H. J. STEHLI.

FEEDING MECHANISM.

APPLICATION FILED APR. 27, 1911.

1,215,739.

Patented Feb. 13, 1917.

2 SHEETS—SHEET 1.

Fig. 2.

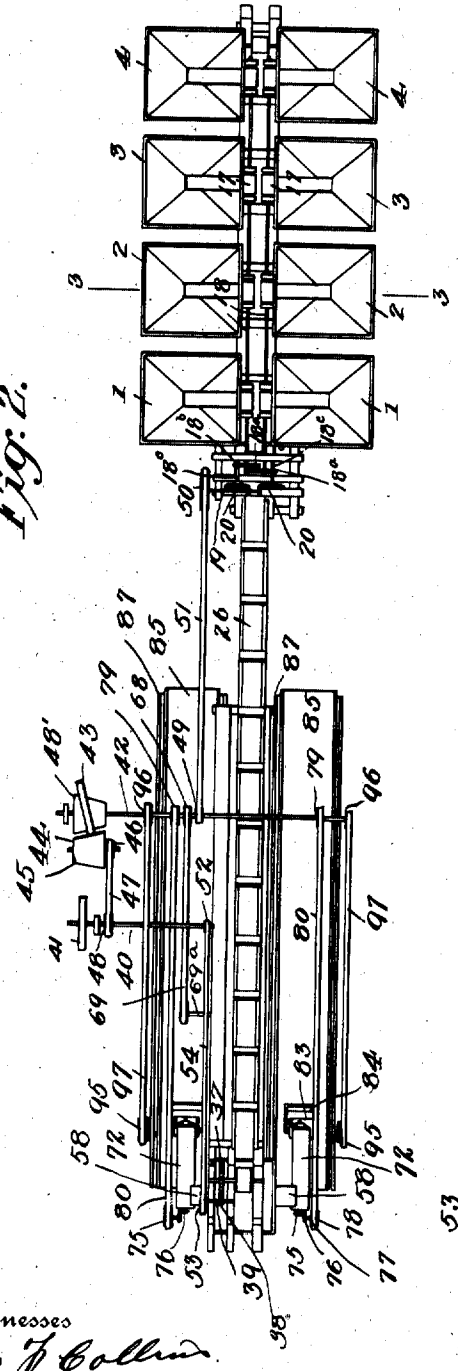
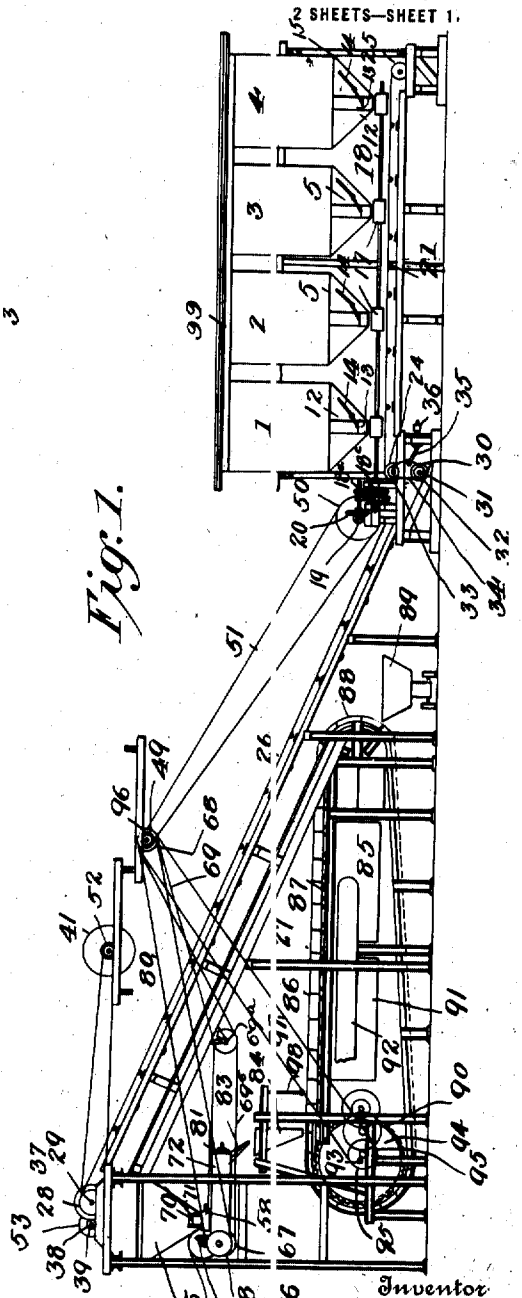


Fig. 1.



