

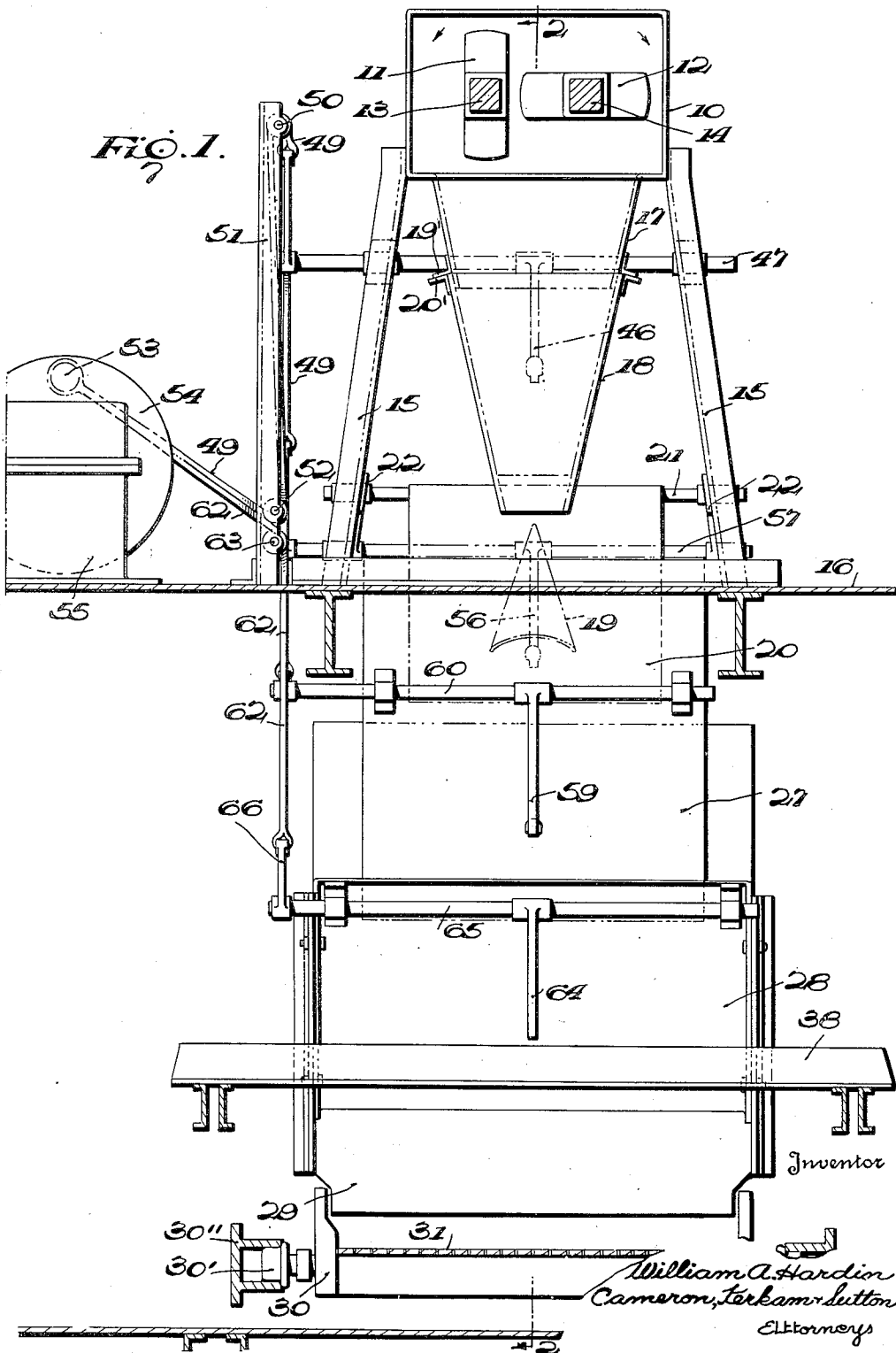
Nov. 6, 1951

W. A. HARDIN
SINTERING APPARATUS

2,574,388

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3 Sheets-Sheet 1



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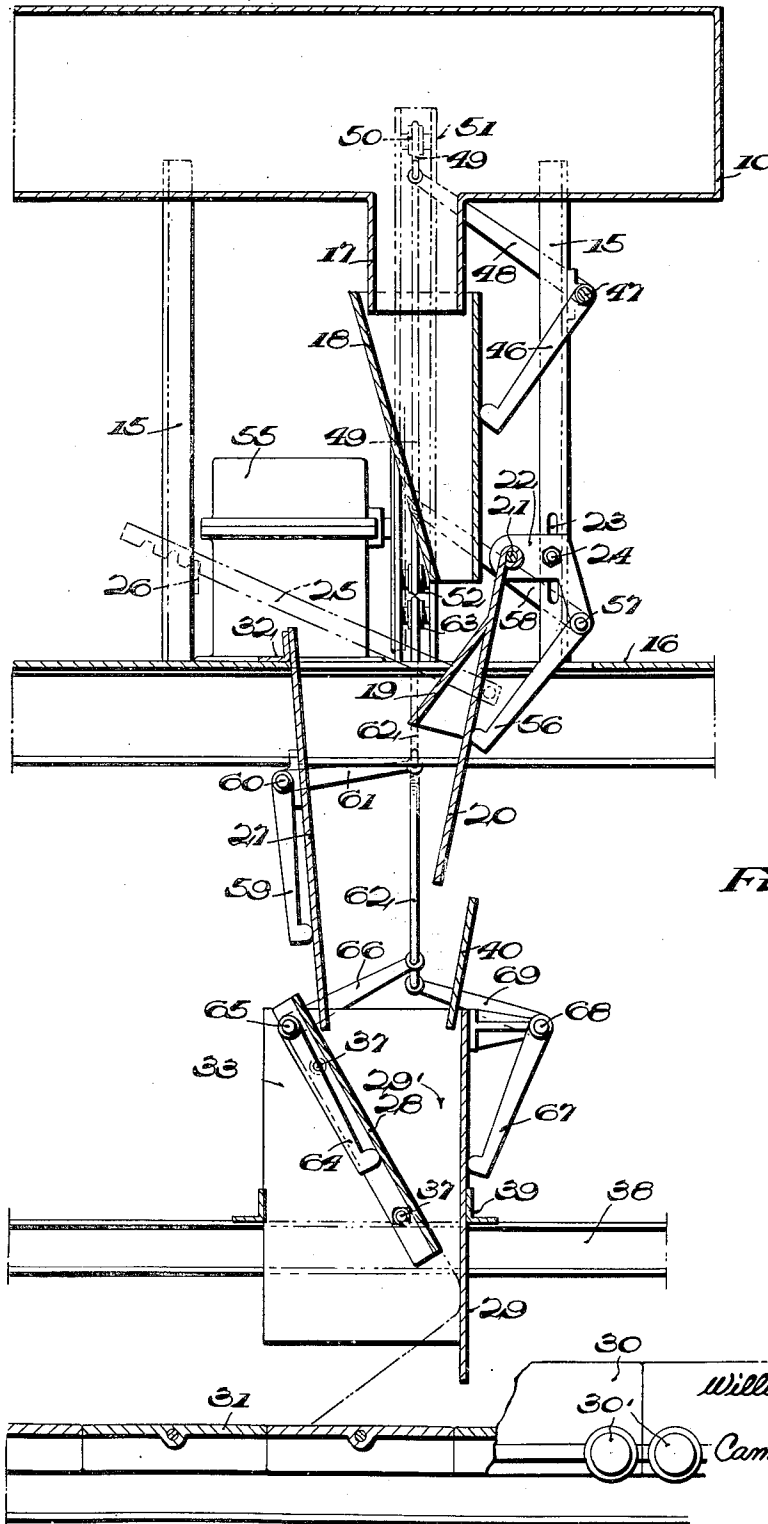
