Feb. 23, 1937. W. W. DARTNELL 2,071,456

DOMESTIC SCREENING PLANT AND BIN ARRANGEMENT FOR COAL

Filed Jan. 4, 1934 4 Sheets-Sheet 1

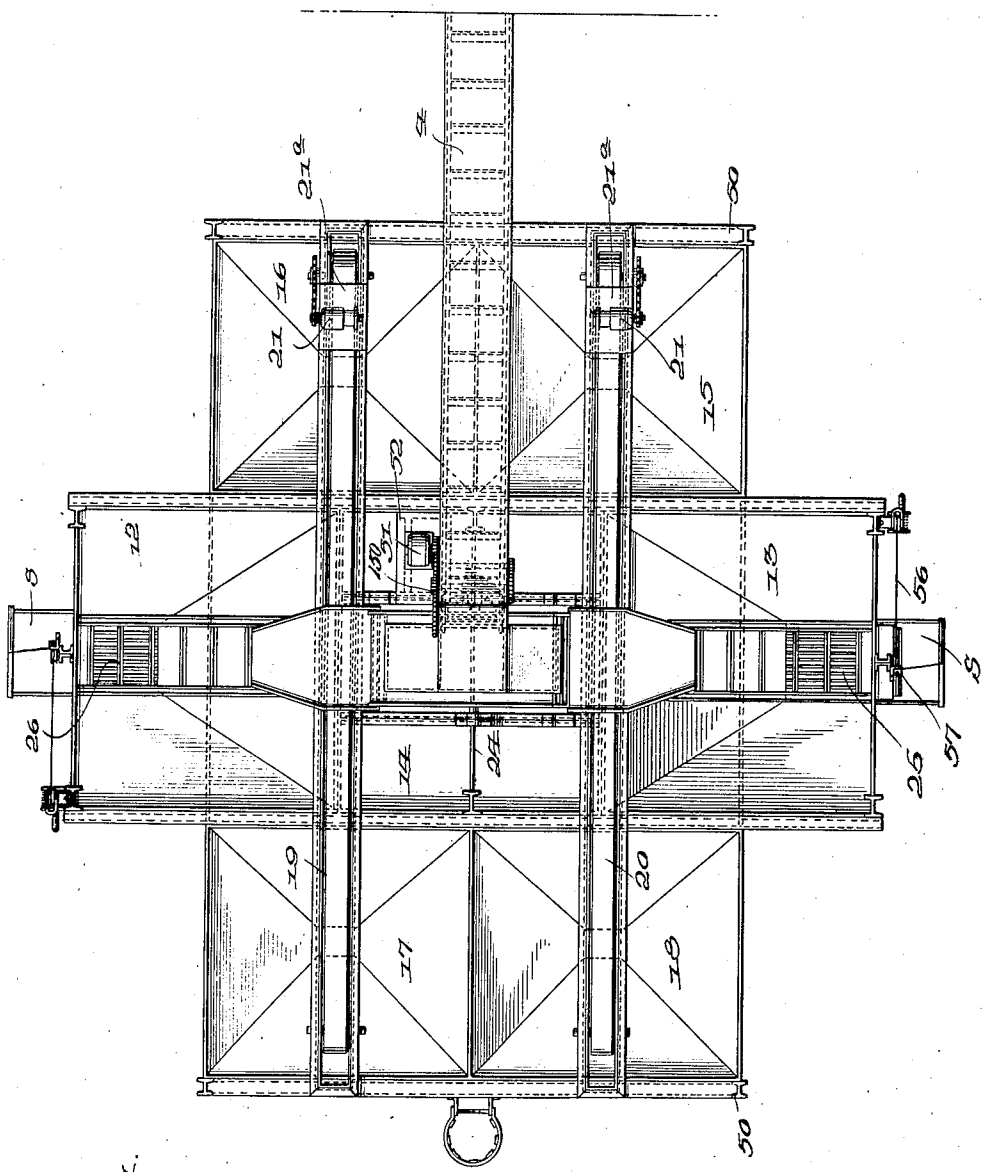


Fig. 1.

