C. S. WILLIAMSON.

COAL HANDLING PLANT.

APPLICATION FILED FEB. 26, 1916.

1,316,129.

Patented Sept. 16, 1919.

7 SHEETS—SHEET 1.

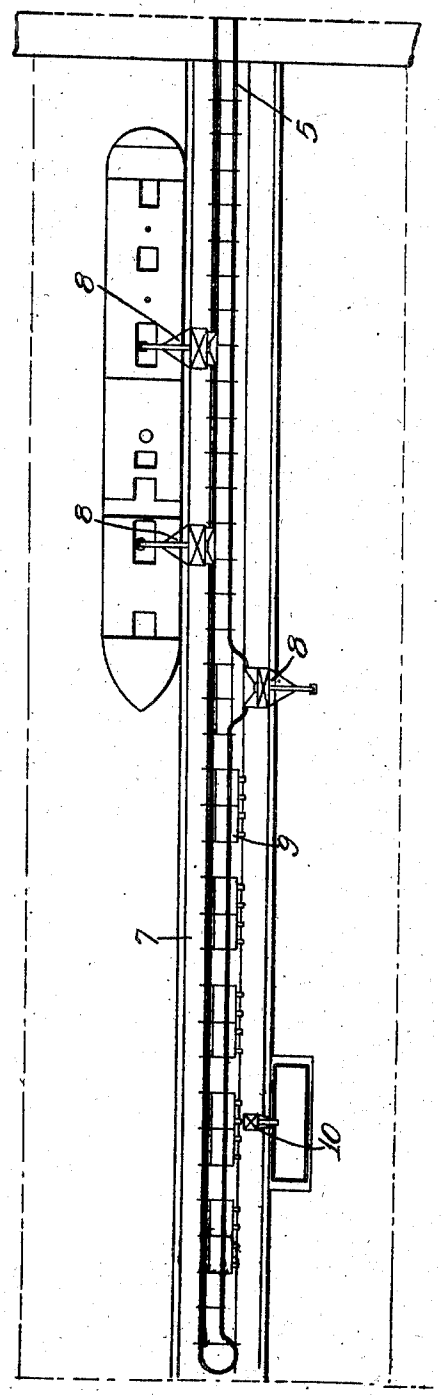


Fig. 1

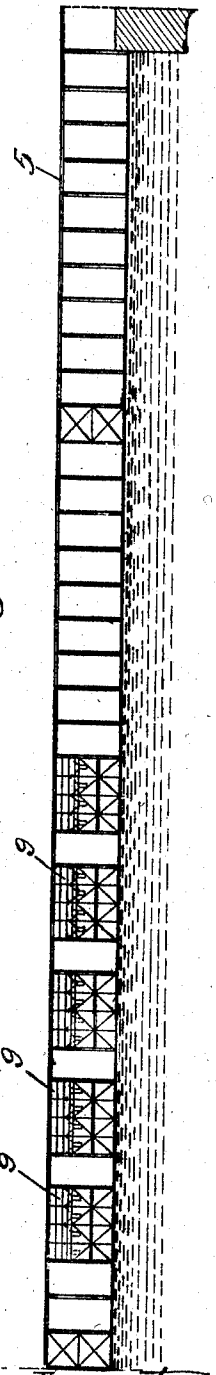


Fig. 3

Witnesses:

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7 SHEETS—SHEET 2.

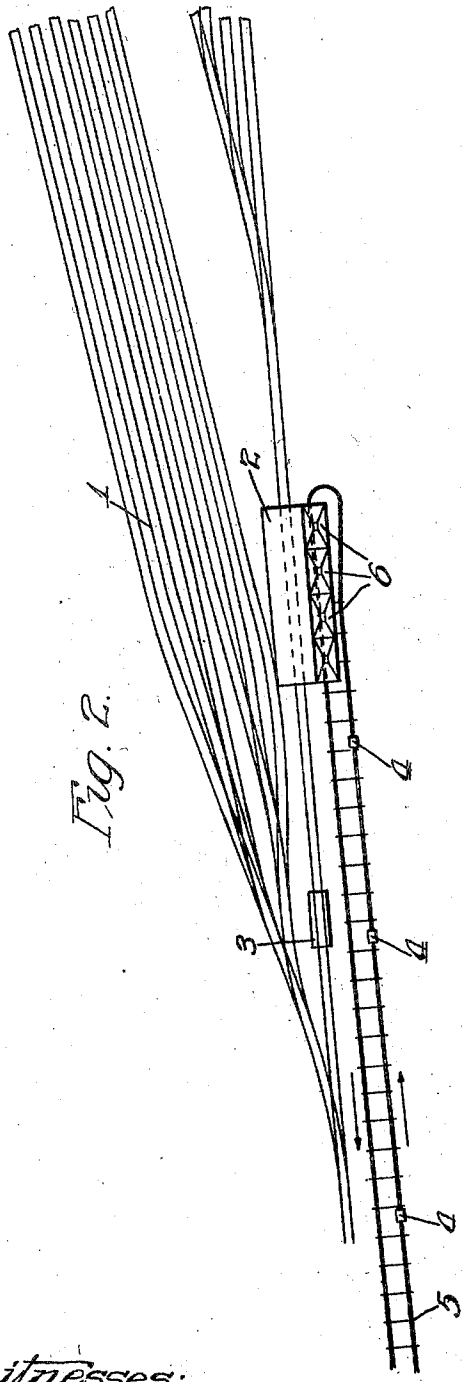


Fig. 2.

