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METHOD AND MEANS FOR COOLING GRANULAR MASSES
CONTAINING EVAPORABLE LIQUID

2,863,190

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4 Sheets-Sheet 1

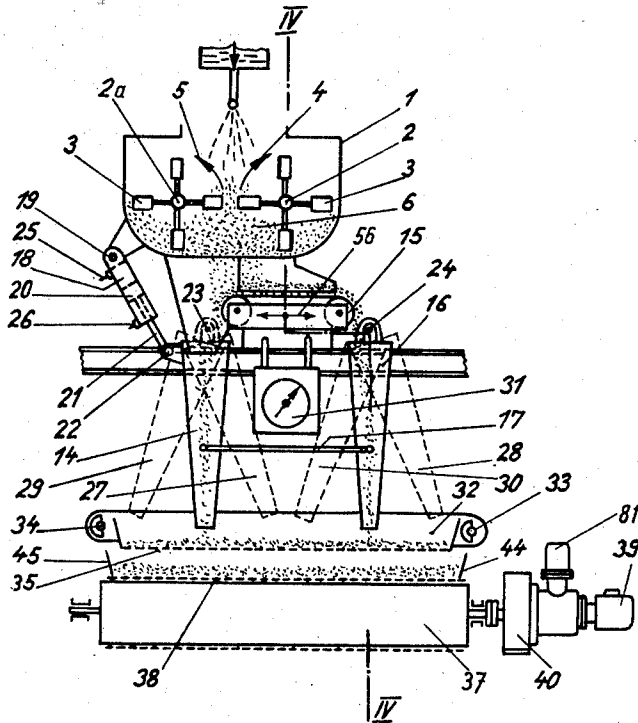


Fig. 1

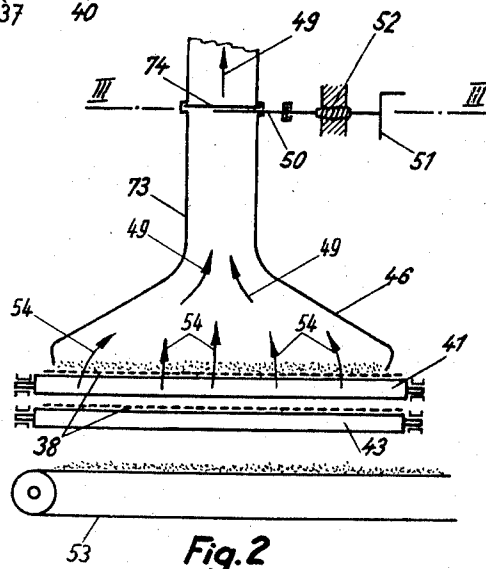


Fig. 2

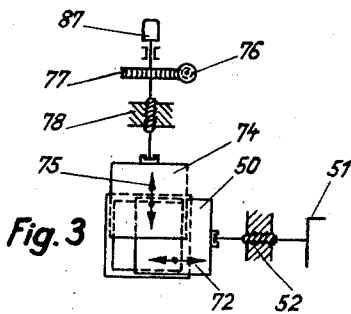


Fig. 3

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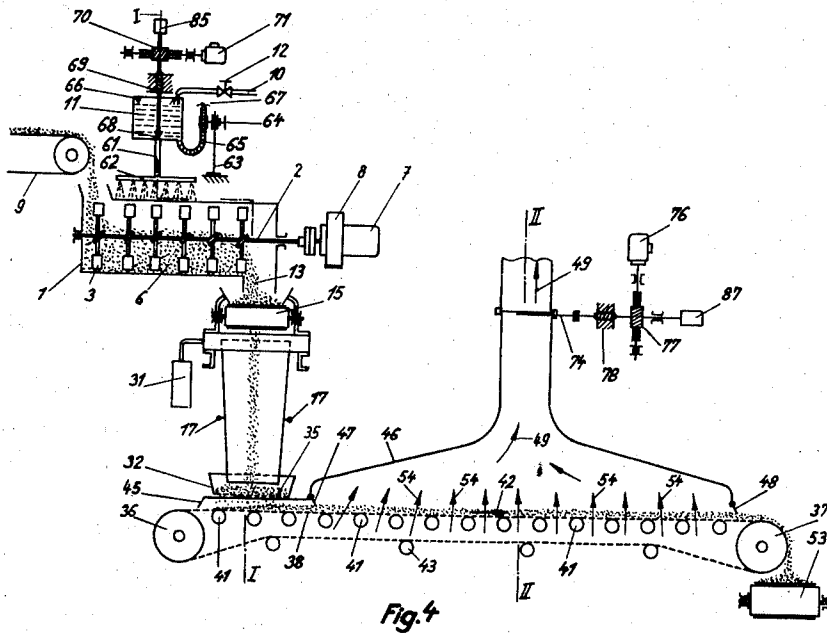
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4 Sheets-Sheet 3

