J. L. HILLER.

PROPORTIONING AND DIVIDING HOPPER.

APPLICATION FILED APR. 20, 1917.

1,354,747.

Patented Oct. 5, 1920.

4 SHEETS—SHEET 1.

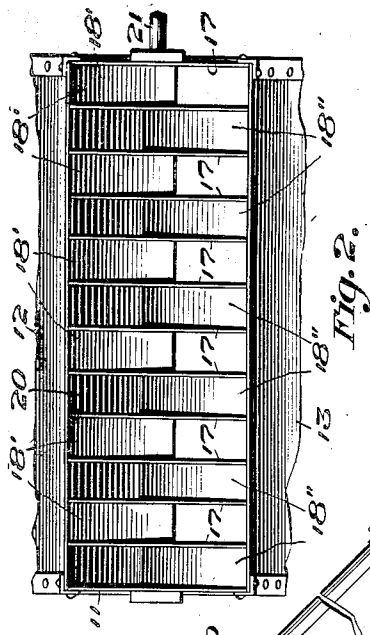


Fig. 2.

Fig. 1.

Witnesses

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4 SHEETS—SHEET 2.

Fig. 3.

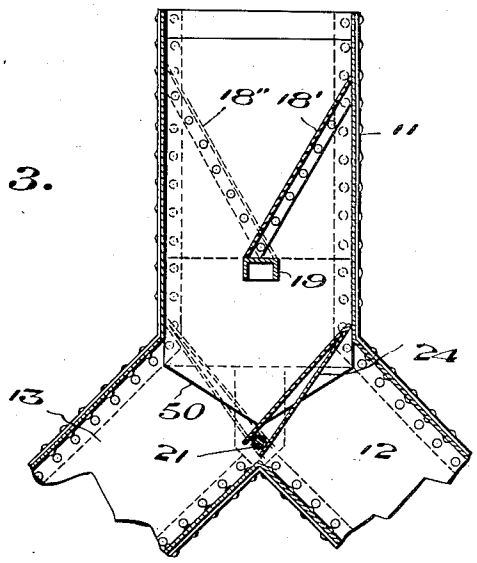
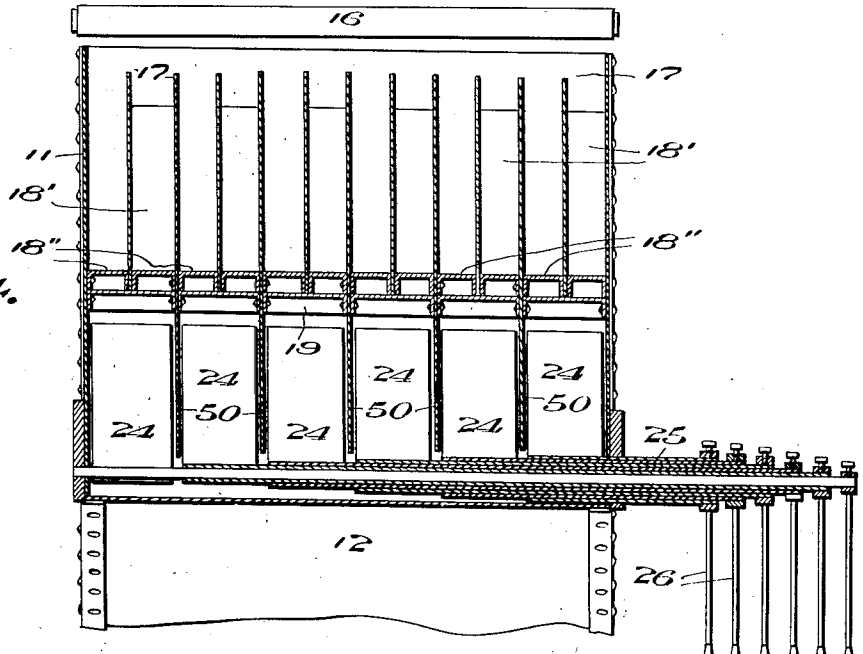


Fig. 4.



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4 SHEETS—SHEET 3.

Fig. 5.

