March 28, 1944. H. L. BURG 2,345,457

MOLDING SAND MILLING MACHINE

Filed Nov. 13, 1942 4 Sheets-Sheet 1

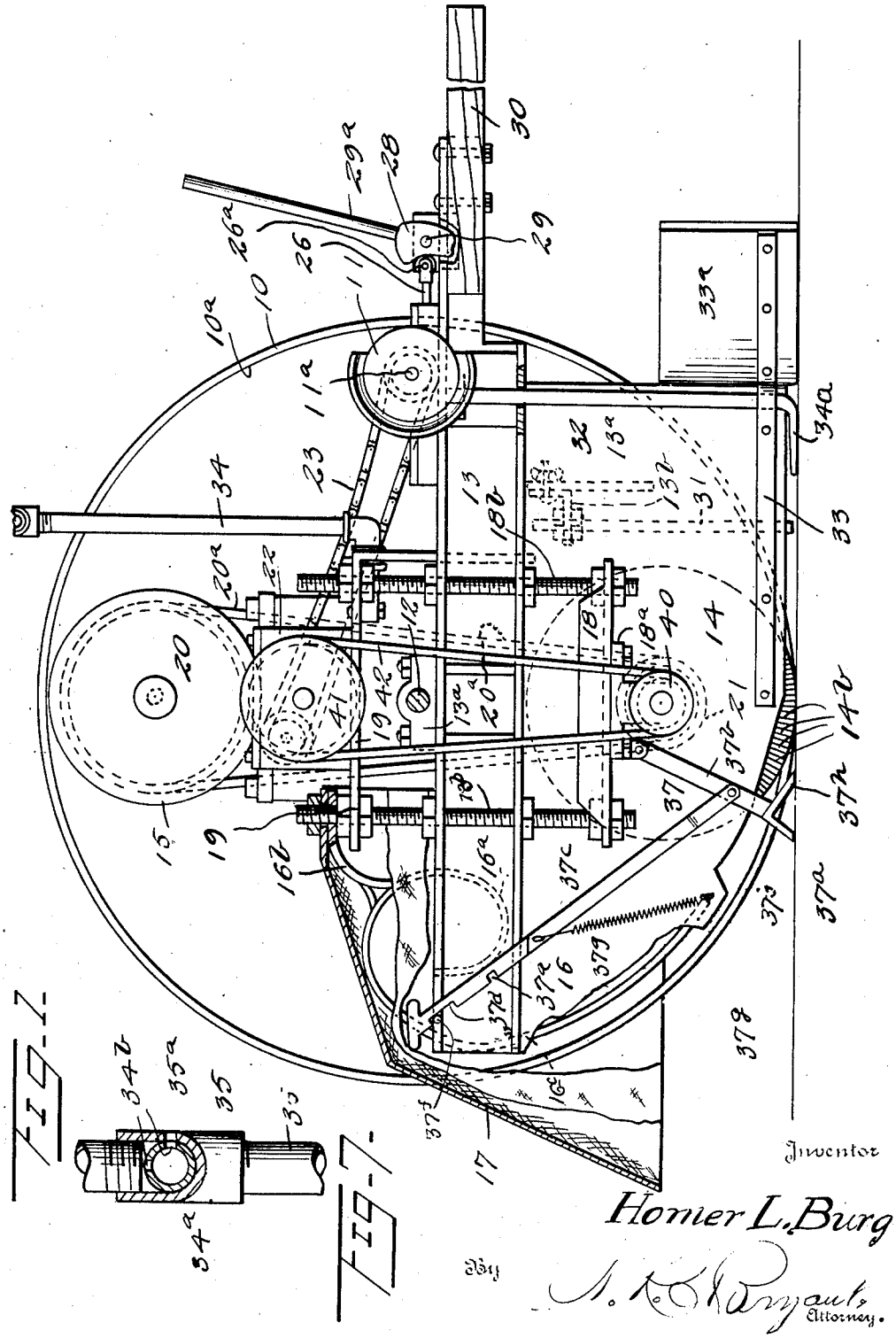


FIG. 1.

FIG. 7.