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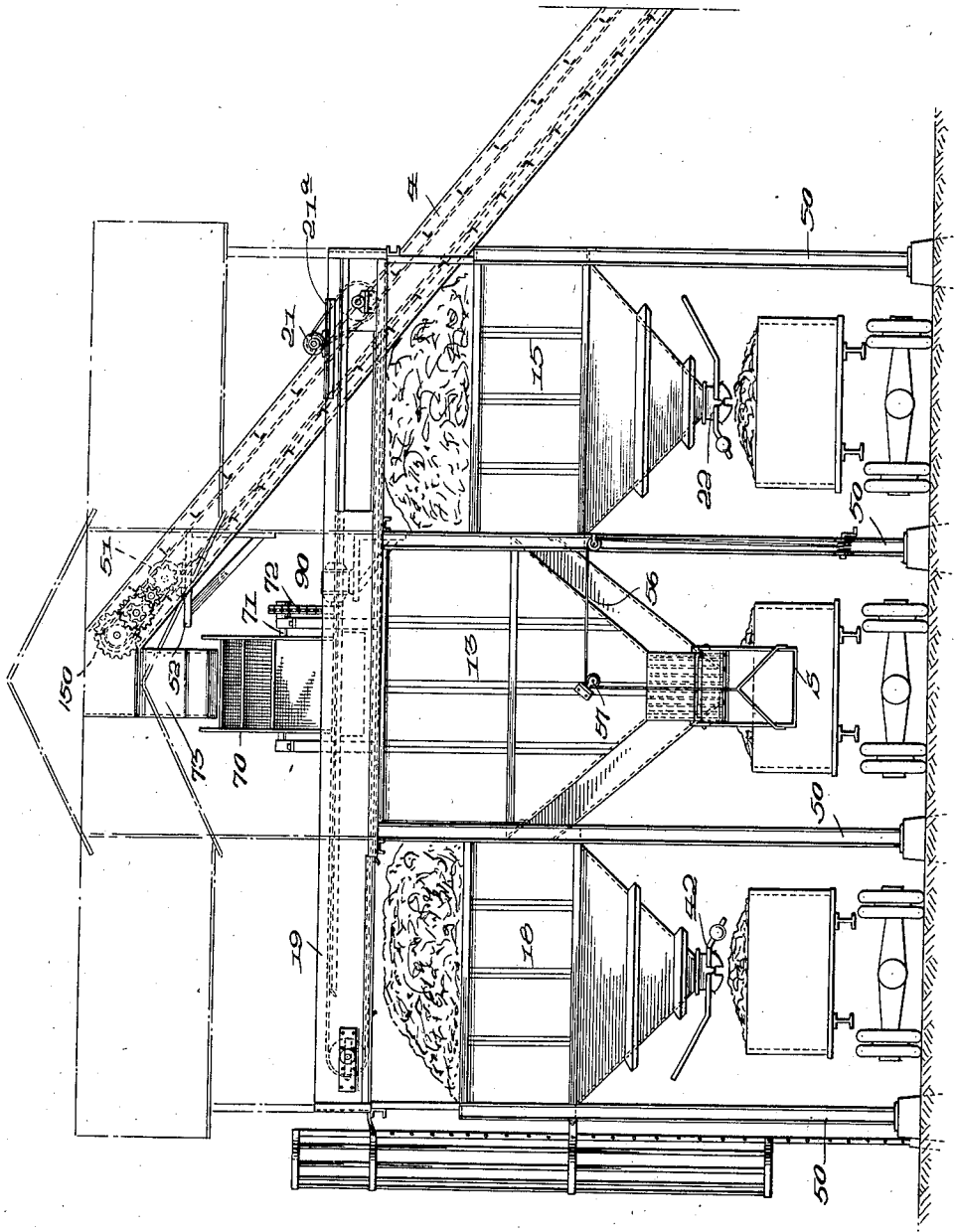


Fig. 2.