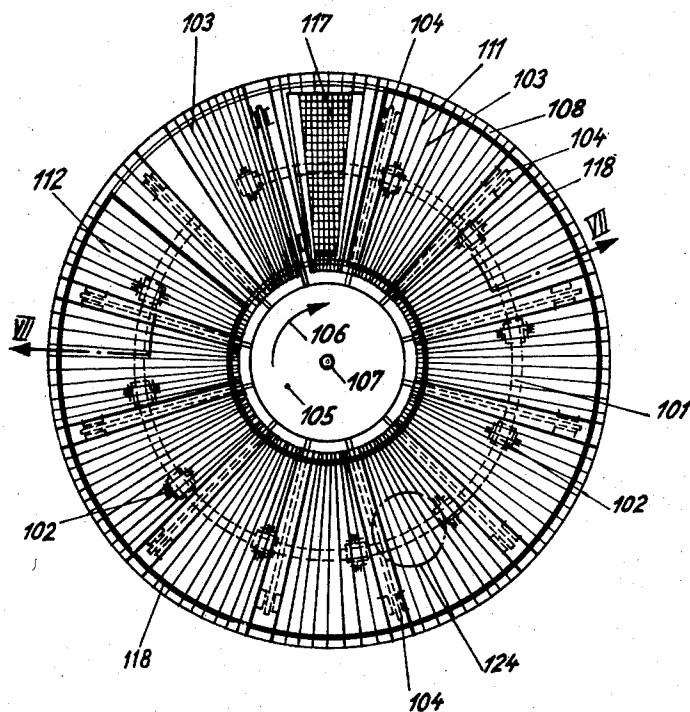


Fig. 6

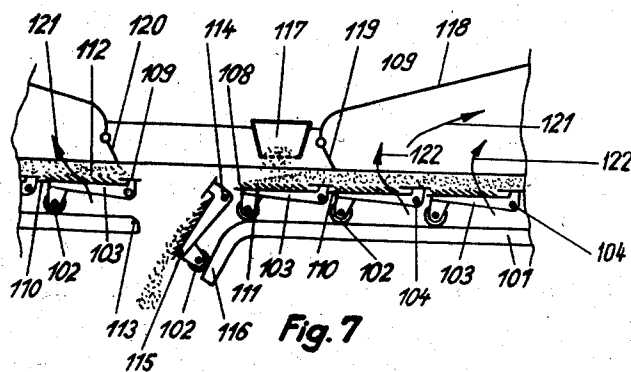


Fig. 7

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4 Sheets-Sheet 4

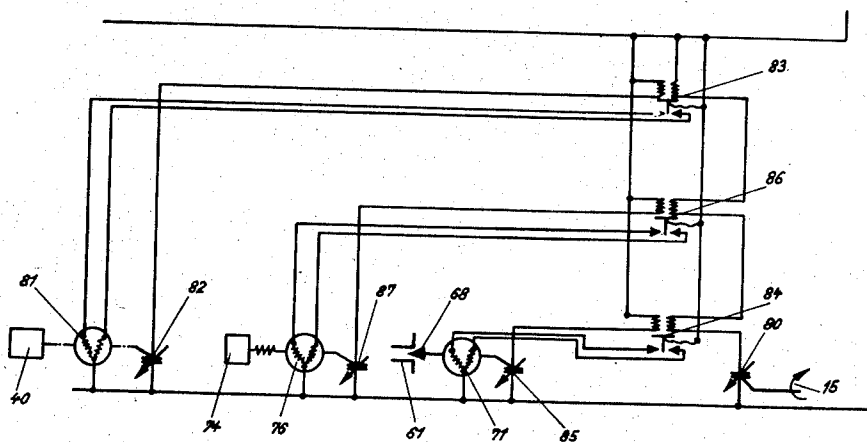


Fig. 5

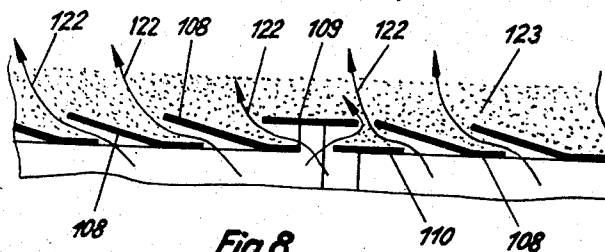


Fig. 8

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METHOD AND MEANS FOR COOLING GRANULAR MASSES CONTAINING EVAPORABLE LIQUID

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Application January 24, 1955, Serial No. 483,703

Claims priority, application Switzerland October 20, 1954

22 Claims. (Cl. 22—89)

This invention relates to method and means for cooling foundry sand.

When casting molds with metal in liquid state, the molding sand is subjected to heat. This heating effect is the larger, the more liquid metal participates in contacting the material, and the longer the time interval (heat transfer time) is extended between the casting operation and the separation of the castings from said molding and material. Since the molding sand mass is a bad heat conductor and if no particular steps are taken in view of this fact, a very long period of time for cooling purposes will of course become necessary.

