

F. K. HOOVER & A. J. MASON.

SCALE CAR.

APPLICATION FILED NOV. 24, 1902.

933,452.

Patented Sept. 7, 1909.

6 SHEETS—SHEET 1.

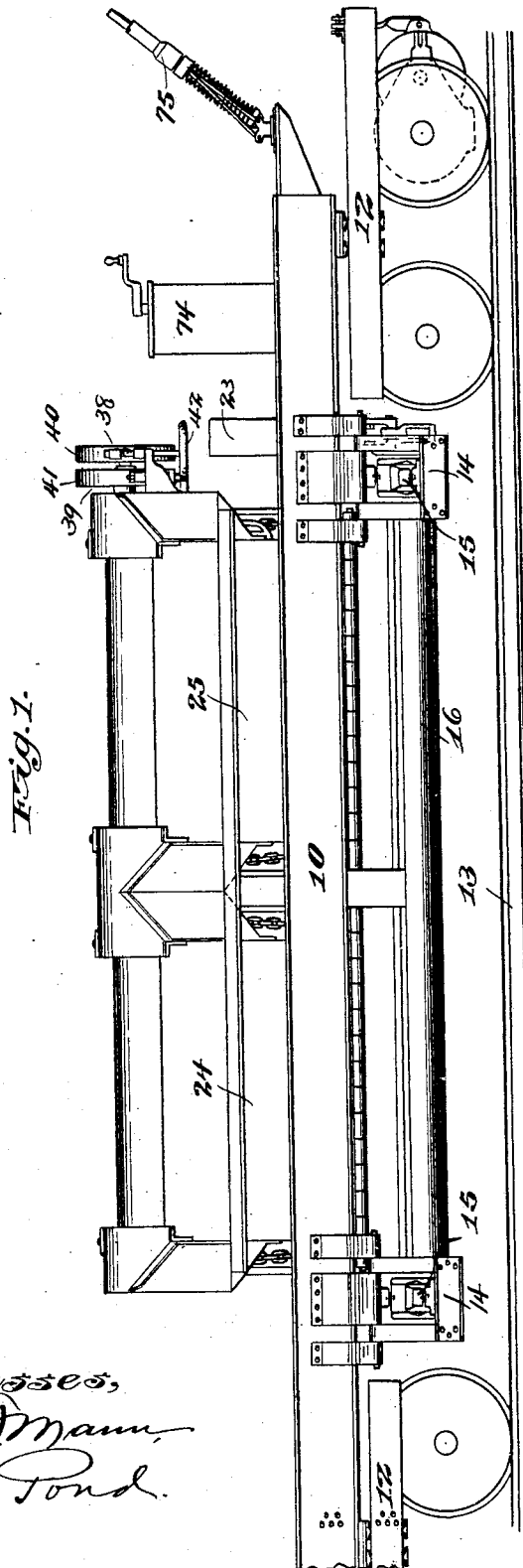


Fig. 1.