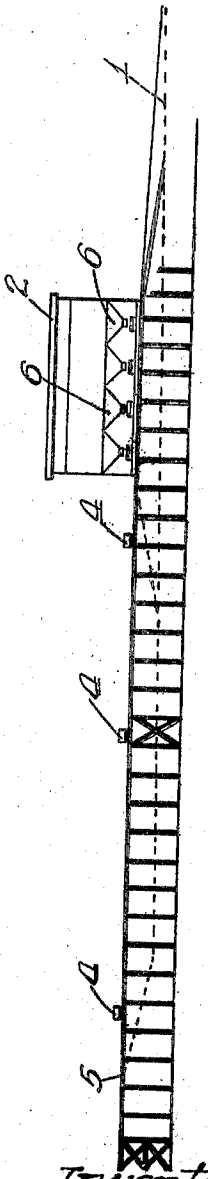


Fig. 4.

Witnesses:
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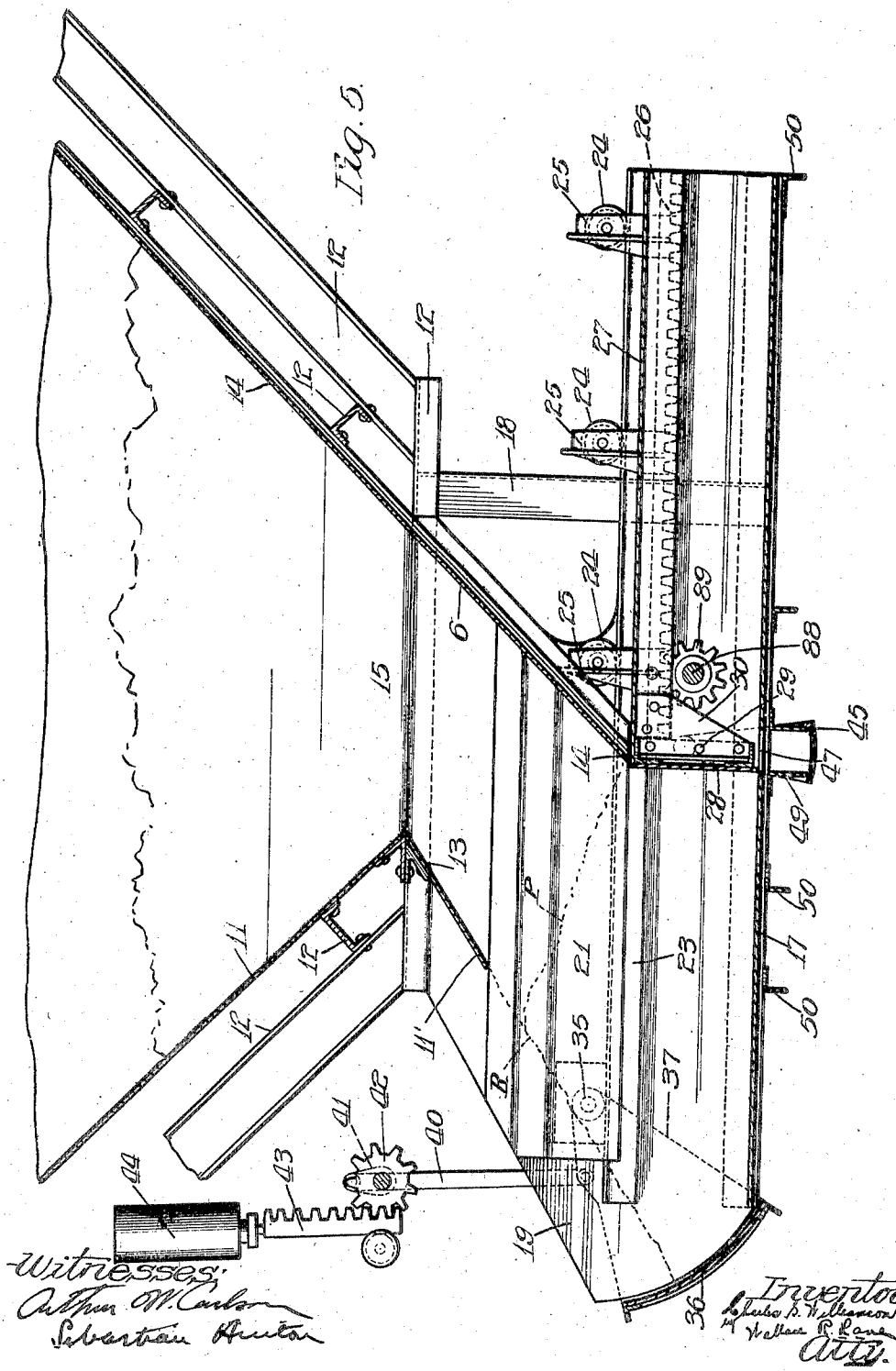
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7 SHEETS—SHEET 3.

Fig. 5.



Witnesses:
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7 SHEETS—SHEET 4.

Fig. 6.