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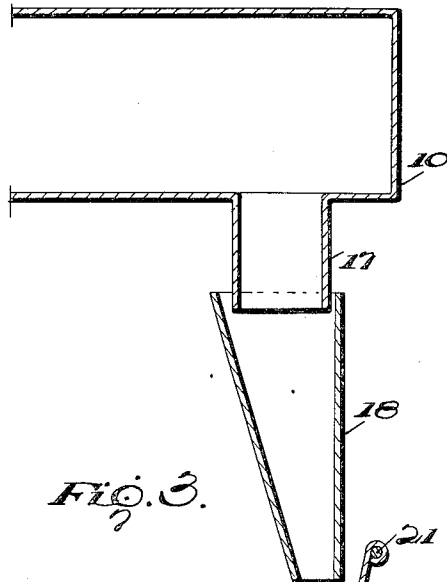
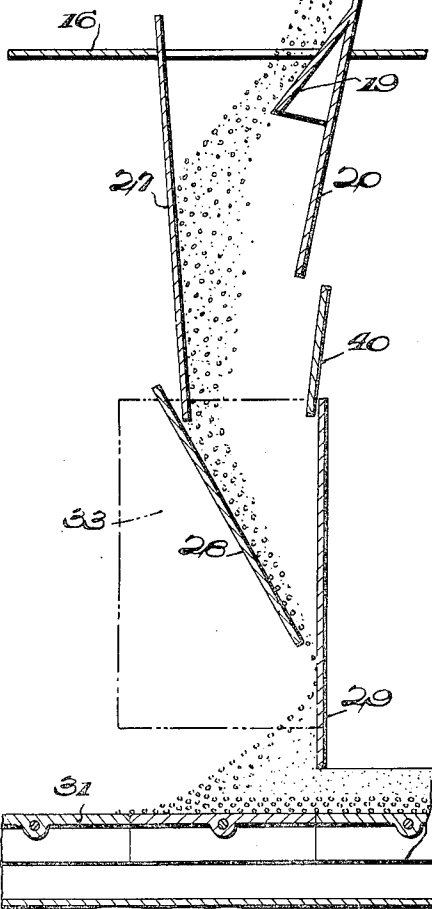
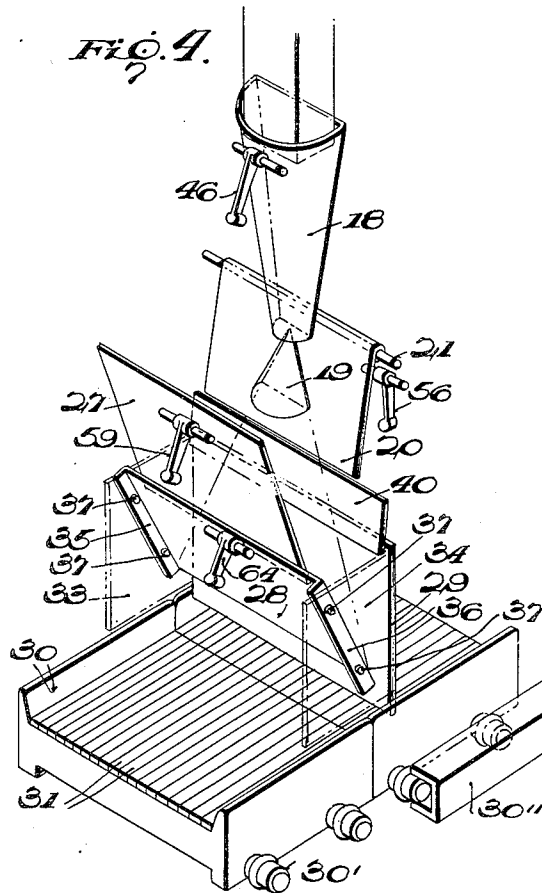
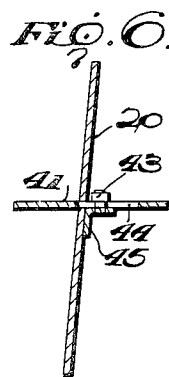
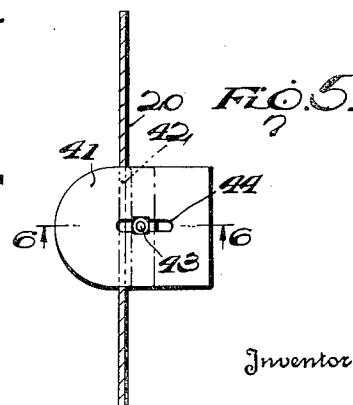
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SINTERING APPARATUS

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The present invention is an improved method and apparatus for delivering and distributing material to a sintering machine such as a mixture of iron oxides and sulfides.