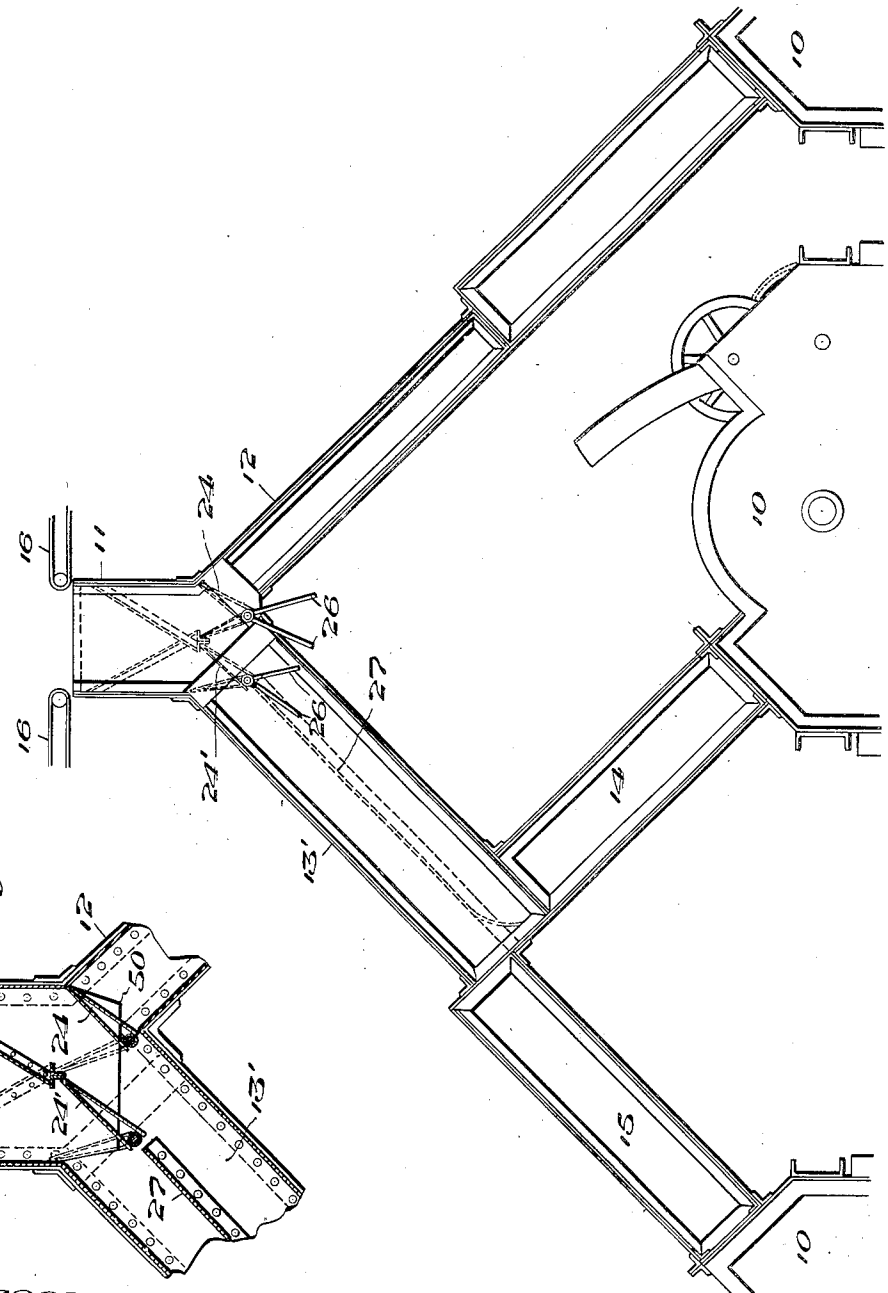


Fig. 6.

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4 SHEETS—SHEET 4.

Fig. 7.