In production line operations (mass production), where relatively short time intervals are required to perform molding, replenishing and preparing of the molding sand, the heat transfer to the sand increases continuously and finally reaches an undesirable high degree of temperature at which said sand becomes unsuitable for further re-processing or re-use.

The disadvantages which are thus encountered, are in particular as follows:

The properties of the clay-bonded molding sand, hereinafter referred to generally as wet type re-usable binder containing molding sand, depend to a great extent on the moisture content of the sand.

There exists a definite and rather limited range for the moisture content, within which molding sand has the best working consistency (tempering water). As the moisture content, to which the sand is adjusted during its preparation, is subject to fast changes, as said sand becomes warmer, excessively heated molding sand assumes variable properties and affords rarely the optimum properties required for best molding and casting conditions.

Experience has also taught, that heated molding sand is prone to adhere more readily to metal patterns and metal pattern plates due to the occurrence of condensation caused by moisture in the molding sand.

It has further been found that warm and damp sand cannot be readily subjected to screening and, in particular, to fine sieve operations, which appear necessary for repeated use of molding sand in order to free the same from foreign matter and agglomerations of quartz and like granules, which otherwise deteriorate desirable qualities and properties of the molding sand.

It has also been observed, that an economical and effective cooling of sand may only be obtained, when during its damp or moist state water is extracted or otherwise removed through vaporization, so that the heat of vaporization may be employed for performing a cooling step. In order to cool down molding sand, it has heretofore been proposed to direct the same into drums in which the sand was subjected to a whirling or throwing motion or to throw the sand by means of aerators through screens or distributing means, or to squash the sand and to subsequently subject the same to slinging action. A further proposition is to divert said sand through bucket elevators and to subsequent crushing mills or to cause it to pass

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through drums through which said sand is fed or advanced by means of built-in screw-feeders.

In all these cases, provision was made to simultaneously suck in or pass certain quantities of cooling air through these mills or aggregates.

For an effective cooling system of this type, however, great quantities of air are necessary, because the air during its short passage and due to the relatively insufficient contact with sand cannot be completely saturated with water vapor and because the cross sections of the passageways of these aggregates are predetermined, relatively, high speeds of air are necessary which, however, remove from the sand mass under treatment great quantities of fine sand grains. While this occurrence may be desirable in exceptional cases where one works exclusively with organic binders, or for instance, with cement, where the binder loses its bonding property after casting, such occurrence is however greatly undesirable, if one works as in most of the cases with clay-bonded molding sand, as in such latter case the percentage of fine material in regard to the granular mass consists predominantly of active swellable clay which would have to be replaced during re-employment and re-processing. In practice, however, such disadvantage could be partly diminished in that one does not completely cool the molding sand and does not completely remove through suction clay binder substances contained therein.

It was further proposed to admit in known sand mixer systems with circulating rollers from below compressed air prior to or during the mixing operation and to exhaust subsequently air again from above said mixer system. Such treatment, however, has inherently great disadvantages, as the finished mixed sand depending upon the temperature of the sand initially fed thereto and in accordance with its moisture content is subjected to considerable changes which cause variations in the characteristics and properties of the molding sand when the same is discharged from the mixer system.

It has further been suggested to conduct the sand along a transporting or feed channel and to roll over the mass for the purpose of cooling, to comb or to displace the same, or to throw the sand continuously and repeatedly through the air. However, this cooling process for sand masses was very little effective and not sufficiently economical.

A further proposition heretofore known resides in the employment of two vertical cylinders arranged successively to each other, which have a narrow passageway therebetween, whereby the sand passes downwardly, while the cylinders are impinged by a stream of air moving in opposite direction. However, this cooling system is applicable only to sand which contain primarily used-up binder substance, as this cooling process acts to a great extent on the fine particles of the sand.

It has further been contemplated to prepare the molding sand on rotary and superimposed tables or disks, on which the mass will be continuously turned over, whereby it will be moved from one disk to the successive disk therebelow, while cool air is continuously brought into contact with such sand mass. Although this cooling system is considered to be quite effective, it has, however, the disadvantages that on account of high air velocity a higher proportion of fine material is removed from the granular, clay-bond containing mass and that installments or devices therefor necessitate extremely high investment expenses and become rather costly during operation.

In order to overcome these and other disadvantages which ensue from processes and devices heretofore used for cooling of sand which contain usable binder substance, such as clay, the present invention contemplates for the first time a novel process according to which the

molding sand mass is built-up in loose heap formation on a support which is permeable to air, whereby the latter is subsequently forced through such sand resting on the air-permeable support.

In the event that the sand does not as yet possess the required moisture for the ensuing cooling operation, provision is made to subject said sand to a prior moist treatment.

In order to achieve the greatest possible penetration of air and a large contact surface between said sand and air, provision is made according to the invention that the sand is sieved or screened onto said support at a relatively reduced depth of drop. When the sand is screened or passed through a sieve in moist state, a relatively good penetration of air is possible, but is only maintained, if during screening operation the loose state of compaction of the sand will not be disturbed when same is heaped or piled-up. The present invention further includes a process step according to which the state of compaction of said sand remains substantially unaltered during the cooling step.

