

W. E. HAMILTON.
 SYSTEM OF HANDLING COAL.
 APPLICATION FILED NOV. 27, 1911.

1,050,272.

Patented Jan. 14, 1913.

4 SHEETS—SHEET 1.

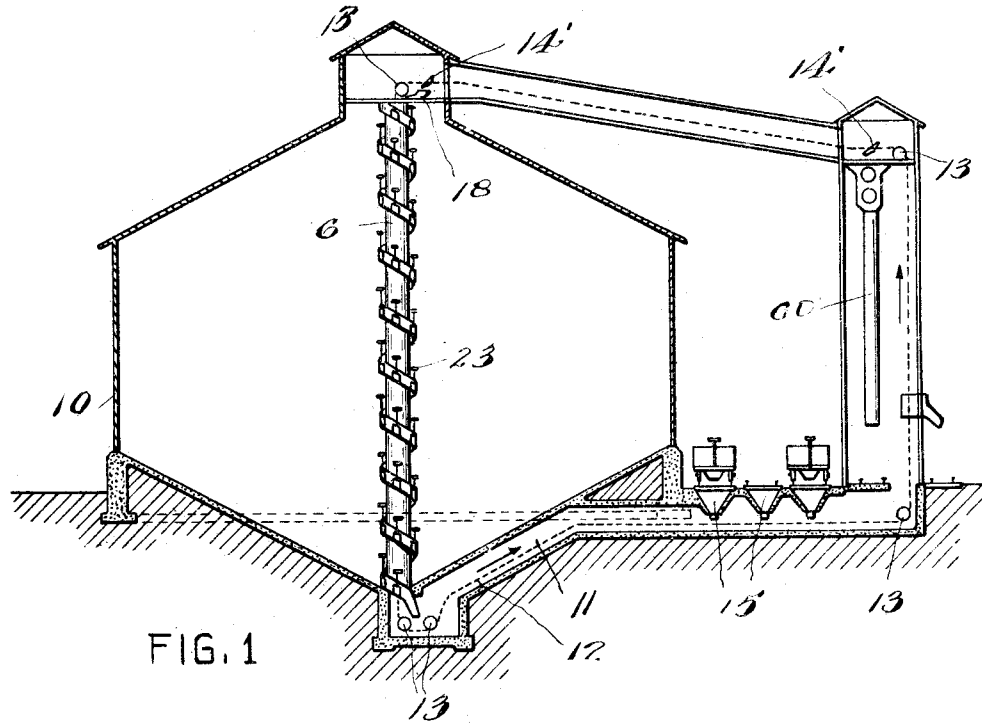