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F. K. HOOVER & A. J. MASON.
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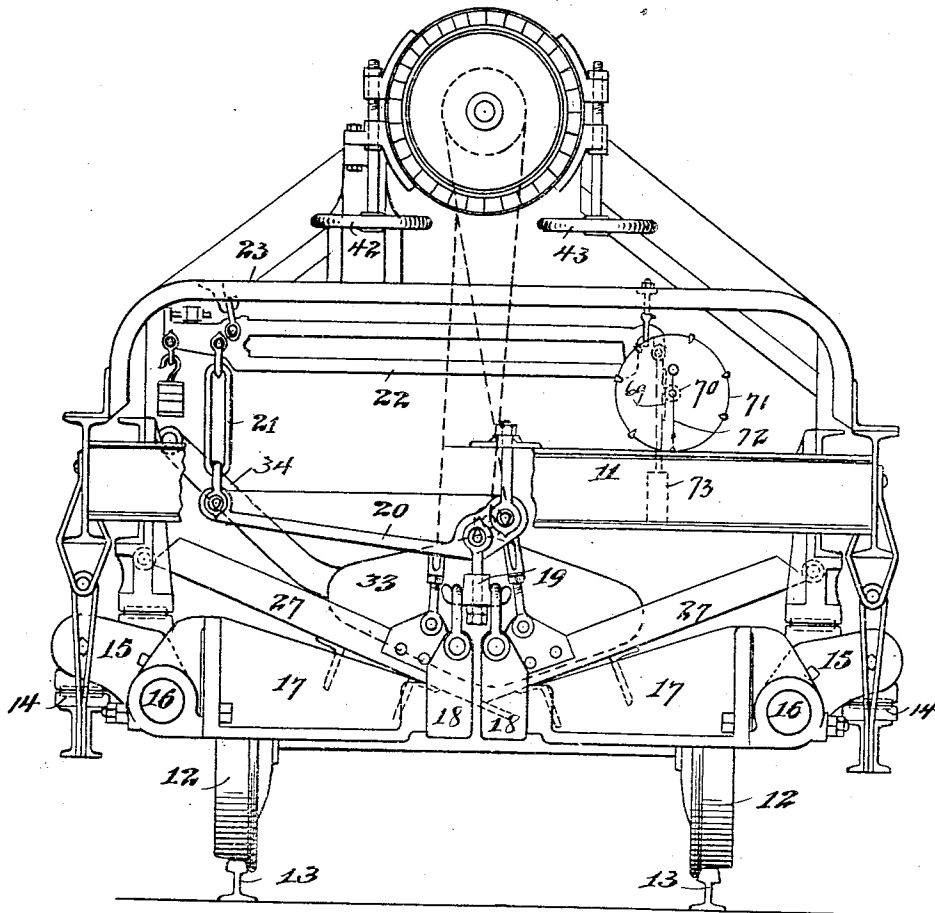
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6 SHEETS—SHEET 2.

Fig. 2.



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6 SHEETS—SHEET 3.

Fig. 3.

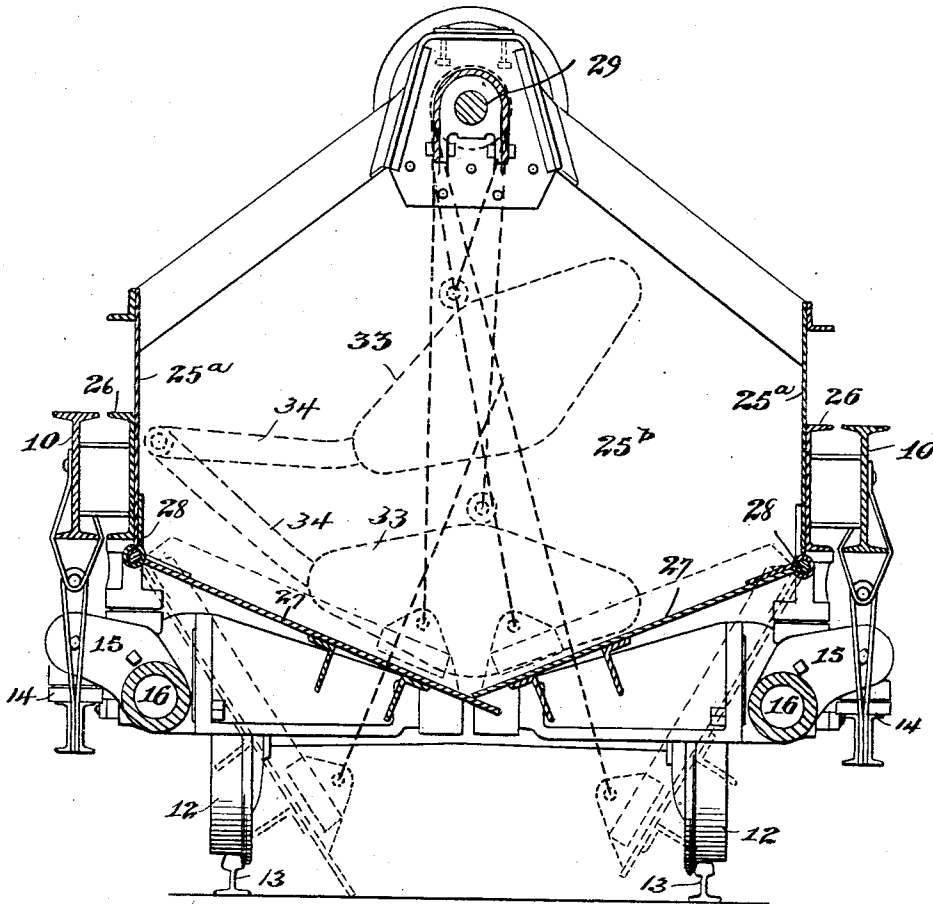
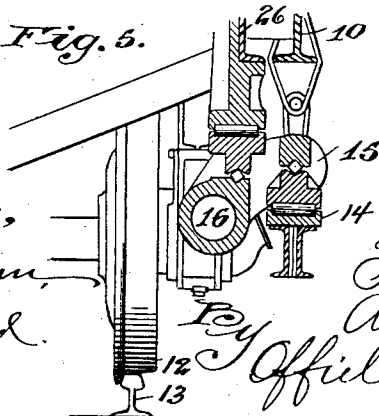


Fig. 5.