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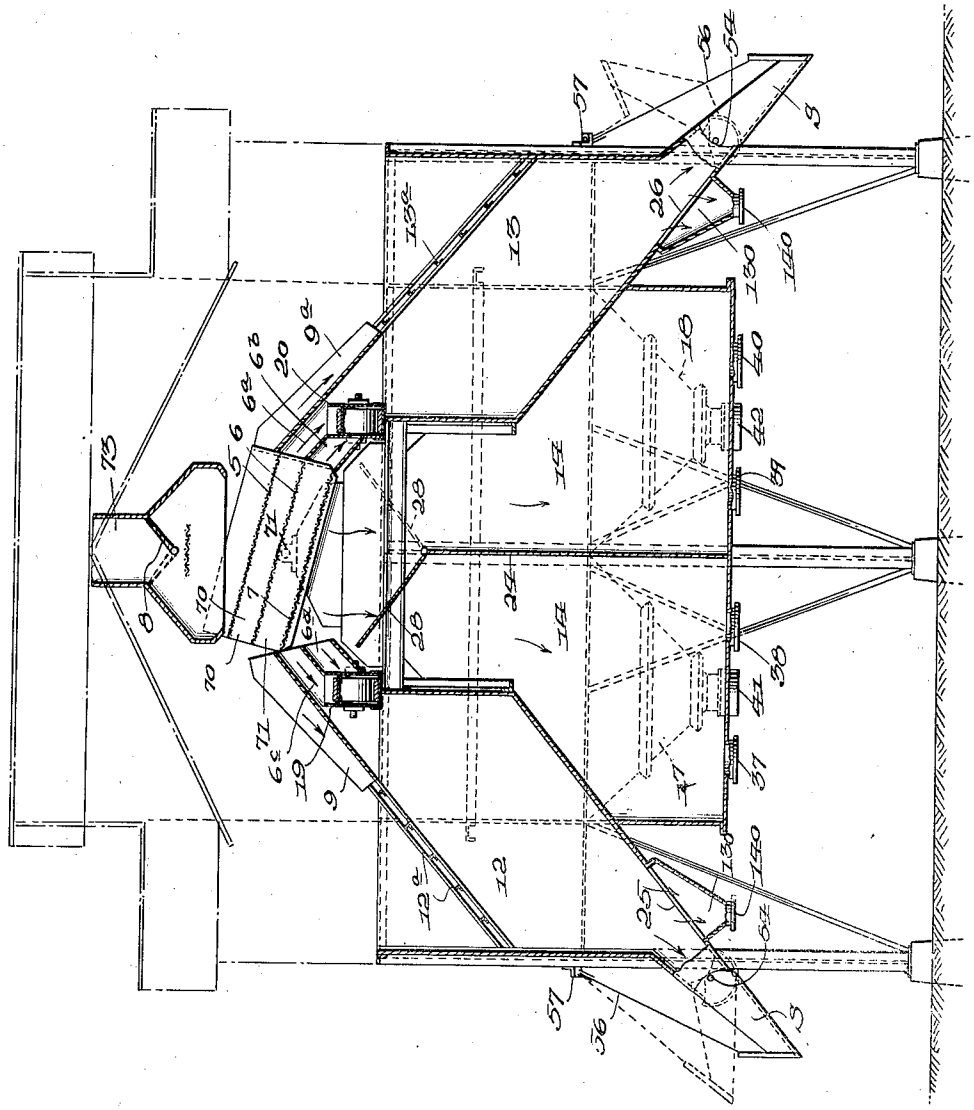


Fig. 5.