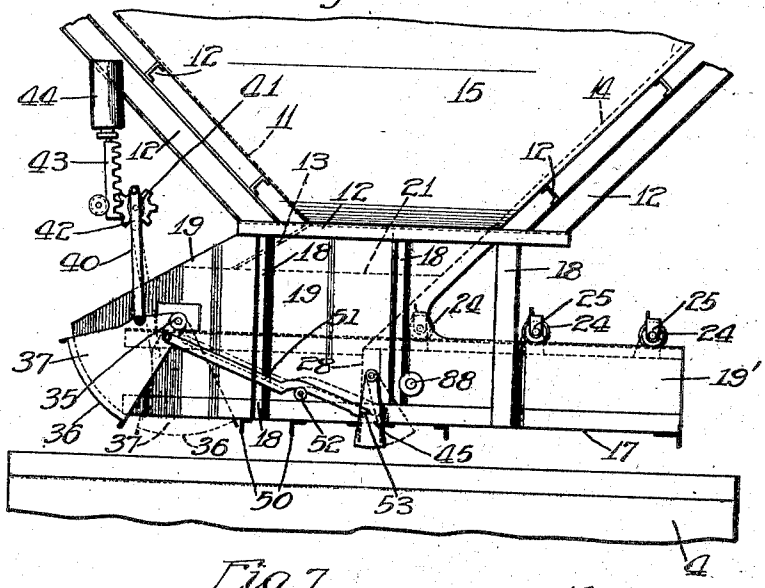
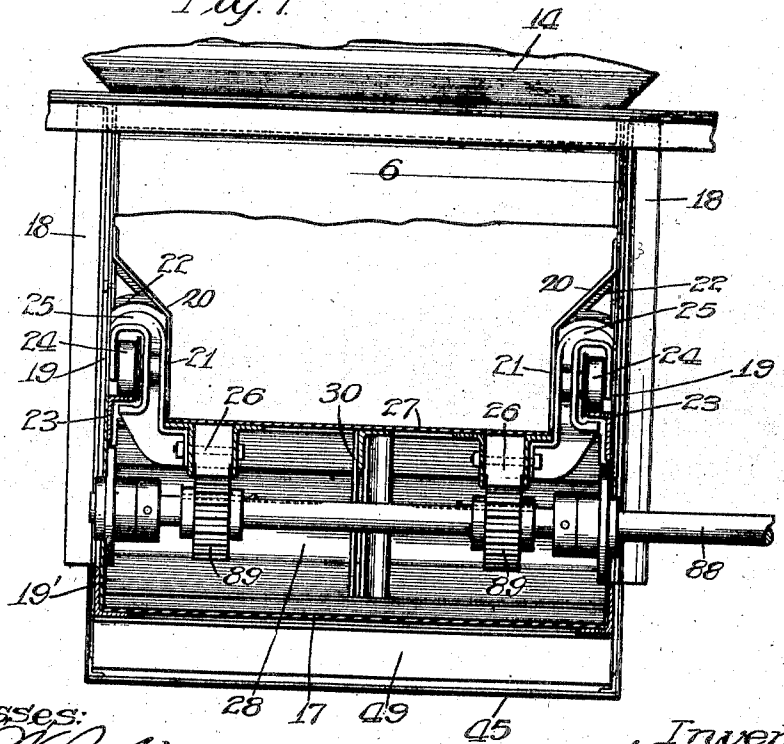


Fig. 7.



Witnesses:
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7 SHEETS—SHEET 5.

Fig. 8.

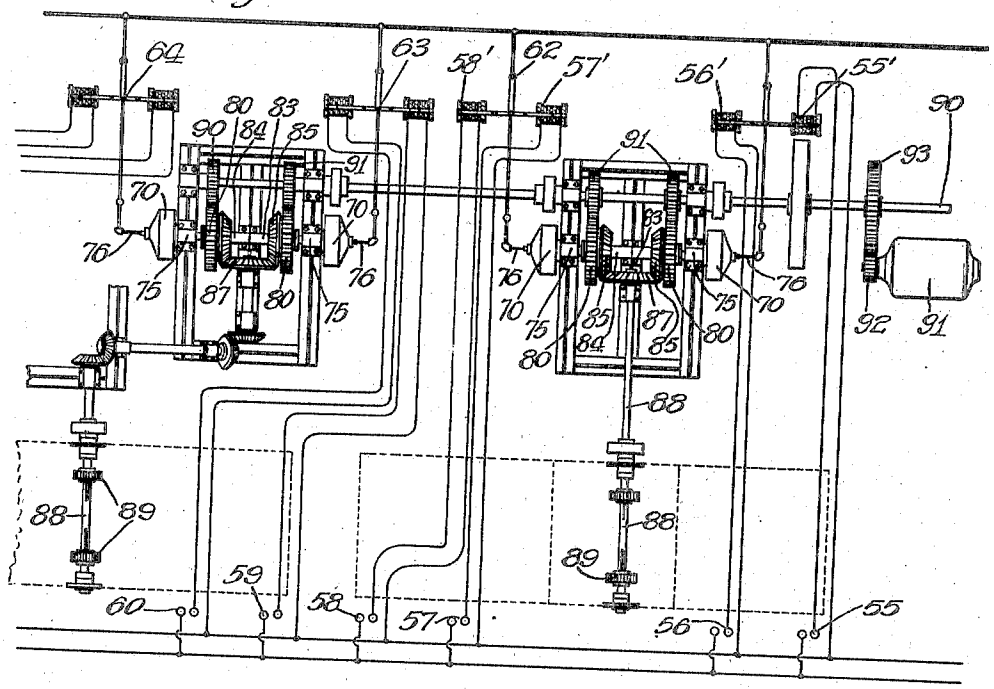
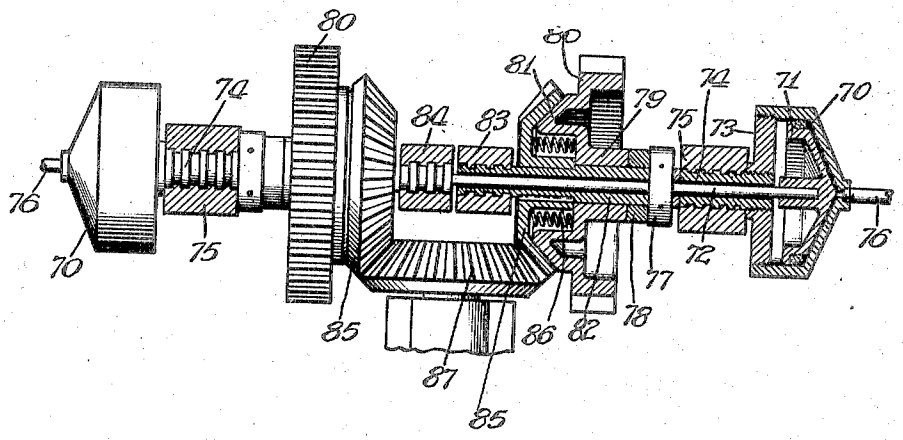


