

Sept. 16, 1952

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2,610,843

SCALE WEIGHT TOTALIZING DEVICE

Filed Aug. 28, 1948

3 Sheets-Sheet 1

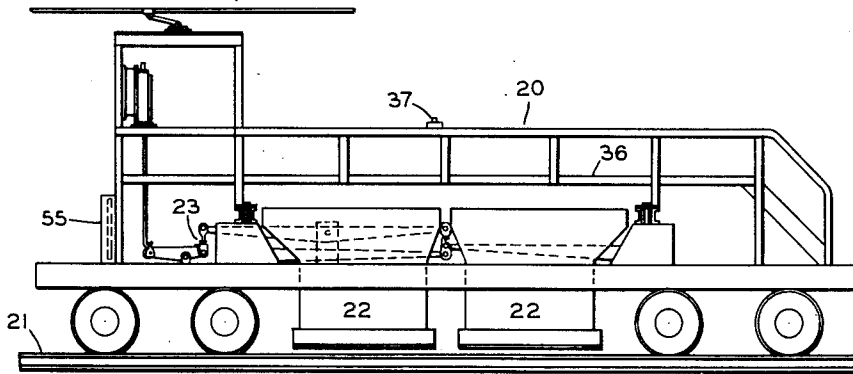


FIG-1

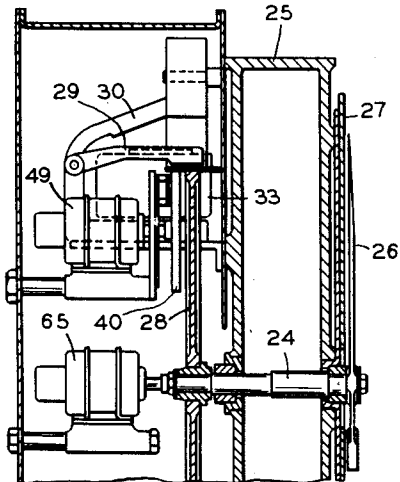


FIG-2

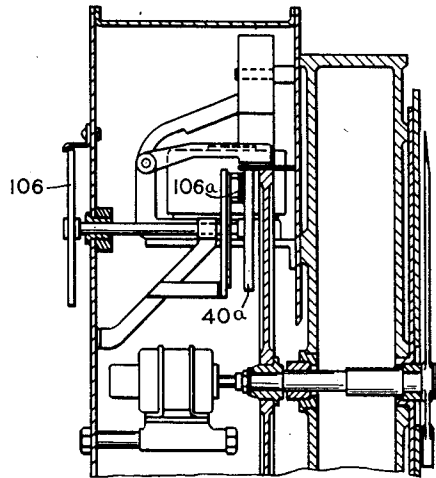


FIG-3

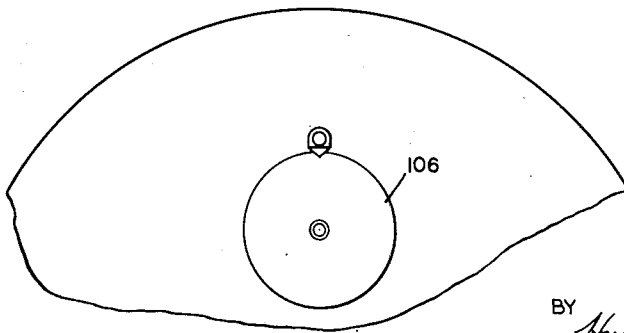


FIG-4

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3 Sheets-Sheet 2

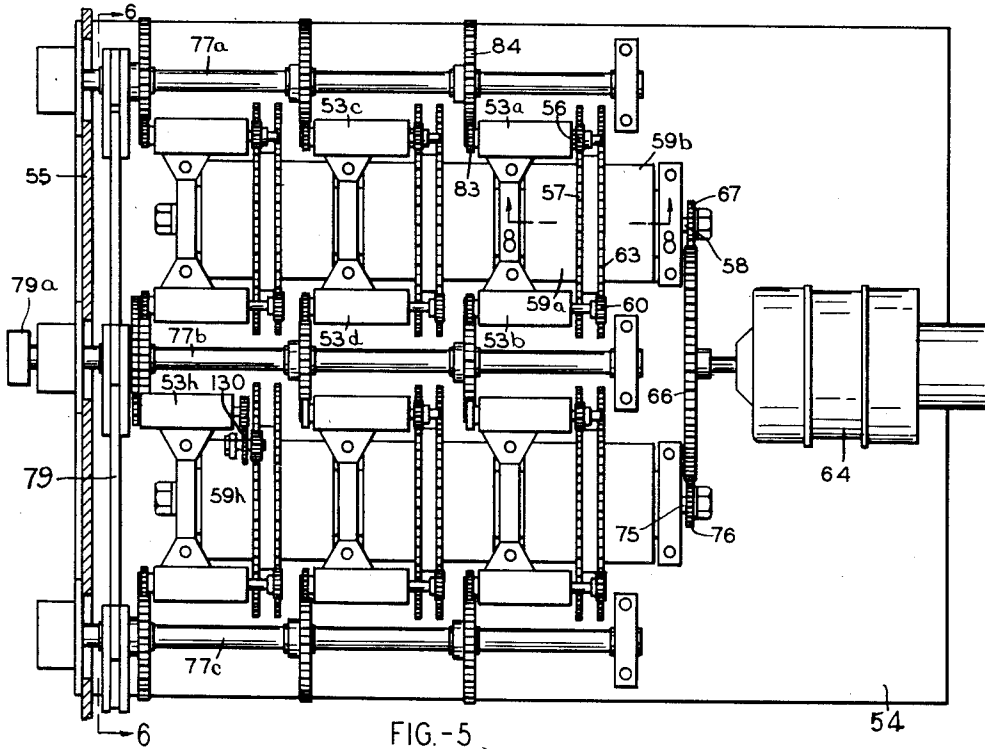


FIG.-5

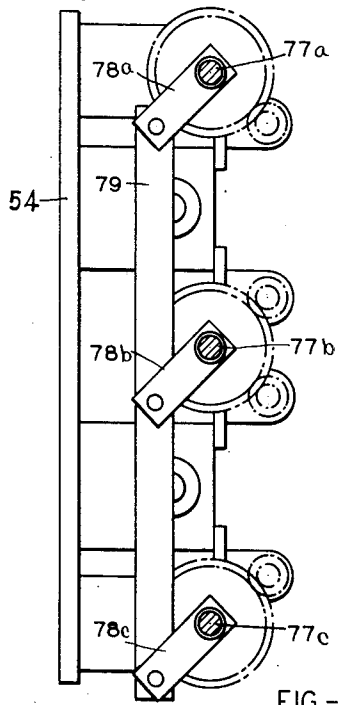


FIG.-6

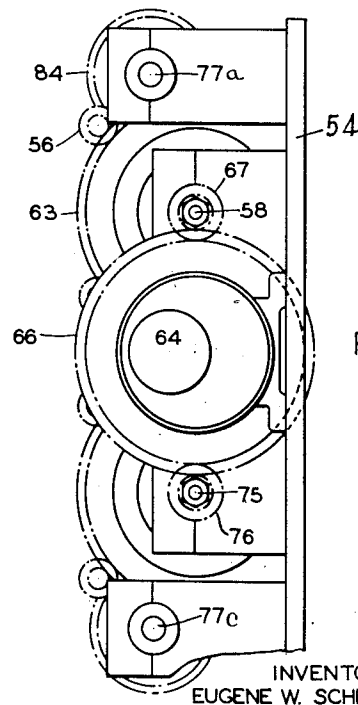


FIG.-7

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3 Sheets-Sheet 3

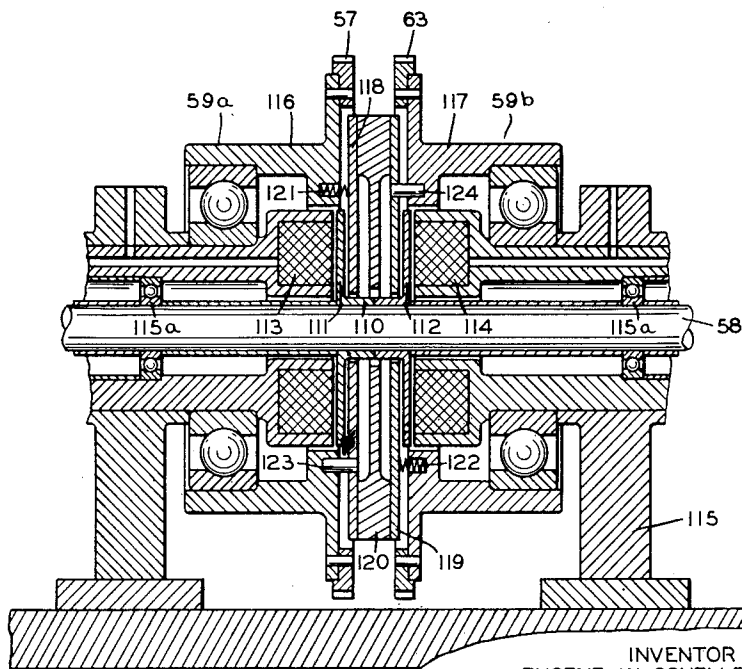
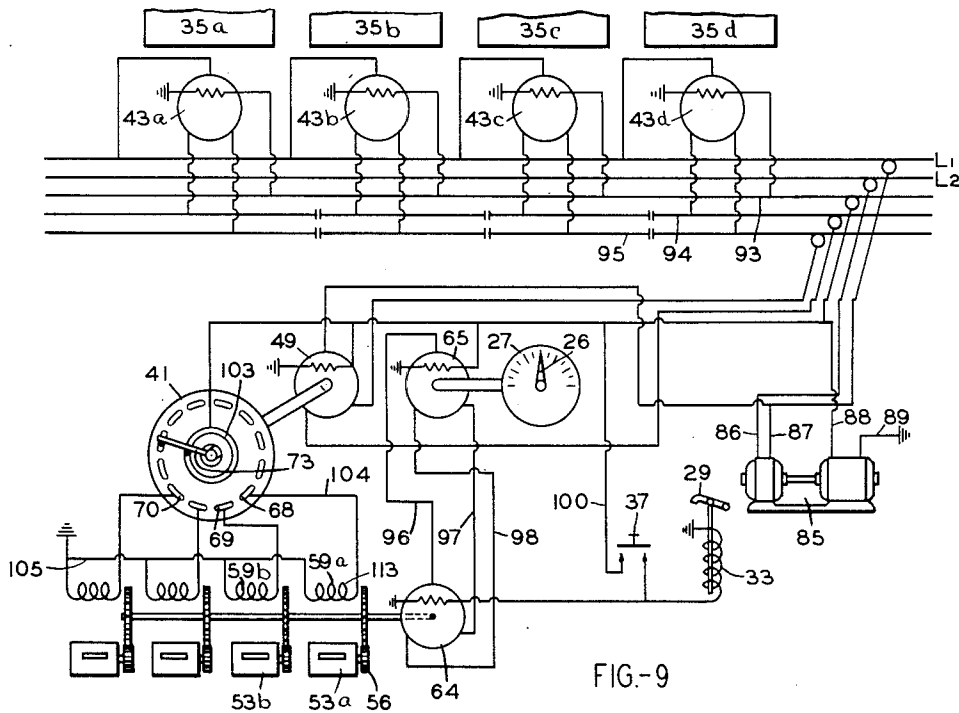


FIG-8

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UNITED STATES PATENT OFFICE

2,610,843

SCALE WEIGHT TOTALIZING DEVICE

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Application August 28, 1948, Serial No. 46,637

7 Claims. (Cl. 265—5)

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The invention relates to novel and improved weight recording, identifying, and totalizing means for registering, indicating, and individually totalizing the weights of successive charges of materials delivered to a container of either stationary or movable type.