FIG. 1

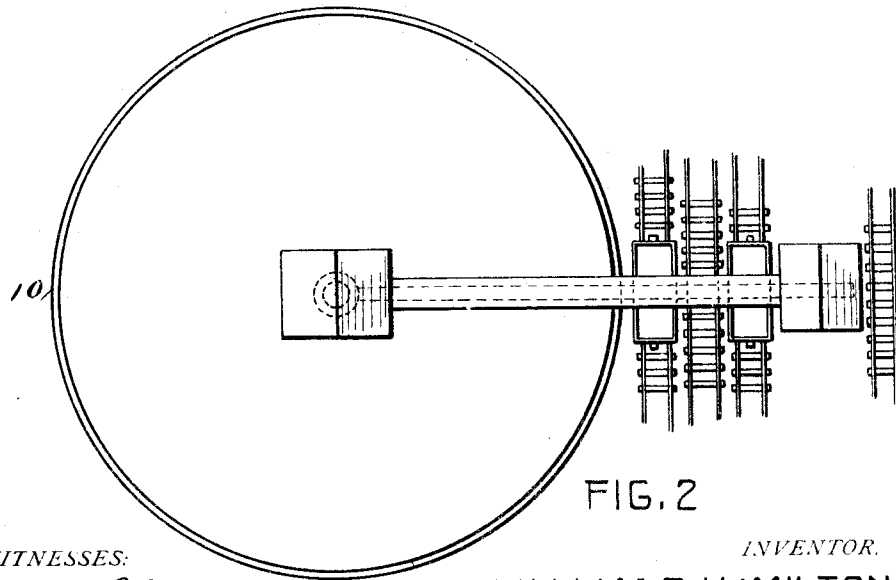


FIG. 2

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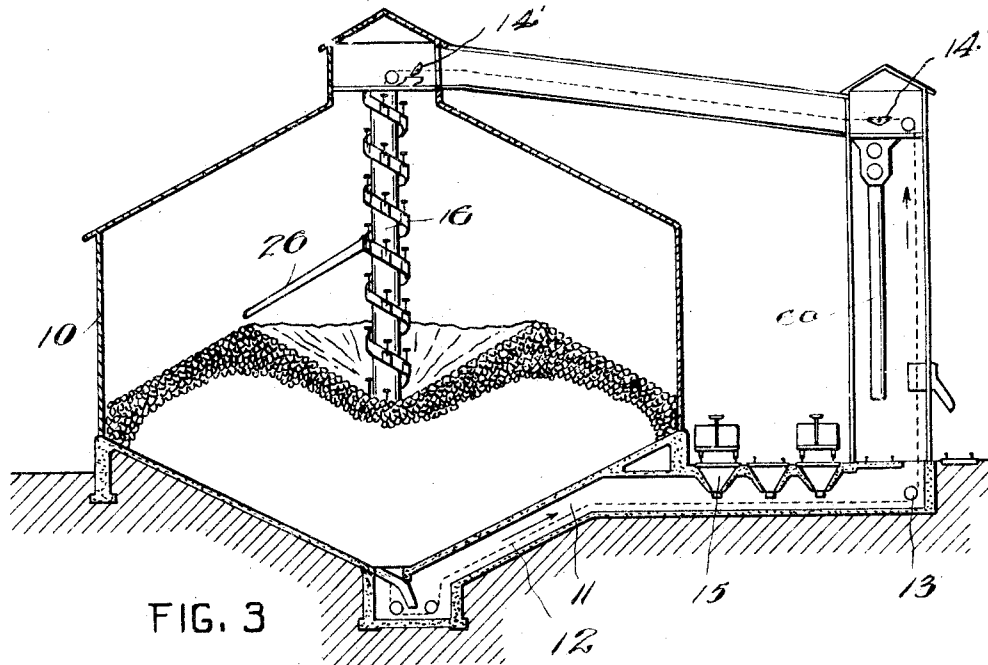


