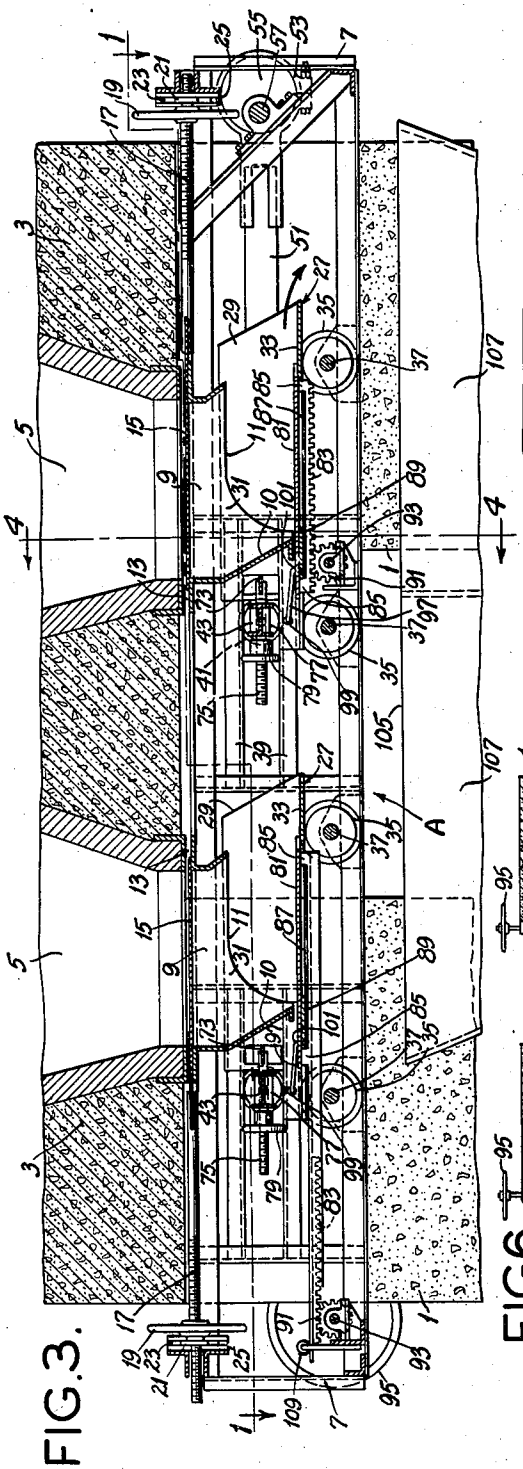


FIG. 3.

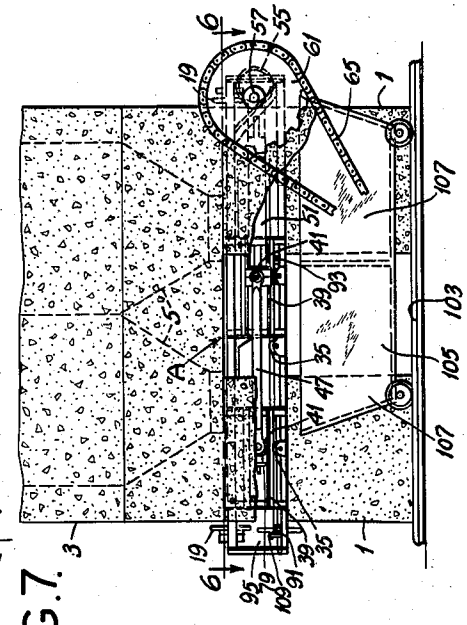


FIG. 7.

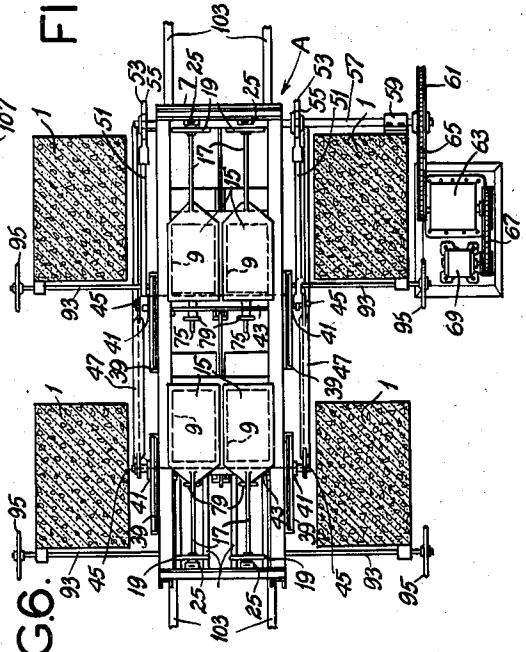


FIG. 6.