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MOLDING SAND MILLING MACHINE

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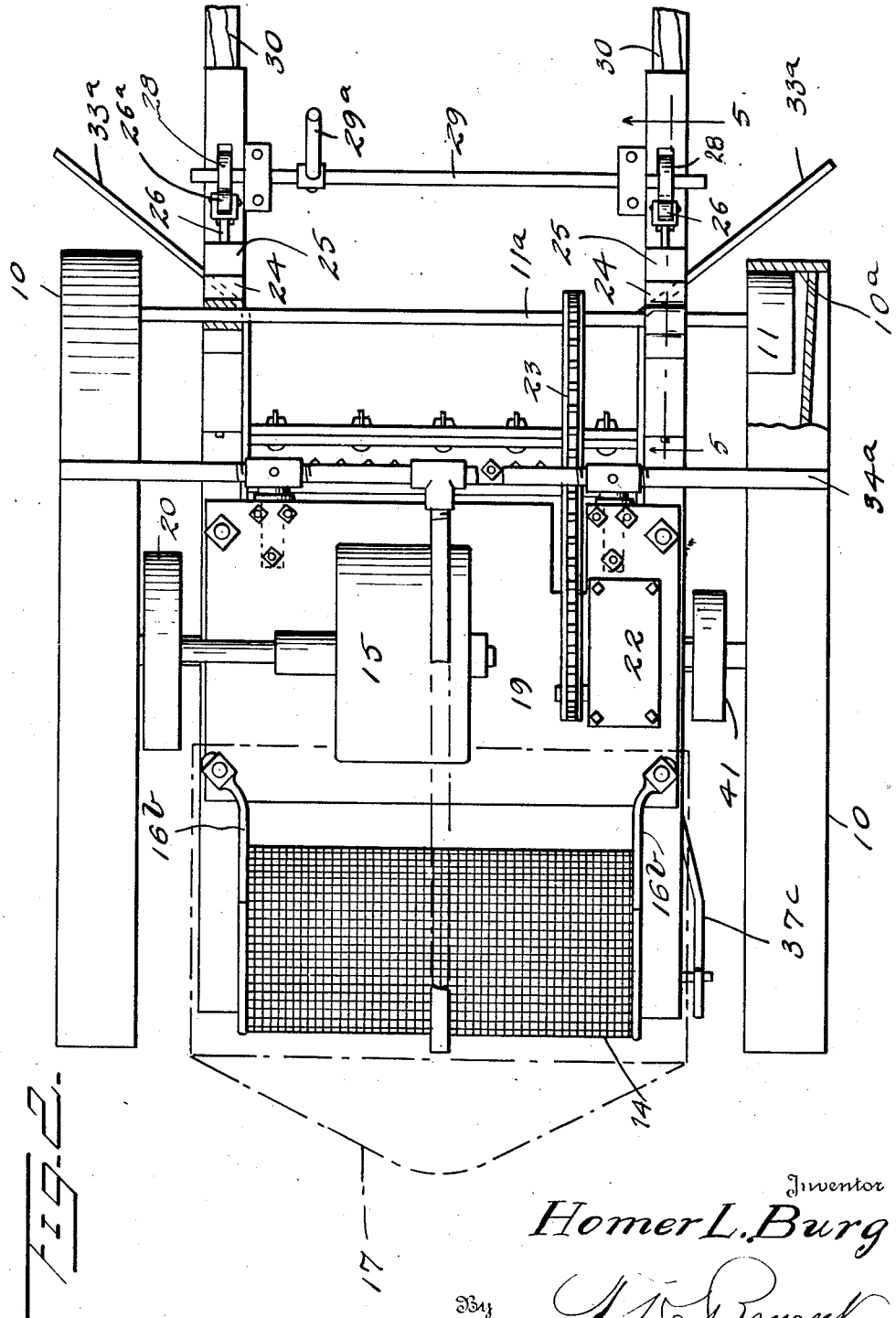


FIG. 2.