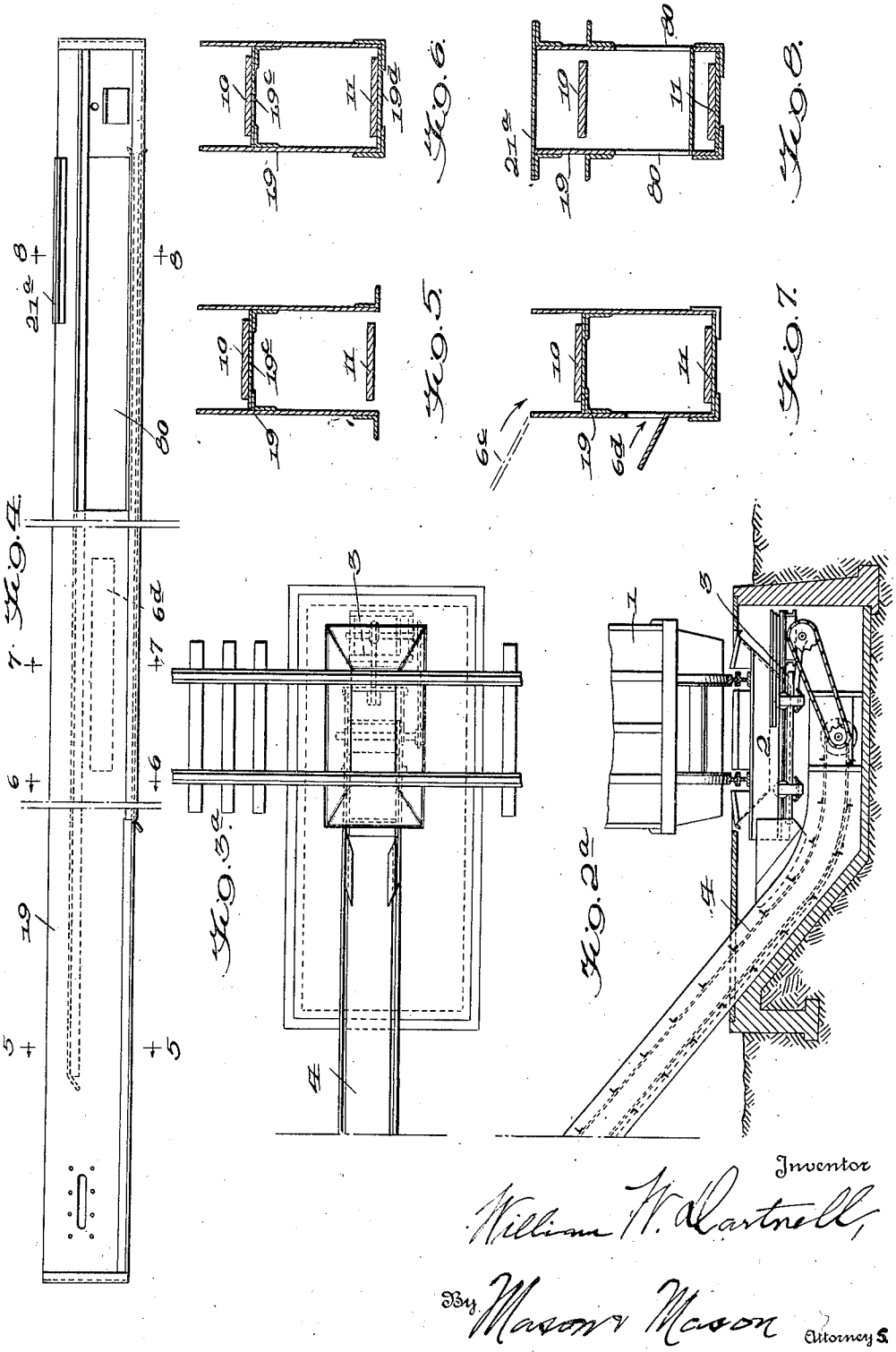
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DOMESTIC SCREENING PLANT AND BIN ARRANGEMENT FOR COAL

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UNITED STATES PATENT OFFICE

2,071,456

DOMESTIC SCREENING PLANT AND BIN ARRANGEMENT FOR COAL

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6 Claims. (Cl. 209—257)

This invention relates to an apparatus for screening coal, separating a plurality of sizes and a plurality of grades of coal, and distributing the same into separate bins for subsequent domestic distribution and use.

An important feature of the invention is comprised in a coal screening and distributing plant of the character referred to, in which a plurality of bins are arranged in compact relation to each other, and to a single screening device which automatically separates the coal into four different sizes and two different grades. Under this feature of the invention a single screen device having thereon a plurality of separate screens of different meshes, is arranged to separate either of two grades into four different sizes of coal, and supply these sizes to separate bins.

Preferably the bins are so placed that four sizes of coal, of either grade, in accordance with the position of inclination of the screen, are discharged separately to their respective bins; as, for example, two bins will be arranged upon one side of the screen to receive, respectively, nut size and pea size, grade A coal, two bins will be arranged on the opposite side of the screen to receive, respectively, nut and pea size, grade B coal, while other bins will be arranged between the two pairs aforesaid for receiving a large size of coal known as "lump" coal, and slack coal, respectively. By such arrangement the bins are nested in close juxtaposition, and may be supplied with the appropriate size and grade of coal for each bin by conveyors travelling in opposite directions, the coal of two sizes of each grade, as nut and pea coal, being carried by the upper and lower runs of each belt of a conveyor.