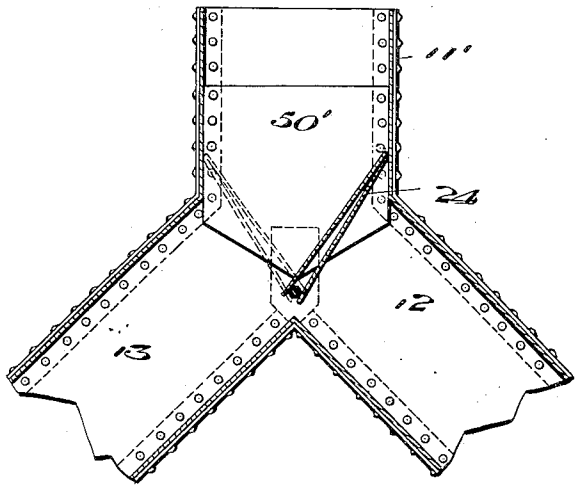
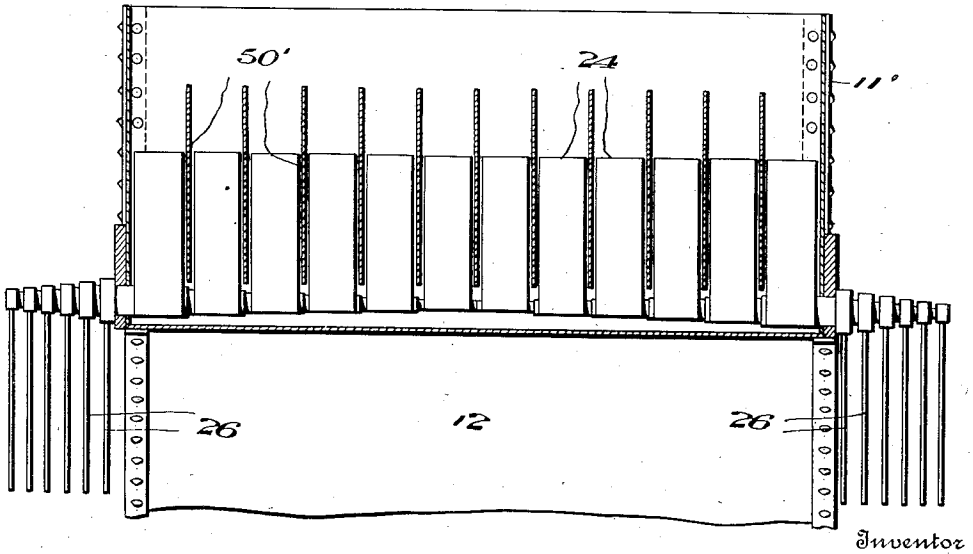


Fig. 8.



Inventor

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Witnesses

Philip E. Barnes

By Lyon, Lyon, Lyon & Co

Attorney

UNITED STATES PATENT OFFICE.

JOSEPH L. HILLER, OF MATTAPOISETT, MASSACHUSETTS, ASSIGNOR TO PENNSYLVANIA CRUSHER COMPANY, OF PHILADELPHIA, PENNSYLVANIA, A CORPORATION OF PENNSYLVANIA.

PROPORTIONING AND DIVIDING HOPPER.

1,354,747. Specification of Letters Patent. Patented Oct. 5, 1920.

Application filed April 20, 1917. Serial No. 163,398.

To all whom it may concern:

Be it known that I, JOSEPH L. HILLER, a citizen of the United States, residing at Mattapoisett, in the county of Plymouth and State of Massachusetts, have invented new and useful Improvements in Proportioning and Dividing Hoppers, of which the following is a specification.

This invention relates to means for proportioning and dividing materials into a plurality of parts composed of the materials mixed in correct and predetermined proportions.

More particularly, my invention has as its purpose to provide an apparatus for dividing and proportioning materials into two or more portions, the operation being such that each of the resultant portions constitutes a predetermined definite part of the whole amount of the materials fed to the machine, and each of the portions contains the predetermined and correct percentages of the different kinds of materials.

My invention is particularly applicable for use in all cases where it is desired to divide two or more materials, which are delivered separately but simultaneously to the dividing and proportioning apparatus into definite portions made up of the desired percentages of the mixed materials, but by way of example, and for illustrative purposes only, I have disclosed my invention as applied to a coal crushing plant. It is to be understood, however, that my invention is not limited to the particular application illustrated.

In the present instance, my invention is disclosed as applied to a coal-crushing plant comprising a plurality of crushing instrumentalities or machines, a delivery chute for each of said machines, and a single hopper from which the chutes lead. In a plant of this kind, it is sometimes desirable to mix several grades of coal in the correct proportions before delivering the coal to the pulverizing machines. The materials to be crushed are usually fed to the hopper in the form of streams or blankets, and for this purpose, belt conveyers extending across the hopper may be employed. Not infrequently the depth of the layer or stream of the materials delivered by the conveyers will vary throughout the width thereof so that more of one kind of material will be delivered to one end of the hopper than at the other end of the hopper, and, heretofore, this has led to considerable difficulty in properly dividing the materials into parts containing the correct proportion of the materials, but with my arrangement this difficulty is obviated.