FIG. 3

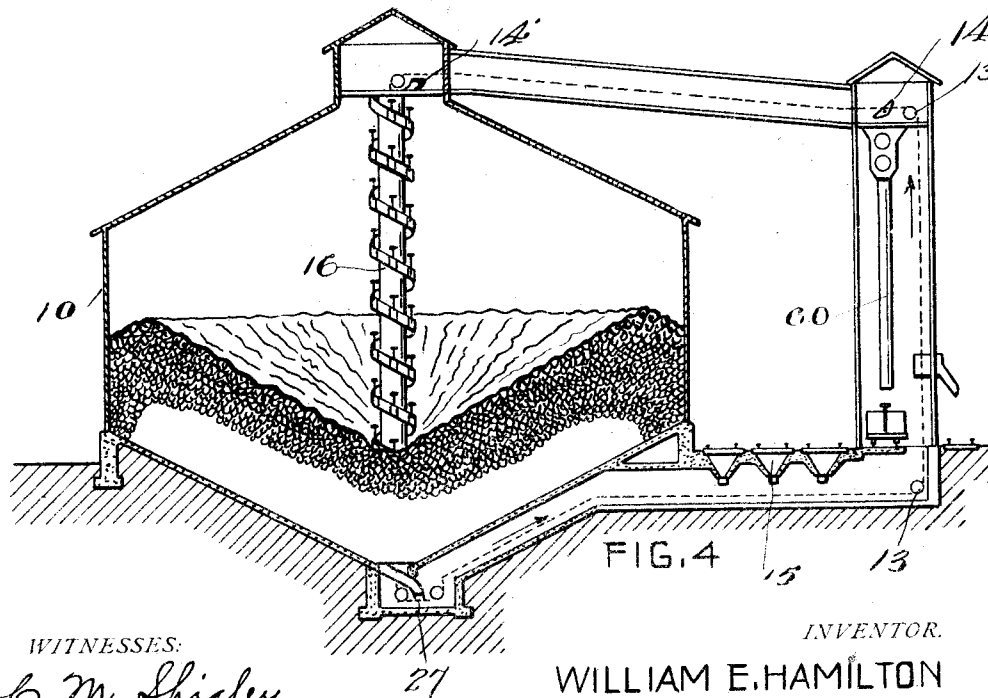


FIG. 4

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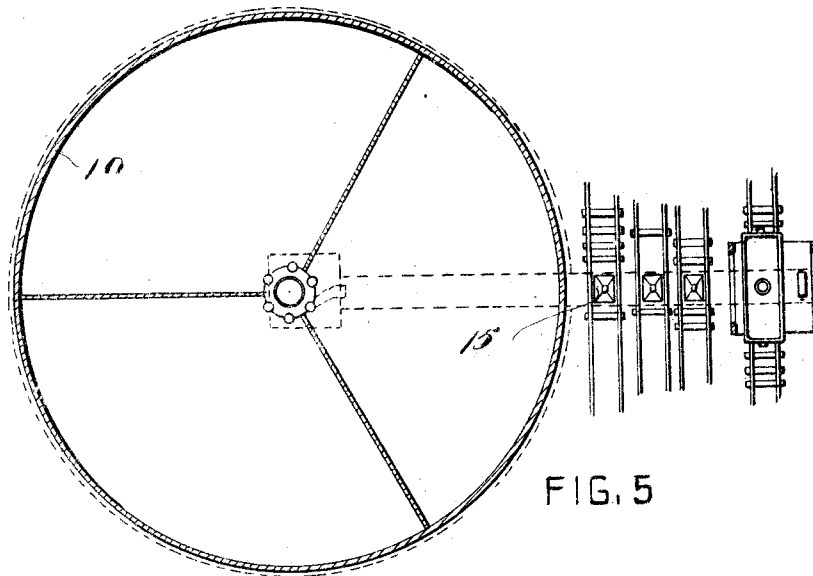


FIG. 5

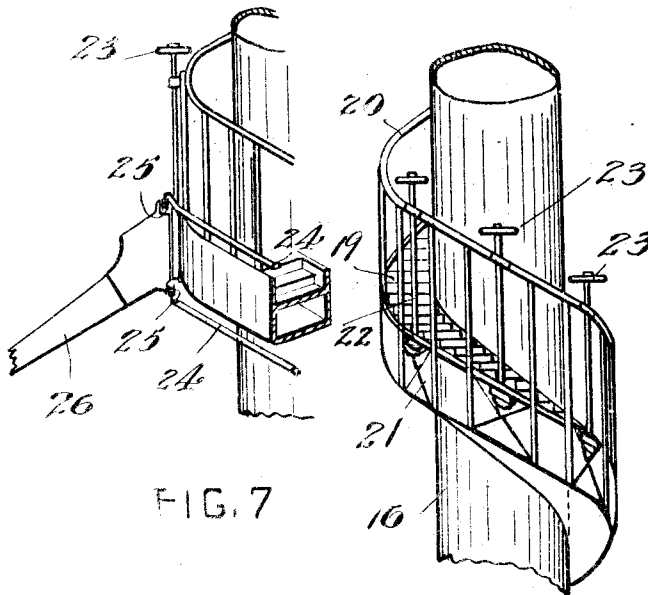


FIG. 7

FIG. 6

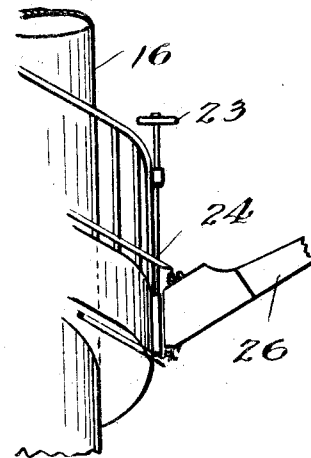


FIG. 8

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4 SHEETS—SHEET 4.