Witnesses

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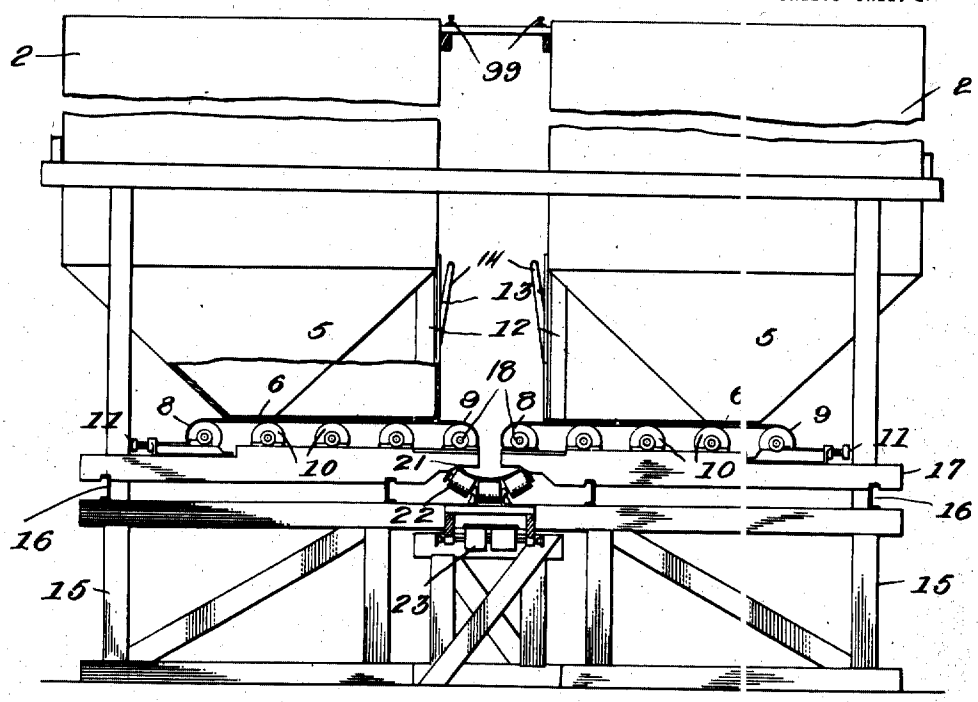


Fig. 3.

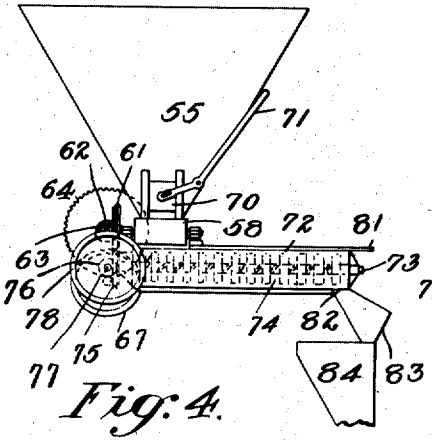


Fig. 4.

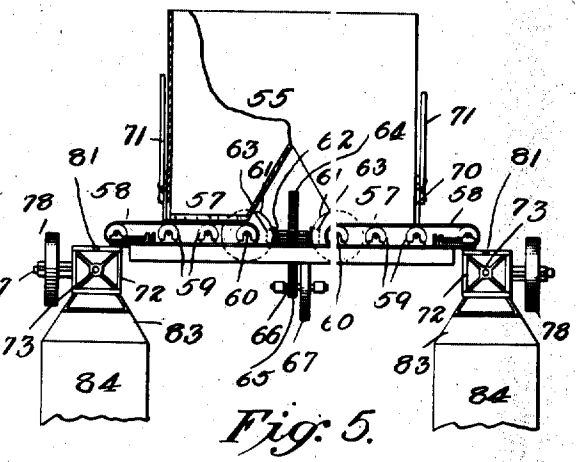


Fig. 5.