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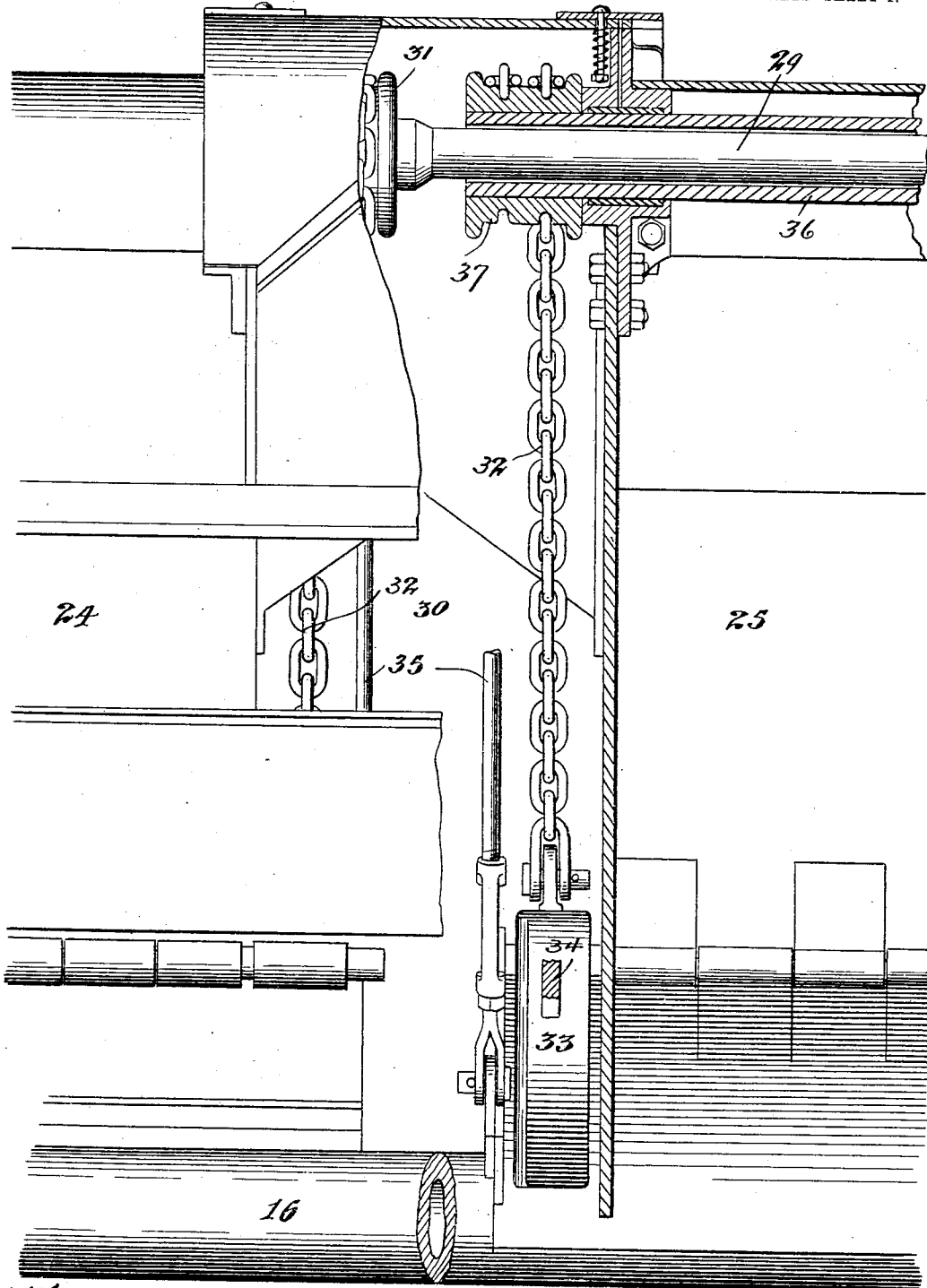
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6 SHEETS—SHEET 4.