Fig. 9.



Witnesses:

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7 SHEETS—SHEET 6.

Fig. 10.

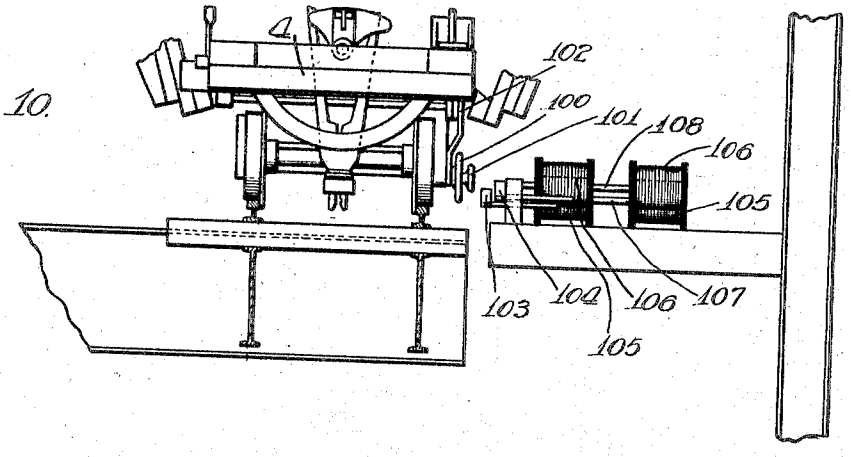


Fig. 11.

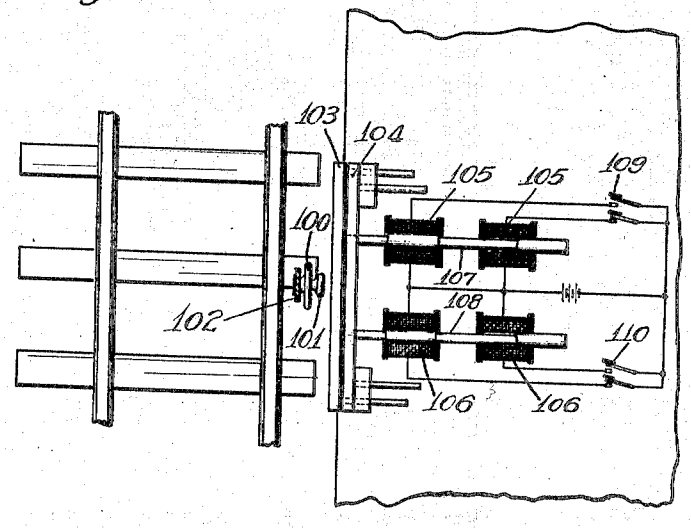
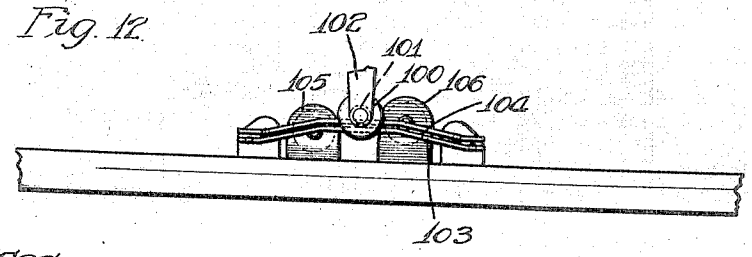


Fig. 12.



Witnesses:

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COAL HANDLING PLANT.