In the accompanying drawings,—

Figure 1 is a side elevational view of a coal crushing plant to which my invention is applied.

Fig. 2 is a top plan view of the hopper shown in Fig. 1.

Fig. 3 is a sectional view taken through one embodiment of my improved hopper having a gate structure therebeneath comprising a plurality of sections.

Fig. 4 is a vertical sectional view through the structure shown in Fig. 3 taken at right angles thereto.

Fig. 5 is an elevation of a crushing plant showing another embodiment of my invention.

Fig. 6 is a transverse sectional view through the hopper and upper ends of the chutes shown in Fig. 5.

Fig. 7 is a sectional view of a hopper having a gate structure similar to that illustrated in Fig. 3.

Fig. 8 is a vertical sectional view through the structure shown in Fig. 7 taken at right angles thereto.

Referring to the drawings, wherein like characters represent like parts in the several views, and particularly to Fig. 1, the numeral 10 designates crushing instrumentalities, in the present instance, coal crushers being conventionally illustrated. The materials to be proportioned and divided are delivered to the crushing machines 10 by means of a plurality of chutes leading from a hopper 11. In the embodiment shown in Fig. 1, are disclosed three crushing machines 10, a chute 12 leading directly from the hopper to one machine and a second chute 13 having branches 14 and 15 which deliver to the other machines. It is, of course, to be understood that any number of chutes may be employed; that the disposition of these chutes may be varied as desired, and that the chutes may deliver to other kinds of devices than the crushing machines. The hopper 11 is, in effect, a chute which delivers to the chutes 12 and 13.

In the present instance, I have shown the

material to be divided and crushed as being delivered to the opposite and longest sides of the hopper in the form of streams or blankets by means of belt conveyers 16, and while I have shown but two conveyers, it is to be understood that any number may be employed depending on the number of materials to be mixed and divided. In case more than two conveyers are used, the additional conveyers are located above, and will deliver between the streams delivered by the lower two conveyers. The proportions in which the coal is delivered are usually determined by the thickness of the blankets of coal upon the conveyers, but, if desired, the speed of the conveyers may be regulated to control the amounts or proportions in which the different grades are delivered to the hopper.

In accordance with my invention, the hopper 11, which is preferably elongated and rectangular in shape, is divided into a plurality of compartments by means of transverse vertical division plates 17. The division plates 17 are, preferably, spaced equidistances apart and in parallelism with each other so that the compartments throughout the length of the hopper are of equal size. In the present instance, the hopper is divided into twelve compartments, but a larger or smaller number may be employed. It is preferable, however, to divide the hopper into as many compartments as practical, so that the width of the several compartments is small as compared to the width of the streams in which the materials are fed to the hopper.

In each of the alternate compartments of the hopper is an inclined diverting plate or bottom 18′ which extends from near the top of one wall of the hopper to a point slightly past a central longitudinal line of the hopper. In the intervening compartments are diverting plates or bottoms 18″ extending from near the top of the opposite wall of the hopper and in a direction opposite to that of the diverting plates 18′ to a point slightly past the central longitudinal line of the hopper. Preferably the lower ends of the diverting plates 18′ and 18″ are attached to a supporting member 19 extending longitudinally and centrally through the hopper, in the present case the member 19 being illustrated as comprising a channel iron. With this arrangement, it will be seen that one series of plates 18′, mounted in alternate compartments of the hopper, delivers to one side thereof, and the other series of diverting plates 18″, located in the intervening compartments, delivers to the other side of the hopper.

The chutes 12 and 13 are so arranged that the line on which the lower walls thereof join is located immediately beneath the longitudinal center of the hopper, that is, the channel iron 19, so that those compartments in which the plates 18′ are disposed will normally deliver to the chute 13 and the intervening compartments will normally deliver to the chute 12.

In the embodiment disclosed in Fig. 1, I have disclosed a gate 20, located beneath the compartments of the hopper 11, and composed of a single vane or diverting plate extending throughout the length of the hopper. The gate 20 is fixed to a rotatable shaft 21 extending immediately above the line on which the bottom walls of the chutes 12 and 13 meet, and this shaft has at one end an operating handle or lever 22.