While my invention is adaptable to a variety of uses in the industrial field, it will be described with relation to the charging of a blast furnace. As is well known to those skilled in metallurgical arts, predetermined charges of raw materials such as coke, limestone, iron ore, etc., are conveyed from a receiving zone to the skip hoist of the furnace, which elevates the material and dumps it into a hopper at the furnace top. The molten iron is tapped off near the bottom. The process is a continuous one, over relatively extended periods, and as the charged material settles to the molten zone, fresh charges are periodically added.

It is necessary that the amounts of the several ingredients be carefully predetermined in the light of various operating factors, and the weight and character of each charge should therefore be controlled and recorded, preferably in such manner as to eliminate the personal equation comprising the fallibility of unskilled operators.

In U. S. Patent No. 1,909,724, granted to me on May 16, 1933, there is disclosed improved mechanism which not only indicates the amount of each individual charge delivered from a charging source to a conveyor, but also automatically records such weight, and, by means of identifiable characters, establishes the individual identity of each ingredient of the charge in conjunction with its individual weight.

Since the development of the invention covered by my said prior patent, the need has arisen for an automatic means which indicates and records the weight of each ingredient comprising a total charge, and in addition is capable of automatically segregating and totalizing the amount of each single ingredient added during a working period which comprises a plurality of successive charges, such as for example the total amount of iron ore, and/or coke, and/or limestone added to a continuously operating blast furnace within a 24 hour operating period.

An object of the present invention, therefore,

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is to provide novel and improved scale means which identifies and individually records the weight of each ingredient added to a charge, and which totalizes the weight of each individual ingredient over a succession of charges in a continuous time period.