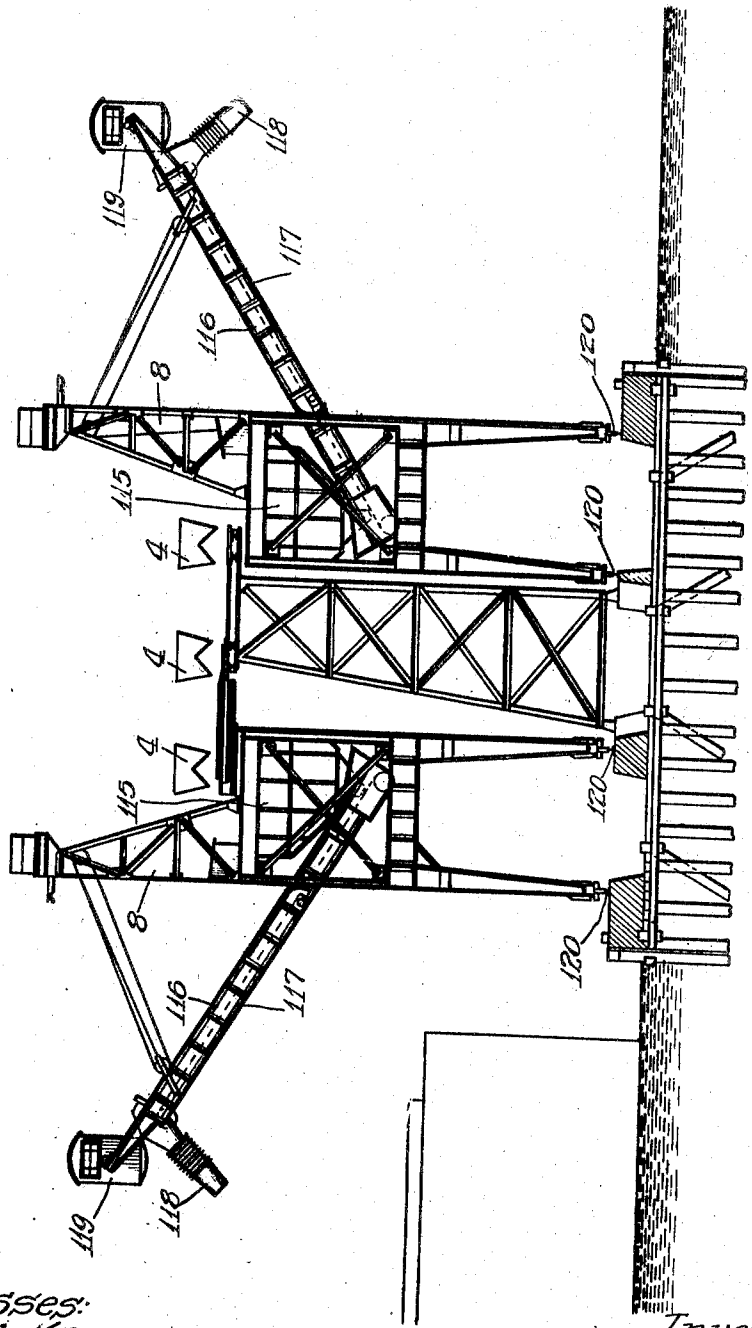
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7 SHEETS—SHEET 7.

Fig. 13.



Witnesses:

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UNITED STATES PATENT OFFICE.

CHARLES S. WILLIAMSON, OF CHICAGO, ILLINOIS.

COAL-HANDLING PLANT.

1,316,129. Specification of Letters Patent. Patented Sept. 16, 1919.

Application filed February 26, 1916. Serial No. 80,577.

To all whom it may concern:

Be it known that I, CHARLES S. WILLIAMSON, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Coal-Handling Plants, of which the following is the specification.

This invention relates to plants for handling coal, ore, or the like, and particularly to a combination and arrangement of various mechanism whereby quick and simultaneous loading of large and small ships is made possible as well as the continuous "capacity" operation of the plant when once started, although the number of loading points and rate of loading of each may vary.

It is an object of the invention to combine a car dumper or its equivalent with a car system running out to a loading point or points, as for instance, upon a dock where ship loaders may load the coal from the car system into ships.

It is another object of the invention to provide mechanism by which the ship loaders may select a predetermined fraction of the continuous stream of coal carried past them by the car system to suit the requirements of each loader at all times.

It is another object of the invention to provide an arrangement wherein storage or relief bins are provided to take the overflow during a temporary stoppage or delay in the operation of the ship loaders for any reason, so as to keep the plant running continuously and avoid stoppages thereof, the storage bins at the same time serving to supply small boats or the like.

It is another object of the invention to provide mechanism of a novel kind for taking coal from a hopper into the cars of a cable or equivalent system, this mechanism eliminating to a large extent, the heretofore unavoidable dropping and consequent breakage of the coal.

It is another and important object of the invention to provide apparatus for loading an ocean-going coal carrier or a small pleasure yacht equally well, simultaneously if necessary, and without breaking the coal and thus diminishing its value. In this respect, the system herein disclosed constitutes an important advance over systems heretofore used, where generally ships of a predetermined freeboard alone could be loaded without breakage of coal.

Other objects and advantages of the invention will appear as the description to follow proceeds.

In the drawings:

Figures 1 and 2 together comprise a plan view of the entire system constructed according to my invention.

Figs. 3 and 4 constitute an elevation of the same.

Fig. 5 is an enlarged cross-sectional view of the mechanism for loading cable cars.

Fig. 6 is an elevation of the car loading mechanism.

Fig. 7 is a transverse cross-sectional view thereof.

Fig. 8 is a detailed plan view illustrating the control for the plunger comprising a part of mechanism for loading the cable cars.

Fig. 9 is an enlarged elevation, partly in cross section showing the control means for the plunger operating mechanism.