It is therefore a primary object of the invention to provide means imparting to the molding sand mass during its preparation a predetermined moisture content to thereby facilitate a very efficacious cooling treatment therefor. By choosing the quantity of water of the sand at the beginning of the treatment, as well as that of cool air passing through the sand at the termination of said treatment, a predetermined moisture content and a definite temperature even below room temperature may be obtained.

It is another feature of the invention to provide means affording the passage of air from below and through the bottom of a support, whereby the air pressure takes off the load exerted by the sand mass located on said support.

Still another object of the invention is to provide means conducive to simplified foundry operation, whereby the preparation of molding sand for re-use may be carried out in a continuous and predetermined fashion. Although the possibility exists to perform such operations intermittently, it has been found in practice that such continuous operations are preferred.

It is still a further object of the invention to provide means facilitating withdrawal of heat from used molding sand and the preparation of the latter for re-use in a most efficient and economical manner, at high speed and at reduced cost. Another object of the present invention is to provide means facilitating cooling of molding sand in a foundry at a location intermediate the mold shake-out station and a molding sand recovery station.

A further object of the present invention is to provide means conducive to effective cooling of used and still warm molding sand removed from the mold after shake-out to reduce the sand temperature down to substantially ambient temperature.

Still a further object of the present invention is the provision of means affording cooling of used molding sand without causing from said molding sand any substantial separation of its expensive components or particle additions consisting of bonding clay or like binders of known type.

Another object of the present invention is the provision of means of contributing to an effective treatment of used molding sand which will not only effect a cooling of such used sand but will also serve to regulate a constant predetermined degree of moisture in such sand.

A further object of the present invention is the provision of means ensuring the treatment of used molding sand so as to maintain in such sand substantially uniform and casting improving conditions as to temperature, moisture and components of the sand.

Still a further object of the present invention is the provision of means contributing to very efficacious cooling of molding sand, notwithstanding the fact that sand

cooling has to be effectuated from either relatively high, or relatively low temperatures.

Another object of the present invention is the provision of means enabling cooling of molding sand automatically and in relatively large quantities for re-use.

A further object of the present invention is the provision of means facilitating cooling of used molding sand so as to require a minimum of maintenance or repair of foundry equipment, and to further means necessitating during operation relatively small quantities of cooling air, thus providing for extremely economical and reliable foundry sand reconditioning.

These and other objects of the invention will become further apparent from the following detailed description, reference being made to the accompanying drawings, showing preferred embodiments of the invention.

In order to more clearly understand the invention reference is had to the accompanying drawings in which:

Fig. 1 shows schematically a section of a part of plant for the preparation of molding sand according to the invention, the section being taken along lines I—I of Fig. 4.

Fig. 2 is a sectional view taken along lines II—II of Fig. 4.

Fig. 3 is a sectional view taken along lines III—III of Fig. 2.

Fig. 4 is a sectional view taken along lines IV—IV of Fig. 1.

Fig. 5 is a wiring diagram used in connection with the invention.

Fig. 6 is a plan view of a plant embodying the invention.

Fig. 7 is a sectional view taken along lines VII—VII of Fig. 6.

Fig. 8 is a fragmentary view, partly in section, of Fig. 7 and drawn to an enlarged scale.

Referring now more particularly to the drawings, there is shown in Figs. 1 and 4 a plant for the preparation of molding materials, in particular of molding sand or like granular material, said plant including a trough or like open-ended receptacle 1 for mixing granular materials, shafts 2 and 2a in said receptacle and supporting radially extending inclined blades or shovels 3, which upon rotation in the direction of arrows 4, 5 (Fig. 1) agitate the granular mass 6 within trough-receptacle 1. Shafts 2 and 2a are driven by a motor 7 over a suitable transmission gear box 8.

A supply or belt conveyor 9 delivers sand 6 to receptacle 1. From a pipeline 10 a suitable liquid or water is supplied to a tank 11, whose supply or quantity of water may be regulated by hand by means of faucet or valve 12. A discharge conduit 61 connects tank 11 with a sprinkler device 62, from which water is delivered to receptacle 1 onto the sand 6 while same is being agitated. On a standard 63 and displaceable thereon there is disposed a support 64 for holding a hose or overflow conduit 65, which is thus adjustable with respect to the water level in tank 11. The level 66 in tank 11 corresponds to the position of the end or level 67 of conduit 65. Consequently, the height of level 66 may be readily regulated through the adjustment of said conduit and relative to standard 63 and support 64.