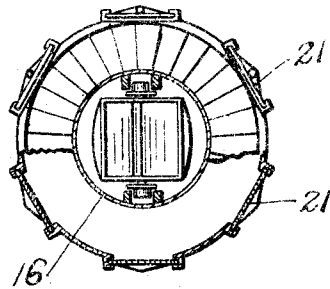


FIG. 9

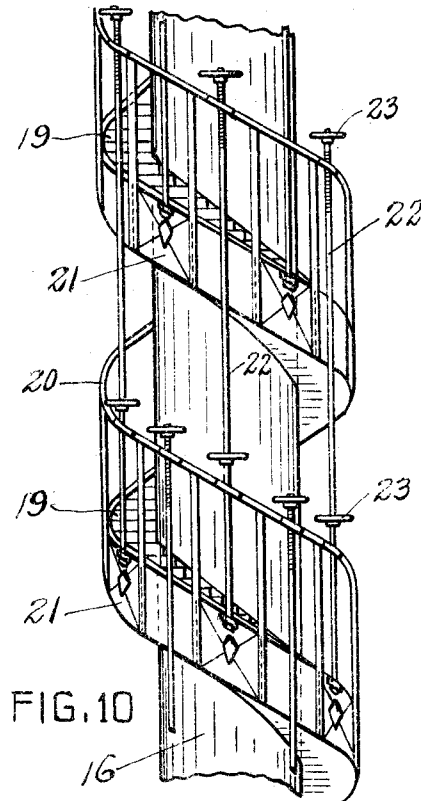


FIG. 10

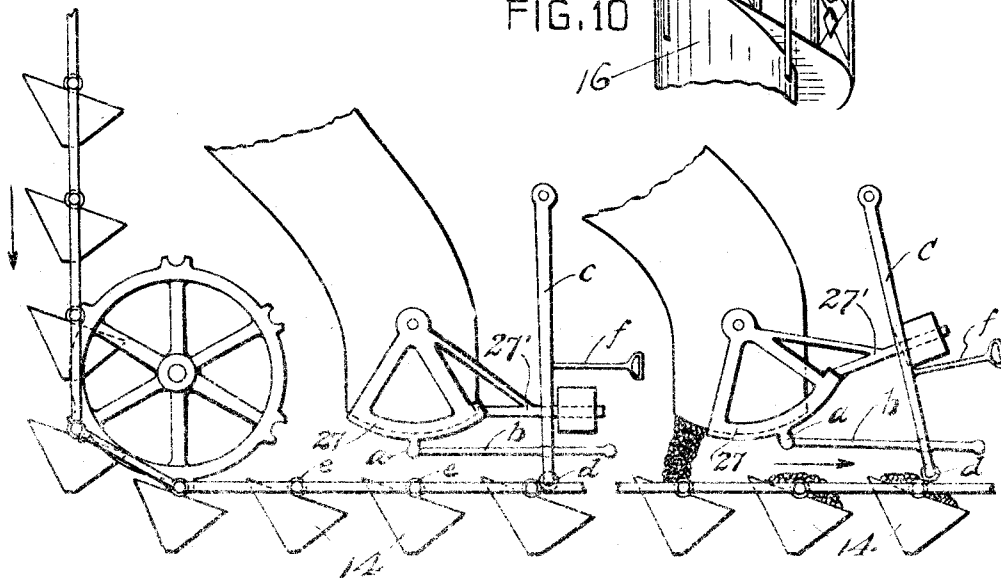


FIG. 11

FIG. 12

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UNITED STATES PATENT OFFICE.

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SYSTEM OF HANDLING COAL.

1,050,272.

Specification of Letters Patent.

Patented Jan. 14, 1913.

Application filed November 27, 1911. Serial No. 662,639.

To all whom it may concern:

Be it known that I, WILLIAM E. HAMILTON, a citizen of the United States, residing at 21 East Eleventh avenue, Columbus, Ohio, have invented certain new and useful Improvements in Systems for Handling Coal, of which the following is a specification.

This invention relates to an improved system for the loading and unloading of loose material in bulk; it is particularly useful in the handling for storage purpose and for delivery into cars or carts, of coal and like material.

The object of the invention is to facilitate the handling of coal, sand, grain and other loose material in bulk for storage purposes and also to simplify and cheapen the removal of charges of stored coal for delivery purposes, either to cars or to other vehicles placed alongside of the bin in which the coal is stored.

With the above and other objects in view, the invention consists of the parts and the combination of parts constituting the improved system of loading and unloading, which I will hereinafter describe and claim.

In the accompanying drawings, forming part of this specification and in which like reference characters indicate corresponding parts in the several views, Figure 1 is a cross sectional view through a storage bin showing a conveying system and showing in elevation a vertical column or tower with its spirally arranged chute. Fig. 2 is a plan view of Fig. 1. Fig. 3 is a vertical sectional view corresponding to Fig. 1 showing material delivered from cars to the bin. Fig. 4 is a sectional view similar to Fig. 3, but showing material reclaimed or being delivered from the bin to cars. Fig. 5 is a horizontal sectional view showing a bin of compartment form. Fig. 6 is an enlarged detail in perspective showing a portion of the central column or tower and its encircling combined stairway and chute, and showing, also, certain of the gates controlling the openings which communicate with the chute. Fig. 7 is a detail showing a discharging spout connecting with the chute and adapted to deliver into the bin at a point distant from the chute. Fig. 8 is a similar view showing the spout reversed and adapted to direct material from the bin into the chute for reclaiming purposes. Fig. 9

is an enlarged horizontal section of the central tower or column showing a portion of the spiral chute broken away and the conveyer in the column. Fig. 10 is a side elevation of a part of the column and spiral chute showing a manner of actuating the gates one or more turns on the stairway above the gate to be operated. Fig. 11 is an enlarged detail showing a part of the conveyer and the lower end of the spiral chute, and an automatic gate and mechanism for operating the same, the gate being shown in its closed position. Fig. 12 is a similar view showing the gate open.

It is well recognized in the art of handling material in bulk, such as coal, that in the storing of this material frequent handling causes a large percentage of breakage and accordingly it is one purpose of the present invention to provide a system of storing coal or other material wherein there shall be the fewest possible transfers of the material from one handling device to another, thereby reducing the percentage of breakage of the material to a minimum.