Another important feature of the invention is comprised in a screen of the vibrator class, which may be shifted from one side to the other of a central point, for discharging the different sizes of coal, of each grade, on either side of a vertical plane in which the screen is pivoted.

Other features of the invention, including important combinations of elements and details of construction, will be better understood by reference to the following description, in connection with the accompanying drawings, in which:—

Fig. 1 is a plan view of an arrangement of bins and coal distributing devices embodying the invention;

Fig. 2 is an end elevation thereof;

Fig. 2a is a detail view, illustrating a coal loading car, together with the lower portion of the conveyor;

Fig. 3 is a vertical sectional view centrally through the apparatus, shown in Fig. 1;

Fig. 3a is a plan view of Fig. 2a with the car removed therefrom;

Fig. 4 is an enlarged view in side elevation, partly broken away, showing the housing for either one of the coal distributing belt or scraper conveyors;

Fig. 5 is a sectional view on the line 5—5, Fig. 4;

Fig. 6 is a sectional view on the line 6—6, Fig. 4;

Fig. 7 is a sectional view on the line 7—7, Fig. 4; and

Fig. 8 is a sectional view on the line 8—8, Fig. 4.

The sections on which Figs. 5, 6, 7 and 8 are taken are to be viewed in the direction of the arrows which are applied to these section lines, on Fig. 4.

The invention contemplates the use of an apparatus for efficiently screening coal and dividing each of two grades of coal into four different sizes which are separately conducted to suitable bins. The screening devices are so arranged that coal can be screened into four of the most popular sizes for domestic use, namely, lump, pea, nut and slack.

A suitable framing, comprising the upright members 50 which may be secured together by suitable cross I-beams, or by any desirable framing structure, support various parts of the apparatus. The layout includes bins 15 and 16 for nut coal, centrally located bin 14 for slack coal, and bins 12 and 13 for lump coal, and bins 17 and 18 for pea coal, located on the opposite side of the bins 12, 13 and 14.

The coal may be considered as being divided into four sizes, namely, lump coal, nut coal, pea coal, and slack coal. The size of the coal can be varied according to the size of screen cloth used in each deck. The run-of-mine or raw coal as it is shipped in the railroad car 1, may have been re-screened at the mine, or merely shipped as located by the coal loader. This coal is dumped into a small hopper 2 which is located below the track and from there is fed at a steady rate of flow by a small reciprocating, or any suitable type of feeder, 3, to a conveyor 4. This conveyor may be of the belt, pan, or any well known type, and is driven from a suitable motor 51 through gearing 150, the motor being located on a platform 52 supported from the framework. The coal is carried upward by the conveyor 4 to a point above the bins and above the screen 70, and is discharged through a suitable hopper 73 above the screen. The coal is diverted, either to the right or the left, in accordance with the position of a

damper-like valve 8, pivotally mounted and movable into either the position shown in full lines, or that shown in dotted lines.

The screen 70 is shown as pivotally mounted at 71 upon a suitable support from the frame of the apparatus. As is common with such screens, the same is vibrated through suitable means (not specifically herein shown), by power derived from a motor 90, which is or may be applied to a suitable eccentric, or other vibrating device on the shaft 71. The latter is driven from the motor 90 through a V belt drive 72 and pulleys.

The screen 70 comprises three decks of screen cloth, the largest, which may be, say, four inch mesh, 5, is located nearest the top, the next screen, 6, therebelow may have a two inch mesh, and the lower screen, 7, may have a still finer, as a one-half inch mesh, for example. The coal is discharged from the hopper 73 upon the screen, and is separated into its several sizes by the progressively diminishing meshes of the screen, from the uppermost screen to the lowermost one. As the coal drops on the screening surface the largest size, or lump coal, will be retained upon the screen 5, and will flow down either the chute 9 or 9a into lump bin 12 or 13 for grade A or B coal. The lump coal is retarded in its downward movement by the bars 12a, or 13a, but eventually settles into the lump bin 12 or 13. The coal of the next size is retained on the screen 6, and passes thence along a short chute 6a to the upper run 10 of the chain of conveyor 19 or 20. These conveyors are driven by the electric motors 21 whose shafts are connected by suitable drive chains with sprockets on the shafts of the drive pulleys of the two conveyors.