A needle valve 68 in tank 11 is movable by means of a threaded stem 69 and rotatable by a worm gear 70, which is set in rotation by means of regulator motor 71, whereby the cross section of the outlet from tank 11 into the discharge pipe 61 may be altered. The sand 6 leaves trough-receptacle 1 at the egress 13 and about one half of said mass drops into a pivotally suspended tube 14 and the remaining half onto a belt conveyor 15. The transporting band 15 forms part of a balance device and delivers the respective half of the sand received by the latter into a pivotally suspended funnel-shaped tube 16, which is operatively connected through connecting lever 17 with said tube 14. A double-acting cylinder 18 which is piv-

otally joined to trough-receptacle 1 by means of fulcrum 19, contains a piston 20 with piston rod 21 which, in turn, is linked through fulcrum 22 with said tube 14, the latter being pivoted at 23 and connected by means of rods 17 to the aforesaid tube 16 which, in turn, is journaled about pivot 24.

If compressed air is supplied through pipe connector piece 25 to the cylinder 18, and if connector piece 26 is switched to exhaust, the pivotally suspended or pendulum tube 14 will be swung from a position shown in full lines to a position 27 shown in dotted lines, while pendulum tube 16 will assume then the position 28 also shown in dotted lines. In this latter position, a regulating element (not shown), will be so controlled due to said pendulum movements, that compressed air will be supplied to connector piece 26, while connection 25 is switched to exhaust.

Pendulum tube 14 thus moves from position 27 to position 29, while pendulum tube 16 assumes simultaneously position 30. In this position the aforesaid regulating element (not shown) will be reset under the action of the pendulum movements, to its starting position, whence the pendulum movements will also be reversed, and the operation starts anew.

In housing 31 (Fig. 4), in which the balance 15 proper is accommodated there are arranged regulator elements whose functions will be later explained.

The sand discharged from pendulum tubes 14 and 16 hits an oscillatory screen or support 32 which is moved by means of eccentric drive means 33, 34 (in a manner not shown in the drawing). Through the bottom 35 of screen or support 32 passes the sand while in a loose state and with a relatively reduced height of drop to arrive at wire mesh band 38 which is supported and guided by rollers 36, 37 (see Fig. 2) and whose mesh is determined in accordance with the specific grain size of the mass to be worked upon.

A drive motor 39 moves through the intermediary of a gearing 40 (the operation of which will be later described) wire mesh band 38 with such speed that the height of the layer of the sand on said band will be practically constant, while the quantity of supply of said sand is subjected to changes.

Supporting rollers 41 (Fig. 2) disposed at relative short distance from each other support wire mesh band 38 and prevent the loaded upper track from sagging and thus any disturbance in the working and build-up of the sand during its passage from roller 36 to roller 37 in the direction of arrow 42 (Fig. 4), while some of the band supporting rollers 43 take off the load from the lower track of the wire mesh band 38. Sand which rests on the wire mesh band 38 is laterally supported by sheet flap members 44 and 45 forming parts of the exhaust funnel 46. Furthermore, through pendulum flaps 47 and 48 which abut against the sand, the remainder of the exhaust hood 46 will be sealed off that a fan (not shown) which exhausts air in the direction of arrows 49 through exhaust hood 46, will force air to pass exclusively through the wire mesh band 38 and through the granular mass resting thereon.

A slide valve 50 may be regulated by rotating a crank 51 through the intermediary of threaded shaft 52 in the direction of arrow 72 (Fig. 3) and thus a change in the cross section of the passageway 73 for the air will be had. This regulation may be carried out by hand. A second slide valve 74 is movable in crosswise direction to slide valve 50 in the direction of arrows 75 and is actuated by means of a motor 76 through the intermediary of a worm gearing 77 and threaded spindle 78. This regulation which may be effected automatically, will be later referred to.

The sand then drops from roller 37 onto a belt conveyor 53 which delivers this mass to a further milling and cleaning installation, where the degree of moisture

may be controlled to reach a desired degree, in a manner known per se.

The apparatus shown in Figs. 1 to 4 operates in the following manner:

The sand which is supplied from transporting band 9 to trough-receptacle 1 will be moistened in the latter through sprinkler device 62 from which a fine water spray is discharged. At outlet 13 the sand mass is discharged with predetermined moisture but still in a relatively warm state, in a manner heretofore referred to, so that about one half of the sand falls directly into pendulum tube 14 while the other half falls onto the balance device 15 and therefrom into pendulum tube 16. Balance device 15 is adjustable in the directions indicated by respective arrows 56.

Since the pendulum tube drive is actuated from compressed air cylinder 18 and remains at constant and uniform speed of rotation and is suddenly reversed in the end positions 28 and 30 on the one hand and 27 and 29 on the other hand, the sand will be uniformly and equally distributed over the entire length of the oscillatory sieve or screen 32. Thus a uniform distribution of the granular sand mass over the entire width of the wire mesh band 38 is also effectuated.

Due to a relatively short distance between bottom 35 of screen 32 and wire mesh band 38, the sand arrives at the latter band 38 in a rather completely loose state. If the number of wire mesh of the screen bottom 35 is chosen accordingly, the sand may further be sieved out in fine-crumbly form. This facilitates during the ensuing treatment with air passing through in the direction of arrow 54, that the air not only passes through the sand substantially without any undue decrease in pressure, but also causes the entire air, since fine porous channels are formed in the sieved-out sand mass, to pass in direct proximity of the mass, so that the air will be saturated to a great extent with water vapor when it leaves the sand which is thus cooled down and is thereafter conducted to an exhaust fan (not shown) in the direction of arrow 49.