Other objects and advantages will be apparent from a study of the following specification, in conjunction with the accompanying drawings, in which

Fig. 1 is a conventional side elevational view of a traveling dump car which supplies the skip hoist of a blast furnace;

Fig. 2 is a vertical sectional view, somewhat enlarged, of a portion of the weight indicating, recording and totalizing means shown in side elevation in Fig. 1;

Fig. 3 is a view similar to Fig. 2 but showing a somewhat modified embodiment of the apparatus;

Fig. 4 is a fragmentary elevational view as seen from the left in Fig. 3;

Fig. 5 is a top plan view of a bank of totalizers, with ancillary operating means, responsive to operation of the apparatus shown in Figs. 2 or 3;

Figs. 6 and 7 are, respectively, left and right end elevational views of the totalizer bank shown in Fig. 5;

Fig. 8 is a vertical sectional view, somewhat enlarged, taken on the line 8—8 of Fig. 5;

Fig. 9 is a schematic and diagrammatic showing of the essential elements of the present invention.

As previously mentioned, the invention is shown as applied to a dumping railway car such as is used in conveying raw materials to a blast furnace hoist. The indicating, recording, and totalizing devices are carried on the car which is also provided with electrical motive and operating means under the control of an operator who rides the car.

The car shuttles on a track between a plurality of loading positions and a delivery position. A plurality of bins, or car loading chutes, occupy the respective loading positions. Starting from the bin most remote from the delivery position the car receives successive loads of ingredients at the respectively successive bins. As will appear, the increments of increasing car

load are automatically recorded and identified when charged into the car, and as part of the same operation the individual weight of each ingredient is accumulated on a respectively individual totalizer, a bank of such totalizers being carried on the car. At the end of a day, or a week, or any desired period, the total appearing on each totalizer may be examined and copied, and if desired the totalizers may then be reset to zero to begin a new period.

As part of the means whereby these ends are accomplished, I show paired sets of Selsyn motors disposed and connected as will hereinafter more specifically appear. A Selsyn (or self-synchronous) couple consists of two paired motors, the armatures of which are electrically coupled in such manner that when the armature of one (then known as the transmitter) is turned through any desired angle, the armature of the other (then known as the receiver) automatically follows suit in the same direction and through exactly the same angular extent. If the coupling between the pair of Selsyns is completed after one has been turned, the other will instantly turn to the same angular position.

In my prior U. S. Patent No. 1,909,724 above referred to, I disclose the use of a respective Selsyn transmitter associated with each material bin, and successively connectible with a single receiving Selsyn during charging of the car from each such bin, in such manner that the receiving Selsyn causes identification of the charge from each bin as the weight of such charge is automatically recorded. This operation will be briefly reviewed hereinbelow in conjunction with the novel and improved automatic totalizer now herein to be disclosed.

In operating under the present invention, I use two distinct Selsyn-controlled operations, but both interrelated to accomplish the final result.

In one operation, whereby individual charge weights are identified and totalized, I use paired Selsyns herein sometimes termed for convenience the material-identifying Selsyns. In this system a Selsyn transmitter is disposed adjacent each charging point, and a common Selsyn receiver, connectible to each such transmitter in turn, operates a rotatable type wheel carrying, spaced thereon, identifying characteristics adapted to be recorded on a traveling paper strip or other means, so that as the car stops by a charging point, the type wheel identifies the stopping point on the strip. While the system so far described in this paragraph has previously been disclosed in my prior U. S. Patent Number 1,909,724 heretofore mentioned I have now provided novel and improved additional features, as follows.

I have provided a bank of mechanical counters of the numerically progressing or accumulating type, each counter being adapted to accumulate a total of successive charges of a single ingredient. The counters are driven by a main shaft, or by a single drive means which energizes two or more such shafts simultaneously, the shaft or shafts being responsive to the rotation of a Selsyn receiver, which in turn responds to a Selsyn transmitter, this present Selsyn couple being herein sometimes identifiable as the weight-registering Selsyns. Each counter is coupled to its driving shaft through an individual clutch arrangement, and the clutches are normally disengaged. As the car receives a load, for instance of coke, the weight-registering Selsyn transmitter rotates, and with it the weight-registering Selsyn receiver and all counter driving shafts. As will im-

mediately appear, however, only one clutch has been energized, and only one counter, in the present instance the coke counter, turns to total the weight of coke just added.

Associated with the shaft of the type wheel, which turns responsive to the material-identifying Selsyn receiver as above noted, is a traveling contact means adapted to select and complete a circuit to the proper clutch, as mentioned in the last paragraph. This contact means closes only one circuit to one clutch, and therefore only one counter registers the weight added at one charging station.

While the system is completely automatic and fool proof as just described, manual control may be substituted for the clutch selecting contact arm, as will appear.