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Fig. 4.

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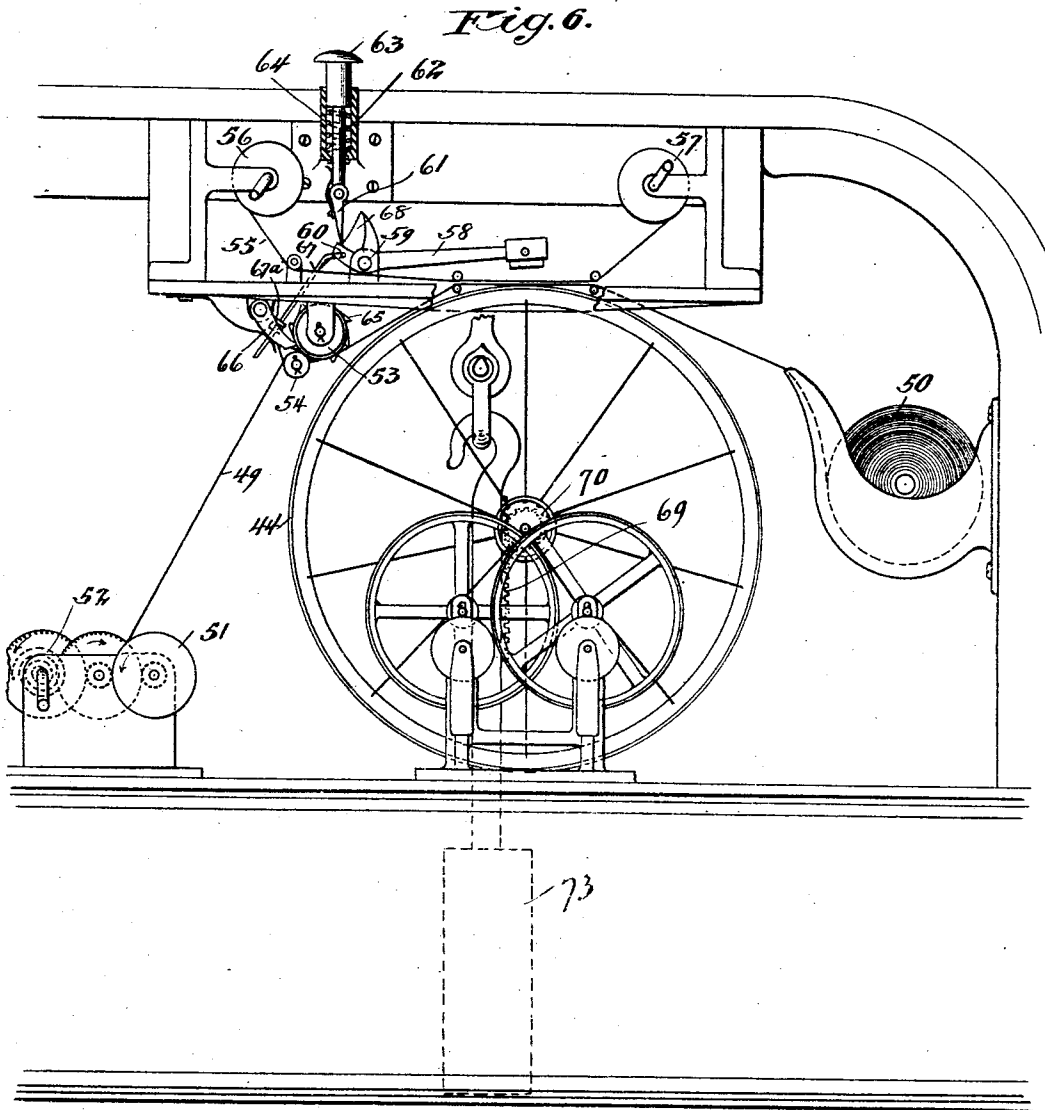
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6 SHEETS—SHEET 5.