It is of particular importance to note that the state of compaction of the sand during the passage of the air and in view of the ensuing cooling and drying operations remains substantially unaltered. If the aforesaid state of the sand is disturbed, then the density of the state of compaction will be increased and thus the permeability (capability of penetration) for air will be reduced.

Tests have shown that in the manner hereinabove described a very efficient cooling effect is brought about without removing from the granular mass to be cooled inordinately any fine particles thereof.

It has further been found that the sand may be easily and readily brought to room temperature or even therebelow and that a predetermined moisture content for the sand may be kept within a narrow range of fluctuations, near the limit of formation of dust. Such latter dust formation limit defines a certain moisture content at which the sand is about to transform into dust and at which said mass may already be very well screened.

Since the quantity of sand supplied from time to time is subject, in the course of practical operations, to variations and fluctuations and the type of castings to be manufactured and consequently the warming-up degree of the sand may experience certain changes, regulator means appear to be absolutely necessary.

Such regulations or compensations may be carried out in the following manner:

If heavy castings are to be produced which influence and warm up to a considerable degree the sand and thus reduce the moisture content to a great extent, then through lifting of the conduit or pipe support 64 and in a manner heretofore mentioned, the level of water 66 within tank 11 may be increased, whereby increase in the static pressure is caused and a sufficient quantity

of water will be supplied from the sprinkler device 62 to mixing trough-receptacle 1.

Simultaneously, by opening of slide valve 50 and in a manner heretofore mentioned, the cross section of the passage of air through the exhaust 73 will be increased to such extent that a sufficient quantity of air may pass the sand for cooling purposes. Both these regulating stages will only be changed, if the condition of the sand requires the same. If the quantity of the sand has changed, the balance 15 effectuates automatically a change in regulation.

In Fig. 5 there is shown a wiring diagram in which the balance 15 is indicated by an arrow and actuates a condenser 80. A regulating gearing 40 is controlled by means of motor 81 which is coupled with condenser 82 by means of a differential relay 83. This gearing 40 (also indicated in Fig. 1) is controlled by means of motor 81 in accordance with the indicator position of balance 15 and condenser 80 coupled therewith, which, in turn, acts on the differential relay 83 and condenser 82, so that the number of revolutions of roller 37 and thus the speed (see arrow 42 of Fig. 4) of the wire mesh band 38 is modified in a manner that upon changing of the quantity of sand delivered to balance 15, a substantially uniform height of sand is screened onto wire mesh band 38. Control of supply of water corresponding to such passing quantity of sand occurs through the intermediary of balance 15, whereby a regulator needle 68 is checked in a manner heretofore referred to by means of regulator motor 71 from the position of the balance 15 and its condenser 80 coupled therewith through differential relay 84 and condenser 85, thus varying the cross section of passageway through discharge tube 61 proportional to the quantity of sand.

The regulation of the quantity of air proportional to the quantity of sand is obtained through balance 15 with slidable valve 74. Balance 15 and condenser 80 coupled therewith regulate through the intermediary of differential relay 86 and condenser 87 regulator motor 76, whereby slidable valve 74 will be moved in the direction of arrows 75, and thus the cross section of the passageway for air through exhaust 73 will be changed proportional to the quantity of passing sand.

In wiring diagram of Fig. 5 there is disclosed one of many possible examples for bringing about regulation by means of a varying condenser capacity and differential relay system. This regulation may also be carried out by means of changes brought about in inductive or ohmic resistance or any other known means.

In Figs. 6 and 7 there is disclosed a fixed rail 101 which supports rollers 102 which carry circular segments 103 which are articulated about stub shafts 104 operatively connected with a rotary table or turntable 105. This rotary table 105 is rotated in the direction of arrow 106 about axle 107. The circular segments 103 have each a plurality of lamellae 108 (Fig. 8) with a starting lamella 109 and an end lamella 110. The segments 103 move in the direction of arrow 106 from position 111 to position 112 without changing their location. If roller 102 of a predetermined segment 103 leaves rail 101 at its end 113, then the same is tilted about the axle 114 into a swinging or tipping position 115, as seen in Fig. 7.

During subsequent engagement with rail 101 on its connection piece 116, the segment 103 will again be lifted to the position 111 and thus reaches again its normal location.

This modification works with supply means similar to that shown in Figs. 1 and 4, has also an oscillatory screen, which in Figs. 6 and 7 is designated by numeral 117. The circular ring composed of many segments 103 runs from the position below oscillatory screen 117 in the direction of arrow 106 below the exhaust hood 118, as indicated, and is sealed off upon entering and

leaving the hood by means of pendulum sealing plates 119 and 120.