Fig. 10 is a detailed front elevation showing controlling mechanism for selective car unloading.

Fig. 11 is a plan view of same without the car.

Fig. 12 is an elevation of unloading cams.

Fig. 13 is an end elevation of a dock or pier showing the arrangement of a plurality of ship loaders thereon and tracks for a cable car system.

Reference being had to Figs. 1 to 4 of the drawings showing the general plan or arrangement of various mechanism included in this invention, 1 represents a storage yard into which railroad tracks may discharge their cars of coal, or the like, this yard generally including a thawing shed and other customary appliances.

Adjacent to the storage yard is a car dumper 2 to which railroad cars are sent from the storage yard 1 through the intermediary of a barney 3, this mechanism and arrangement being well known in the art. The cars are emptied by the car dumper into a series of hoppers and from these hoppers the coal is transferred through mechanism to be hereinafter described, into a series of propelled cars, preferably cable cars 4 upon a track system 5, which passes under the hopper 6 associated with the car dumper 2, and out to the end of a pier 7 so that a suc-

cession of cars is continuously operated to move a stream of coal or the like from the car dumper out to the end of the pier 7 and back to the car dumper unless the coal is diverted as it passes the loading point on the pier.

The pier 7, as shown, will accommodate a plurality of ships ranging in size from an ocean liner to a small pleasure yacht and, for the purpose of loading these ships with equal facility and absence of breakage irrespective of the freeboard of the ship, is provided with a plurality of ship loaders 8; in the practical modification illustrated two of these ship loaders being shown upon one side of the pier and one upon the other. Each of the ship loaders is provided with mechanism hereinafter described, whereby it may take a predetermined fraction of the coal passing it upon cable cars 4; thus the first ship loader 8 may take the contents of every other car, or every car, or of one car in four, etc. Similarly the second ship loader may take the contents of all the cars allowed to carry their loads past the first ship loader, or any predetermined fraction of these cars and a third ship loader may do likewise. This arrangement very materially increases the efficiency of the system and lowers the operating cost because it, when employed in connection with other features next described, results in "capacity" operation of the system and a predetermined and continuous load even when one or more of the ship loaders is not taking coal. In order to complete the continuity of operation of the plant and make it possible to operate such plant absolutely without stoppage or even without diminution from full capacity, I have provided as part of my system a series of storage bins 9 on the return leg of track 5 and adjacent the end of the pier, these storage bins being provided (as are the ship loaders) with mechanism preferably manually controlled, for diverting and collecting a predetermined portion of the stream of coal passing them upon the cable car system.

Associated with the bins 9, I provide a small ship loader 10 designed to run back and forth on special tracks so as to operate with any particular bin designed for loading small vessels, barges or the like so that during operation of the main plant and the large ship loaders 8 or during a temporary stoppage in such operation, the plant may still be employed to fill the bins 9 with coal and these bins may be availed of to supply small boats or the like through the small ship loader 10. By having a large number of bins 9, as indicated, it is possible to provide individual bins for different concerns or subdivide in any other way.

My system in general then comprises as indicated, a cable road system or its equivalent, in combination with a car dumper or its equivalent, as means to distribute coal from the yards to various loading points on the pier and arrangements whereby the entire plant may be run continuously and at capacity whenever it is running at all, the storage hoppers serving as elastic reservoirs to take all the coal not taken by the ship loaders.

I will now describe particular details of construction and arrangement forming important parts of my invention and by which the general system or plan alluded to is made possible of embodiment in an actual construction. The storage yard, barney and car dumpers are all old and well known and need no specific description. The mechanism however, for loading cable cars from the hoppers supplied by the car dumper is entirely new and embodies many important advantages. Reference being had to Figs. 5, 6 and 7, 6 represents one of the hoppers associated with the car dumper, four such hoppers being in this instance provided arranged successively along and over the cable car track and supported on suitable structural steel supports. The hopper 6 is provided with a front wall 11 suitably supported by I and channel irons 12 and provided near its bottom with a reverse angle 13, while the rear wall 14 of the hopper 6 is continuous past the angle 13 so as to provide an inclined and constricted passage 15 leading to the bottom 17 of the hopper. The front wall 11′ of the hopper below the angle 13 is cut off so as to leave a considerable space between its lower edge and the bottom of the hopper. The coal is shown in the hopper in Fig. 5, its angle of repose being indicated by the line R. Firmly mounted on the channel beams 12 forming the structural support for the hopper are channel irons 18 which support the floor 17 and to which are fastened side plates 19 extended forward with the floor 17 to confine the coal at the sides of the hopper and also provided with a rearwardly extending portion 19′ to carry the plunger to be described. Inner linings 20 are provided in hopper 6 and are constricted as indicated at 21 so as to leave a space between them and the outer side walls 19, braces 22 reinforcing the angles. In the spaces thus formed are firmly secured angle iron tracks or runways 23 extending the entire length of the side plates 19 including the extensions 19′. Running upon the tracks 23 are wheels 24 of carriages or standards 25 bolted to racks 26, which are firmly fastened (as by welding) to the top plate 27 which with the face of plate 28 forms a plunger for loading the cable cars. The top plate 27 and the face plate 28 are held in correct relative position

by suitable reinforcements 29 as indicated in Fig. 5 and suitably secured to these reinforcements 29 are braces 30 bolted to the racks 26 which as stated are in turn welded or otherwise suitably secured to the top plate 27. The plunger structure is thus strongly reinforced and braced throughout.