In the system shown in the accompanying drawings as one embodiment of my invention, a bin, 10, of suitable material is constructed at an appropriate point. This bin is designed for large capacity in that it may hold fifty thousand tons, more or less, of the material to be loaded and unloaded. The bin may be constructed of any suitable material and in any well known manner, and may rest upon a foundation of concrete which may constitute the bottom of the bin and which may have downwardly inclined walls leading to the vertical center of said bin. This inclined bottom forms a conical pit with a floor whose inclination is about the same as the angle of repose for the material stored.

The bin and its adjuncts may be constructed after any of the approved methods commonly employed for like purposes, and there is built under at least a portion of the bin, a tunnel, 11, through which the conveyer for handling the material, is caused to pass, this conveyer, 12, passing around suitable direction pulleys, 13, and being equipped with pivoted or other buckets, 14, or like elements of any character appropriate for the handling of the said material.

In the plant or system illustrated in Figs. 1 to 4 inclusive, the coal, which I will hereinafter refer to as the material handled, is de-

signed to be "spotted" or appropriately positioned over suitable hoppers, 15, built in the roadway to receive the material as it is dumped through the bottom of the cars, these hoppers communicating at their lower ends with the tunnel leading from below the bin and through which tunnel the conveyer, 12, is designed to travel continuously in one direction. The coal delivered from the cars is received into the buckets, 14, as they pass under the hoppers and which buckets are only illustrative of any form of device useful for conveying purposes. The conveyer shown is of the endless type and it passes over a direction pulley, 13, located at the top of a vertical column or tower, 16, said conveyer and its buckets passing vertically through this column, which is hollow for the purpose, and emerging from the bottom thereof into a pit, which connects with the tunnel, 11, through which the buckets or like elements are caused to return beneath the feeding hoppers, 15.

A leading feature of my invention is the employment of the hollow column or tower, which is constructed of any suitable and desired material, and which has an unobstructed interior for the passage of the conveyer and its flights or buckets which travel empty through the column. The column or tower extends throughout the height of the bin and in the case of covered storage, as shown, the column serves the useful function of a main support for the roof and also for a spiral stairway and chute which I will presently describe.

In the drawings illustrating one embodiment of my invention I have shown a covered storage plant, but it will be understood that this is not essential in the working of the other and leading features of the invention and hence the invention is not limited to any particular size or design of storage bin, receptacle, area or space.

As shown in Figs. 1 to 4 inclusive, the central column or tower is encircled by a combined stairway and chute which extends spirally from one end of the column or tower to the other. This combined stairway and chute is composed of metal or other suitable material and at its upper end it is provided with a receiving hopper, 18, disposed in the range of action of the conveyer and into which the buckets or like conveying members thereof are designed to automatically discharge their load and thence proceed empty vertically through the column and into the tunnel and beneath the hoppers, 15, to be reloaded. Any suitable mechanism as for tripping the buckets so that they will discharge into the hoppers, 18, of the spiral chute may be employed and as this constitutes no essential part of the present invention, a specific form of tripper is not disclosed, but it will be understood that any

appropriate means may be employed for tripping the buckets so that as they successively arrive over the hopper, 18, they will discharge their load into said hopper. The hopper, 18, communicates directly with the upper end of the spiral chute which underlies a spirally arranged stairway, 19, which has a suitable hand rail, 20, for the convenience and safety of the operators, who travel over the stairway in order to reach and operate certain controlling gates. The spiral chute is preferably square in cross section, but it may have other form; it is smooth and continuous throughout and through said chute the coal slides with a free and easy action, the inclination of the chute being such as will enable the coal to slide gently from its point of inlet to the point of discharge, which may be the pit below the column which pit is traversed by the conveyer, as shown in Figs. 1, 3 and 4. At suitable points along the spiral chute there are made in the side walls thereof openings which are controlled by suitable gates, 21, preferably of a vertically-slidable type, these gates being connected to stems or rods, 22, which are journaled on the chute and the hand-rail thereof and which have their upper portions supplied with hand-wheels, 23, or like parts by which the stems may be turned to cause the gates to move vertically to open or close their respective openings.