This arrangement operates in the following manner:

Upon delivery onto oscillating screen 117 the sand arrives in a loose and fine-crumbly form at the segments 103. As these segments pass the pendulum sealing plate 119, air will be sucked through the sand in the direction of arrow 121 in a manner as hereinabove described, whereby the same leaves in the direction of arrows 122 between lamellae 108 and is admitted to the sand 123, passes through the exhaust hood 118 and suction connection 124 (Fig. 6) in the direction of an exhaust fan (not shown). The cooling and drying process is terminated upon the sand leaving the pendulum sealing plate 120. If roller 102 of the respective segment 103 leaves rail 101 at one end 113 thereof, then this respective segment 103 assumes a tilting position 115 and discharges the sand onto a transporting band (not shown).

The segment 103 then runs onto the rail end 116 and will again be moved from tilting position 115 to normal position 111 and the operation starts anew.

It is well understood that the embodiments herein referred to, may be carried out with one pendulum tube only or with several parallel pendulum tubes coupled together. The operation is not dependent on the operation of pendulum tubes, since also vibrating supply guides or other means may be employed in order to bring about screening of the sand.

In practice it has been shown that the embodiment hereinabove described is preferred in order to prepare the sand on the air-permeable support in uniform layer formation as to height, loose and fine-crumbly state. If warming of the sand after the cast is relatively small, and the moisture thereof relatively high, then a sprinkler device as shown in Figs. 1 and 4 may be omitted. Principally it is to be mentioned that the supply of a predetermined quantity of water by means of sprinkler device 62, cooling of the sand down to room temperature may be achieved so that after passage of a definite quantity of air through the sand, the latter will always be kept in the proximity of its dust-forming state.

The present invention provides for an air-permeable support for granular masses, in particular sand masses which may be constituted by a fine-mesh screen or sieve or by subdivided and spaced lamellae forming support means and overlapping each other.

The invention is not limited to the embodiments shown, as different shapes and different means may be used to bring about penetration of air or permeability of air through the support to thereby contact the sand from therebelow.

It can thus be seen that there has been provided in accordance with the invention a novel device and process of cooling molding sand and like granular material for foundry use according to which said material is first supplied in a relatively loose state to a first station, is then agitated at said first station, while spray of liquid is added to said material to thereby condition the latter to contain a predetermined degree of moisture. Thereafter the material thus treated is distributed to a second station, at which second station the material is subjected to screening, compressed air being forced through said material while being screened. The air is then exhausted from said material, which finally passes to a third station for foundry use.

Various changes and modifications may be made without departing from the spirit and scope of the present invention and it is intended that such obvious changes and modifications be embraced by the annexed claims.

Having thus described the invention, what is claimed as new and desired to be secured by Letters Patent, is:

1. In a plant for conditioning molding sand and like granular material preparatory to molding operations; means for agitating said material to thereby mix the latter to assume a relatively loose state of compaction,

means communicating with said agitating means for uniformly and evenly distributing said material when received from said first mentioned means, supporting means provided with perforations and positioned below said distributing means for receiving said material therefrom, means for directing compressed air through said perforations and through said material from therebelow while resting on said supporting means, whereby said material is aerated prior to its delivery to a mold, said distributing means including spaced apart funnel-shaped tube means, weighing means for said material and positioned intermediate said agitating means and said tube means, and control means cooperable with said weighing means for regulating the quantity of material to be released by said distributing means.

2. In a plant according to claim 1, including spray means for a liquid extending toward said agitating means, and means for regulating the spray of liquid from said spray means.

3. In a plant according to claim 1, whereby said distributing means is spaced from said supporting means to reduce the depth of drop for material received by said supporting means to a minimum.

4. In a plant according to claim 1, said supporting means including an endless wire mesh band for movement below said distributing means.

5. In a plant according to claim 1, said supporting means including a plurality of lamella-shaped elements which are spaced from and at least partly overlap each other.

6. In a plant according to claim 5, including a turntable, said lamella-shaped elements being supported by said turntable.

7. In a plant according to claim 6, including tiltable members for receiving said material, rail means along which said tiltable members may be moved, said rail means being mounted on said turntable and having ends separated from each other to form a discharge opening for said material when received by said tiltable members.

8. In a plant according to claim 1, further including air exhaust means operatively connected to and positioned above said supporting means.

9. In a plant according to claim 8, including valve means for regulating the exhaust from said air exhaust means.

10. In a plant according to claim 1, said supporting means including vibratory means for imparting oscillatory movement to said supporting means.

11. In a plant according to claim 1, including means operatively connected to said tube means for moving the latter.

12. In a plant according to claim 1, including further control means for regulating movement of said supporting means relative to said distributing means to thereby determine the height of layer formation of said material on said supporting means.

13. In a plant according to claim 1, including means operable by said weighing means and operatively connected to said directing means for said compressed air to regulate the quantity of the latter commensurate with the quantity of granular material on said supporting means.

