

May 8, 1934.

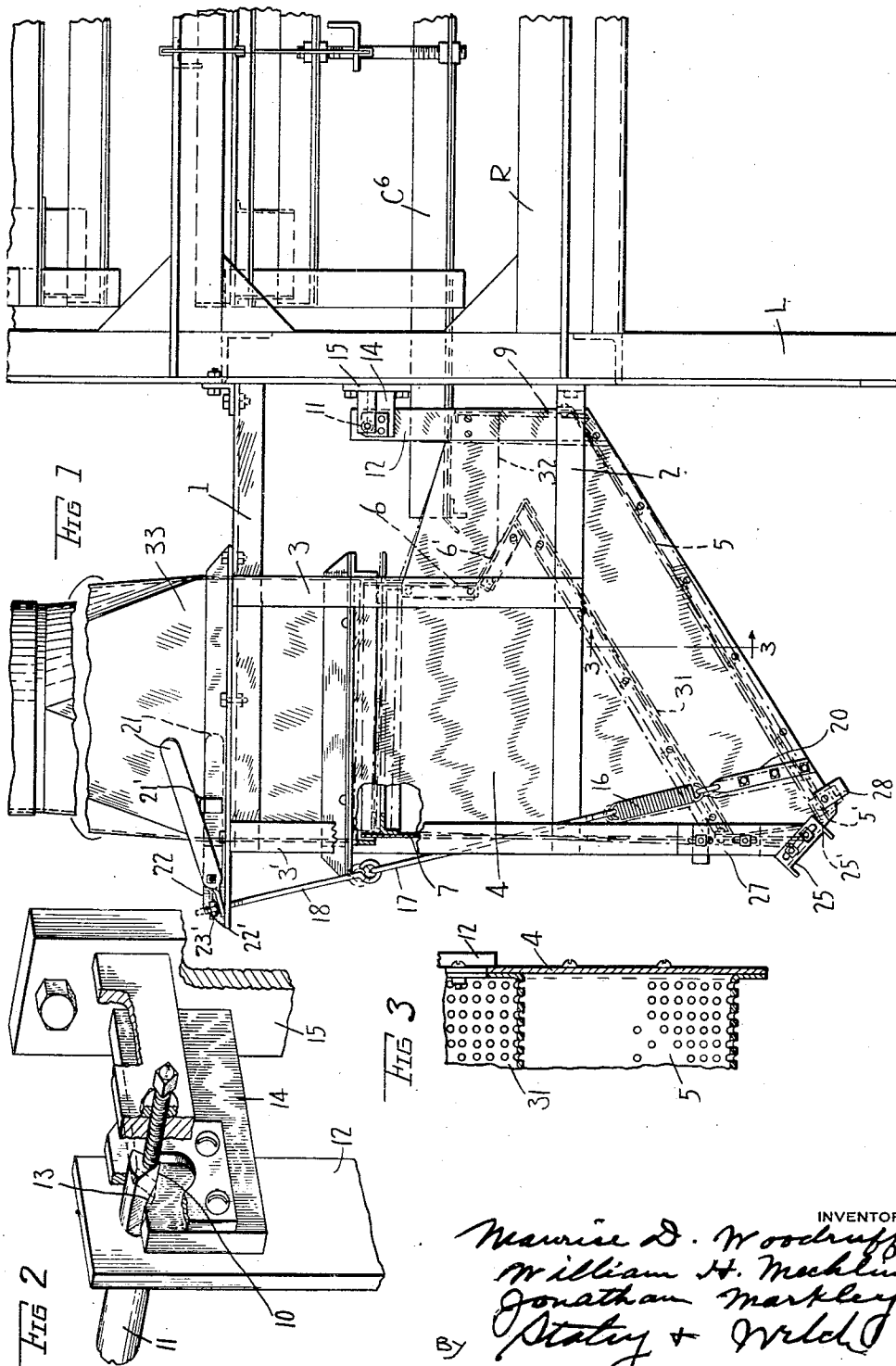
M. D. WOODRUFF ET AL

1,958,291

COOLING APPARATUS

Filed Dec. 21, 1933

2 Sheets-Sheet 1



May 8, 1934.