The operation of the arrangement above described, will be readily understood. Suppose, for example, that it is desired to divide the total amount of materials fed into the hopper into equal parts between the chutes 12 and 13, and that the one kind or grade of material, fed to one side of the hopper by one of the conveyers, constitutes one-third of the final product issuing from the hopper, and that the other kind or grade of material fed to the other side of the hopper constitutes the remaining two-thirds of the final product issuing from the hopper. The gate 20 will be moved into vertical position. The first kind of material delivered to the hopper, and which constitutes one-third of the total material issuing from the hopper, is divided into two equal parts, one of these parts being delivered to the right, and the other to the left of the hopper. Of the material delivered by the other conveyer, and which constitutes two-thirds of the final product, one-half will pass to the right and one-half to the left.

It is to be remarked that by dividing the hopper into a relatively large number of compartments and causing adjacent compartments to deliver in opposite directions, the parts issuing from the hopper are each composed of the correct and predetermined proportions of the two kinds of materials. The fact that the blankets or streams of coal delivered by the conveyers 16 may vary in depth crosswise of the hopper does not materially effect the proportioning of the parts of the materials for the final parts of the materials issuing from the hopper are primarily made up of a relatively large number of portions which are taken from the conveyer at points spaced throughout the width of the hopper.

In some cases, it may be desirable to divert the total product issuing from the hopper to either of the chutes 12 or 13, and where such is the case, the gate 20 is swung to the right or left depending on which chute is to be shut off.

In Fig. 1, I have shown the chute 13 as having a vertical section 23 provided with compartments and diverting plates 18′ and

18'' corresponding in construction and arrangement to like parts of the hopper 11. Immediately beneath the hopper section 23 and at the confluence of the two branches 14 and 15 of the chute 13 is a gate 20' which may be employed to divert all of the material passing through the chute 13 to either of the branches 14 or 15. When the gate 20' is in vertical position, as shown, the material is equally divided between these branches.

In the embodiment disclosed in Figs. 3 and 4, the construction of the hopper 11 is similar to that illustrated in Figs. 1 and 2 in that it is provided with transverse dividing plates 17 and oppositely disposed diverting plates or bottoms 18' and 18''. In this embodiment, however, the gate which is located beneath the compartments of the hopper, consists of a plurality of sections or diverting plates 24, there being preferably more compartments in the hopper than there are sections of the gate so that one diverting plate of the gate may control the disposition of materials issuing from two or more compartments of the hopper. In the present instance, I have shown each of the sections 24 of the gate as being located beneath two compartments, but, of course, three or more compartments may deliver to the same gate section.

Preferably, the spaces in which the several gate sections move are separated from each other by depending partitions 50 which may be formed by extending certain of the transverse plates 17 downwardly beneath the position of the supporting member 19. Any suitable means for independently mounting the gate sections for rotation may be adopted, but by way of illustration, I have disclosed each of the gate sections as being secured to a sleeve 25. The several sleeves are of different lengths and telescope each other and each has at its outer end an operating lever handle 26. In the present case, I have shown all of the operating handles 26 as being located to one side of the chutes, but, if desired, half of the handles or levers may be mounted on one side and the other half on the other side, so as to reduce the number of different sizes of sleeves employed.

With the construction shown in Figs. 3 and 4, the function of the hopper is to divide the materials fed thereinto into two equal parts and to insure that each of these parts is composed of the correct amounts or proportions of the materials fed to the hopper. The plates 24 of the gate structure may be maintained in vertical position so as to keep separated the equal parts issuing from the hopper. By swinging all of the gate sections 24 to the left, the total material will be delivered to the chute 12 and by swinging all of the gate sections to the right all of the material may be delivered to the chute 13.

It is sometimes desirable to divert a greater portion of the materials fed to the hopper to one of the chutes than to the other chute. Suppose that it is desired to divert two-thirds of the total material handled to the left, and one-third to the right as would be the case with the arrangement of chutes shown in Fig. 1 when all three crushing machines are operating at equal capacities. Four of the gate sections or plates would be swung to the right and the other two to the left where six sections are used. It will be seen that, with the structure shown in Figs. 3 and 4, the materials issuing from the hopper may be divided into two parts of any desired unequal proportions. However, all of the parts are composed of the correct predetermined percentages of the materials delivered to the hopper.

It is, of course, obvious that the sectional gate construction shown in Figs. 3 and 4 may be substituted in the coal-crushing plant, shown in Fig. 1, for the gate 20 which has a single vane extending throughout the length of the hopper.