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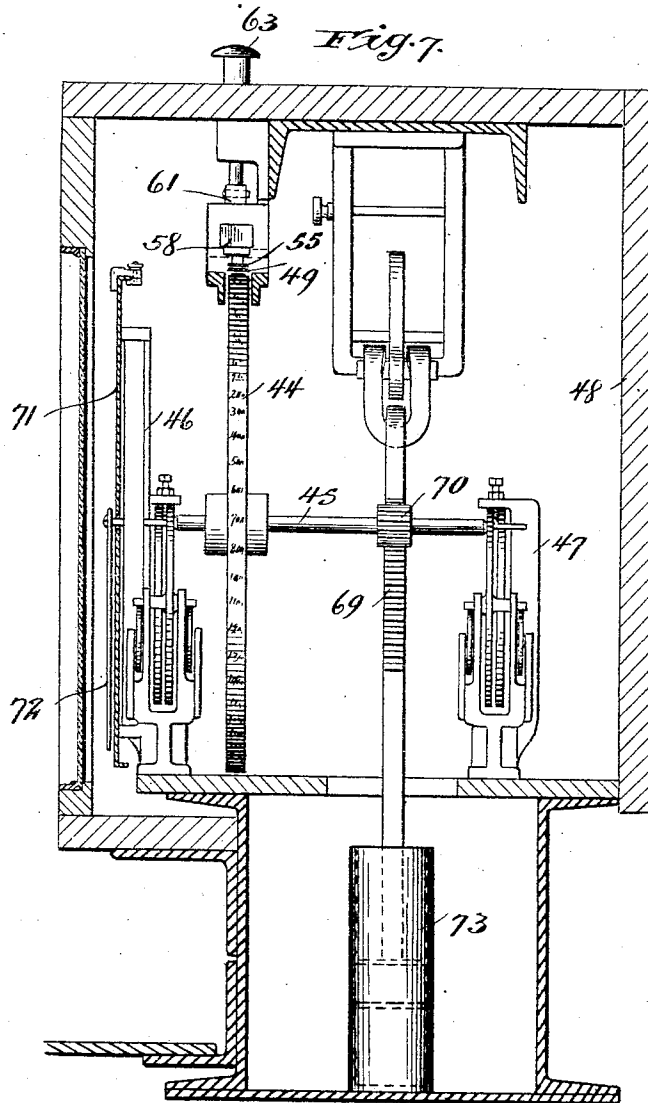
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6 SHEETS—SHEET 6.



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UNITED STATES PATENT OFFICE.

FRANK K. HOOVER AND ARTHUR J. MASON, OF CHICAGO, ILLINOIS.

SCALE-CAR.

933,452.

Specification of Letters Patent.

Patented Sept. 7, 1909.

Application filed November 24, 1902. Serial No. 132,615.

To all whom it may concern:

Be it known that we, FRANK K. HOOVER and ARTHUR J. MASON, both citizens of the United States, and residents of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Scale-Cars, of which the following is a specification.

This invention relates to scale cars such as are employed in transporting and delivering measured quantities by weight of ore, coke, coal, or other materials; and the invention has been designed more particularly with reference to its use in ore-handling plants for delivering measured quantities of ore, coke and flux to the skips which feed blast furnaces.

The difficulty which has hitherto been experienced in conducting large blast furnaces is that of delivering promptly and in exact predetermined quantities the needed ore, fuel and flux. These materials have hitherto been assembled in separate stock piles or other receptacles at points adjacent to the furnaces, and various kinds of conveying and delivering devices have been employed to supply the constituents of the furnace charge to the furnace skips; but such devices have hitherto lacked capacity for rapid work and for the delivery of exact proportions of the constituents, which is essential to the best results in the output of the furnaces.

With these faults and deficiencies of the prior art in view, our present invention has for its object to present a complete remedy therefor through the provision of a scale car adapted to receive from a series of storage bins or pockets exact measured quantities by weight of the constituents of the furnace charge, and transfer the loads thus taken and deliver the same to the furnace skips in a clean and thorough manner and with a maximum rapidity and despatch, thus avoiding delays in the feeding of the furnace which are so detrimental to the efficiency thereof.

To these and other ends our invention consists in a scale car having certain novel structural features particularly relating to the discharging mechanism, as hereinafter described and pointed out in the claims. We also preferably employ means for weighing, in full view of the operator, the load

as it is received, and also means associated with the weighing mechanism whereby the operator may record on a tape or other record the exact weight of each load received and delivered, so that the furnace master may ascertain from a subsequent inspection thereof just what has gone into the furnace and in what proportions.