Referring now to the drawings, and first to Fig. 1, the traveling dump car 20 shuttles on track 21, and in the illustrated embodiment, it carries two hoppers 22 which rest on a weight-responsive leverage system 23. The leverage system is operatively connected to a shaft 24 (Fig. 2) rotatable in a housing 25 carried on one end of the car. Shaft 24 has affixed thereto near one end a pointer 26 which swings in registry with scale indicia on a dial 27 whereby an operator may visually observe the total car weight after any charge. Near the other end of shaft 24 is a disk 28, termed for convenience a type wheel, which carries on its periphery a series of type figures corresponding to the range of weight of the loads to be handled. Adjacent the top of the type wheel is a hammer 29 arranged to be actuated towards the type wheel by means of an armature 30 upon energization of a solenoid 33. The type wheel turns with shaft 24 and pointer 26 so that the weight indicating number on the type wheel periphery always corresponds with the total car load. A roll of paper record strip is continuously advanceable between the hammer and the type wheel periphery by suitable feeding mechanism. After the discharge of each increment of load into the car the solenoid 33 is energized, as will appear, the hammer strikes the paper strip against the type wheel, and a weight record is made on the strip.

The car is movable along track 21 past a succession of charging bins 35a, 35b, etc. (Fig. 9), each arranged to discharge into the car, and controllable manually or otherwise by the operator who can walk along the car runway 36. Adjacent the operator as he operates the bin discharge control is a button 37 with which he energizes solenoid 33 to cause an operation on the weight recording strip as previously described. The car is power driven by means not shown, but more fully described in my U. S. Patent No. 1,909,724.

Means for identifying the discharge from each bin, and recording the identification will now be described, since such description is necessary for a thorough understanding of the totalizing apparatus.

Immediately adjacent the weight type wheel 28 is mounted an identifying type wheel 40, whose periphery bears a plurality of indicia corresponding respectively to the various materials in the bins, for example "C" for coke, "L" for limestone, etc. Any one of these indicia is respectively registrable on the paper strip adjacent the weight as the hammer 29 operates. Each bin has associated therewith its individual Selsyn transmitter 43a, 43b, 43c, 43d, etc. (Fig. 9) operatively associatable in turn with a Selsyn receiver 49 on the shaft of identifying wheel 40 as will later appear from a description of the wiring arrangement.

Each individual Selsyn transmitter armature 43a, etc., is present at its own distinctive position, so that movement of the car from one position to the next causes Selsyn receiver 49 to turn wheel 40 to a respectively corresponding distinctive position so that the weight and character of each increment of load is recorded, in juxtaposition, on the paper record strip. This is the identifying Selsyn system previously mentioned.

The totalizing system, responsive to the apparatus just described, will now be disclosed in detail, reference being had at first to Figs. 5, 6 and 7.

A bank of counters 53a, 53b, 53c, etc., is assembled on a base 54 which is carried in a housing 55 on the car. All counters operate similarly, and only the operation of counters 53a and 53b will be described. Counter 53a is directly coupled by a pinion 56 to a ring gear 57 which is energized from shaft 58 through a normally disengaged electric clutch 59a. Counter 53b is similarly coupled through pinion 60, and ring gear 63 to a clutch 59b. Shaft 58 is responsive to the rotation of Selsyn receiver 64 which is coupled to Selsyn transmitter 65 (Fig. 2) on weight responsive shaft 24. Summarizing this phase of the operation, any load dumped into the car rotates shaft 24 and the armature of Selsyn transmitter 65, and, responsive thereto, Selsyn receiver 64 causes rotation of shaft 58 through gears 66 and 67. If the proper clutch, for example clutch 59a, has been energized, counter 53a will register the weight just dumped in the car. This is controlled as follows.

A fixed contact disk 41 (Fig. 9) is disposed adjacent to and coaxial with type wheel 40, and carries a plurality of switch contacts 68, 69, 70 etc., which are adapted to be wiped in succession by a rotatable wiper arm 73 rotating with the type wheel 40. As will appear, as the type wheel 40 registers the "coke" position, wiper arm 73 closes the contacts to the "coke" circuit which includes a clutch 59a. Clutch 59a is engaged putting shaft 58 in direct drive relationship with counter 53a, the "coke" counter. As soon as the coke load is dumped into the car, shaft 24 turns and with it pointer 26, weight type wheel 28, and Selsyn transmitter 65. As heretofore described, the operator thereafter presses button 37, Selsyn receiver 64 turns, and since clutch 59a is energized, the coke load is accumulated on counter 53a.

Referring further to Figs. 5, 6 and 7, Selsyn receiver 64 also operates shaft 75, through its ring gear 66 and a pinion 76 on the end of shaft 75. Another group of counters, each with its respective clutch control, is associated with shaft 75. Only one driving shaft would have been sufficient, but the provision of two shafts permits shortening of the overall length of the assembly.