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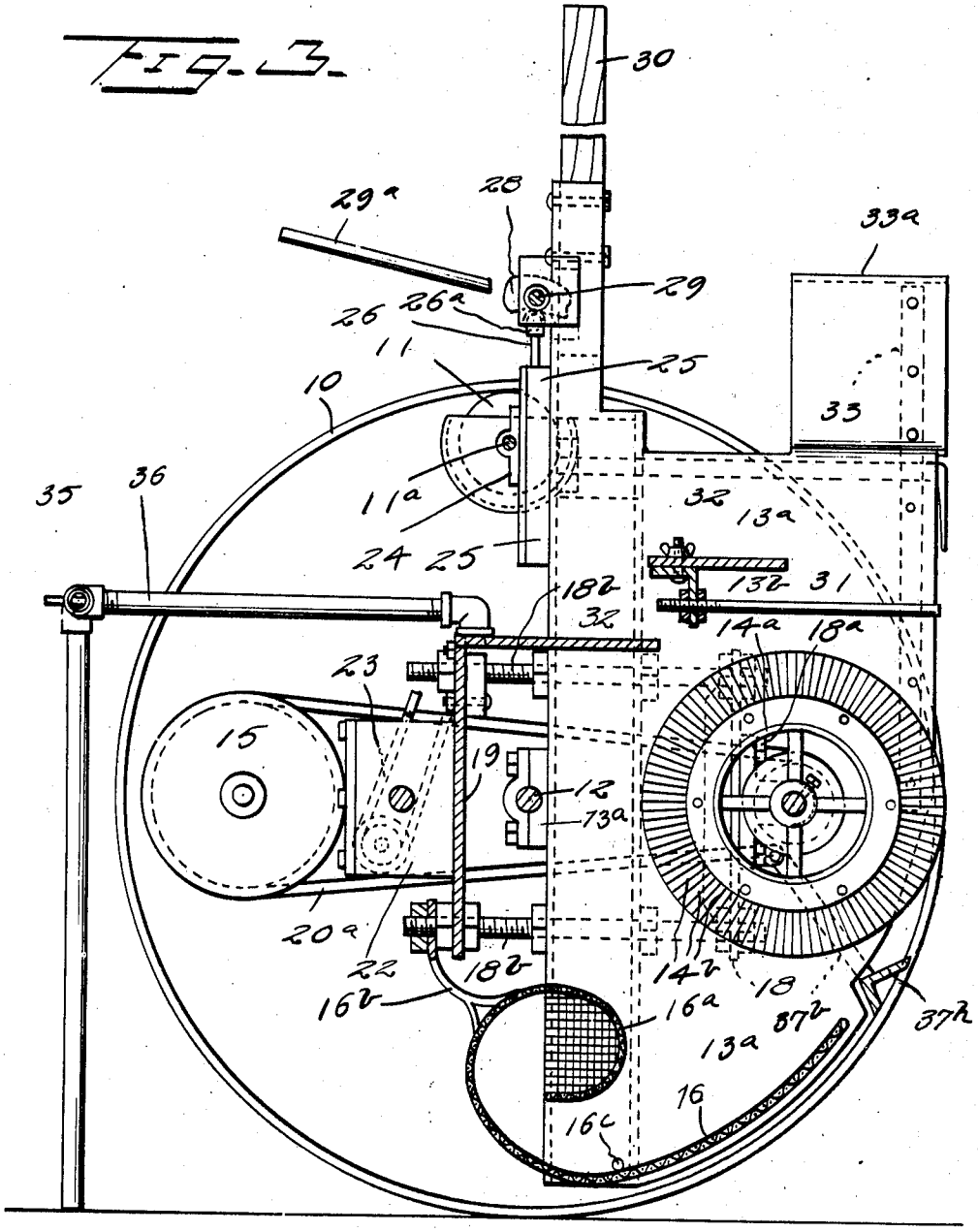
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MOLDING SAND MILLING MACHINE

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Fig. 3.



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MOLDING SAND MILLING MACHINE

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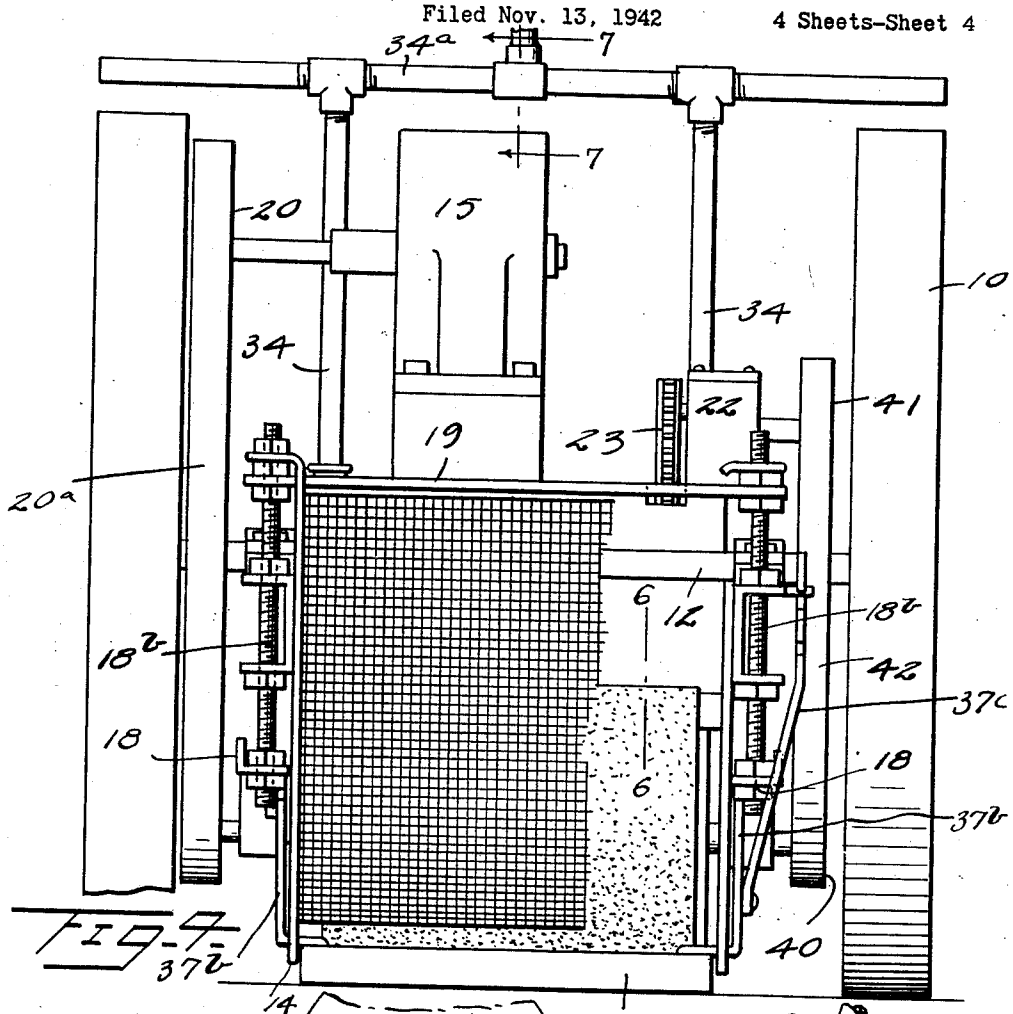