The hand-wheels are manipulated by an operator stationed on the stairway which latter affords easy access to the several gates throughout the entire length of the spiral chute, whereby the gates may be successively opened and closed in either ascending or descending order in the loading and unloading of the storage bin. I also provide the combined chute and stairway with spirally arranged rails or tracks, 24, between which suitable wheels or rollers, 25, are designed to travel, this wheeled structure being in fact a part of the inner end of a suitable tiltable spout, 26, which is designed to be brought into register with the various openings in the side of the chute so that when any opening is exposed by the raising of its controlling gate, the material is discharged through said opening and into the spout, as I will hereinafter explain in the operation of the system. I also propose to use at the lower end of the spiral chute where it enters the pit leading to the tunnel, some well known and appropriate form of automatic discharge gate, 27, which will be operated automatically by the conveyer, or may be operated by hand if desired. The discharge gate, 27, may be kept closed by reason of its counterweighted arm, 27', or by any other well known means and when closed the gate shuts off the escape of material from the bottom of the chute, consequently the material will accumulate in the chute to a point

about the level of the pile of stored material, and the material thus accumulated in the chute will serve to deflect the incoming material through the proper openings into the bin. When the gate, 27, is opened, the material in the lower part of the chute passes out and into the conveyer therebelow, and the material at the top of the pile will drift inwardly through the proper open gates, which operation occurs when the material is being reclaimed or removed from storage.

The specific character of the discharge gate is immaterial provided it will successfully control the discharge at the bottom of the spiral chute. One embodiment of such gate, 27, appears in Figs. 11 and 12, as of segmental form pivoted to the lower end of the spiral chute and having an outwardly extending weighted arm, 27', to insure the proper automatic closing of the gate after it has been opened for the discharge of material. Fixed to said gate, 27, is an arm, *a*, to the lower end of which is connected a horizontally extending arm, *b*, which in turn is pivotally attached to a vertically extending arm, *c*, whose lower end extends into the range of action of the conveyer so as to be actuated thereby. The arm, *c*, may be supplied with a roller, *d*, engaged by rollers, *e*, or like parts on the conveyer chain to open the gate as the buckets pass thereunder, said gate being returned by its weighted arm, as before described. If desired, the arm, *c*, may be supplied with a suitable rod or handle, *f*, which serves as a means for opening the gate by hand.

By the means described, or others of an equivalent character, charges of material may be removed from the bin and deposited on the conveyer for reclaiming; in other words for transfer to cars or other vehicles positioned on tracks alongside of the storage bin.

In Figs. 1, 3 and 4, I show a vertical spout, 60, which may be employed for conducting material to cars standing alongside the storage bin, said spout being of any well known construction and being shown only diagrammatically in the drawings as it forms no essential part of the present invention. I have also shown in Fig. 5, that the bin may be subdivided by radial partitions, into various compartments which will be useful in the storage of different kinds or grades of coal, or other material, it being understood that these various compartments communicate with the spiral chute through the gate-controlled openings before mentioned, whereby those gates which communicate with a particular compartment may receive the coal or material from the latter and deliver it to the conveyer in the manner before described.

In handling coal for storage purposes, the cars are "spotted" or brought over the re-

ceiving hoppers, 15 and the dumped coal is taken up by the conveyer and deposited into the receiving hopper, 18, of the spiral chute. In this operation all of the gates, 21, controlling the side outlets from the chute are closed except the one at the bottom and hence the coal flows out of this lowest gate and fills the lower part of the storage space or bin; as soon as the coal flowing out of this now open gate has reached the level of repose, the next higher gate is opened by an attendant on the stairway which overlies the chute and this operation is continued, successively higher gates being opened until the storage space is entirely filled, and the coal is stored to substantially the maximum capacity of the bin, or to any desired height, the coal thus stored being in the form of a conical pile of which the spiral chute and the hollow column form the center. It will be understood that there is a decided advantage in this manner of storing coal for there is a great saving in breakage, and in storage space, while the area of surface over which the coal slides after its passage through the spiral chute is very much diminished by the confining walls of the bin or storage chamber, and may be further diminished by the use of the traveling spout, 26, which may be caused to move into register with any of the gate-controlled outlets. 21, this spout traveling radially around the spiral chute, and said spout, 26, having sufficient length to deliver the coal some distance from the spiral chute so that it does not slide over itself as great a distance as when discharged from the gates directly on the pile and near the center of the same.

In reclaiming or loading out of storage, the operation before described is simply reversed. The gates, 21, are already closed, including the automatic gate, 27, at the bottom of the chute and which controls the discharge of the material from the chute to the conveyer beneath. This gate, 27, is opened to allow the material to be properly fed to the conveyer, and as the spiral chute has an excess capacity over the conveyer so that it is always kept full, there is present in the spiral chute sufficient material to continuously feed the conveyer.