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UNITED STATES PATENT OFFICE

2,300,860

KILN DRAWING MEANS

Victor J. Azbe, Webster Groves, Mo.

Application April 21, 1941, Serial No. 389,542

11 Claims. (Cl. 214—18)

This invention relates to kiln drawing means, and with regard to certain more specific features, to automatic draw apparatus for lime kilns and the like.

Among the several objects of the invention may be noted the provision of an automatic draw apparatus for multi-sectioned, vertical lime kilns and the like by means of which uniform but independent flow of material may be obtained in the various sections whereby better advantage may be taken of the more uniform but controlled heating afforded by this particular form of kiln; the provision of an automatic draw of the class described which will permit of independent control of draw from the respective section and control of combustion therein; the provision of a draw of the class described which permits of simultaneous automatic or manual delivery of lime of different characteristics from the respective kiln sections; the provision of improved take-off means for the material produced; and the provision of a draw of the class described which steadily produces a better lime product at much higher kiln capacities and efficiencies with lower draft requirements and less deterioration.

The invention accordingly comprises the elements and combinations of elements, features of construction, and arrangements of parts which will be exemplified in the structures hereinafter described, and the scope of the application of which will be indicated in the following claims.

In the accompanying drawings, in which is illustrated one of various possible embodiments of the invention:

Fig. 1 is a sectional plan view of the apparatus in position below a multi-sectioned kiln being taken on line 1—1 of Fig. 3;

Fig. 2 is a vertical longitudinal section taken on line 2—2 of Fig. 1;

Fig. 3 is a vertical longitudinal section taken on line 3—3 of Fig. 1;

Fig. 4 is a vertical cross section taken on line 4—4 of Fig. 3;

Fig. 5 is a vertical cross section taken on line 5—5 of Fig. 1;

Fig. 6 is a plan of the apparatus reduced in scale, being a section on line 6—6 of Fig. 7; and,

Fig. 7 is a front elevation of Fig. 6.

Similar reference characters indicate corresponding parts throughout the several views of the drawings.

In my United States Patent 2,199,384 dated May 7, 1940, for calcining apparatus, is shown a multi-sectioned kiln employing a center burner and having in its lower portion sectionalized coolers through which a plurality of streams of finished lime pass by gravity. It has been the practice to draw the kilns of this and similar types intermittently by hand in order to "hang" the lime and permit trimming of the charge in the kiln. Automatic draw means have not been used because (1) of impossibility of even heat distribution, unless structures are used such as shown in Patent 2,199,384, and (2) of lack of proper individual mechanical draw controls, which among other things the present invention provides. Without individual control of the various streams of material some of the advantage of a multi-sectioned kiln is lost. The present invention provides this control in an automatic system.

Referring now more particularly to Fig. 1, there are shown at numerals 1 four supporting columns for a vertical kiln. The lower portion of the kiln is shown in general at 3, including portions of independent sectional coolers 5, of which there are four, as indicated in Figs. 2 and 4. Through these independent cooling zones flow streams of material as specified in said Patent 2,199,384.

Suspended from the bottom of the kiln, between pairs of the columns 1, is the automatic draw unit indicated generally at A. This consists of a built-up frame 7 in which are four independent chutes 9. These chutes 9 form continuations from the respective coolers 5. They are open in front as indicated at 11, having sloping backs 10 and sides 31. These chutes 9 are spaced from the lower ends of the zones 5 as indicated at 13 (Figs. 3 and 4) to accommodate horizontal sliding control gates 15. The primary purpose of these gates is effectively to block the ingress of air when the kiln is on a dead bank. The gates 15 are separably adjustable, each being provided with a threaded stem 17 on which is threaded a hand control wheel 19. Each wheel 19 may be rotated but may not move endwise because of a flange 21 thereon rotary in a groove 23. The grooves 23 are formed in stationary parts connected with the frame as indicated at 25. By this means, each gate 15 is independently adjustable from its respective wheel 19 to be moved into closed or partially open positions with respect to the outlets at the bottom of the cooling sections 5, respectively.

At 27 are shown reciprocating shakers consisting of vertical sides 29 which are adjacent to the depending portions 31 of the fixed chutes 9 (Fig. 4). At their lower portions, the vertical sides 29 are provided with inward flanges 33 which ride upon the treads of flanged supporting wheels 35. The flanges 34 of said wheels 35

guide the sides 29. The wheels 35 are supported upon shafts 37 carried in the frame 7.

Reciprocation of each shaker 29 is accomplished as follows:

Lateral guides 39 are provided on the frame for cross-head rollers 41. For each pair of shakers 29 is provided a pair of the rollers 41. Each pair of rollers 41 supports a cross head 43. Each cross head carries endwise studs 45.