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UNITED STATES PATENT OFFICE

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FEEDING MECHANISM.

1,215,739. Specification of Letters Patent. Patented Feb. 13, 1917.

Application filed April 27, 1911. Serial No. 623,594.

To all whom it may concern:

Be it known that I, HENRY J. STEHLI, citizen of the United States, residing at Montclair, in the county of Essex and State of New Jersey, have invented certain new and useful Improvements in Feeding Mechanisms, of which the following is a specification, reference being had therein to the accompanying drawing.

This invention relates to improvements in mechanisms of the class of those used for producing composite masses of materials from two or more differing initial submasses.

One of the objects of the present invention is to provide means whereby there can be finally and continuously formed a relatively shallow stratum uniform throughout in its depth and other dimensions, and constituting a body which is, throughout, uniform in physical condition and chemical constitution at all points, from a number of initial predetermined and measured masses differing from each other physically and chemically; and whereby there can be close and accurate inspection of the composite mass prior to the complete commingling of the various initial strata to guide in varying or modifying the quantities, conditions and qualities of the several materials that are being supplied; and whereby the conditions and qualities of the mass finally obtained can be varied at option.

In the accompanying drawings, which form a part of this specification, I have shown for purposes of illustration that form of mechanism embodying my improvements which I at present deem preferable. However, numerous changes and modifications may be made within the scope of my invention.

Of the drawings,

Figure 1, is a side elevation of a feeding or proportioning mechanism embodying my invention. For the sake of clearness the row of hoppers nearest the observer have been omitted.

Fig. 2 is a plan view.

Fig. 3 is an enlarged cross-sectional view taken along the line 3—3, of Fig. 2.

Fig. 4 is an enlarged fragmentary side elevation showing one of the mixing devices.

Fig. 5 is an enlarged elevation showing the mixing devices as viewed from the initial hoppers or receptacles.

Referring to the drawings, 1—1, 2—2, 3—3, and 4—4 represent hoppers or receptacles into which ores of different kinds may be placed, preferably in a finely pulverized condition. These hoppers are arranged in two parallel rows. In the drawings I have shown four pairs of oppositely disposed hoppers, but it will be understood that any desired number of pairs, either more than or less than four, can be used. Each pair of hoppers is similar to each of the others and it will therefore be sufficient to particularly describe but one pair with the parts immediately associated with them.

Referring more especially to Fig. 3, it will be observed that each hopper is provided with a pyramidical or conical bottom 5, at the lower apex of which is an opening 6. 7, 7 are two endless flat feed belts extending over the end pulleys 8, 8 and 9, 9. Other rollers 10, 10 are provided for supporting the feed belts at points intermediate the pulleys 8, 8 and 9, 9. The pulleys 9, 9 are preferably made adjustable. The adjustment may be effected by means of screws 11, 11, or by any other usual or preferred means.

Each of the hoppers is preferably provided with a communicating housing 12 which projects downward. This housing extends in the direction of the feed belt and has its lower edges immediately above the belt. The bottom of the housing is open. At the bottom of the end wall of the housing 12 there is an opening in which is mounted a vertically adjustable gate or door 13, which can be adjusted by means of a lever 14.

Any desired structure can be used for supporting the hoppers and feed belts. In the drawings, for the sake of illustration, I have shown uprights 15, 15 for supporting the hoppers. Upon these are mounted longitudinal channel sections 16, 16. Transverse beams 17, preferably of wood, rest upon the channel sections 16, 16 and on these transverse beams 17 the feed belts are supported.