Fig. 4.

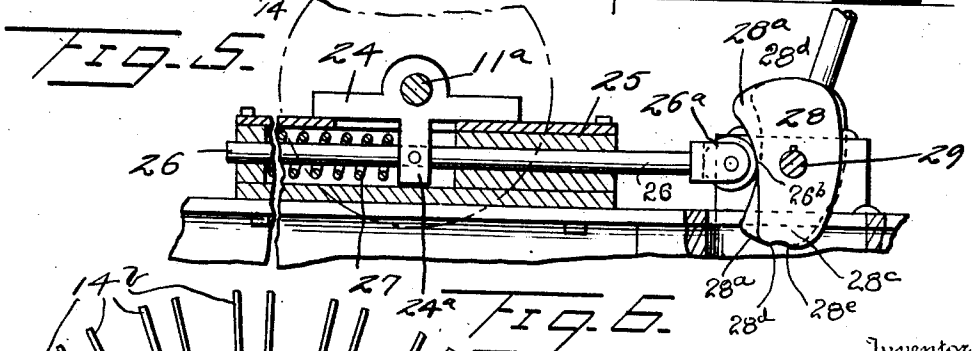


Fig. 5.

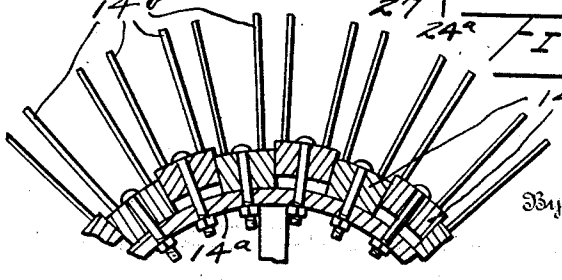


Fig. 6.

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Patented Mar. 28, 1944

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UNITED STATES PATENT OFFICE

2,345,457

MOLDING SAND MILLING MACHINE

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Application November 13, 1942, Serial No. 465,493

17 Claims. (Cl. 22—89)

This invention relates to improvements in molding-sand milling machines, and is designed more particularly as an improvement upon a machine for similar purpose disclosed in my companion application, filed December 4, 1940, Serial No. 368,541.

The machine of the companion application is designed to condition the sand used by molders in foundry practice, being applicable for service with either the natural molding sands as well as with the synthetic molding sands, making it possible to provide the desired admixture of the latter in the "heap" position—due to portability of the machine—and avoiding the necessity of transporting the heap to a milling machine for re-conditioning and then return to heap position for molding operations. The present invention is designed to produce similar service results, but, while operating on generally similar lines, presents certain features which make it possible for greater efficiency in operation and in transportation and storage. To produce the results under the changed conditions certain of the units have been changed structurally and positionally and certain additions made, while one of the units has been omitted.