14. A plant for processing molding sand and like granular materials preparatory to molding operations; comprising a receptacle for receiving said molding sand, agitating means in said receptacle, drive means connected to said agitating means to move same to thereby impart to said molding sand a relatively loose state of compaction, regulatable liquid spray means located above said receptacle to moisten said sand, said receptacle having an opening in its bottom through which said sand is passed after being treated by said agitating means, a first open-ended, swingable funnel-like tube positioned substantially vertically beneath said opening, a balance device including a transporting band located beneath said

opening and having one end located adjacent the upper end of said first tube, the relative positions of said upper end of said first tube and said one end of said transporting band being such that a portion of said sand falls directly into said tube and the remainder onto said transporting band, means responsive to the weight of said sand on said balance device to regulate said liquid spray means to thereby control the moisture content of said sand, a second open-ended, swingable funnel-like tube positioned substantially vertically adjacent the other end of said transporting band for receiving from the latter said remainder, a lever connecting said tubes for joint swinging movement, actuating means connected to one of said tubes for swingably moving said tubes, said support means located beneath said tubes to receive sand discharged from the latter, means connected to said support means for oscillating the same, conveyer means having one end beneath said support means to receive sand discharged from the latter and to convey said sand to a molding station, said conveyer means being provided with perforations to permit passage of air therethrough, and aerating means controlled by the weight of said sand on said balance device to direct air from below said conveyer means through said perforations of said conveyer means and thus through said sand located on said conveyer means.

15. A plant according to claim 14, said agitating means comprising a pair of substantially parallel, horizontally oriented shafts rotatably journaled in said receptacle, and blade means on said shafts.

16. A plant according to claim 14, said means to regulate said liquid spray means including valve means for controlling the flow of liquid to said liquid spray means, a mechanism for adjusting said valve means, and electrical means varied in accordance with the weight of said sand on said balance device to regulate said adjusting mechanism.

17. A plant according to claim 16, said liquid spray means including nozzle means, a liquid storage tank located above and communicating with said nozzle means, and adjustable means in communication with said tank for varying the hydrostatic pressure of said liquid above said nozzle means.

18. A plant according to claim 14, said aerating means including an exhaust conduit located above said conveyer means, adjustable valve means in said exhaust conduit to regulate the flow of exhausted air therethrough, and a mechanism responsive to the weight of said sand on said balance device to adjust said valve means.

19. In a plant for conditioning molding sand and like granular material preparatory to molding operations; means for agitating said material to thereby mix the latter to assume a relatively loose state of compaction, means communicating with said agitating means for uniformly and evenly distributing said material when received from said first mentioned means, perforated supporting means positioned below said distributing means for receiving said material therefrom, means for directing air through said perforated supporting means and through said material from therebelow while the latter rests on said supporting means, whereby said material is aerated prior to its delivery to a mold, means for measuring the rate of flow of said material and positioned intermediate said agitating means and said distributing means, and control means cooperable with said measuring means for regulating the quantity of material to be released by said distributing means.

20. In a plant for conditioning molding sand and like granular material preparatory to molding operations; means for agitating said material to thereby mix the latter to assume a relatively loose state of compaction, means communicating with said agitating means for uniformly and evenly distributing said material when received from said agitating means, continuously and unidirectionally movable material supporting means provided with perfo-

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rations and positioned below said distributing means for receiving said material from the latter, drive means operatively connected to said material supporting means to impart a continuous and unidirectional movement to the latter, means for directing air under pressure through said perforations and through said material from therebelow while the latter rests on said supporting means during said continuous and unidirectional movement of the same, whereby said material is continuously aerated prior to its delivery to a mold, said distributing means including pivotably arranged spaced apart funnel-shaped tube means, oscillating means operatively connected to said tube means to impart a pivoting movement to the latter, and weighing means for said material and positioned intermediate said agitating means and said tube means, said weighing means and said tube means during pivoting movement of the latter cooperating with each other to uniformly and evenly distribute said material on said supporting means.

21. The process of continuously preparing molding sand and like granular material for foundry use; comprising the steps of delivering said material in a relatively loose state to one location, subjecting the material at said one location to mixing action with fluid spray, regulating supply of said fluid spray proportional to the quantity of said material, to thereby condition the material prior to arrival at another station, then substantially evenly and uniformly distributing said material from said other station onto perforated support means whereby said material assumes on the latter a layer formation of equal height throughout, controlling passage of air through said support means and said material positioned thereon so that the latter will remain substantially stationary on said support means, and then exhausting said air upon penetration of said material substantially without removing any solid constituents from said material.

22. The process of continuously preparing molding sand and like granular material for foundry use; comprising

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the steps of delivering said material in a relatively loose state to one location, subjecting the material at said one location to mixing action with fluid spray, continuously weighing said material for regulating supply of said fluid spray proportional to the quantity of said material, to thereby condition the material prior to arrival at another station, thereafter substantially evenly and uniformly distributing said material from said other station onto perforated support means whereby said material assumes on the latter layer formation of equal height throughout, forcing sufficient air from below said support means and said material positioned thereon so that the latter remains substantially stationary on said support means, and then exhausting said air upon penetration of said material substantially without removing any solid constituents from said material.

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