Our invention will be best understood when considered in connection with the accompanying drawings which illustrate a preferred form thereof, and in which—

Figure 1 is a side elevational view of our improved scale car, with certain unimportant details omitted for the sake of greater clearness; Fig. 2 is an end view of the same partly broken away to show the weighing mechanism; Fig. 3 is a transverse vertical section through one of the compartments of the car, and clearly illustrating the hinged bottom feature thereof; Fig. 4 is an enlarged side elevation, partly broken away and partly in longitudinal section at the adjacent ends of the twin compartments of the car, more particularly illustrating the means for supporting and manipulating the hinged bottoms; Fig. 5 is a transverse sectional detail illustrating the manner of supporting the car-body and the scale-beams from the stationary frame-work of the car; and Figs. 6 and 7 are respectively side and end elevations of the recording devices, illustrating also the connection of the latter to the scale-arm.

Referring to the drawings, 10 designates the side members and 11 the end members of the main rectangular car frame, the end portions of which are mounted on suitable trucks 12 rolling on a track 13.

14 designates stirrups pivotally suspended from the side members of the car frame at each end thereof. said stirrups supporting on the usual knife-edges the outwardly-extending arms 15 at the ends of the longitudinal scale-beams 16 (Fig. 5). Fast on the ends of the scale-beams 16 are inwardly-extending arms 17 (Fig. 2), the inner ends of which lie in stirrups 18 themselves suspended from a double hook 19, which in turn is pivotally suspended from a lever-arm 20 near its fulcrumed point of suspension from the end member 11 of the car frame. The opposite end of said lever-arm 20 has a link connection 21 with the scale-arm 22, which

latter is fulcrumed at its point of suspension from a transverse stationary member 23 of the car frame.

Passing now to a consideration of the immediate load-receiving and carrying elements of the car, it may be noted that within our invention the car may be equipped with a single compartment or with two or more compartments, according to the longitudinal dimensions of the car frame and the quantities of material desired to be separately carried. The car herein shown has two longitudinally-alined twin load-carrying compartments, designated each as an entirety by 24 and 25, respectively. As these compartments are substantially identical in all constructional features, a detailed description of one will obviously suffice for both.

Referring more particularly to Fig. 3, which shows the compartment 25 in transverse section, it will be observed that the side walls 25^a of the compartment are secured to longitudinal side beams 26 lying within and parallel to the main side frame members 10, which beams 26 are supported through suitable intermediate roller and knife-edge connections (Fig. 5) on the scale-beams 16. The side walls 25^a, as also the end walls 25^b, of the compartment-body are vertical, as shown; and the entire bottom of the compartment is composed of a pair of inwardly and downwardly-inclined plate-sections 27 hinged longitudinally of their outer edges to the lower edges of the side walls 25^a, as shown at 28. When the bottom of the car is closed, the hinged sections 27 occupy the relative full line positions shown in Fig. 3, and when opened to dump or discharge the load they swing outwardly and downwardly to substantially the positions indicated in dotted lines in said figure. In order to insure a clean and certain delivery of even sticky materials, we have made all the stationary containing elements of the compartment vertical, while we have made the entire bottom thereof movable. In order that the movable bottom sections may be readily manipulated without requiring motor mechanisms which are more or less complicated and liable to get out of order, we have provided a construction wherein the weight of the load itself effects the opening of the bottom sections or doors, the latter being automatically returned to closed position when the load has been discharged through the agency of counterbalancing-weights, and maintained in such closed position during the reception and conveyance of the load by a lock in the form of a simple brake device which may readily be manipulated by the operator. In the drawings we have shown one form of such counterbalancing mechanism which in practice has thus far proved reliable and satisfactory. Referring thereto, 29 designates a shaft extending longitudi-

nally of and centrally above both compartments and suitably journaled at its opposite ends in the end uprights of the car frame. As shown in Fig. 4, there is between the adjacent end walls of the compartments 24 and 25 a narrow intermediate compartment 30. Fast on the shaft 29 just outside the end walls of the compartment 24 are a pair of pulleys 31 over which are passed chains 32, which chains connect at one end with counterweights 33 hinged by means of arms 34 adjacent to the end walls of the compartment near opposite sides thereof, while the other ends of said chains are connected through link-rods 35 with the hinged doors 27 near their free meeting margins. In order that the doors of the compartments may be separately and independently operated, there is mounted on that portion of the shaft 29 which extends through the other compartment 25 a sleeve 36 carrying on its opposite ends just outside the end walls of the compartment pulleys 37, over which are trained chains 32 connected up to the counterweights and the hinged doors in the manner already described. On the projecting end of the shaft 29 forward of the compartment 25 is mounted a brake-disk 38, and on the overhanging end of the sleeve 36 just in rear of the brake disk 38 is mounted a similar brake-disk 39, these disks being equipped with brake-straps 40 and 41, respectively, operated by hand-wheels 42 and 43.