A conventional arrangement is shown for returning all counters to zero at the end of any desired computing period. Briefly, it comprises three shafts 77a, 77b, 77c having levers 78a, 78b, 78c fixed to respective ends of the shafts. All three levers are pivotally attached to a rocker link 79. Each counter is operatively engageable with one of the shafts, and referring to counter 53a, such engagement is effected through gears 83 and 84. When it is desired to clear all counters to zero, link 79 is rocked for example by a lever 79a to produce the desired effect.

Referring to the schematic wiring diagram of Fig. 9, lines L₁ and L₂ constitute a D. C. power supply which may be used to supply driving

power for the car, by circuit means not shown. Since the Selsyn system requires A. C. power a motor generator set 85 is energized from L₁, L₂, through conductors 86 and 87, and A. C. is developed and supplied through conductors 88 and 89, the latter being grounded. As may be noted, all Selsyns have one A. C. ground connection for their field wiring, and one wired A. C. connection in circuit with conductor 88. The motor-generator set is located on the car, and the bin Selsyns 43a-43d maintain their circuits through trolley wires 93, 94, 95. Wire 93 is continuous, supplying the field connection simultaneously for all bin Selsyns, but wires 94 and 95 are broken between each bin, as shown, so that when the car stops by any bin, only that bin's transmitter is in circuit with Selsyn receiver 49 of the material-identifying system. Selsyns 64 and 65 of the weight transmitting system, being both on the car, have their armatures directly connected through leads 96, 97, and 98, but the field connection to Selsyn receiver 64 is broken at switch 37 in conductor 100 (from A. C. main lead 88) to prevent response of the counter drive until after a load has been discharged, and the proper clutch has been energized. Closing of switch 37 also energizes solenoid 33 to operate hammer 29 as heretofore mentioned. A circuit to a particular clutch proceeds, for example, from A. C. line 88 through continuous ring 103, arm 73, line 104, coil 113 of clutch 59a and line 105 to ground.

Fig. 3 shows a somewhat modified clutch control in which manually rotatable means 106 turns the contact arm 106a to identify the bin from which the charge is being received, thereby closing the circuit to the proper clutch and eliminating Selsyns 43 and 49 of the prior embodiment, since such manual operation also turns the type wheel 40a. This system is not preferred since it introduces the possibility of operator error.

In referring to the counter bank arrangement shown in Fig. 5, I have spoken, for example, of clutch 59a and clutch 59b, and have described them as independently operatable mechanisms which they actually are. Referring to Fig. 8, in which I have again used reference characters 59a and 59b as generally relating, respectively, to the left and right sides of the figure, it will be apparent that I have provided novel and improved magnetic clutch means, the specific advantages of which will be apparent after a description of the construction and operation of the clutch device.

Shaft 58 has attached thereto a member 110, U-shaped in cross section, having parallel disk portions 111 and 112 which, of course, rotate with the shaft. Opposed ring shaped magnet coils 113 and 114 are fixed with respect to the base 115, the shaft 58 rotating in bearings 115a within the magnet coil supports. A pair of sleeves 116 and 117 are rotatable, respectively, around and concentric with the fixed magnet coil supports. Previously mentioned ring gears 57 and 63 are fixed to sleeves 116 and 117.

Between disks 111 and 112 are a pair of spaced armature disks 118 and 119. Armature 118 is adapted to be attracted towards disk 111 when magnet 113 is energized, but is normally urged into contact with a fixed, centrally disposed brake disk 120 by springs 121. Armature 119 is similarly inwardly biased by springs 122. Armatures 118 and 119 are disposed to rotate respectively with sleeves 116 and 117, being loosely pinned thereto by pin and socket arrangements 123 and 124.

The operation is as follows. Magnets 113 and 114 are normally de-energized and movable armatures 118 and 119 are spring biased to contact with fixed brake 120. As a result sleeves 116 and 117 are held immovable, and so, of course, are ring gears 57 and 63. The two counters associated with the ring gears do not move, even if shaft 58 is rotated by Selsyn receiver 64 (Fig. 5).

Assume that magnet coil 113 is energized. Armature 118 is attracted to contact with disk 111. If now shaft 58 rotates, and disk 111 rotates with it, sleeve 116 and ring gear 57 also rotate, causing operation of counter 53a.

Similarly, energization of magnet coil 114 would place sleeve 117, ring gear 63, and counter 53b in driving association with shaft 58.

The main advantageous feature of this arrangement is the provision of a fixed system of magnet coils and a rotatable armature. In previous magnetic clutch structures the coils were rotatable, thereby requiring commutators, etc., to complete the electrical circuits.