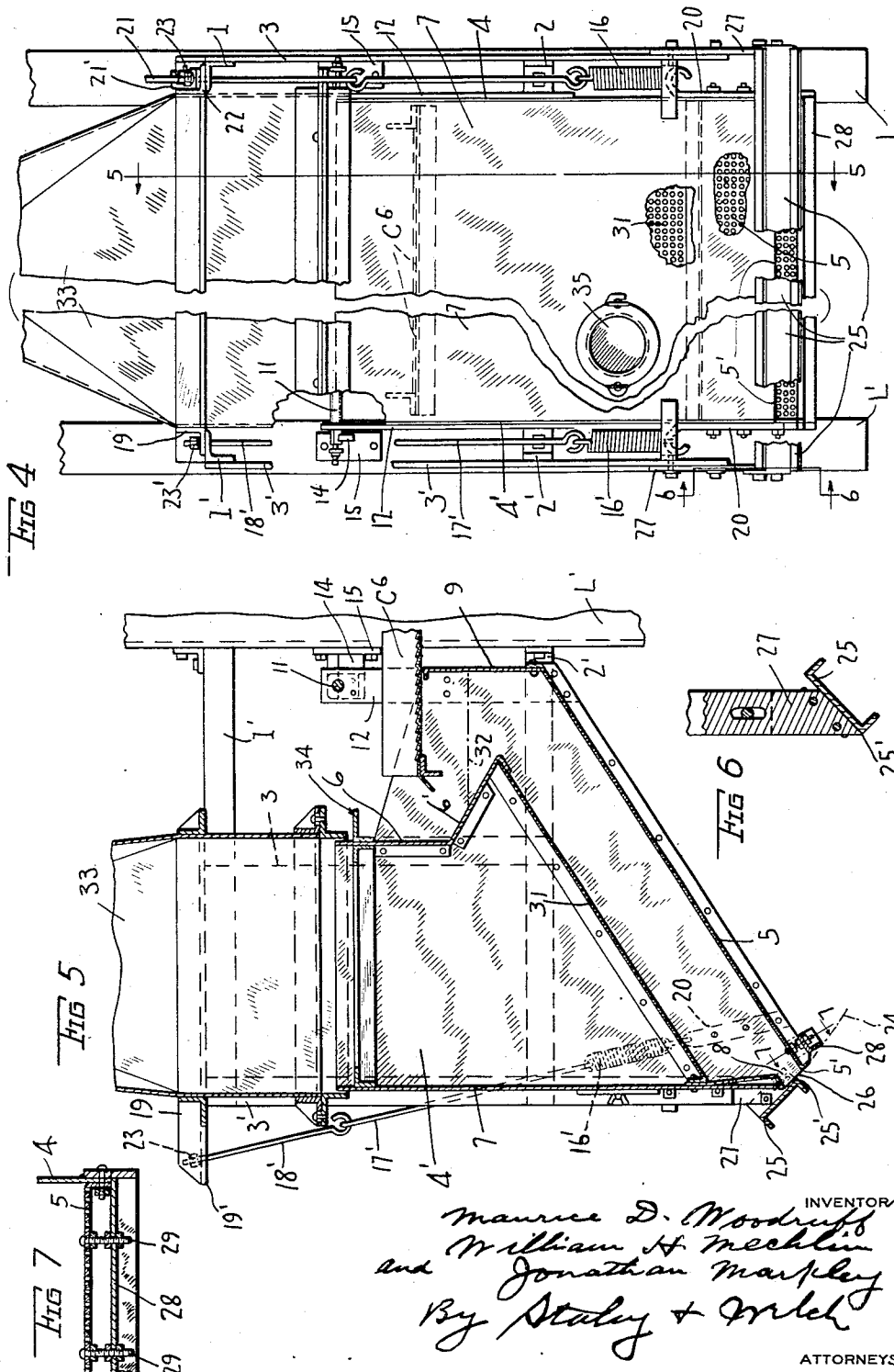
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COOLING APPARATUS

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9 Claims. (Cl. 34—33)

This invention relates to improvements in cooling apparatus for such material as roasted coffee, roasted peanuts and the like, the invention relating more particularly to means whereby the delivery of cooled material is held in substantially equal proportions to the quantity of roasted material supplied for cooling.