The studs 45 of one cross head (the rearmost one, to the left in Fig. 6) are pivoted to the ends of drag links 47. The other end of each drag link is pivoted to the other pair of studs 45 on the other cross-head 43. These latter studs are respectively pivoted to connecting rods 51. The connecting rods 51 at their forward ends are provided with eccentric straps 53 passing around eccentrics 55 which are affixed to a power shaft 57. The power shaft passes laterally to and through an outboard bearing 59, and beyond carries a sprocket 61. Sprocket 61 is driven from a gear reduction box 63 by means of a chain 65. The box 63 is powered through a chain drive 67 from a driving motor 69. From the above it will be seen that rotation of the drive shaft 57 results in reciprocation of both cross heads 43 with their rollers 41 in guides 39.

One cross head 43 is used for reciprocating two shakers. There is a lost-motion connection between each cross head and each of the respective shakers which it controls. The lost-motion connections are as follows: At the rear of each shaker 29 is a cross bar 73 from which rigidly extends a threaded shank 75. Each shank 75 may slide freely through a hollow guide 77. There are two guides 77 on each cross head 43. Threaded on each stem 75 is an adjustable abutment 79. By adjusting each abutment 79 on its stem 75, various degrees of lost-motion may be provided between the respective cross heads 43 and the shakers 29. In Fig. 1 the two-right-hand and the upper left-hand shakers are shown without lost-motion, so that they receive all of the motions of their respective cross heads; whereas the abutment 79 at the lower left is adjusted so that its respective shaker receives little motion. By this means, the stroke of the reciprocating shaking motion of each shaker may be controlled independently from its respectively adjustable abutment 79, although all shakers are operated from a common reciprocating mechanism having a fixed stroke.

In some cases it may be desirable to cut off the automatic draw for one or more sections, and effect a release by hand, but it is not desirable at the same time that the operation of other automatic draw gates be interfered with. In order to provide for this, each shaker 9 has resting upon its flanges 33 a sliding, bottom-forming gate 81. Each gate 81 is provided on its lower side with a pair of racks 83 fastened at two points 85. This two-point attachment provides a clearance 87 between the respective racks and plate, for accommodating an endwise brace 89 which extends between the supporting flanges 33.

Each pair of racks 83 meshes with a pair of pinions 91. Two independently movable pinions and two racks are used for each gate 81 as indicated in Fig. 4. Each pair of pinions 91 for a given gate 81 is carried upon an independent control shaft 93 which extends outward for control from a hand wheel 95. Each hand wheel 95, along with its shaft 93, is movable axially, so that the respective pairs of pinions 91 may be thrown out of engagement with their respective pairs of racks 83. At 103 are shown hold-down guides for the racks.

When the pinions are disconnected, the gates 81 in their closed positions move with the shakers 29. In order that the gates 81 may positively move with the shakers 29 when closed, stop pins, such as shown at 97, are employed, which are rotary at 99 on the respective shakers and have fingers 101 which extend through aligned openings through the gates 81 and a portion on the respective shakers 29.

Should it be desired to hand draw a given section 5, it is only necessary, after releasing pins 97, to engage the respective pairs of pinions 91 with the respective pairs of racks 83 on the respective shaker 29 and open the respective gate 81. This permits material to move directly through the resulting open bottom of the shaker. This may be done in the old way manually without benefit of any substantial shaking action from the respective shaker.

In order to receive material which is drawn out from the kiln, a track 103 is provided between the supports 1, upon which is a car 105 having four separate compartments 107, each respectively under a section 5 when the car is in proper position below the kiln. Each section or compartment 107 of the car receives material from the respective section of the kiln under which it is located, and thus the different types of material which are available from the different sections, according to the controls exercised, is kept separate from the material in other parts of the car.

Operation is as follows: The shaft 57 is driven from the motor 69 through the chain drive 67, reduction gear box 63 and chain 65. This rotates the eccentrics 55, which through the connecting rods 51 located on opposite sides of the apparatus reciprocates the pair of cross heads 43, the cross heads being connected by the links 47.

Any desired degree of reciprocating motion (or stroke) of any respective shaker 29 may be obtained by adjusting the lost-motion with the cross head which drives that shaker. With no lost-motion, the shaker partakes of motion having a stroke equal to twice the eccentricity of the eccentric 55. If the lost-motion equals twice the eccentricity of the eccentric, then the respective shaker does not move at all, which is a desired limiting possibility of operation.

Under shaking conditions, the gates 81 of the respective shakers 29 are presumed to be shut so that the material falls out over the ends of the gates, as indicated by the arrow at the right in Fig. 3, this material flowing from the openings 11 of the open chutes 9 which extend into the trough-like or channel-shaped or U-shaped shakers 29.