Particular objects of the present invention are to provide sintering machines in which a bed of uniform porosity is laid on the grates the full width of the machine by which is secured improved quality of sinter and sulfur dioxide and greater capacity and yield. Further objects are to provide distributing means which are simpler and cheaper to build and maintain, and which avoid the complications, expense, limitations and insufficiencies of the conventional swinging chute system.

These objects are attained primarily by substituting for the conventional lateral swinging chute system a system that has no lateral displacement and that deposits a thin continuous stream the full width of the machine and that acts on the mixture of aggregates and fines to separate the former from the latter and deposit the aggregates at the bottom of the bed to be sintered and the fines on top thereof and without lateral segregation between the aggregates and the fines. This segregation in depth provides greater and uniform porosity and insures better oxidation as the openings between the grates are not closed by the smaller particles; and this gives improved quality of sinter and sulfur dioxide and increased output.

Generally stated the preferred means for securing these objects is a stationary semi-conical body of metal or other material that forms the falling mixture into a semi-circular stream that is continuously projected onto baffle means interposed between the semi-conical body and the cut-off plate at the surface of the bed. The baffle means thus interposed between the semi-conical body and the cut-off plate slow down the falling material, convert the semicircular stream into a straight line stream and deliver it in a thin stream the full width of the machine against the lower portion of the cut-off plate where the coarse particles or aggregates separate from the fines and rebound from the cut-off plate down onto the grates. The finer particles contain most of the moisture and do not rebound like the coarser particles and therefore are slower to reach the grates.

The invention will be better understood by reference to the accompanying drawings illustrating two embodiments of the inventive idea and wherein

Fig. 1 is a vertical end elevation partly in section showing the distributing means in associa-

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tion with the pallets and grates of a Dwight and Lloyd sintering machine;

Fig. 2 is a vertical sectional view at right angles to Fig. 1;

Fig. 3 is a corresponding sectional view with certain parts omitted;

Fig. 4 is a perspective view showing the material distributing means;

Fig. 5 is a detail of a modification for producing the distributing cone for the material to be sintered; and

Fig. 6 is a section on line 6—6 of Fig. 5.

Referring to the drawings wherein like reference numerals indicate like parts, 10 is a mixer through which the material to be sintered is fed by reversely rotating inclined blades 11 and 12 mounted on shafts 13 and 14 that are driven by any suitable means. This material consists of a necessary amount of combustible ingredients, contains a large part of relatively fine material or fines and a substantial amount of hard, coarse material or aggregates. Water is added to the material in mixer 10 to increase the porosity of the bed when the moisture is evaporated by passage of the bed under the usual ignition device or furnace. The mixer 10 is mounted on four standards 15 projecting upwardly from mixer floor 16. A discharge spout 17 projects downwardly from mixer 10 and into the upper end of mixer chute 18. The chute 18 is preferably connected to and suspended from spout 17 in any desired manner as by spot welding angle members 19' and 20' carried thereby.

The material from the chute 18 impinges on a body 19 that causes the material to fall in a semi-circular stream the lateral margins of which are indicated by broken lines on Fig. 4. This body 19 may be formed in various ways so long as it has no lateral displacement but it is preferably a semi-cone of metal, wood, rubber or the like. Preferably the semi-cone is mounted on a plate 20 which is pivotally connected at its upper edge to a bar 21 carried by plates 22 which are vertically adjustable in slots 23 in two of the uprights 15. The plates 22 are secured in the desired vertical position by any suitable means such as screws or bolts 24. Dependent upon the character of the material being fed the inclination of the semi-conical body 19 and the plate 20 about the pivot 21 may be varied by movement of adjustment bar 25 which engages a latching member 26 carried by one of the uprights 15.