At the option of the user, the devices just described are adapted to include an overall totalizing counter which registers the total weight dumped into the blast furnace or other charge-receiving receptacle over any given interval. Briefly speaking it consists of a counter mechanism similar to those already described, but provided with reverse gearing, so that when the load is dumped, and as a consequence the scale pointer 26 and its shaft 24 turn in reverse direction, the Selsyn transmitter 65 transmits the effect to the Selsyn receiver 64. A position-identifying Selsyn at the dumping station functions similarly to Selsyns 43a, 43b, etc., already described, so as to energize a clutch, for example 59h (Fig. 5) when the car arrives at dumping position. Clutch 59h is geared, through conventional reverse gearing 130, to counter 53h. The purpose of the reverse gearing is merely to permit the use of a counter identical in all respects with the others in the assembly, but adapted to show numerical forward progression when the drive shaft 75 is traveling in reversed direction responsive to Selsyn receiver 64.

The operation of the overall total weight counter will be obvious from what has already been said. As the car advances from one charge-receiving position to another, the respective individual counters accumulate individual charge weights although the scale pointer and type disk show total weights for the car load. When the car moves to the dumping position, clutch 59h puts counter 53h in driven relationship with drive shaft 75 and Selsyn 64. When the car is dumped, scale shaft 24 reverses, Selsyn 65 turns backward with the shaft, Selsyn 64 turns drive shaft 75 backwards, and counter 53h, by reason of its reverse gearing, turns forwardly to show the total weight being dumped. This overall totalizing counter means continues to accumulate total weight dumped from the car until such time as all counters are cleared as heretofore described.

While the apparatus herein disclosed has been described with special reference to a system wherein a movable dump car moves past a plurality of charging points, it is apparent that the advantageous features of the invention can be utilized to good purpose in a fixed scale installation on which successive loads of the same or different ingredients are weighed.

What I claim is:

1. In a material receiving and conveying system wherein a car is movable along a way between

a plurality of car charging positions and a car discharging position, and where loading means is provided at each such car charging position for loading a respective plurality of different ingredients into the car, in combination, an ingredient identifying member rotatable to a plurality of indexed points corresponding to respective charging positions, weight indicating means rotatable responsive to change in car weight at any loading position, and disposed adjacent said ingredient identifying member, and individual ingredient weight totalizing means comprising a plurality of independent weight counters, driving means for said weight counters, each such counter having a normally disengaged clutch adapted to couple it to said driving means, a totalizing Selsyn transmitter coupled to said weight indicating means, a totalizing Selsyn receiver coupled to said driving means and to said totalizing Selsyn transmitter, whereby movement of said weight indicating means produces corresponding movement of said driving means, each said clutch being responsive only to position of said identifying member in one said indexed point, whereby driving movement of said driving means is effective only upon one said clutch and upon its respective counter.

2. In a material receiving and conveying system wherein a car is movable along a way between a plurality of car charging positions and a car discharging position, and where loading means is provided at each such car charging position for loading a respective plurality of different ingredients into the car, in combination, an ingredient identifying member rotatable to a plurality of indexed points corresponding to respective charging positions, weight indicating means rotatable responsive to a change in car weight at any loading position, and disposed adjacent said ingredient identifying member, and individual ingredient weight totalizing means comprising a plurality of independent weight counters, driving means for said weight counters, each such counter having a normally disengaged clutch adapted to couple it to said driving means, a totalizing Selsyn transmitter coupled to said weight indicating means, a totalizing Selsyn receiver coupled to said driving means and to said totalizing Selsyn transmitter, whereby movement of said weight indicating means produces corresponding movement of said driving means, each said clutch being responsive only to position of said identifying member in one said indexed point, whereby driving movement of said driving means is effective only upon one said clutch and upon its respective counter, and means for rendering effective the coupling between said Selsyn transmitter and said Selsyn receiver only after energization of a clutch responsive to an indexed position of said identifying member.

3. In a material receiving and conveying system wherein a car is movable along a way between a plurality of car charging positions and a car discharging position, and where loading means is provided at each such car charging position for loading a respective plurality of different ingredients into the car, in combination, ingredient identifying means comprising an identifying Selsyn receiver on said car, differently indexed Selsyn transmitters one adjacent to each loading position, an ingredient identifying member rotatable to a plurality of indexed points corresponding to respective charging positions, said member being movable responsive to said identifying Selsyn receiver, electric circuit means

responsive to car position providing an operative connection between a respective one of said identifying Selsyn transmitters and said identifying Selsyn receiver, weight indicating means rotatable responsive to change in car weight at any loading position and disposed adjacent said ingredient identifying member, and individual ingredient weight totalizing means comprising a plurality of independent weight counters, driving means for said weight counters, each such counter having a normally disengaged clutch adapted to couple it to said driving means, a totalizing Selsyn transmitter coupled to said weight indicating means, a totalizing Selsyn receiver coupled to said driving means and to said totalizing Selsyn transmitter, whereby movement of said weight indicating means produces corresponding movement of said driving means, each said clutch being responsive only to position of said identifying member in one said indexed point whereby driving movement of said driving means is effective only upon one said clutch and its respective counter.