The improved cooler is especially adapted to employment in connection with the continuous roasting apparatus shown and described in our co-pending application Serial No. 703,436, filed Dec. 21, 1933, a portion of which is shown in elevation in the present drawings, and the object of the invention is to effectively cool the material and to govern the quantity discharged from the cooler according to the amount received from the roasting apparatus, so that there will be maintained at all times a uniform depth of material in the cooler regardless of the rate of flow from the roasting apparatus, resulting in preventing the material from flowing too rapidly through the cooler, particularly when the flow from the roasting apparatus is slow.

Other objects of the invention will be obvious from the accompanying description and claims.

In the accompanying drawings:

Fig. 1 is a view mainly in side elevation, but with a small portion in vertical section, of the improved cooling apparatus attached to the discharge end of the previously mentioned continuous roasting machine, a fragment of which is shown conventionally in side elevation with side casings removed.

Fig. 2 is an enlarged perspective view of a portion of a detail of the cooler.

Fig. 3 is an enlarged fragmentary vertical section on the line 3—3 of Fig. 1.

Fig. 4 is a fragmentary end elevation of the cooler with some of the parts partly broken away.

Fig. 5 is a longitudinal section, the section being taken on the line 5—5 of Fig. 4.

Fig. 6 is a slightly enlarged fragmentary vertical section on the line 6—6 of Fig. 4.

Fig. 7 is a slightly enlarged fragmentary section on the line 7—7 of Fig. 5.

Referring to the drawings, the frame-work of the cooler consists of the horizontally disposed angle-section members 1 and 1' and the flat bar members 2 and 2' (Fig. 4). These members are arranged in pairs, the pair 2 and 2' being located directly below the pair 1 and 1'. A portion of the roasting machine is shown conventionally at R, and fragments of two supporting legs thereof are indicated at L and L'. The cooler frame is attached to these legs, the members 1 and 2 being

secured to the roaster leg L, while the members 1' and 2' are attached to the leg L'. Vertical stays 3 and 3' are employed to brace the cooler frame members 1, 1', 2 and 2', the stays 3' being extended downwardly below the members 2 and 2' for a purpose which will appear later.

The present cooler is especially adapted to being employed in connection with the continuously operated roasting machine which is the subject matter of the co-pending application previously mentioned. In order that thorough cooling will be obtained of the comparatively large amounts of material that may possibly be run through the two machines the present cooler is provided with a hopper so devised that a large mass is retained therein at all times so as to prolong the time that the material is acted upon by the cooling agent, which in the present case is an air flow induced by a suction fan (not shown), the suction conduit of which is connected with the stationary stack member of the cooler herein-after described.

To facilitate the flow of material through the hopper, the hopper is provided with a sloping bottom as will be described, with a variable discharge opening at the lower portion thereof, and after the correctly sized mass is built up in the hopper, it will be seen that to maintain that mass, it is only necessary to discharge from the hopper, only so much material as is being delivered thereto. This is the reason for employing a variable discharge opening, the size of which is varied to the point of being totally closed at times, as otherwise the material would gravitate so rapidly through the hopper as to be but partially cooled.

To provide that the material is held back sufficiently to be effectively cooled, the hopper is arranged so as to be pivotally and resiliently supported, and at times to be swung to a closed position until a certain level of material is built up in the hopper. The resilient supporting means (tension springs) are adjusted so that by an increase above the level of the material mentioned, the additional weight will overcome the tension existing in the springs, whereby the hopper will swing slightly and an amount will be discharged substantially equal to the amount being received.

There is another reason for building up the mass of material to the level indicated, which as will be explained will appear to be comparatively high, this reason being that the air flowing upwardly through the hopper, and if a small quantity only were to be held back, the air would "short circuit" around the small mass and would only partially cool that mass.

The hopper is composed of sheet metal, and has two side sheets 4 and 4' disposed in parallel vertical planes within the frame-work of the cooler. The lower edges of the side sheets are cut at an angle sloping downwardly from the roasting machine R whereby when the hopper bottom sheet 5 is attached to the lower edges of the side sheets a sloping bottom for the hopper is provided. The hopper bottom sheet 5 is perforated throughout its extent to provide for the passage therethrough of the cooling air as will be explained.