For instance, provision has been made for producing a more or less symmetrical heap of conditioned sand during the conditioning travel of the machine over the unconditioned heap. To retain this condition of the heap the conditioning instrumentality is swung on and about its axis so as to raise the conditioning brush above an unconditioned heap during the travel of the machine to its starting position for milling, the swing being through an arc of approximately 90° to the inactive position. To permit this, certain changes in the structural arrangement and locations are essential in order to enable the swing without interference, changes which aid in increasing the efficiency in operation; in addition, the dirigibility effect has been increased to enable the machine to be more easily moved about the floor of the foundry and positioned either for service or held inactive. In addition, the arrangement of the units produces a semi-balanced assembly of the conditioning instrumentality, thus rendering the swinging movement of the instrumentality readily producible manually; and, since the swing to the inactive position sets up a practical balance, the machine can be readily moved about manually and without materially disturbing the operating connections with the power source, whether the latter be of the one or two unit type.

Generally, the machine, in service, utilizes certain of the fundamentals of the machine of the companion application, thus enabling it to treat different types of sand, similarly to the machine of such application. However, one of the features of the companion machine—the additional material distributor—has been omitted, in order to provide for the better balancing conditions, reliance being placed upon the usual methods of introducing the added material, such as distributing it on the flasks for dumping with the sands used with the previous molding and casting. While the preliminary distribution is not as accurate as in the companion application, it is sufficiently so as to provide for the proper admixture through by the brush action and the showering effect set up on the sands in connection with the screen.

One of the features of the present invention pertains to the dirigibility control. The traction wheels are driven from the power source by individual drive rolls which can be rendered active concurrently or individually or rendered inactive as a drive, the selection being entirely within the control of the operator. Hence, it is possible to drive straight-away when servicing a heap, the speed of travel of machine and rotation of wheels being coordinated to prevent overload, disconnect the drive during the manual return, or swing the machine dirigibly by power source by the activity of the proper individual roll.

To provide for the swinging arcuate movement of the conditioning instrumentality, it is essential that a zone of the instrumentality in rear of the brush do not extend beyond the major radius of the traction wheels—the swinging movement raises the front of the instrumentality and it must be possible for a zone of approximately 90° of the rear of the instrumentality to swing through such arcuate path below the axle. This zone includes the screen, and because of this the latter is given a different form and specific location as compared with the companion disclosure; while the screen is usually removed during the return travel over the heap, it is possible that the heap conditions and the service may not require removal at times, and hence the screen is made to conform to this dimensional condition brought about by the arcuate swinging of the instrumentality.

The instrumentality also includes a removable flexible heap-shaping apron or hood in rear of

and overlying the screen. This apron, in service extends beyond the dimensional zone referred to, but inasmuch as it can be removed with the screen and/or be rolled up to be located within the dimensions, such apron projection will not affect swinging of the instrumentality.

While the conditioning brush has the general characteristics of the similar brush of the companion application—formed of wire or fibre bristles sufficiently flexible to permit ready passage over larger objects but capable of tossing smaller objects over the screen and into the collection zone, with the desired content thrown onto and through the screen in such manner as to tend to "shower" the conditioned sand to produce the working heap—certain changes are made in structure of the brush to increase and permit maintenance of its stability for service.

Due to the fact that the screen is located within the limited dimension zone, it has been given a particular shape different from that of the companion application; in addition, it has been mounted to permit ready removal for cleaning, etc.; hence, it may be omitted in service, if the heap condition does not require its use, the apron being usable with or without the screen.

Due to the fact that the conditioning instrumentality is arcuately swingable, provision is made to prevent such swinging at undesired times. For instance, should one or both of the traction wheels engage an obstacle such as to tend to stop advance of the wheels, the continued operation of the drive rolls on the traction wheels will tend to swing the instrumentality frame on its pivot axle away from the instrumentality service position in the direction of inactivity. To prevent this, a drag structure is utilized, the latter being located in rear of a vertical plane through the axis and, during service, riding on the ground floor; in case of traction wheel stoppage the drag resists the swinging action of the instrumentality; when desired swinging is to be had, the drag is moved to a raised position thus permitting the free swinging of the instrumentality.

In addition to the above, certain changes and additions have been made as to details which contribute to the operability of the machine under the above conditions; these will be pointed out in detail hereinafter, and are intended to be included within the objects of the invention.

To these and other ends, therefore, the nature of which will be more fully enlarged upon hereinafter, said invention consists in the improved constructions and combinations of parts, described in detail herein, illustrated in the accompanying drawings, and more particularly pointed out in the appended claims.

In the accompanying drawings, in which similar reference characters indicate similar parts in each of the views,

Figure 1 is a view partly in longitudinal section and partly in side elevation of a machine embodying the present invention with the parts shown in service position.