4. In a material receiving and conveying system wherein a car is movable along a way between a plurality of car charging positions and a car discharging position, and where loading means is provided at each such car charging position for loading a respective plurality of different ingredients into the car, in combination, ingredient identifying means comprising an identifying Selsyn receiver on said car, differently indexed Selsyn transmitters one adjacent to each loading position, an ingredient identifying member rotatable to a plurality of indexed points corresponding to respective charging positions, said member being movable responsive to said identifying Selsyn receiver, electric circuit means responsive to car position providing an operative connection between a respective one of said identifying Selsyn transmitters and said identifying Selsyn receiver, weight indicating means rotatable responsive to change in car weight at any loading position and disposed adjacent said ingredient identifying member, and individual ingredient weight totalizing means comprising a plurality of independent weight counters, driving means for said weight counters, each such counter having a normally disengaged clutch adapted to couple it to said driving means, a totalizing Selsyn transmitter coupled to said weight indicating means, a totalizing Selsyn receiver coupled to said driving means and to said totalizing Selsyn transmitter, whereby movement of said weight indicating means produces corresponding movement of said driving means, each said clutch being responsive only to position of said identifying member in one said indexed point, whereby driving movement of said driving means is effective only upon one said clutch and its respective counter, and means for rendering effective the coupling between said totalizing Selsyn transmitter and said totalizing Selsyn receiver only after energization of a clutch responsive to an indexed position of said identifying member.

5. In a material receiving and conveying system wherein a car is movable along a way between a plurality of car charging positions and a car discharging position, and where loading means is provided at each such car charging position for loading a respective plurality of different ingredients into the car, in combination, weight indicating means rotatable responsive to change in car weight at any loading position,

individual ingredient weight totalizing means comprising a plurality of independent weight counters, driving means for said weight counters, each such counter having a normally disengaged clutch adapted to couple it to said driving means, a totalizing Selsyn transmitter coupled to said weight indicating means, a totalizing Selsyn receiver coupled to said driving means and to said totalizing Selsyn transmitter, whereby movement of said weight indicating means produces corresponding movement of said driving means, an ingredient identifying member rotatable to a plurality of indexed points corresponding to respective charging positions, a plurality of switches respectively corresponding to each such indexed point, a plurality of electric circuit means, each such circuit including one said switch and being effective upon one said clutch, a contact arm operatively coupled with said ingredient identifying member to rotate therewith and effective to close a corresponding circuit and energize a clutch when said ingredient identifying member stops in an indexed position, whereby, upon energization of said last named clutch, a single counter is placed in operative association with the driving means and with the identifying means so as to totalize the weight of an identified ingredient charged into the car.

6. Material receiving and weighing apparatus adapted to respond to, indicate, and totalize the weights of successively received charges of different ingredients, comprising, in combination, ingredient identifying means movable to a plurality of registry points corresponding to a respective plurality of receivable ingredients, means for indicating the weight of each said ingredient so received, and ingredient weight totalizing means comprising a plurality of operationally independent weight counters, driving means for said weight counters, each such counter having a normally disengaged clutch adapted to couple it to said driving means, a totalizing Selsyn transmitter coupled to said weight indicating means, a totalizing Selsyn receiver coupled to said driving means and to said totalizing Selsyn transmitter, whereby movement of said weight indicating means produces corresponding movement of said driving means, each said clutch being responsive only to position of said identifying member in one said registry point, whereby driving movement of said driving means is effective at one time only upon one said clutch and upon its respective counter, and means for rendering effective the coupling between said Selsyn transmitter and said Selsyn receiver only after energization of a clutch responsive to a registry position of said identifying means.

7. In a material receiving and conveying system wherein a car is movable along a way between a plurality of car charging positions and a car discharging position, and where loading means is provided at each such car charging position for loading a respective plurality of different ingredients into the car, in combination, ingredient identifying means movable to a plurality of registry points corresponding to a respective plurality of car charging positions, ingredient weighing means including a part movable in proportional response to respective ingredient weights, ingredient weight totalizing means comprising a plurality of operationally independent weight counters, one respectively for each ingredient, and means comprising a Selsyn motor couple, mechanical linkage uniting the first member of said

couple with said movable part whereby said first member moves responsive to movement of said movable part, a rotatable shaft, individual clutch means for each counter and adapted to transmit actuating movement from said shaft to said counter when its respective clutch is operated, mechanical linkage uniting said shaft with the second member of said couple, and individual electric circuit means for each clutch, each such circuit being closed during registry of the car with a respective charging position, whereby, at such registry, a respective clutch is energized to permit actuation of one such counter by the afore-said shaft movement.

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