The upper portions of the side plates 4 and 4' are so formed that with the addition of the transversely disposed sheets 6 and 7 (Fig. 5) a stack of rectangular cross-section, in the present case, is provided. The material enters the cooler from the open end of the roaster conveyor C⁶ and falls on an inclined imperforate plate 6' which is a continuation of the sheet 6 and is placed in an angular position as shown in Fig. 5, in order to spread the material efficiently and to break the fall. The transverse sheet 7 is extended downwardly to a point closely adjacent the edge 5' of the bottom sheet 5 leaving a narrow, horizontally disposed opening 8 (Fig. 5). Another smaller sheet 9 is attached to the upper edge of the bottom sheet 5 and extends upwardly to just below the portion of the conveyor C⁶ projecting over the hopper.

The receiving end of the hopper is pivotally supported by the roaster frame on knife edges in order to reduce the friction. A knife edge 10 (Fig. 2) is formed in each end of a rod 11 which is inserted in the upper ends of a pair of straps 12, a strap 12 being attached by bolting or other suitable means to each side of the hopper at the roaster end thereof. To each leg L and L' of the roaster frame is secured a plate 15 having attached thereto preferably by welding a forwardly extending arm 14, and in each of the upper edges of arms 14 a V-notch 13 is cut into which a knife edge 10 is placed.

The remainder of the hopper weight is carried by a pair of resilient suspension means, one on each side of the hopper at the end thereof opposite the pivotal support. Each suspension member depends from auxiliary cooler frame members attached to and extending beyond the upper frame members 1 and 1', and each suspension member contains a coiled spring 16 and 16' respectively, which forms the resilient members thereof, the springs being placed in tension when the weight is placed on them. The other parts of each suspension member are the links 17 and 18 on the right hand of Fig. 4 and the links 17' and 18' on the left side. As shown, the lower end of a link 17 or 17' is hooked into the upper end of a spring 16 or 16', while the spring is hooked to a strap 20, there being a strap 20 attached on each side of the hopper.

The upper ends of the links 18 and 18' are threaded and passed through the extended ends 19' and 22' respectively of the auxiliary frame members 19 and 22, and nuts 23 and 23' are threaded on the links 18 and 18' respectively whereby proper tension is given the springs. However, to elevate the hopper manually, use is made of a lever 21 which is pivotally connected to the vertical leg of the auxiliary frame member 22 and which may be depressed to the broken line position (Fig. 1) as desired, and retained there by a bent latch 21'. On the left side of the cooler as seen in Fig. 4, the nut 23' bears on the upper side of the auxiliary frame member 19, whereas on the right side, the companion nut 23 bears on

the short arm of the lever 21. Proper adjustment of a loaded hopper consists in depressing the lever 21 to the broken line position, and running each nut 23' and 23 down on the respective threaded ends of the links 18 and 18' until the tension on the springs is sufficient to draw the hopper upwardly to the extent that a transverse sheet such as the sheet 7 stands vertically. It will be seen that any additional weight carried by the hopper will result in a downward swing thereof, the dot-dash arc 24 in Fig. 5 showing the path of movement made by the lower edge 5' of the hopper in such a swing.

The discharge opening 8 of the hopper is of fixed size and to vary the amount that can be discharged from this opening a gate 25 is adjustably secured to the cooler frame in such position as to be extended horizontally across the opening 8 and to entirely close the same when the hopper is empty.

When the hopper is full, the load on the springs is increased and the hopper swings downwardly and increases the size of the opening, which size will vary with the swinging movement of the hopper and thus discharge more or less material, as the case may be. The gate 25 is adjustably secured at each end to a comparatively short flat bar member 27 whose lower end is cut diagonally so that the gate will be positioned at an angle with the vertical approximating the slope of the arc 24, and the nature of the adjustment is such that the gate is movable along this angular line.

One each of the short bars 27 is in turn adjustably secured to the lower end of the vertical frame members 3' and is formed with elongated bolt holes so placed that the possible adjustment is in a vertical plane as seen. The result of the two adjustable movements is that the gate may be readily lowered or raised to or from the edge 5' in a vertical direction and in an angular direction as well.