The face plate 28 is adapted to snugly fit in and completely occupy the recess between the bottom of rear wall 14 of the hopper and its floor 17, and between the side plates 19 below the constricted portion 21 of the hopper.

Mounted upon a shaft 35 in the side plates 19 is a gate comprising curved web 36 integrally connected at both ends to sectors 37 mounted at their angles upon the shaft 35. The gate 36 is operated in conjunction with the plunger 28 and is moved downwardly at the proper time into dotted line position (see Fig. 6) so as to permit coal to be pushed over the edge of the floor 17 into cars traveling below by the plunger at each of its operations. It is operated by a link 40 connected to a crank 41 upon a suitable shaft provided with a gear 42 operated by a rack 43, in turn operated by air cylinder 44 the control for this cylinder being similar to or a part of that for the plunger 28 hereinafter described.

Pivotally mounted in the side plates 19 are a pair of sector arms 45 and integrally connecting their bottoms is a curved web similar to that forming gate 36 and adapted to form a closure for an opening 47 in the floor 17 of the hopper just behind the retracted position of plunger 28, the opening 47 being bounded by angle irons 49 slightly larger than angle irons 50 forming part of the structural support for the hopper. The construction just described is provided to catch coal dust caused to move backwarlly on each return stroke of the plunger and discharge this dust into a car beneath the hopper saving approximately a handful of dust on each stroke and aggregating an appreciable amount of coal in the day's operation. The members 45 are operated in an obvious manner by a bent link 51 connected to one of sector members 37 running on roller 52 in the side plates 19 and adapted to impinge the pin 53 mounted in the sector member 45, so that each time the gate 36 is moved into position shown in the dotted line in Fig. 6 the bucket structure 45 will be quickly thrown to one side dumping the accumulated dust into the car below.

I will now describe the mechanism for operating the plunger 28, it being of course understood that any other means than the specific one here described and capable of doing like work could be substituted therefor without departing from the broad features of the invention. Reference being had to Figs. 8 and 9, it will be seen that I provide a series of electrical contacts 55, 56, 57, 58, 59 and 60, there being as many of these contacts as necessary to fit the requirements of any particular situation. These contacts are adapted to be closed by shoes on the cable car and operate valves 61, 62, 63, and 64, as many of these valves as required to fit the particular situation being employed. The contact 55 acting through solenoid 55′ operates to start the associated plunger forward by letting air into the pneumatic apparatus to be described. The contact 56 when closed, causes the valve to be closed again through solenoid 56′ stopping the plunger. The contact 57 acting through solenoid 57′ and valve 62 returns the plunger. The contact 58 acting through solenoid 58′ again closes the valve. The contacts 59 and 60 acting through their associated solenoids again operate the plunger. It will be readily seen that the pneumatic mechanism controlled by the valves 61, 62, 63, etc., comprises a cylinder in which is mounted a piston 71 rigidly connected with the rod 72, the cylinder 70 being provided with a head 73 screwed therein and also screwed to the sleeve 74 in which the rod 72 slides, which sleeve 74 is mounted in a thrust bearing 75. Air is supplied to cylinder 70 through tube 76 in communication with one of the valves 61, 62, etc. The rod 72 is connected adjacent thrust bearing 75 with collar 77 having an extended hub 78, bearing against the hub 79 of a gear 80 provided with a conical friction face 81, the collar 77 and hub 79 being mounted upon the journal 82 forming a continuation of sleeve 74 as does the sleeve 83 mounted in the thrust bearing 84, a suitable connection being provided to permit the collar 77 to move longitudinally with the rod 72. The entire construction described is duplicated in the left hand side of Fig. 9 though the parts do not appear as they do in the right hand or sectional side of the drawing.

Rotatably mounted upon the sleeves 83 are bevel gear pinions 85 having inner friction faces adapted to coöperate with friction faces 81 as clearly seen, and equipped with springs 86 to separate the friction surfaces. From the construction so far described, it will be apparent that admission of air to one of the tubes 76 will push the rod 72 and therefore the rear friction face 81 into frictional engagement with the nearest bevel pinion 85 and release the engagement of the other bevel pinion so as to rotate the gear 87 in one direction or the other. The gear 87 is rigidly mounted upon the shaft 88 which is provided with bearings in the side plates 19 of the hopper and carries the gears 89 in mesh with racks 26 connected to plate 27 of the plunger as above explained.

The drive for gears 80 is provided by the

shaft 90 having thereon gears 91 in engagement with each of the gears 80 and continuously driven by means of an electric motor 91 or by equivalent means driving through pinion 92 a large gear 93. By the mechanism just described it will be apparent that as each car proceeds under one of the hoppers the associated plunger will move forwardly to deposit a load therein and then move backwardly into retracted position ready for the next load.

It will be clearly seen that with the plunger in its retracted position (see Fig. 5) the coal will rest upon the floor 17 of the hopper in front of the plunger, the line of repose of the coal being shown by the line R. When the plunger moves forwardly the mass of coal between the line R and dotted line P, Fig. 6, will be gently shoved forward over the front edge of the floor 17 and deposited in the car immediately below. The coal below the line P simply slides down into and rests upon the plate top 27 of the hopper as the same moves forward. As the plunger 28 is retracted after having deposited the mass of coal M in the car below, the coal will drop down over its front plate 28 onto the floor 17. The gate 36 is provided to prevent coal "splashing" out of the hopper at this time.