The falling semicircular stream of material passing from the semi-conical body 19 is projected against baffle means, here shown as baffle plates

27 and 28. From plate 28 the material to be sintered is projected against the lower portion of a cut-off plate 29 which is arranged above the usual endless traveling pallets 30 and grates 31 of a conventional Dwight and Lloyd sintering machine. The pallets 30 are provided with rollers 30' that engage a track 30'' part of the upper run of which is shown in Fig. 4. The lower plate 28 closely approaches the lower edge of the cut-off plate 29 so that a thin stream of material passes to the grates.

The upper edge of baffle plate 27 is secured in position against angle member 32 on the mixer floor 16 and the lower edge of said plate 27 overlaps plate 28 which in one embodiment of my invention is arranged at an angle of 60 degrees to direct the falling material against the cut-off plate 29, as indicated in Figs. 2 and 3, to obtain maximum deflection of the coarser particles or aggregates so that they will reach the grates 31 before the fines. In this embodiment of my invention the forward edge of plate 28 is about 3'' from the plate 29.

The cut-off plate 29 is maintained in a vertical position, and constitutes the front wall of a box 29' which is also provided with side walls 33 and 34 (Fig. 4). Lower baffle plate 28 is provided with flanges 35 and 36 which are suitably secured to said side walls by bolts 37 or otherwise. The front wall 29 and side walls 33 and 34 of the box 29' are secured to and carried by a beam 38 and are fixed in position thereon by any suitable means as angle members 39. Above the front wall or cut-off plate 29 there is secured in any suitable manner a guard plate 40 which prevents the material rebounding from baffle plate 27 over the top of the cut-off plate 29.

The baffle plates 27 and 28 slow down the speed of the falling material, convert the semicircular stream of aggregates and fines into a straight line stream, and progressively widen and thin the stream to the full width of the machine; and control the speed and the angle for maximum deflection at which the material is discharged from plate 28 against the cut-off plate 29 to cause the aggregates to rebound to the grates 31. The thinner the stream at the discharge edge of plate 28 the easier the aggregates escape the fines and bounce off the cut-off plate 29 to effect the desired segregation to give maximum and uniform porosity to the bed, better oxidation, a faster sintering rate and improved quality of sinter and sulfur dioxide; and inasmuch as this prevails for the entire width of the machine largely increased production and output are secured.

It is important to note that in my improved system a simple vertical adjustment of the semi-cone 19 is all that is necessary to adapt my distributing means to machines of varying widths. Accordingly by the provision of the semi-cone 19 and the baffle means 27 and 28 sintering machines of any desired size and width may be employed having all of the above specified advantages.

Other advantages of the stationary semi-cone spreader over the swinging chute type of distribution are that it is cheaper and simpler to build, install and operate, has no moving parts, requires no lubrication, minimizes repairs and, as heretofore noted, provides a simple means for continuously and uniformly feeding the material the full width of the sintering machine without lateral segregation but with segregation in depth.

With the swinging chute arrangement the

stream of mixture that falls directly on the cut-off plate at any instant is relatively compact; and in view of the fact that the lateral discharge from the swinging chute is associated with the forward movement of the grates the bed is laid in a saw-tooth pattern that inherently has varying porosity. Accordingly the output is slowed down to the sintering rate of the most compacted areas; and at this time the more porous areas in which the sintering action is first completed permit excess or "false" air to be drawn into the gas stream as the bed passes over the wind boxes. Besides reducing sinter production this has the disadvantages of diluting the sulfur dioxide concentration of the gas and requires greater power to handle the volume of excess or "false" air at the prevailing high vacuum.

With the present stationary semi-cone type of spreader and the baffle plates 27 and 28 the stream of mixture is not compacted at the cut-off plate 29 but is thinned and widened to the full width of the machine thus providing a uniform bed of uniform porosity. This is a matter of prime importance in sintering materials, particularly fine materials, where the uniform passage of air through the bed is necessary for maximum output and quality.