In connection with the automatic weighing mechanism already described, we preferably employ means for readily and permanently recording the exact weight of every load received and delivered by the car and also means for visually indicating the weight of each load. For this purpose any known recording apparatus capable of use in this relation may be employed; and in the drawings we have shown such a known form of recording mechanism adapted to this particular situation.

Referring more particularly to Figs. 2, 6 and 7, 44 designates a recording disk having on its periphery permanent raised type indicating a graduated scale of weights. This disk is fast on a shaft 45 suitably mounted on the usual anti-friction bearings in a pair of uprights 46 and 47 housed within the casing 48 which incloses the scale-arm and its link and lever connections to the scale-beams. Over the periphery of the disk 44 is guided a tape 49, this tape being unwound from a spool 50, and wound up on a spool 51 actuated by any suitable clockwork mechanism 52. Between the receiving and delivery spools the tape passes between and is clamped by a pair of friction rolls 53 and 54, which rolls, when held against rotation as hereinafter described, arrest the winding up of the tape. 55 is an inking-ribbon extend-

ing between receiving and delivery spools 56 and 57, and suitably guided over the disk 44 directly above the tape 49. 58 is a hammer pivoted at 59 and having a tail-piece 60 adapted to be engaged and depressed by a finger 61 on the lower end of a rod 62 extending upwardly through the top of the housing and terminating in a push-button 63, whereby the rod and finger may be depressed to actuate the hammer, being returned and normally upheld by a coil spring 64. Fast with the friction roll 53 on one face thereof is a ratchet-disk 65, the teeth of which are engaged by a spring-pressed pawl 66. A rod 67 connected at its upper end to the tail of the hammer passes through the pawl 66, having a stop-pin or collar 67^a thereon through which a downward movement of the rod when the hammer is elevated thrusts the pawl away from the ratchet-disk. The point of the pivoted finger 61 engages and is guided by the inclined cam-surface of a stationary upright 68 disposed alongside of the tail-piece of the hammer, the result of which construction is that when the push-button 63 is depressed the hammer is elevated and simultaneously the pawl 66 is withdrawn to allow the tape to be drawn forward one step, but the continued depression of the button 63 to its full extent effects a disengagement of the point of the finger 61 from the heel of the hammer, thus allowing the head of the hammer to drop with a sudden sharp stroke and make a record upon the tape. On the subsequent release of the push-button, the finger 61 again engages the heel of the hammer and holds the same in its slightly elevated normal position as shown in Fig. 6. The disk 44 is rotated in proportion to and in accordance with the movements of the scale-arm through a vertical rack-bar 69 pendent from the nose of the scale-arm, and engaging a small pinion 70 on the shaft 45. One of the reduced bearings of the shaft 45 extends to the front of an indicating face 71 and is provided with a pointer 72. To prevent chattering of the pointer 72 when moving to indicate the weight of a load as it is received, the rack 69 is extended downwardly into a dash-pot 73, which serves to steady and prevent undue vibration of the end of the scale-arm.

The operation of the car has been to a considerable extent already indicated, but may be briefly described as follows: The car, is of course, equipped with a suitable motor for propelling it along its track,—preferably an electric motor, of which the controller is indicated at 74, and the trolley-pole, broken away, at 75. The car shown and described is best (though not exclusively) adapted for cooperation with ore pockets of the type shown in our Patent No. 702,731, granted June 17, 1902, and in taking on a load, whether of ore, fuel, or flux, the car is run