The feed belt pulleys 8, 8 are mounted upon longitudinal rotatable shafts 18, 18. The shafts 18, 18 carry spur gears 18^a, 18^a, which mesh with spur pinions 18^b, on the

shafts 18c, 18c. These shafts 18c, 18c are driven by a transverse shaft 19, to which they are connected by bevel-gearing 20.

21 is a feed or conveyer belt arranged parallel to and between the rows of hoppers which have been described. As shown in Fig. 3, the upper strand of this belt is supported by rollers 22, 22, arranged in sets of three, to hold the belt concaved or dished. The lower strand is supported by pairs of rollers 23, 23. The belt 21 passes over and is supported at its ends by the large pulleys or rollers 24 and 25.

26 is an inclined endless belt conveyer, the lower end of which extends to a point beneath the discharge end of the belt 21. This conveyer 26 may be mounted upon any convenient frame-work, as, for instance, that indicated as a whole by 27. The upper end of the conveyer 26 passes over the pulley 28 on the shaft 29. The lower end passes over the pulley 30 on the shaft 31. 32 is a pulley on the shaft 31 and 33 is a similar pulley connected with the roller 24 for the belt 21. 34 is a belt passing over the pulleys 32 and 33. 35 is a tensioning device for the belt 34. This is controlled by the adjustable weight 36.

The shaft 29 at the upper end of the conveyer 26 carries a spur gear 37 which meshes with a pinion 38 on the shaft 39.

40 is the main drive shaft for the whole plant. This shaft is connected with a suitable source of power by means of a belt passing over the pulley 41. 42 is a jack-shaft parallel to the shaft 40 and is driven from it by means of a pair of cone pulleys 43, 44. The cone 43 is mounted on the shaft 42 and the cone 44 on a separate shaft 45. The shaft 45 carries a pulley 46. A belt 47 extending over the pulley 48 on the shaft 40 and over the pulley 46 on the shaft 45 serves to drive the cone 44. The cone 44 drives the cone 43 through the loop or belt 48′ which serves as a friction device. This loop may be shifted from one end of the cones to the other by means of a suitable shipper, which is not shown.

49 is a belt pulley on the shaft 42. 50 is a pulley on the shaft 19. A belt 51 passing over these two pulleys serves to transmit power to the shaft 19. 52 and 53 are belt pulleys on the shafts 40 and 39 respectively. The belt 54 passing over these two pulleys serves to transmit power to the shaft 39.

55 is a hopper mounted upon the framework 56 to receive material discharged from the conveyer 26. As shown in Figs. 4 and 5, openings 57, 57 are provided in the bottom of the hopper at opposite sides. Endless feed belts 58, 58 are supported beneath these openings on rollers 59, 59. The rollers at the outer ends of the belts may be adjustable as indicated. The rollers at the inner ends are mounted upon shafts 60, 60, which carry the bevel-gears 61, 61. 62 is a short transverse shaft upon which are mounted bevel-pinions 63, 63. These bevel-pinions mesh with the gears 61, 61. 64 is a spur gear on the shaft 62, and this meshes with the spur pinion 65, on the shaft 66 which carries the belt pulley 67. 68 is a belt pulley on the shaft 42. A belt 69 passing over the pulley 68 serves to transmit power to the shaft 69a, and a belt 69b transmits power from this shaft through the gearing, which has been described, to the belts 58, 58.

Openings are provided in the outer walls of the hopper 55 at points immediately above the feed belts. Vertically adjustable doors 70 are mounted in these openings. They are controlled by means of levers 71, 71.

72, 72 are mixing and conveying troughs. Each of these troughs is arranged to receive at one end material discharged from one of the belts 58, 58. Through the center of each trough there extends a rotatable shaft 73 upon which there are mounted oblique blades or paddles 74, 74. 75 is a bevel-gear mounted on one end of the shaft 73. This bevel-gear meshes with a bevel-pinion 76 on the shaft 77, the shaft also carrying a belt pulley 78. 79, 79 are belt pulleys on the shaft 42. Belts 80, 80 passing over the pulleys 78, 78, and the pulleys 79, 79 on the shaft 42 serve to transmit power through the gearing which has been described to the mixers within the troughs 72, 72.