I consider the plunger loading apparatus just described in detail of great importance for the reason that it is the first so far as I am aware, to provide for loading cars without leaving a very considerable clearance between the loading apparatus and the car made necessary by turning, upsetting or other similar movement of the actual loading device in loading the car. By employing a plunger movable in the same plane as the car, I may make the clearance between the car and the loading apparatus just as small as practicable to permit a car to pass under the bottom of the hopper, and the device will operate perfectly to deposit coal from the hopper into the car. This reduces the "drop" of the coal by many inches and very largely diminishes breakage. Furthermore, and as an important feature of this invention, the coal is moved forwardly by the plunger in the same direction as that in which the car is going, so that practically all the shock or jar of the coal in a horizontal direction as it is dumped into the car, is eliminated, the coal and the car moving together at practically the same speed when they come together. With the horizontal jar upon the coal eliminated and more important the great reduction in its "drop," I very greatly reduce the breakage.

In the particular modification of the invention herein disclosed I provide four hoppers each provided with a plunger as just described and each adapted to push a quarter of the full carload into the car passing underneath it so that a four ton car (for instance) going under the four hoppers picks up a ton from each hopper. This method of installment loading reduces breakage and makes the operation simple and faster than to load the full load in one charge.

Coal having been deposited in the cars of the system as above explained, is carried outwardly in a continuous stream around the track loop and deposited in ship loaders according to requirements of the particular situation. For this purpose I provide mechanism shown in Fig. 10 comprising a plurality of different sized or different located trip wheels arranged upon the cars and cooperating with the plurality of corresponding cams associated with the ship loaders and storage bins. In the particular modification herein illustrated I show two wheels 100 and 101 of different size, mounted upon link 102 which dumps car 4 through mechanism well known in the art and unnecessary to be described here, and a pair of cams 103 and 104 operated by solenoids 105 and 106 through armatures 107 and 108. Half of the cars can have only small wheels and half with large and small or any other arrangements may be devised involving if necessary more cams and differently located wheels, so that by suitable manipulation of the switch indicated at 109 and 110, any desired portion of the cars passing a loading point may be unloaded.

The cars passing around the loops are selectively dumped as indicated at ship loaders represented generally by 8 and comprising receiving hoppers 115 associated with slat conveyers 116, carrying arms 117, and discharging into spouts 118 all under the control of an operator in a house 119, the ship loaders running on tracks 120 adjacent the water's edge so as to assume any position along the tracks desired.

I claim:

1. In a coal handling plant a supply track, a car dumper adjacent said supply track, a dock adapted to receive ships, a cable system having stationary tracks extending from said car dumper to and along said dock, a movable ship loader on said dock, said cable system including cars operating around a cable loop for transferring coal from the car dumper to the ship loader in a plurality of positions of the latter whereby said coal may be continuously loaded into ships by said ship loader.

2. In a coal handling plant a supply track, a car dumper adjacent thereto, a hopper into which said dumper discharges, a dock adapted to receive a plurality of ships, a cable system having stationary tracks extending from said hopper to and along said dock and back to said hopper, said cable system including cars and means to move the same around said stationary tracks, loading devices for loading said cable cars from said

hopper, and a plurality of movable ship loaders on said dock served by said cable cars whereby the operation of loading said ships may be continuously carried on.

3. In a coal handling plant, a car dumper, a plurality of ship loaders, a cable system including cars for conveying coal or the like from the car dumper to the ship loaders, dumping apparatus upon the cars, selective mechanism upon one of the ship loaders for selectively dumping thereinto loads from certain cars.

4. In a coal handling plant, a receiving space, a car dumper therein, a car system, a dumper supply track, a dock, a plurality of ship loaders movable along said dock, a track system connecting said car dumper with the ship loaders, cars on said track system, selectively operated mechanism for dumping selected cars into one of said ship loaders.

5. In apparatus of the class described, a car dumper, a car filling mechanism associated with the car dumper, a ship loader, a storage bin, a car system including power propelled unloadable cars and tracks for transferring coal or the like from the car filling mechanism to the ship loader and storage bin, selective means upon the ship loader to selectively take the loads from predetermined cars, and unloading mechanism on the storage bin to take the load from other cars.

6. In apparatus of the class described, a car dumper, a car filling mechanism associated with the car dumper, a plurality of ship loaders, a storage bin, a car system including power propelled unloadable cars and tracks for transferring coal or the like from the car filling mechanism to the ship loader and storage bin, selective means upon the ship loaders to selectively take the loads from predetermined cars, and selective unloading mechanism on the storage bin to take the load from predetermined other cars.

7. In apparatus of the class described, a car dumper, a dock, a ship loader movable upon said dock, a storage bin, a cable system, cars running upon said cable system from said car dumper past said ship loader and storage bin and back to said car dumper, selective means upon said ship loader for taking the contents of predetermined cars, and means for unloading other cars into said storage bin, whereupon the plant can be run at capacity operation, although the ship loader is not operating at capacity, by returning the overflow into the storage bins.

In witness whereof, I hereunto subscribe my name to this specification in the presence of two witnesses.

CHARLES S. WILLIAMSON.

Witnesses:
SEBASTIAN HINTON,
MARGARET J. RYAN.