While the semi-conical body is preferably made of metal, wood, rubber or other suitable material a semi-conical body may be formed by projecting a semicircle of sheet metal 41 horizontally through a slot 42 in plate 20 (Figs. 5 and 6) in place of the semi-cone 19. The plate 41 may be fixed in the desired position of adjustment for cones of varying sizes by any suitable means as bolt 43 passing through slot 44 and angle support 45. The sintering mixture is directed from the chute 18 upon this semicircular plate and immediately builds up and forms a semi-cone 40 which conforms to the shape of the semicircular plate as a base. Thereafter the material to be sintered rolls down the semi-cone in a continuous semicircular stream as with semi-cone 19 heretofore described.

The baffle plate 28 may be adjusted to varying angles of inclination, depending upon the nature of the material being handled, by changing the positions of bolts 37.

To facilitate the feed through the chute 18 and past the baffle plates 27 and 28 and cut-off plate 29 of the material to be sintered I have provided a series of pivoted bell crank levers one arm of each of which carries a hammer or rapper and the other arm of each of which is connected to a strap or chain that is periodically actuated to engage the several hammers or rappers with its associated part. The hammer for the chute 18 is carried by one arm 46 of a bell crank pivoted at 47 the other arm 48 being connected to a strap 49 that passes over pulley 50 carried on upright 51 and under pulley 52 also carried by upright 51, said strap being then connected at 53 to a disk 54 rotated by speed reducer 55. The hammer for the plate 28 is carried by one arm 56 of a bell crank pivoted at 57 the other arm 58 being also connected to strap 49. The hammer for baffle plate 27 is carried by one arm 59 of a bell crank pivoted at 60 the other arm 61 being connected to a strap 62 that passes over pulley 63 and is then connected to strap 49. The hammer for baffle plate 28 is carried by one arm 64 of a bell crank pivoted at 65 the other arm 66 being also connected to strap 62. The hammer for cut-off plate 29 is carried by one arm 67 of a bell crank pivoted at 68 the other arm 69 being also

connected to strap 82. The disk 54 is preferably rotated at about 40 R. P. M. and the several hammers are actuated upon each rotation.

While two embodiments of the inventive idea have been disclosed and described it is to be understood that the invention is not limited thereto and that various other embodiments of the inventive idea may be had within the limits of the appended claims.

What is claimed is:

1. In a sintering machine, pallets provided with grates on which material is to be sintered, discharge means for dropping the material, arcuate means on which the falling material is deposited and formed into a continuous semicircular stream, baffle means intercepting the semicircular stream of material, converting the semicircular stream into a straight line stream and progressively widening and thinning the stream, and a cut-off plate positioned adjacent the grates against which the material is delivered at a deflecting angle and from which the aggregates rebound onto the grates with the aggregates on the bottom and the fines on the top.

2. In a sintering machine, pallets provided with grates on which material is to be sintered, discharge means for dropping the material, stationary arcuate means for forming the falling material into a continuous semicircular stream, baffle means intercepting the falling material and converting the semicircular stream into a thin straight line stream, and a cut-off plate positioned adjacent the grates against which the material is delivered at a deflecting angle and from which the aggregates rebound onto the grates with the aggregates on the bottom and the fines on the top, along substantially the entire width of the machine.

3. In a sintering machine, grates on which material is to be sintered, discharge means for dropping the material, a semi-conical body on which the falling material impinges and which forms the falling material into a continuous semicircular stream, baffle means arranged at an angle to said conical body receiving and slowing down the falling material from said body and converting the semicircular stream into a straight line stream and progressively widening and thinning said stream, and a cut-off plate positioned adjacent said grates against which the material is delivered at a deflecting angle and from which the aggregates rebound onto the grates with the aggregates on the bottom and the fines on the top.

4. In a sintering machine, grates on which material is to be sintered, discharge means for the material, a stationary semi-conical body on which the discharge material impinges and which forms the falling material into a continuous semicircular stream, baffle means positioned below said body and receiving the falling material from said body and converting the semicircular stream into a straight line stream and progressively widening and thinning the stream, and a cut-off plate positioned adjacent said grates against which the material is delivered along substantially the entire width of the machine and from which the aggregates rebound onto the grates with the aggregates on the bottom and the fines on the top.