Figure 2 is a top plan view of the same.

Figure 3 is a view taken on a different longitudinal section and showing the conditioning intrumentality shifted to its inactive position.

Figure 4 is a rear elevation, with parts broken away, and in which the instrumentality is in its service position.

Figure 5 is a detail sectional view of the control means for applying power to the wheels.

Figure 6 is a sectional view of a portion of the conditioning brush and showing the manner in which the brush elements are mounted.

Figure 7 is a detail view partly in section of a support connection.

As above indicated, the specific embodiment of the invention disclosed herein presents the general type of machine disclosed in the companion application—a machine capable of operating in connection with synthetic sands as well as the natural molding sands, the machine being operative to properly mill and distribute the added material when the heaps are being reconditioned. Certain changes have been made to enable the machine to have the additional activities above pointed out. The following presents the details of construction:

The apparatus or machine includes a pair of traction wheels 10, of a desired diameter, each of which has a tread of sufficient width to provide an inner surface 10*a* with which a pair of drive rolls 11—one for each wheel—cooperate for advancing the wheels. The wheels 10 are spaced apart a distance sufficient to straddle a heap, and carry an axle 12 arranged to provide and maintain the desired spacing of the wheels.

The axle 12 supports a frame formation 13, of semi-skeleton type, suitable bearings 13*a* being mounted on the axle to support the frame thereon in such manner as will permit the frame to swing on and about the axle at will. The frame provides the support for the various features of the conditioning instrumentality. Because of the possibility of swing, the general arrangement of the instrumentality elements is such as to tend to balance the assembly and thus make for easier operation by the operator during service and for swinging between service and inactive positions in meeting the various conditions to be met.

Hence, the instrumentality tends to take on a zonal characteristic. For instance, in service, the conditioning brush 14—which operates in connection with the unconditioned heap and therefore extends into close proximity to the foundry floor—is symmetrically disposed below and spaced from the axle 12, while the power source 15—which may be of suitable type, and which may comprise one or two power units—is symmetrically disposed above the axle; hence, the two units are ideally located for service conditions, and tend to balance each other during the swinging movements. Similarly, the screen 16 and heap-shaping unit 17 are located at the rear, while the front carries the rolls 11 and the control means therefore, and an extended steering handle arrangement for the operator, this general arrangement tending to afford a somewhat similar balancing condition. Other features are present and so arranged as to aid in producing such balancing effect.

Since, as heretofore pointed out and as presently described in detail, the conditioning instrumentality is swung pivotally on and about the axle 12 when moving between service and inactive positions (the swinging is counterclockwise in Figure 1 when moving to inactive position), the zone content in rear of brush 14 is so formed and mounted that its maximum radius from the axle is not greater than the radius of wheels 10—in practice it is sufficiently less as to permit the instrumentality to swing without materially interfering with the content of an unconditioned heap in the end zone of the latter. While, in Figure 1, the heap-shaping unit 17 is shown as extending beyond the wheel periphery, said unit is, in practice, of flexible material and

capable of being raised and placed in position above the screen zone and therefore within the wheel radius dimensions. Since the front portion, including the steering handle arrangement swings upwardly when moving to inactive position, there are no interference conditions set up, since the movement is in the direction of the vertical dimension of the foundry.

The brush 14 is of the type disclosed in the companion application, involving a spool-like portion 14a to which are secured a plurality of radially extending flexible bristles 14b, formed of wire or of fibre. However, as indicated in Figure 6, the mounting of the bristles is somewhat changed. For instance, the bristles are carried by longitudinally extending bars 14c with each bar carrying two rows of the bristles, the rows being spaced apart, the bars being arranged about the body of the spool. In the form of the companion application, they are held in place by end members which places each bar in contact with the spool body. In the present arrangement the bars are preferably arranged in two series, one series made up of alternate bars contacting with and being secured to the spool body, while the second series formed by the remaining bars are also secured to the spool body but are spaced from the outer periphery of the body. The result is obtained by making each bar slightly overwidth with respect to the equal angular division of a cross-section of the periphery of the spool body; with the adjacent side faces of the bars extending substantially radial, it is apparent that the assembly will present the characteristics of Figure 6. The advantage of the arrangement can be understood from the fact that it is possible to draw the assembly into a practically solid or rigid formation by tightening the bolts of the spaced bars, ensuring against any looseness; the service is onerous, and can therefore disturb an arrangement of bristle holders—with the present arrangement, should any difficulties in this direction arise, they can be met by further tightening of the bar securing bolts to restore the desired conditions.