81, 81 are water spray pipes each arranged above one of the mixing troughs 72, 72.

At the discharge end of each of the conveying and mixing troughs is an opening 82 into a distributing chute 83, the lower end of which opens into a hopper 84. The hoppers 84, 84 serve as feed reservoirs for the ore treating machines 85, 85.

In the drawings, for the purposes of illustration, I have shown ore treating machines which are adapted to effect a sintering action. The machines which I have selected are similar to those shown and described in my co-pending application for apparatus for use in treating ores, filed May 13, 1910, Serial No. 561,116, which has matured into Patent 1,027,084, dated May 21, 1912.

Briefly considered this machine comprises a series of disconnected pallets 86, 86 which are provided with perforate bottoms. These pallets are adapted to move along an endless trackway 87 and to be loaded from the hopper 84. Each pallet as it reaches the curved part 88 of the trackway moves downward away from the others under the action of gravity and discharges its load into a car 89 provided for the purpose of receiving it. 90 represents one of two continuously rotating toothed wheels adapted to engage the pallets 86 to return them to the upper part of the trackway and also to advance them

toward the other end of the machine in an unbroken series. 91 is an air box over which the moving pallets pass. A vacuum is maintained within this box by means of a fan or other suitable device connected to the pipe 92.

The wheels 90 are mounted upon the shaft 93. This shaft also carries the large spur-gear 94 which is connected by means of suitable reducing gear with the belt pulley 95. 96, 96 are two belt pulleys on the shaft 42. Belts 97, 97 pass over these pulleys and over the pulleys 95, 95 to the two sintering machines and serve to transmit power to drive the machines.

98 is a gas pipe or equivalent device adapted to supply heat by a direct flame or otherwise to the upper surfaces of material on the pallets 86 for a purpose to be hereinafter described.

As shown in Figs. 2 and 3, a track 99 may be provided upon which cars can be run for loading the initial ore hoppers.

The operation of the sintering machines which I have shown is as follows: The wheel 90 is rotated very slowly by the power transmitting devices, which have been described, and in this way the pallets 86 are lifted from the lower part of the track-way and forced slowly along the upper part in a continuous series. As they pass under the hopper 84 there is deposited on them a continuous layer of ore of uniform thickness. As this layer of ore is carried beneath the gas pipe 98 the combustible elements in it, such as sulfur, or carbon, are ignited. On account of the vacuum which is maintained within the air box 91, a continuous down draft of air is caused to pass through all parts of the layer of material. This down draft of air causes the combustion to slowly progress downward through the mass. On account of the heat of combustion certain fusible elements of the ore are melted and these by uniting effect the sintering of the ore into substantially homogeneous porous blocks or cakes, which are broken off at the end of the machine and discharged into the car 89. The rate of travel of the machine is so regulated that the oxidizing and sintering actions are completed at or near the point of discharge of the cakes or blocks from the machine. On account of minor variations in the character of the ore and on account of other conditions, it is frequently necessary to change the speed of the machine.

The ore to be treated is brought in finely pulverized condition by cars on track 99 to receptacles 1, 2, &c. Each of these receptacles holds many tons. The mass in one comes from one mine; while the masses in the others, respectively, come from other mines. No two mines provide ore materials of the same physical and chemical constitution. And the supply from any one mine may suddenly or gradually vary in its characteristics. But the roasting, sintering and smelting of the ores demand that there should be a certain proportion of each of the constituent bodies for successful operation.

In obtaining copper there should be in the mass that is introduced into the roasting furnace certain proportions, respectively, of copper, iron, lead (generally) and silica. And when the roasted ore reaches the smelting furnace there should be certain proportions of the matte sulfid, the metallic oxids and silica. And the same is true of the pulverulent raw ore mass which reaches the holders at 86 in the present illustration.

A very slight variation in these proportions will completely thwart the effort to obtain the metal.