5. In a sintering machine, pallets provided with grates on which material is to be sintered, a discharge chute for the material, a semi-conical body on which the discharged material impinges and which continuously forms the fall-

ing material into a semicircular stream, means for vertically adjusting said body, baffle means positioned below said body receiving the falling material from said body and converting the semicircular stream into a straight line stream, and a cut-off plate positioned adjacent the grates against which the material is delivered in a thin stream and from which the aggregates rebound onto the grates with the aggregates on the bottom and the fines on the top.

6. In a sintering machine, pallets provided with grates on which material is to be sintered, a discharge chute for the material, a semi-conical body on which the discharged material is deposited and which continuously forms the falling material into a semicircular stream, baffle means arranged below said body comprising a pair of inclined baffle plates one above the other receiving and slowing down the falling material from said body, converting the semicircular stream into a straight line stream and progressively widening and thinning said stream, and a cut-off plate positioned adjacent said grates against which the material is delivered in a thin stream from the lower baffle plate and from which the aggregates rebound onto the grates with the aggregates on the bottom and the fines on the top.

7. In a sintering machine, pallets provided with grates on which material is to be sintered, a discharge chute for the material, a semi-conical body positioned below said chute on which the material impinges and which continuously forms the falling material into a semicircular stream, baffle means positioned below said body comprising a pair of inclined overlapping baffle plates receiving the falling material from said body, converting the semicircular stream into a straight line stream, and progressively widening and thinning said stream, and a cut-off plate positioned adjacent said grates against which the material is delivered by the lower baffle plate and from which the aggregates rebound onto the grates with the aggregates on the bottom and the fines on the top.

8. In a sintering machine, pallets provided with grates on which material is to be sintered, a discharge chute for the material, a semi-conical body positioned below said chute on which the material impinges and which continuously forms the falling material into a semicircular stream, upper and lower baffle plates positioned below said body arranged at different angles and receiving the falling material from said body and converting the semicircular stream into a thin straight line stream, and a cut-off plate positioned adjacent said grates against which the material is delivered and from which the aggregates rebound onto the grates with the aggregates on the bottom and the fines on the top, the lower baffle plate being positioned at a flatter angle than the upper baffle plate and having its discharge edge adjacent the lower portion of the cut-off plate.

9. In a sintering machine, pallets provided with grates on which material is to be sintered, a discharge chute for the material, a semi-conical body positioned below said chute on which the material impinges and which continuously forms the falling material into a semicircular stream, baffle means positioned below said body comprising a pair of inclined baffle plates one above the other arranged at different angles receiving the falling material from said body, converting the semicircular stream into a straight line stream,

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and progressively widening and thinning said stream, a cut-off plate positioned adjacent said grates against which the material is delivered along substantially the entire width of the machine and from which the aggregates rebound onto the grates, the lower baffle plate being arranged at an angle of about 60 degrees to secure maximum deflection of the aggregates from the cut-off plate.

10. In a sintering machine, pallets provided with grates on which material is to be sintered, a discharge chute for the material, a semi-conical body on which the material impinges and which continuously forms the falling material into a semicircular stream, baffle means comprising a pair of inclined baffle plates one above the other receiving and slowing down the falling material from said body and converting the semicircular stream into a straight line stream, a cut-off plate against which the material is delivered and from which the aggregates rebound onto the grates with the aggregates on the bottom and the fines on the top, rappers for said chute and plates, and means for operating said rappers.

11. In a sintering machine, pallets provided with grates on which material is to be sintered, a discharge chute for the material, a semi-conical body on which the material impinges and which continuously forms the falling material into a semicircular stream, baffle means compris-

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ing a pair of inclined baffle plates one above the other receiving and slowing down the falling material from said body and converting the semicircular stream into a straight line stream, a cut-off plate against which the material is delivered and from which the aggregates rebound onto the grates with the aggregates on the bottom and the fines on the top, rappers for said chute and plates, and common means for periodically operating said rappers.

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