The pea coal passes through the screen 6, and is carried by a short conveyor 6b to the lower run 11 of the chain of one of the conveyors, which run 11 travels in an opposite direction from the run 10 thereof, carrying the nut size coal. The two belt or scraper conveyors for distributing the nut and pea sizes of coal are enclosed, respectively, in casings 19, 20, and are located as shown in Fig. 3, upon opposite sides of the screen 70. If the screen is tilted to the position shown in Fig. 1, it will be understood that while in such position grade B coal, for example, is being deposited on the screen by the conveyor 4. If the screen 70 is tilted in the opposite direction, grade A coal is being deposited on the screens. It will be seen that the different grades of coal, as they are separated by the screen cloths of successively smaller mesh, 5, 6 and 7, will be conducted to the chutes 9a, 6a, 6b, and to the bin 14, and upper and lower runs 10, 11, of the conveyor belt or chain on the right hand side of the apparatus, as seen in Fig. 3, nut and pea coal being delivered to the bins 15 and 18.

As shown in Figs. 4 to 8, inclusive, of the drawings, each of the casings 19, 20, for the conveyor belts or chains which distribute the nut size and pea size of the two grades of coal to their respective bins, is provided opposite the appropriate bin, with a lateral or bottom opening which permits the run of the belt or chain carrying the coal at that point to discharge the coal from the casing 19 (or 20), into the proper bin. For example, as shown in Fig. 5, the lower run of belt or chain 11 in the casing has reached a point where the bottom wall of said casing is removed, and the lower run 11 of the belt or chain being then unsupported, the coal thereon will drop through the chain and scraper bars or be plowed from the belt and discharge automatically into the bin 17 for pea size coal. The upper portion of the belt or chain 10 is at this part of the casing supported upon a portion 19c of the raceway. In Fig. 6 both runs of the belt or chain 10, 11, are supported upon solid portions 19c, 19d, of the casing, and no coal is discharged. This portion of the conveyor is located over the lump coal bin 12, into which it is not desired to discharge pea or nut size coal, as will be obvious.

As shown in Fig. 7, the upper run of the belt or chain is supported and no coal is being discharged therefrom, which is also true of the lower run 11, but at this point the lower run of the conveyor is receiving pea size coal through a lateral opening in the casing from a short chute or passage 6d, and the upper portion of the casing above the run 10 of the belt or chain is open, and communicates with a short chute 8c for receiving nut size coal.

The numeral 21 is applied to two like motors, which are mounted upon platforms 21a on top of the casings 19, 20. These motors are suitably connected by worm reducers, sprockets and chains to operate shafts carrying sprockets for driving the belt or scraper conveyors in the casings 19, 20.

Fig. 8 shows a section through that part of the conveyor casing where the lower run of the belt or chain 11 is supported and enclosed to prevent coal being deposited thereon or discharged therefrom, while the upper run 10, is unsupported and free to permit downward and lateral discharge of the coal through side openings 80, which is that position of the parts over the bin 16 for receiving nut size coal. While the upper run of the belt or chain accordingly is passing this particular point in the casing 19, nut coal will be discharged into the bin 16.

By the construction described, it will be seen that each of the conveyor belts or chains for distributing the nut and pea sizes of coal functions to discharge these sizes in the bins intended therefor. It will also be seen that upon tilting the screen 70 into one position, as for example that shown in Fig. 3, the several sizes of coal referred to, namely, lump, nut, pea and slack, will all be separated, and discharged into their respective bins located in position for receiving the different sizes of grade B coal, while, if the screen is tilted in the opposite direction from that shown in Fig. 3, the several sizes of coal referred to of A grade, will be separated, and discharged into the bins intended for the reception thereof, but located upon opposite side of a plane which passes centrally through the bin layout or assembly.