In the embodiment shown in Figs. 5 and 6, I have illustrated the chute 13' as being divided longitudinally into two passages by means of a partition 27. One of the passages delivers directly to the branch chute 15 and the other to the branch chute 14. The hopper 11 is similar in construction to that illustrated in Figs. 3 and 4. In this embodiment I have illustrated two gate structures similar to that disclosed in Figs. 3 and 4 as being disposed beneath the hopper 11, one gate 24' being located at the upper end of the partition 27 for controlling the discharge of the material from the hopper to either of the passages of the chute 13'. The second gate 24 is located on a line above that on which the bottoms of the chutes 12 and 13' unite. By adjusting the diverting plates of the gate 24 and 24', the material issuing from the chutes may be diverted in the desired proportions to the various crushing machines.

In the embodiment illustrated in Figs. 7 and 8, a gate structure similar to that shown in Figs. 3 and 4, is disclosed, but, in this embodiment the hopper 11' into which the conveyers 16 are adapted to discharge, is divided into compartments and is provided with inclined bottoms in the form of adjustable gates. In the present instance, I have shown the gate structure as having twelve vanes or diverting plates 24, each section of the gate being operated by the handles 26. The spaces in which the gate sections operate are separated from each other by means of the division plates 50'. When the hopper is not provided with the diverting bottoms 18' and 18'', it is preferable to increase the

number of diverting plates or sections of the gate, and, in the present instance, I have shown the gate as comprising twelve sections, although it is to be understood that the number of sections may be increased or decreased as desired.

In the employment of the embodiment shown in Figs. 7 and 8, when it is desired to divide the material into two equal parts, the alternate gate sections should be so arranged as to deliver to one side and the intervening sections to the other side, and in this position they correspond in arrangement to the diverting bottoms 18′ and 18″ of the preceding embodiments. The gates can also be so arranged that the materials delivered to the hopper would be divided into parts of unequal proportions. By suitably arranging the gates two-thirds of the material may be diverted into the chute 13 and the remaining one-third of the total material fed to the hopper is diverted to the chute 12. It is not always practical to divide the gate into as many divisions or sections as may be desired, when a hopper having the stationary bottoms shown in Figs. 1 and 2 is not employed, and I have, therefore, sometimes found it preferable to employ my gate structure in combinaton with my improved hopper as it is practical to divide the hopper with oppositely disposed stationary diverting plates.

It is obvious that this invention is susceptible of various modifications and changes which would be within the spirit of the invention without departing from the scope of the following claims.

What I claim is:

1. In combination a chute or hopper having an outlet adapted to discharge material in a plurality of streams, means for delivering material to the hopper in a stream or blanket, and means for positively separating the material within the hopper into a plurality of bodies and selectively directing a predetermined number or proportion thereof into each stream discharged by the hopper.

2. In combination a chute or hopper having an outlet adapted to discharge material in a plurality of streams, means for delivering material to the hopper in a stream or blanket, and adjustable means within the hopper for selectively diverting a predetermined definite portion of the contents of the hopper to each stream discharged thereby, and for varying the proportions delivered to each stream.

3. In combination a chute or hopper having an outlet adapted to discharge material in two streams, means for delivering material to the hopper in a stream or blanket, means dividing the hopper longitudinally into a series of compartments adapted alternately to deliver their contents to said streams respectively, and means for causing all of said compartments to deliver their contents to either of said streams.

4. In combination a chute or hopper, a plurality of means for delivering material to the hopper, and adjustable means within the hopper for selectively separating material received from all of said delivery means into bodies of definitely predetermined proportions.

5. In combination a chute or hopper adapted to deliver material in a plurality of streams, a plurality of means for feeding material to said chute, means for positively separating the total body of material in the chute and delivering it in definite proportions to each stream discharged thereby, and means for controlling the direction of flow of the different streams from the chute.

6. In combination an elongated chute or hopper having an outlet, means adapted to deliver material over a side wall of the hopper, and means within the hopper for positively separating the material in the direction of the length of the hopper into a plurality of bodies and delivering a predetermined number of said bodies to said outlet from the hopper.

7. In combination, a chute divided into a plurality of compartments, means for delivering a plurality of materials to said compartments, plates in spaced-apart compartments extending from one side thereof but terminating short of the other side so as to cause the materials delivered to these compartments to issue from these compartments at the latter side, and plates in the remaining compartments disposed oppositely to those of the first compartments so as to cause the materials delivered to these compartments to issue from the first side thereof.