To furnish a continuous stream or mass of commingled ores which will finally be uniform throughout, in respect to the standard and necessary proportions of its ingredients, the receptacles 1, 2, 3, 4, &c., can be arranged (as concerns their operation) in sets, of which sets there will be at all times a series of two or more. For instance, we will assume that the left hand hoppers 1, 2 and 4 are selected to constitute a set during a given operation, and that the right hand hoppers 1, 2, 3 and 4, together with the left hand hopper 3, are selected to constitute another set. This means that the eight inch stratum which will be formed in the holders at 86 (and be formed there continuously and indefinitely) can be derived from the first set of receptacles above specified (the first, second, and fourth on the left) or can be derived from the second set (the first, second, third and fourth on the right, and the third on the left) at option. It means that the ores in the three specified receptacles of the first set are of such constitution and qualities that three relatively deep sub-streams or sub-strata taken from these three receptacles will, when homogeneously commingled, provide for each cubic centimeter in the final mass at 86 those relative proportions of copper, iron, lead, sulfur and silica which are required for uniform reactions throughout the eight inch stratum in the holders at 86; and also that if five shallower streams be taken respectively from the five receptacles of the other set an exactly similar eight inch stratum will be formed at the same rate at 86 with the same chemical constitution in each cubic centimeter.

The feed belts 7, 7 under each pair of hoppers are continuously moved in directions to draw material out from the hoppers and deposit it on the conveyer belt 21. The rate of withdrawal of material from

each of the hoppers is regulated by properly positioning the hopper door 13. In this way the rate of supply for each hopper may be fixed independently of the others.

The belt 21 is actuated from the belt 26 by means of the power belt 34, which passes over the pulleys 32 and 33. The belt 21 discharges onto the belt 26 the materials which have been discharged onto it by the various belts 7, 7. The conveyer belt 26 is actuated from the shaft 40 by means of the power transmitting devices, which have been described. This belt serves to transport the material discharged onto it by the belt 21 and to discharge this material in the hopper 55.

As shown in Fig. 5, the belts 58, 58 serve to draw out continuous streams of material from opposite sides of the hopper 55. The rates of withdrawal are regulated by the positions of the doors 70, 70. From the belts 58, 58 the materials are discharged into the troughs 72, 72, where they are engaged by the rotating blade 74, 74 and thoroughly mixed. The blades also serve to slowly advance the materials to the discharge openings 82, 82, from which and through the distributing chutes 83, 83 they pass into the sintering machine supply hoppers 84, 84. During the passage of the materials through the troughs 72, 72 they are wetted by water sprays from the pipes 79, 79.

The streams or strata of materials that are delivered from the several hoppers to the common carrier 21 maintain their several individualities to a sufficient extent although there is slight commingling. This enables the attendant to know the character and volume of the work which is being performed at each of the hoppers.

For example, if the pulverulent materials in the several hoppers are masses of copper sulfids or lead sulfids which differ from each other to the ordinary extent (as concerns their proportions of sulfur, silica, &c.) the eye of a practised attendant seeing the separate streams or strata quickly detects any departure from predetermined conditions. The carrier 21 at its delivery end exposes the different lines or strata of materials to view. If the attendant observes that any one of the materials is being delivered improperly (as concerns either its constitution, quantity or quality) he is ready to instantly modify the stream or to shut it off and start the supply of another or others of proper constitution. Or, following the above illustration, if he finds that the materials delivered from the receptacles of the set which have been in operation is exhibiting an improper proportion of copper, iron, sulfur, silica or the like, he quickly shuts off the flow from all of the receptacles of that set and as quickly starts the delivery of material from each of the receptacles of the second set and the latter, as described, furnish a total volume, through five strata or streams (of differing compositions), equal to the volume of the previous total stratum, and with proportions of the ultimate ingredients (copper, iron, lead, sulfur, silica, etc.) the same, in relation to the total, as the proportions thereof in the earlier stream. And there is practically no interruption in the flow of supply to the holders at 86, through the commingling or mixing devices at 55, 74.

It will be observed that the main conveyer belts 26 and 21 are driven directly and at uniform speeds from the shaft 40. The blades of the mixing and conveying troughs are also driven directly from this shaft at uniform speeds. The other parts of the mechanism, including the sintering machine itself, and the feed belts for withdrawing materials from the various hoppers, are driven from the shaft 42 which is connected with the shaft 40 by means of the speed cones, which have been described, or by means of other change speed devices.