along the track to a position to bring one of its compartments directly above the discharge roller of the pocket, the hinged bottom sections of the compartments, of course, being in closed position. Upon rotating the discharge roller of the pocket the material contained in the latter is caused to fall in a regular and uniform stream into the compartment, and the gradually-increasing weight thereof acting through the scale mechanism causes the pointer of the indicating-dial to gradually move until it indicates exactly the weight of material desired to be taken. Simultaneously with this movement of the scale-pointer, the printing disk 44 rotates, and presents beneath the hammer 58 the type of a number of a weight-indicating numeral that corresponds with the numeral at which the scale-pointer stands. Thereupon the operator strikes or pushes the button 63, thereby recording on the tape 49 the exact weight of the load taken on, this act concurrently effecting the advance of the printing tape one step to a fresh printing position. One of the compartments having thus been filled and weighed, and the weight of the load recorded, the latter may at once be run to the furnace skip, or the car may be run to another pocket containing other material, and the second compartment filled and its load weighed and recorded in the manner already described. The track on which the car runs is designed to extend directly over the path of travel of one or more chains of furnace skips; and in discharging the car of its load or loads it is run to a position with one of its compartments directly over said skip. Thereupon the operator loosens the friction brake pertaining to that compartment which overlies the skip, and the weight of the entire load, acting substantially as a unit, immediately spreads and opens the hinged sections of the bottom, as shown in Fig. 3. Thereupon the operator quickly tightens the friction brake sufficiently to prevent the hinged sections from returning to closed position before the last of the material has fallen therefrom. In this way the entire load is discharged and dropped into the underlying skip, whence it is drawn up the incline and dumped into the furnace.

It will be observed as constituting a salient advantageous feature of our invention that the entire bottom of the compartment opens up for the quick and complete discharge of the load, while the only stationary elements of the compartment are the side and end walls, which, being vertical, do not permit even sticky material to adhere there-to. Hence the described construction insures the complete discharge of the load, thus insuring the reception by the furnace of nothing less than the full amount of the material intended to be delivered thereto. In this

way our invention contributes to the efficiency of the blast furnace itself, the best results from which are dependent upon the delivery thereto without delay of the ore, fuel and flux in certain predetermined exact proportions. Immediately upon the final discharge of the load from the compartment, the operator loosens the friction brake and the counterweights 33 instantly become effective to return the hinged sections of the bottom to closed position, after which they are locked in such position by the operator through the application of the friction brake 40 or 41, as the case may be. The car is then ready to return to the ore pockets or other receptacles for another load, and the above-described operation is repeated.

It is of course obvious that our improved scale-car is capable of useful employment in the handling and delivery of materials other than the ingredients supplied to an ordinary blast furnace in the manufacture of iron, although the invention has been more particularly designed for such employment. We do not, therefore, limit our invention either to the mechanical details of the separate elements of the car, many of which are old of themselves, nor to the use or employment of the car in the relation more particularly described.

We claim:

1. The combination with a car frame and its supporting trucks, of a scale mechanism mounted thereon, and a receptacle continuously supported by said scale mechanism and provided with automatically closing gravity-operated discharging means, said discharging means being provided with means for regulating the velocity of both its opening and its closing movements, substantially as described.

2. The combination with a car frame and its supporting trucks, of a scale mechanism mounted thereon and a receptacle continuously supported by said scale mechanism, the bottom of said receptacle being constituted by automatically closing hinged doors adapted to open and discharge the contents, and a means serving to release the doors, to regulate the velocity and extent of their

opening movement, the velocity of their closing movement, and to hold them when closed, substantially as described.

3. The combination with a car frame and its supporting trucks, of a scale mechanism mounted thereon and a receptacle continuously supported by said scale mechanism, the bottom of said receptacle being constituted by hinged doors adapted to open under the weight of the contents to discharge the latter, a means serving to release said doors, to regulate the velocity and extent of their opening movement, the velocity of their closing movement, and to hold them when closed, and means for automatically returning said doors to closed position upon the discharge of the contents of the receptacle, substantially as described.

4. The combination with a car frame and its supporting trucks, of a scale mechanism mounted thereon and a receptacle continuously supported by said scale mechanism, the bottom of said receptacle being constituted by hinged doors adapted to open under the weight of the contents to discharge the latter, a brake mechanism serving to release the doors, to regulate the velocity and extent of their opening movement, the velocity of their closing movement, and to hold them when closed, and counterbalance-weights connected to said doors and acting to return them to closed position when the receptacle has been emptied, substantially as described.

5. The combination with a car frame and its supporting trucks, of a scale mechanism mounted thereon, a receptacle continuously supported by said scale mechanism and provided with automatically closing gravity-operated discharging means, said discharging means being provided with means for regulating the velocity of its opening and closing movements, and a visual weight-indicating mechanism connected with said scale mechanism, substantially as described.

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