In the reclaiming operation, the uppermost gate is first opened to allow the material to drift through the exposed opening into the spiral conveyer; if desired, the chute, 26, may be inclined upwardly, as in Fig. 8, to assist this operation. Successively lower gates are opened as the pile decreases and accordingly the coal drifts through these successively-opened gates and forms a continuous stream of a gently moving body of coal, which practically fills the spiral chute from the point of gate-controlled inlet to the automatic discharge. There is manifestly a great advantage in the reclaiming

of coal and like material by removing successive portions from the top of the pile rather than from the bottom, or underneath the pile under pressure, as it is a well established fact, that coal drawn off from the bottom of a pile under the heavy pressure of overlying coal, is very much broken, consequently there is a saving in material and far less breakage when removing coal from the top of the pile where it is not undergoing pressure.

The gates, even though covered with the coal may be readily operated by the hand-wheels, 23, and in case an avalanche of coal covers a particular gate, said gate can be operated from a higher turn on the stairway. An arrangement for this purpose is shown in Fig. 10, the stems of the gates being in this case of sufficient length to extend from one turn of the spiral stairway to another and being supplied with hand-wheels placed one, two or more turns on the stairway above the gate.

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

1. In a system of the character described, the combination of a conveyer and a hollow column around which the material is stored, said column having a spiral inclosed chute along which the material gravitates after being discharged from the conveyer, said chute having outlets for the material and said chute filling with the piling of the material and the material in the chute serving to deflect incoming material through said outlets.

2. In a storage system of the character described, the combination with a conveyer, of a hollow vertical column through which the conveyer passes, said column forming a center about which the material is stored, and having a spiral inclined chute into which the material is discharged and along which it gravitates to the point of discharge.

3. In a system of the character described, the combination of a conveyer and a spiral chute into which the conveyer discharges and along which the material gravitates, said chute having outlets for the material and said chute filling with the piling of the material and the material in the chute serving to deflect incoming material through said outlets.

4. In a system of the character described, the combination of a conveyer and a spiral chute into which the conveyer discharges, said chute forming a center about which the material is stored and along which the material gravitates to the point of discharge, said chute adapted to fill with the piling of the material outside of the same and the material in the chute, serving to deflect incoming material through said discharge.

5. In a storage system of the character de-

scribed, the combination with a conveyer, of a chute with which the conveyer communicates, said chute having openings at different levels, and having a bottom closure whereby material will accumulate in the chute and serve to deflect incoming portions of material through said openings.

6. In a storage system of the character described, the combination with a conveyer, of a spiral chute with which the conveyer communicates, said chute having a closable bottom, and having gate controlled outlets at different levels, and means whereby the gates may be opened or closed in ascending and descending order for the storage or reclaiming of the material.

7. In a storage plant of the character described, the combination of a conveyer, a spiral chute, a closure at the lower end of the chute, means for discharging material into said chute along which chute the material gravitates, said material collecting in the chute and serving to deflect laterally incoming portions of the material when the bottom closure is closed, and passing unobstructedly through the chute when said closure is open, said chute having side openings arranged in spiral order along the chute, corresponding gates controlling the openings, and a covered bin within which the chute is arranged.

8. In a storage system of the character described, the combination with a conveyer, of a hollow vertical column through which the conveyer passes, said column forming a center about which the material is stored, and having a spiral inclined chute into which the material is discharged and along which it gravitates to the point of discharge, said chute having outlets and means for controlling the same.

9. In a storage system of the character described, the combination with a conveyer, of a vertical column having an encircling spirally arranged chute with openings at points along the length thereof leading to the space outside of the column, said column being hollow for the passage of the conveyer, and said chute having one end arranged in the range of travel of the conveyer and adapted to receive the material therefrom.

10. In a system of the character described, a storage chamber, a vertical column therein, around which material may be stored as a center, said column being hollow and having around its outside a spirally arranged chute, said chute having gate-controlled outlets at points along its length for discharging material at successively higher levels, and means for feeding material to said chute, said column being hollow for the passage of the feeding means.

11. A system of the character described, comprising an endless conveyer, a vertical

column formed hollow for the passage of the conveyer, and a spirally arranged chute formed around the exterior of the column having an inlet end disposed in the range of travel of the conveyer and having gate-controlled outlets at points in its length.

12. In a system of the character described, the combination of a conveyer, a hollow column around which the material is stored in bulk, said column having a spirally inclosed chute along which the material gravitates after being discharged from the conveyer, said chute having gate-controlled openings arranged at successively different levels, means whereby the gates may be opened successively in ascending order when piling material for storage purposes, said chute having means for retaining a part of the material in the chute for the purpose of deflecting incoming portions of material through said openings.

13. In a system of the character described, the combination of a conveyer and a hollow column around which the material is stored, said column having a spiral inclosed chute along which the material gravitates after being discharged from the conveyer, said chute having gate controlled openings arranged in spiral order.