As in the companion application, the brush 14 is mounted in bearings 18a carried by members 18 located at opposite ends of the brush zone, said members being carried by the lower ends of vertically-extending threaded rods 18b which pass through frame 13 to points above such frame. Rods 18b provide convenient means for adjusting the vertical height of the brush bearings 18a and therefore permit the brush to not only be properly positioned relative to the floor surface in service position, but enable this result to be maintained in presence of wear, lowering of the bearings through the adjustments lowering the brush axis to provide for wear compensation, suitable adjusting nuts being employed for the purpose.

Rods 18b also adjustably support a plate 19 above frame 13, said plate serving to support the power source 15 and a portion of the structures used for applying the power to the several units as presently explained. If a single power unit is employed, a speed reduction assembly is necessary, and such speed reduction assembly will be carried by plate 19; if a pair of power units are employed, operative at different speeds, the speed reduction is not needed, and in such case the plate supports both power units. In addition, the plate will support the drive elements which lead to the traction drive unit, any preferred form of drive connections being utilized. For instance, the drive connections for brush 14 may include a pulley 20 driven from the power source, and a belt 20a mounted to drive a pulley 21 on the shaft of brush 14; if desired, the drive may be of the sprocket type instead, the latter being indicated, for instance, in the connections between the speed-reduction unit 22 and the shaft 11a of the traction drive unit presently referred to, the sprocket chain assemblage (sprocket and chain) being indicated as chain drive unit 23, the power source being indicated as of the single unit type.

The drawings show the use of a single power unit, hence the instrumentality is shown as including the speed reduction unit 22. This is shown as driven from the shaft of brush 14, itself driven from the power unit, the shaft carrying a pulley 40 mounted at the opposite end of the brush shaft from pulley 21, pulley 40 being operatively connected with a pulley 41 by belt 42, with pulley 41 serving to drive the speed reduction unit 22. If the power source utilizes two power units, the drive 40, 41 and 42 will be omitted, and the sprocket assembly 23 driven direct by the second power unit, the latter, obviously, operating at greatly reduced speed.

The frame 13 carries depending side plates 13a extending downward beyond the ends of brush 14, and extending rearward into the screen zone and forward of the brush 14, thus tending to form a semi-enclosed zone within which the brush and screen (and other elements presently described) are located, this arrangement being preferred to tend to retain the dust and flying sand particles, etc., produced by the rapidly rotating brush, from being scattered promiscuously. Due to the fact that the conditioning instrumentality swings to and from an inactive position, the rear ends of the side plates are shaped to retain the edges inside the maximum radius of the wheels.

The screen 16 is of about one-quarter inch mesh and of a width approaching the distance between the opposite side plates 13a. In its direction of length the screen is curved with its upper end carried into a spiral contour to provide the effect of a basin 16a at the top, the upper end zone of the screen being supported by brackets 16b removably mounted on the upper ends of the rear rods 18b, the screen carrying, at an intermediate point of its height, suitable brackets 16c designed to rest upon flanges of frame 13. The curvature of the screen is such that, when in position, it lies inside the maximum radius of wheels 10 with its lower portion spaced rearwardly of brush 14, the upper portion being curved forwardly so that when the instrumentality is swung to its inactive position without removal of the screen and with the upper zone of the screen then in approximately a vertical plane through the axis of the wheels (Figure 3), the upper zone of the screen would lie materially above the ground level.

In practice, the brush 14, rotating at say 1000 R. P. M., as it advances along the heap at possibly ten to twenty feet per minute, constantly removes a thin curved layer—corresponding to the curvature of the peripheral path of the brush—and throws it rearwardly with considerable velocity onto the front face of the screen—generally on to the lower half—the velocity carrying the sand particles over the surface of the screen to a greater or less extent, some passing directly

through the screen in the lower zone while others may reach higher zones before passing through the screen mesh. As a result, the material passes through and is discharged from the screen somewhat in the nature of a shower. If the thrown material includes lumpy aggregates too large to pass through the screen mesh, the velocity is sufficiently high as to cause them to continue over the face of the screen and come to rest in the basin 16*a*—as is the case with small articles, such as nails, etc., used in molding, as well as small castings which may have been left in the unconditioned heap; the flexibility of the bristles is such as to cast the latter rearward, and be sufficiently yieldable to permit the brush to pass over any heavy casting which may have remained.

As a result, the brush is constantly removing a curved cross-sectional thin slice from the unconditioned heap and showering it over and through the screen, thus providing an admixture effect on the content including the added material, thus ensuring a proper distribution, with the content of the conditioned heap more or less selective due to the sizing effect of the small mesh of the screen. In addition, the undesired content is segregated in the basin 16*a*; since the bottom of the basin is of the mesh type, any vibration effect set up through operation will tend to loosen and segregate sand particles from the basin content and return these to the showering stream to pass with the latter on to and through the screen.