It will be understood that the casing 19 and enclosed belt or chain for conveying coal to the nut size coal bin 15 and pea size coal to the pea size coal bin 18, are the same structurally as the casing 20, and enclosed belt or chain upon the opposite side of the assembly for distributing these sizes of coal though of different grade, to their appropriate bins.

The lower end portions of the bins 12, 13 for lump coal, as shown in Fig. 3 of the drawings, are provided with discharge chutes S, which are pivoted to the lower portions of the bins at 54. These chutes may be raised or lowered, by suitable cords, 56, passing over pulleys 57, and may thereby be raised into the dotted line positions

to permit a relatively high truck to be driven beneath the discharge end of the bin 12, or 13, to receive the coal therefrom. In the event that the truck is lower than the average, either of the chutes S may be lowered to the positions in which they are shown in full lines, so that the lower end thereof will be suitably positioned to discharge the coal into a lower truck.

In each lump bin 12, 13, there is a small bar screen, 25, 26, which catches any fine coal that collects in the bin. In handling the lump coal, the small coal resulting from breaking settles through the lumps and accumulates on the bottom, as long as the lumps are flowing over the top of the pile, and there will be no slack loaded out of the coal. Lump coal flowing over lump coal is about the same as flowing over a screen, for the voids between the lumps collect a small or fine coal. The last loading of the lump from the bin contains the fine coal, and as it passes over the screen bars 25, 26, the fine slack passes through the bars and the lump passes over and out through the gate. Built into the bottom of the lump coal bin under the screen bars 25, 26, is a small hopper 130 which collects the slack from the re-screened lump coal. As this hopper fills up, it is emptied into a truck by opening a gate 140, and can be dumped into railroad hopper 2 and be re-screened to get the larger sizes out of it.

The slack coal bin 14 has at its lower end valves 37, 38, 39 and 40 for discharging the coal therefrom, and, as shown (by dotted lines), in Fig. 3, the bins 17, 18, for receiving the pea size coal, are provided, respectively, with valves 41, 42, which may be of "clam shell" or any desired type. Similar valves, as 22 (one of which appears in Fig. 2), may be provided at the outlets of the bins 15 and 16 for containing the nut size coal.

It will be noticed that the bins are nested about a central point, instead of being arranged in a straight line, as under the customary practice. It will also be noted that the bins are staggered or offset so that the full loading of the bins can be taken advantage of in that the coal is carried by the belts to the central part of each bin, before being deposited. By taking advantage of the carrying ability of both strands of the conveyor belt, two sizes of coal may be distributed continuously in opposite bins with one conveyor.

The slack bin 14 is divided longitudinally by a partition 24 to the upper portion of which is pivoted a slack coal fly gate 28. This gate may be swung either into the position shown in full lines, or the position shown in dotted lines, in order to direct the slack coal to either side of the partition 24, thus separating the slack coal into two grades, as is done with the other sizes of coal. This is an added advantage to the general construction and arrangement of bins comprised in this plant, and will make eight divisions of the coal possible; that is, four sizes for each of two grades when screened, namely, lump, nut, pea and slack.

Changes may be made in the arrangement of the several elements herein described without departing from the spirit of the invention, provided such changes are within the scope of the following claims. For example, for the vibrator screen 70 while shown mounted upon a central pivot for tilting to discharge the different sizes of coal to one set of bins for grade A, and for tilting in the opposite direction for discharging the different sizes of coal into a different set of bins for grade B, we may substitute a different form of screen, or mount the same in some manner different from that herein shown, provided such variation in the screen will accomplish, by equivalent means, the same results as in the case illustrated. It will also be apparent that while the combination and arrangement of devices herein described are primarily for use in connection with separating, distributing and handling coal, certain features of the invention, and in fact, the entire apparatus may be used for performing similar functions in connection with other granular material than coal where the purposes are to separate the material into a plurality of sizes and distribute the several sizes, of two grades, to different points of delivery for subsequent use.