Any time that it is desired to open a gate 81, the respective shaft 93 is pulled sidewise by means of its respective wheel 95, thus engaging the respective pinions 91, as indicated in Fig. 4. Then by turning the respective wheel 95, the respective gate 81 may be adjusted to open position to effect a manual draw. It should be understod that the intended speed of drive shaft 57 is about one R. P. M., so that it is possible to open the pin connections 97 while shaking is proceeding and the desired engagement between the pinions 91 and the racks 83 may be made during motion, as well as the opening adjustment upon the respective gate 81. Thus it may be seen that independent manual draw may be accomplished on one or more of the outlets 5 while one or

more of the remaining outlets are being automatically drawn.

The gates 15 in addition to shutting off air when the kiln is shut down may also be used in a measure to regulate the flow of material, since if a gate is closely slightly there will be less material coming down along the side of the kiln above the closed portion of the gate. More material will then come down along the open side of the kiln. If desired, fixed plates may be inserted in the guides 13 so as predeterminately to regulate downward flow. In such cases, each gate would close against the edge of its fixed plate, thus to obtain a more centralized flow from the outlet under conditions of partial closure.

In view of the above, it will be seen that the several objects of the invention are achieved and other advantageous results attained.

As many changes could be made in the above constructions without departing from the scope of the invention, it is intended that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

I claim:

1. Draw means for kilns and the like comprising an open chute from the kiln, a shaker under the chute, automatic reciprocating means for driving the shaker, an openable bottom in the shaker, and means for manually opening said bottom.

2. Draw means for kilns and the like comprising an open chute from the kiln, a shaker reciprocating under the chute, reciprocating means for driving the shaker, an openable bottom in the shaker, means for manually opening said bottom while the shaker is automatically reciprocated, and an independently operable control gate between the outlet of the kiln and said chute.

3. Draw means for kilns and the like comprising an open chute from the kiln, a shaker reciprocating under the chute, reciprocating means for driving the shaker, a lost-motion connection between said reciprocating means and the shaker, an openable bottom in the shaker, and means for manually opening said bottom while the shaker is automatically reciprocated through said connection.

4. Draw means for kilns and the like comprising an open chute from the kiln, a channel-shaped shaker reciprocating under the chute, reciprocating means for driving the shaker, an adjustable lost-motion connection between said reciprocating means and the shaker, an openable bottom in the shaker, and means for manually opening said bottom while the shaker is automatically reciprocated.

5. Draw means for kilns and the like comprising an open chute from the outlet of the kiln, a shaker reciprocating under the chute, reciprocating means for driving the shaker, an adjustable lost-motion connection between said reciprocating means and the shaker, an openable bottom in the shaker, means for manually opening said bottom while the shaker is automatically reciprocated, and an independently operable control gate between the outlet of the kiln and said chute.

6. Automatic draw means for kilns and the like having a plurality of outlets, comprising open chutes from the outlets, a reciprocating shaker below each chute, a single mechanism for reciprocating all shakers, a lost-motion connection between said mechanism and each respective shaker, manually openable bottoms in the respective shakers, and independently operable manual means for respectively opening said bottoms while said shakers are automatically operated.

7. Automatic draw means for kilns and the like having a plurality of outlets, comprising open chutes from the outlets, a reciprocating shaker below each chute, a single mechanism for reciprocating all shakers, a lost-motion connection between said mechanism and each respective shaker, manually openable bottoms in the respective shakers, independently operable manual means for respectively opening said bottoms while said shakers are automatically operated, and independently manually operable gates between the respective outlets and said chutes.

8. Automatic draw means for lime kilns and the like comprising an open chute extending from the kiln, a shaker adjacent to said chute and having an open end over which material may be shaken from the open chute, lost-motion driving means for the shaker, said lost-motion connection comprising a cross head, a sliding extension from the shaker passing through said cross head, an adjustable abutment on said extension, a sliding bottom in said shaker, a rack attached to said bottom, a manually operable pinion for moving said rack, and manually operable means for connecting and disconnecting said pinion from the rack.

9. Draw means for kilns with multiple outlets, comprising automatic shaker means for the respective outlets, means for independently adjusting the operation of the respective shaker means for different rates of draw, and manual means for independently drawing any given outlet during automatic drawing of one or more of the remainder comprising an opening in each shaker means, a cover for each opening and means for maintaining each cover closed during automatic shaking or to open it for manual drawing therethrough while the other shaker means are operative.

10. Draw means for kilns with multiple outlets, comprising automatic shakers below the respective outlets, openable bottoms in said shakers, means for independently adjusting the operation of the respective shakers for different rates of draw from said outlets respectively, and independently operable manual means for opening said bottoms whereby a respective shaker with open bottom ceases to shake out from the respective opening whereby the kiln parts connected with that opening may be independently drawn through said bottom.

11. Draw means for kilns with multiple outlets, comprising automatic shakers below the respective outlets, openable bottoms in said shakers, and means for opening said bottoms whereby the respective shaker with open bottom ceases to shake out from the respective opening so that the kiln parts connected with that opening may be independently drawn through said bottom.

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