In order that the bottom edge 5' may be maintained sufficiently straight so that its coaction with the gate will be effective to cut off the flow of material, the bottom sheet 5 is stiffened at intervals by the use of the bolting arrangement shown in section in Fig. 7. Secured preferably by welding to the lower edges of the side plates 4 and 4' adjacent the edge 5' of the bottom sheet 5 is an angle member 28 having one leg parallel to the bottom sheet 5, and a plurality of bolts 29 is passed downwardly through openings in the bottom sheet 5 and also through the parallel leg of the angle member 28. A plurality of nuts is employed on each bolt 29 as seen whereby by adjustment adjacent portions of the sheet 5 may be forced upwardly or brought downwardly as required to produce a straight and effective edge.

It is preferable that thin spots in the mass of material are avoided since the cooling air will find such spots and will pass therethrough in preference to other thicker places whereby poor cooling will result. To provide that the mass will be of uniform thickness, a second perforated hopper plate 31 (Fig. 5) is employed and is placed above the bottom sheet 5 in spaced apart parallel relation thereto. As seen in Fig. 5, the upper plate 31 extends from the lower edge of the spreader plate 6' downwardly to the end sheet 7, and when the space is filled the mass material will be of uniform depth.

The operation of the cooler is as follows: The lever 21 is forced downwardly to the broken line position and latched under the bent latch member 21' (Fig. 1). This pulls the hopper upwardly

until the discharge opening thereof is completely closed by the gate 25.

The material is then allowed to discharge from the roaster conveyor C⁶, filling up the space between the perforated plates 5 and 31 and between the spreader plate 6' and end sheet 9 until the material reaches the level indicated by the dot-dash line 32 (Figs. 1 and 5). The object in having the material level at this height is to prevent a flow of the cooling air from entering the hopper stack through any exposed portion of the upper perforated plate 31 from the vicinity of the lower edge of the spreader plate 6'. With the level at the height shown, the air finds a uniform depth of material ahead of it, and practically all of the air that eventually passes through the openings in the upper perforated plate 31 will have first passed through the openings in the hopper bottom 5 and through the mass of material.

When the material has reached the proper level as indicated, the tension on the springs is adjusted so that the hopper is vertical, by which is meant that such sheets as 6, 7 or 9 stand vertically. The gate 25 is then adjusted until the lower edge 25' is in perfect alignment with the edge 5' of the hopper bottom. The lever 21 is returned to the full line position (Fig. 1), this movement partially relieving the tension of the spring on that side and further so affecting the spring on the other side that the hopper sinks and discharges an amount of material. Since the first material to leave the hopper is that material which collected therein during the time the hopper was filling to the level, it is insured that such material is thoroughly cooled.

As soon as any material leaves the hopper, the weight is thereby lessened to that extent, which lessening may, or may not, be made up by the material entering the hopper. If the material entering is now less than heretofore, the springs, aided by the upward force of the cooling draft, act to decrease the opening and thereby a discharge of less material results. If a greater quantity enters, obviously the hopper descends further and a greater amount is discharged; in either event, the equilibrium which is always maintained between the spring tension and the combined weight of the hopper itself and the contained material is varied only by the inflow of material in greater or less quantities, with a corresponding change in the amounts of material permitted to discharge.

By depressing and latching the lever 21 at times during the operation, the discharge of the material from the hopper may be cut off; such stoppage can only be of a temporary nature, as there is no mechanical connection with the roaster and delivery therefrom is not affected.

After the air passes upwardly through the upper perforated sheet 31 it ascends through the stack hopper, and thence into a stack 33 which is supported by the cooler frame members 1 and 1' and the angle members 19 and 22 previously mentioned. The lower end of the upper stack 33 has a telescoping connection with the upper end of the hopper stack, with sufficient running clearance to insure that the free movement of the hopper is made without friction of the telescoping portions. It will be further noticed that the pivotal knife edges are located in a horizontal plane at substantially the same level as the top portion of the stack hopper, whereby the arcuate movements of the telescoping portion of the stack hopper within the frame-supported stack are so nearly in alignment with the vertical sides of the

latter stack that the clearance between the stacks may be held to a minimum.

The process of roasting such material as peanuts sometimes loosens the skins thereof which are caught by air currents entering the clearance space between the hopper stack and the stationary stack. This is particularly true of the space adjacent the sheet 6, and to prevent any interference to free movement of the hopper caused by the packing of skins in the clearance space at this point, a baffle member 34 (Fig. 5) is secured to the outer surface of the sheet 6 just below the lower edge of the stationary stack. This baffle causes a diversion in upward currents whereby the skins do not rise and enter the clearance space.