8. In combination, a chute divided into a plurality of compartments, means for delivering a material to said compartments in the form of a blanket, plates adjacent the bottoms of the alternate compartments closing the first sides thereof so that the material delivered to these compartments will issue from the open or opposite sides thereof, and plates in the remaining or intervening compartments closing the second sides of these compartments so that the material delivered to these compartments will issue therefrom from the first side thereof.

9. In combination, a chute divided into a plurality of compartments, means for delivering a plurality of materials in the form of blankets to said compartments, and plates inclined from the walls of said chute and partially closing said compartments, said plates in some of said compartments being inclined in one direction so as to divert the material admitted to these compartments to the first side of the chute, and the plates

in the remaining compartments being inclined in the opposite direction so as to cause the materials delivered to these compartments to issue from the second side thereof.

10. In combination, a chute, plates for dividing said chute into a plurality of compartments, inclined diverting plates in alternate compartments extending from one side thereof to at least the central longitudinal line of the chute, and inclined diverting plates in the remaining compartments extending from the other side of the chute in a direction opposite to that of the first-mentioned diverting plates to a point at least past the central longitudinal line of the chute.

11. In combination, a chute, means for delivering material in a stream or blanket to said chute, means for dividing said chute into a plurality of compartments, inclined diverting plates in alternate compartments extending from one side thereof to a point at least past the central longitudinal line of the chute, and inclined diverting plates in the remaining compartments extending from the other side of the chute in a direction opposite to that of the first-mentioned diverting plates to a point at least past the central longitudinal line of the chute.

12. In combination, a hopper divided into a number of compartments, chutes into which said hopper delivers, means for delivering materials in streams or blankets to said hopper, and plates in said compartments extending from one side thereof to at least the line on which the bottoms of said chutes join, the plates in some of said compartments being arranged in one direction so as to divert the material delivered to these compartments into one chute, and the plates in the remaining compartments being arranged in the opposite direction so as to divert the material admitted to these compartments to the second chute.

13. In combination, a chute, means for feeding material to one side of said chute, means for feeding material to the other side of said chute, and a plurality of plates in the chute for positively diverting a definite portion of each of the materials to that side of the chute opposite that at which the respective materials are fed into the chute.

14. In combination, a chute, means for delivering materials in blankets or streams to opposite sides of said chute, and a plurality of plates within the chute for positively diverting a definite portion of each of the materials to that side of the chute opposite that at which the respective materials are delivered to the chute.

15. In combination, a chute, means for delivering one kind of material in a stream or blanket to one side of said chute, means for delivering another kind of material in a blanket to the opposite side of said chute, means spaced-apart in said chute for diverting a portion of the material delivered to the first side of the chute to the other side thereof, and means interposed between said first diverting means for diverting material delivered to the second side of the chute to the first side thereof.

16. In combination, a chute, means for delivering a material in a stream or blanket to the side of said chute, means for delivering a second material in a stream or blanket to the opposite side of said chute, plates in said chute for positively delivering a definite portion of the material delivered to the first side of said chute to the opposite side thereof, a second set of plates for positively diverting a definite portion of the material delivered to the second side of the chute to the first side thereof, and an independent receiving means for each of said portions.

17. In combination, a chute divided into a plurality of compartments, means for delivering a material in a stream or blanket to one side of said compartments, and means for delivering a material in a stream or blanket to the opposite side of said compartments, some of said compartments being open along the first side and being closed at the second side thereof so that the material delivered to the second side of these compartments will be diverted to the opposite or first side of said chute, and the remaining compartments being open along the second side of the chute so that the material delivered to the first side of these compartments will be diverted to the second side thereof.

18. In combination, a chute, divided into a plurality of compartments, means for delivering a material to the first side of each of said compartments, means for delivering a material to the second or opposite sides of each of said compartments, plates adjacent the bottoms of the alternate compartments closing the first sides thereof so that the material delivered to these compartments will issue from the open or opposite sides thereof, and plates in the remaining or intervening compartments closing the second sides of these compartments so that the material delivered to these compartments will issue therefrom from the first side thereof.

19. In combination, a chute, means for delivering materials in streams or blankets to the opposite sides of said chute, means for dividing said chute into a plurality of compartments, inclined diverting plates in alternate compartments extending from one side thereof to at least the central longitudinal line of the chute, and inclined diverting plates in the remaining compartments extending from the other side of the chute in a direction opposite to that of the first-men-

tioned diverting plates to at least the central longitudinal line of the chute.