In the preliminary adjustment of the mechanism the various hopper doors are set at the proper positions to give the desired quantity and proportion of the desired ores. After these preliminary adjustments have been made then the speed of the sintering machine can be changed when necessary by means of the speed cones. When any such change is made in the speed of the sintering machine, then corresponding and proportionate changes are made in the speeds of the belts beneath the hoppers and the rate of supply of material to the machine is changed proportionately to its speed without any change in the relative proportions of the various initial materials.

I have herein referred to the fact that this mechanism was originally designed for the producing of a stratum of metal ore fines of the sulfid class the purpose being to obtain a stratum mass of predetermined dimensions and homogeneous throughout in respect to the proportions and the distribution of the several chemical ingredients; the purpose being to obtain a uniform oxidizing of the sulfids and cause it to effect the desired reactions throughout the mass. But I do not limit myself to using this apparatus in treating that particular material, as it is similarly usable to advantage in other work.

For example, in the preliminary preparation of masses of metallic ores of the oxid class and other materials, with which finely reduced carbon must be intimately and homogeneously commingled, a mechanism embodying these improvements can be used to advantage. These oxid ores, as is well known, vary greatly from each other not only as concerns masses thereof obtained

from different territories, but as concerns even small masses obtained from the same ore deposit, when compared with each other. And it is necessary to mingle them in a manner corresponding with their variations in chemical constitution. For example, the native pulverulent ores of iron oxids vary in the way referred to, and it is frequently desirable to commingle with the native ores the artificially formed flue dust, as well as mix with them quantities of pulverized carbon. And the carbon, the flue dust and the various forms of oxid ore can be deposited in receptacles such as those at 1, 2, &c., and can be delivered to the holders at 86 in homogeneous masses of predetermined dimensions ready for uniform chemical treatment prior to delivery to the blast furnace.

What I claim is:—

1. In a mechanism for producing a homogeneous composite mass, of predetermined dimensions, of fines, from initially delivered strata or streams of predetermined number and volumes and of predetermined varying qualities, the combination of a plurality of initial receptacles adapted to be arranged in respect to their operation in one or another set of a series of sets, each set composed of a plurality of selected receptacles, a flat conveyer belt at the bottom of each receptacle for the support of the material therein and for withdrawing it therefrom, means for optionally stopping, and for varying the rate of, the discharge of material from each receptacle independently of the others, a continuously traveling endless conveyer moving transversely to the paths of the aforesaid conveyers and having its receiving side arranged to take the streams or strata deposited by the aforesaid conveyers and adapted to maintain them as an approximately flat stratified stream and to display the stratified mass thereon, means for receiving the said mass, means for breaking up the strata and forming a homogeneous composite mass with the particles of the several strata uniformly distributed therethrough, and means for delivering the mass, after being made homogeneous, to a supporting mechanism and for forming a stratum thereof uniform in depth and constitution on said supporting mechanism.

2. In a mechanism for producing a homogeneous composite mass of fines, from initially delivered strata or streams of predetermined number and volumes and of predetermined varying qualities, the combination of a plurality of initial receptacles adapted to be arranged in respect to their operation in one or another set of a series of sets, each set composed of a plurality of selected receptacles, a flat conveyer belt at the bottom of each receptacle for the support of the material therein and for withdrawing it therefrom, means for optionally stopping, and for varying the rate of, the discharge of material from each receptacle independently of the others, a continuously traveling endless conveyer moving transversely to the paths of the aforesaid conveyers and having its receiving side arranged to take the streams or strata deposited by the aforesaid conveyers and adapted to maintain them as an approximately flat stratified stream and to display the stratified mass thereon, means for receiving the said mass, means for breaking up the strata and forming a homogeneous composite mass with the particles of the several strata uniformly distributed therethrough.

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

HENRY J. STEHLI.

Witnesses:
CHAS. L. MONTAGUE,
ARTHUR S. DWIGHT.