14. A system of the character described, comprising a vertical column around which material may be successively piled said column having a spirally arranged chute along which the material is allowed to gravitate, said chute having gate-controlled outlets, at successively different levels for leading material outside of the column, and an auxiliary spout movably mounted on the chute and adapted to be brought into register with the gate-controlled openings thereof.

15. A system of the character described, comprising a vertical column around which material may be successively piled said column having a spirally-arranged chute along which the material is allowed to gravitate, said chute having gate-controlled outlets, at successively different levels for leading material outside of the column, and an auxiliary spout movably mounted on the chute and adapted to be brought into register with the gate-controlled openings thereof, said chute having guide rails upon which the auxiliary spout is mounted whereby the spout is adapted to swing around the column and spiral chute as a center.

16. In a system of the character described, the combination with a conveyer, of a vertical column about which the material is stored as a center, said column having a spirally arranged chute with gate-controlled outlets arranged at different levels, an auxiliary spout movably mounted on and adapted to travel around the column and spiral chute as a center, said spout being adapted to receive

coal from the gates to discharge the same at a suitable distance from the central column.

17. A system of the character described, having in combination a bin subdivided into compartments, a spirally-arranged chute forming the center of the bin and about which the material is piled, said chute having a movable closure at the bottom and having gate-controlled openings leading into the different compartments of the bin, and means for operating the gates.

18. In a system of the character described, and in combination with a conveyer, a vertical column or tower forming a center about which loose material may be progressively piled, said column having a central longitudinal passage for the conveyer and having a chute spirally encircling it and along which the material gravitates, said chute having gate-controlled openings arranged at different levels, and a compartment bin inclosing the column and piled material having its compartments connecting with the spiral chute.

19. In a coal or like storage plant, a conveyer, a hollow column arranged about the center of said plant, and a spiral chute coiled around the exterior of the column having an inlet at one end and a discharge at the other, said column serving as a tunnel or protection for the conveyer.

20. In a coal or like storage plant, a conveyer, a hollow column arranged about the center of said plant, and a spiral chute coiled around the exterior of the column having an inlet at one end and a discharge at the other, said column serving as a tunnel or protection for the conveyer, said chute having gate-controlled openings throughout its length and means whereby the gates may be opened in ascending or descending order for the storage or reclaiming of the material.

21. In a coal or like storage plant, a conveyer, a hollow column arranged about the center of said plant, and a spiral chute coiled about the exterior of the column having an inlet at one end and a discharge at the other, said column serving as a support for the spiral chute, and said chute having gate-controlled openings throughout its length and means whereby the gates may be opened in ascending or descending order for the storage or reclaiming of material.

22. In a coal or like storage plant, and in combination with a conveyer, a hollow column having a spirally arranged chute around its exterior, said column and chute forming a center about which material is stored, and said column serving as a tunnel or protection for the conveyer, said chute having gate-controlled openings and means connecting with the gates whereby said gates may be opened in descending order to allow

material to drift back into the chute when loading out of storage.

23. In a system of the character described, a storage bin having a bottom in the form of
5 a conical pit, of which the angle of inclination of its floor is about the same as the angle at which the stored material reposes, said pit having a discharge gate at its central point, a spirally-arranged chute within
10 the bin, a conveyer operable under said gate to receive discharged material therefrom, and a movable closure for the bottom of the chute.

24. In a system of the character described,
15 a storage space or receptacle having a floor in the form of a conical pit, said pit having a discharge opening near its central point, a spirally-arranged chute within the bin, and a conveyer operable under said discharge
20 opening to receive material discharged thereover, said chute having a movable closure at its lower portion for opening or closing the passage through the chute.

25. In a system of the character described,
25 a storage space or receptacle having a floor in the form of a conical pit, said pit having a discharge opening near its central point, a spirally-arranged chute within the bin, a conveyer operable under said discharge
30 opening to receive material discharged

therefrom, and supporting means for the chute.

26. A system of the character described, having a bin with a floor which inclines toward the center of the bin about the same
35 as the angle of repose for the material to be stored in the bin, and mechanism for loading material into the bin and unloading it therefrom, said mechanism comprising a
40 spirally arranged chute forming the center of the stored material and having gate-controlled openings, and means operating axially through the spiral chute and adapted to deliver material into the inlet end, of said
45 chute.

27. In a system of loading and unloading, a vertical column forming the center about which material is piled, said column having a spirally-arranged chute with an inlet at one end and a discharge at the opposite
50 end and having gate-controlled openings, a stairway associated with the chute, and mechanism for operating the gates from said stairway.

In testimony whereof I affix my signature in presence of two witnesses.

WILLIAM E. HAMILTON.

Witnesses:

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CHAS. C. BOSTWICK.