20. In combination, a hopper, chutes into which said hopper delivers, a conveyer for delivering a material to one side of the hopper in the form of a stream or blanket, a second conveyer for delivering a material to the opposite side of said hopper in the form of a stream or blanket, means for dividing said hopper into a plurality of compartments, plates in some of said compartments closing that side thereof above the mouth of one of said chutes, and plates in the remaining compartments above the mouth of the other chute.

21. In combination, a chute, means for feeding a material to said chute, means in the chute for diverting portions of the material to opposite sides of the chute, and adjustable means beneath said diverting means for diverting the mixed materials as desired.

22. In combination, a chute, means for delivering a plurality of materials to said chute, a plurality of spaced-apart means in the chute for diverting a portion of the materials to one side of the chute, a plurality of means interposed between said first means for diverting the remaining portion of the material to the other side of the chute, and a gate beneath said diverting means.

23. In combination, a chute, means for delivering materials in streams or blankets to said chute, plates in said chute for diverting a portion of the materials to one side of said chute, a second set of plates in the chute for diverting the remaining portion of the materials to the opposite side of the chute, and a gate beneath said plates.

24. In combination, a chute divided into a plurality of compartments, means for delivering a plurality of materials to said chute in the form of streams or blankets, plates in spaced-apart compartments extending from one side thereof but terminating short of the other side so as to cause the materials delivered to these compartments to issue therefrom at the first side, plates in the remaining compartments disposed oppositely to those of the first compartments so as to cause the materials delivered to these compartments to issue from the second side thereof, and a gate comprising a plurality of adjustable sections beneath said diverting plates.

25. In combination, a chute divided into a plurality of compartments, means for delivering a material to the first side of said chute in the form of a stream or blanket, means for delivering a material to the second side of said compartment in a stream or blanket, plates in spaced-apart compartments extending from one side thereof but terminating short of the other side so as to cause the materials delivered to these compartments to issue therefrom at the first side, plates in the remaining compartments disposed oppositely to those of the first compartments so as to cause the materials delivered to these compartments to issue from the second side thereof, and a gate comprising a plurality of adjustable sections beneath said diverting plates.

26. In combination, a chute divided into a plurality of compartments, means for delivering material to said compartments, plates inclined from the walls of said chute and partially closing said compartments, said plates in some of said compartments being inclined in one direction so as to divert the material delivered to these compartments to the first side of the chute, and the plates in the remaining compartments being inclined in the opposite direction so as to cause the material delivered to these compartments to issue from the second side thereof, and a gate in the chute beneath said inclined plates, said gate comprising a plurality of sections, each section being at least the width of two compartments.

27. In combination, a chute divided into a plurality of compartments, means for delivering material to the first side of said compartments, means for delivering a material to the second side of said compartments, plates inclined from the walls of said chute and partially closing said compartments, said plates in some of said compartments being inclined in one direction so as to divert the material delivered to these compartments to the first side of the chute, and the plates in the remaining compartments being inclined in the opposite direction so as to cause the materials delivered to these compartments to issue from the second side thereof and a gate in the chute beneath said inclined plates, said gate comprising a plurality of sections, each section being at least the width of two compartments.

28. In combination, a hopper divided into a plurality of compartments, a plurality of chutes into which said hopper delivers, means for delivering material in a stream or blanket to said compartments, inclined diverting plates in alternate compartments extending from one side thereof to at least the central longitudinal line of the hopper, inclined diverting plates in the remaining compartments extending from the other side of the hopper in a direction opposite to that of the first-mentioned diverting plates to at least the central longitudinal line of the hopper, and a gate beneath said inclined plates and between said chutes, said gate comprising a plurality of independently pivoted plates or sections.

29. In combination, a hopper, chutes into which said hopper delivers, plates for dividing said hopper into a plurality of compartments, inclined diverting plates in alternate compartments extending from one side there-

of but terminating short of the other side, inclined diverting plates in the remaining compartments extending from the second side of the hopper in a direction opposite that of the first-mentioned diverting plates, a plurality of compartments beneath the compartments in which said diverting plates are located and of greater width than said first compartments, and an adjustable gate section or plate in each of said second-mentioned compartments.

30. The herein described method of dividing and proportioning material which comprises dividing a body of material transversely into a plurality of bodies, commingling the alternate bodies of the series, and separately co-mingling in an independent body the bodies intermediate of those aforesaid.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

JOSEPH L. HILLER.

Witnesses:
EDWARD B. HILLER,
FLORENCE L. HILLER.