With the same material it may happen that the germs will become brittle and break off from the kernels. The germs gravitate into the hopper and are carried upwardly through the upper perforated sheet 31, but being too heavy to be carried out through the stacks, fall to and collect on the perforated sheet 31. If any considerable amount remains on the sheet 31 the air flow is concentrated at other parts of the hopper with probable poor cooling as a result. To provide for removal of portions of material collecting as described, an opening covered by a removable cover plate 35 (Fig. 4) is fitted to the lower portion of the end sheet 7.

Having thus described our invention, we claim:

1. In a cooler of the character described, a movable hopper having an inclined perforated bottom and a normally covered discharge opening at the lower end of said bottom, means to supply material to said hopper, yieldable means for supporting said hopper adapted to yield upon a predetermined load in said hopper and permit said hopper to move to uncover said opening and allow material to discharge through said opening in quantities proportionate to the amount supplied to said hopper, and a suction conduit communicating with said hopper above the material carried on said perforated bottom.

2. In a cooler of the character described, a movable hopper having an inclined perforated bottom and an inclined perforated top forming a chute having a discharge opening, means to supply material to the upper end of said chute, yieldable means for supporting said hopper adapted to yield upon a predetermined load in said hopper to permit material to discharge through said opening in quantities proportionate to the amount supplied to the upper end of said chute, and an air suction conduit communicating with said hopper above the perforated top thereof.

3. In a cooler of the character described, a movable hopper having an inclined perforated bottom, said hopper having a discharge opening, means to normally close said opening, resilient means for sustaining said hopper adapted to yield upon a predetermined load in said hopper and permit said hopper to move to uncover said opening, and an air suction conduit communicating with said hopper above the perforated bottom thereof.

4. In a cooler of the character described, a hopper having an inclined perforated bottom, said hopper having a discharge opening, means to normally close said opening, a pivotal support for one end of said hopper, and resilient means for sustaining the other end of said hopper adapted to yield upon a predetermined load in said hopper and permit said hopper to move downwardly to uncover said opening, and an air suc-

tion conduit communicating with said hopper above the perforated bottom thereof.

5. In a cooler of the character described, a movable hopper having an inclined perforated bottom and an inclined perforated top, said hopper having a discharge opening, stationary means for sustaining said hopper adapted to yield upon a predetermined load in said hopper and permit said hopper to move to uncover said opening, and an air suction conduit communicating with said hopper above the perforated top thereof.

6. In a cooler of the character described, a movable hopper having an inclined perforated bottom and an inclined perforated top to form a chute, said hopper having a discharge opening at the lower end of said chute, stationary means for sustaining said hopper adapted to yield upon a predetermined load in said hopper and permit said hopper to move to uncover said opening, and an air suction conduit communicating with said hopper above the perforated top thereof.

7. In a cooler of the character described, a movable hopper having an inclined perforated bottom and an inclined perforated top forming a chute, an imperforate deflector at the upper end of said chute to deflect material into said chute, said chute having a discharge opening at the lower end thereof, means to normally close said opening, resilient means for sustaining said hopper adapted to yield upon a predetermined load

in said hopper and permit said hopper to move downwardly to uncover said opening, and an air suction conduit communicating with said hopper above the perforated top thereof.

8. In a cooler of the character described, a movable hopper having an inclined perforated bottom and an inclined perforated top forming a chute, said chute having a discharge opening at the lower end thereof, means to normally close said opening, pivotal means to support the upper end of said hopper, resilient means to support the lower end of said hopper adapted to yield upon a predetermined load in said hopper to permit said hopper to move to uncover said opening, and an air suction conduit communicating with said hopper above the perforated top thereof.

9. In a cooler of the character described, a movable hopper having a perforated bottom and a normally closed discharge opening, a suction conduit carried by said hopper above said bottom, a stationary stack telescoped with said conduit, a pivotal support for one end of said hopper in line with the telescopic joint between said conduit and stack, and yieldable means to support the other end of said hopper to permit the hopper to swing about its pivotal support upon a predetermined load in said hopper to uncover said discharge opening.

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