Having thus described my invention, what I claim and desire to secure by Letters Patent is:—

1. In an apparatus for sorting and storing granular material having in combination, a centrally pivoted separating device provided with a plurality of screens of different mesh arranged at different levels and spaced apart, said device being capable of tilting to discharge material to the right or to the left of a central plane, storage bins upon one side of said plane for receiving separately the sorted materials of one grade, storage bins located upon the other side of said plane for receiving the same sizes of separated material sorted by said screen of a different grade, and endless conveyors extended upon opposite sides of said plane and constructed and arranged to receive the different sizes of material separately upon the upper and lower runs thereof, and to deposit them in the proper bins therefor.

2. In an apparatus of the class described, the combination of a pivoted separating device having a plurality of spaced screens of different sized meshes and located in position to discharge granular material of different sizes on either side of a vertical plane in which said device is pivoted, a plurality of bins upon one side of said plane for receiving granular material of the same size but of different grades, a plurality of bins upon the opposite side of said plane for receiving granular material of a different size from that of the granular material first referred to and of a different grade therefrom, an endless conveyor for receiving from said separating device two sizes of one grade of the granular material for distribution into the two bins for said grade of material, said bins located upon one side of said plane, and a second conveyor located upon the opposite side of said central plane and arranged to receive the granular material of the two sizes of another grade and to distribute them to their appropriate bins upon the opposite side of said plane, a central bin located below said separating device for receiving still a different size of granular material, and two other bins located upon opposite sides of said central bin for receiving still a different size of the granular material, of the two grades, respectively referred to, and means for causing the granular material of the two sizes last referred to to flow into the bins which are located below said distributing device.

3. In a device for separating and storing coal of different sizes, the combination of a movable separator including a plurality of spaced screens for separating the coal into four sizes, namely, lump, nut, pea and slack, said separator being pivoted to discharge the several sizes of coal either to the right or to the left of a central plane according to the grade of coal desired, a bin for receiving slack coal located below said device, bins for receiving lump coal of two grades lo-

cated, respectively, upon opposite sides of said slack coal bin, a pair of bins for receiving nut size coal located upon one side of and adjacent to said slack and lump coal bins, another pair of bins for receiving pea size coal located adjacent to and on the opposite side of said lump and slack coal bins, an endless conveyor extending upon each side of said separator, means for conveying nut size coal to one run of each belt or chain, means for conveying pea size coal to the other run of each belt or chain, casings for said belts or chains, and openings in said casings so arranged as to permit each run of each belt or chain to discharge the nut coal or pea coal of each grade in its appropriate bin, the runs of each of the two belts or chains being adapted to receive coal for its appropriate bin and discharge the same into the bin for nut size coal or pea size coal on both sides of said central plane.

4. In an apparatus of the class described, the combination of a device for separating coal into two sizes upon either side of a central plane passing through said device, bins arranged in pairs upon opposite sides of said plane, each pair to receive coal of a given size, but of a different grade, endless conveyers for receiving, respectively, upon their upper and lower runs the two sizes of coal upon either side of said plane from said separating device, means for discharging said coal into its appropriate bins by each conveyor, a bin located between the two pairs of bins first referred to and arranged to receive slack coal from said device, a partition in the last named bin, and a slack fly gate on said partition and movable for directing the slack coal on either side of said partition in accordance with the desired grade.

5. An apparatus of the class described having, in combination, a coal separating device comprising a plurality of spaced screens of different meshes, said device being pivotally mounted to direct a plurality of different sizes of coal to the right or left of a central plane, a pair of bins upon one side of said plane for receiving coal of a given size of one grade, a pair of bins upon the opposite side of said plane for receiving coal of a different size of another grade, two bins located centrally below said separating device, means for conducting a different size of coal to either of said bins in accordance with the desired grade, a bin located intermediate the last named bins and provided with a central partition, and a movable gate or valve pivoted to said partition and arranged to direct slack coal upon either side of said partition in accordance with the grade of coal desired.

6. In an apparatus of the class described, the combination of means for separating coal into two sizes, two pairs of bins located respectively, upon opposite sides of said means, an endless conveyor adjacent each pair of bins, each having means for discharging material from the upper run into one bin and from the lower run into another bin, means for delivering one size of coal upon the upper run and another size to the lower run of each conveyor, said means comprising a single member supporting said separating means and movable alternately to discharge the coal upon one conveyor or the other.

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