The heap-shaping unit 17 is in the form of a canvas hood-like formation which is also supported from rods 18*b*—and hence removable; it is capable of being gathered into a fold and tucked between the brush and axle. The hood is generally shaped in its construction, and since it rests upon the upper part of the screen—when the latter is present—it extends downward in rear of the screen. Since, in service, the speed of rotation of the brush causes air currents to flow rearward, these will tend to keep the hood in the desired position, especially since the side edges of the hood are preferably detachably connected to the sides of the frame, thus preventing rearward movement of the hood beyond a desired position. In service, the unit serves to limit the extent to which sand particles can be projected beyond the screen, and, being flexible, will act to shape the heap of conditioned sand as the machine advances.

In service practice, the screen and hood can, and are generally used together. However, it is possible that with some heaps the screen may not be required, in which event it is omitted, and the hood alone used—the hood is used at all times during service. While, as above pointed out, the shape and location of the screen is arranged in such manner that it may remain in position during the swinging movements of the instrumentality, it is preferred to remove both hood and screen at the end of the treatment of each heap—especially when both screen and hood are being used; the hood can be housed in its inactive position without removal, but screen removal requires also removal of the hood. When the machine has been positioned relative to the succeeding heap, the screen—if used—and the hood are restored to position.

The dirigibility of the machine under power drive is obtained by the mounting of shaft 11*a* which supports the drive rolls and which is driven through chain drive 23. Shaft 11*a* is supported by a pair of shiftable bearings 24 located at opposite sides of the frame. As shown in Figure 5, each bearing is supported on a casing 25 extending longitudinally of the frame and which carries a plunger 26 supported by a spring 27 housed by the casing. The top of the casing is slotted to permit the passage of a toe 24*a* of the bearing, the latter being secured, as by pinning, to the plunger 26; as a result, the spring tends to hold the bearing in its forward position. The forward end of plunger 26 carries a roller 26*a* which is adapted to contact a face of a cam 28 mounted on a rod 29 extending across the front of the machine readily accessible to the operator, the rod carrying an operating handle 29*a* by which it can be rotated in either direction. This arrangement of bearing assembly is provided on each side of the machine (Figure 2) in the vicinity of the end zones of shaft 11*a*, and is designed to permit manipulation of shaft position, by cam operation, so as to provide for either of three conditions to be present in connection with rolls 11, viz: (1) both rolls in engagement with their traction wheels; (2) both rolls out of engagement with such wheels, and (3) engagement of a selected roll with its wheel while the other roll is out of engagement with its wheel.

These conditions are provided by the shapes of cams 28. Each of the latter has its active face provided with a "high" portion 28*a*, a central "low" portion 28*b*, and a wing 28*c* beyond the low portion and which has a curvature such that if rod 29 is rocked from the low position of the cam, the rocking will not disturb the position of roller 26*a* from such low position although the wing is being rotated toward the roller. The cam 28 on one side of the machine has its high point opposite that of the cam of the opposite side of the machine, with the central low points in alinement on rod 29. The arrangement is such that when the low points of both cams are contacted by the two rollers 26*a*, the springs 27 will retain the bearings 24 in their forward position with both rolls 11 engaging the wheels 10. When the operator rocks rod 29 in one direction, one of the cams will bring its high point in engagement with its roller 26, thus forcing its plunger rearward to shift its bearing rearward and thus move the adjacent roll 11 out of its engagement with wheel 10; the other cam will be rotated in the same direction, but will not affect the position of the roller 26*a* which cooperates with the cam, thus leaving the roll 11 on that side of the frame still in engagement with its wheel 10, with the result that only the latter wheel is being driven, thus turning the machine with the stationary wheel as the axis. If rod 29 is rotated in the opposite direction instead, the same operation will result but the active drive is then with the other wheel. Both cams are provided with an additional face 28*d* at a similar end of each cam, this face of one cam being laterally alined with the face of the other cam, and each of such faces have a depression 28*e* adapted to cooperate with the rollers 26*a*, the bottoms of the depressions being of similar radius from the axis of rod 29; hence, if rod 29 is rotated an additional distance in the direction to bring the depressions into engagement with the rollers 26*a*, both bearings will be moved rearward a corresponding distance, thus releasing the drive from both wheels 10. As is apparent, the "low" points 28*b* and the depressions 28*e* of a cam are active separately, but the activity of the low points or of the depressions of both cams is concurrent; while the

rotating movement of the rod 29 in the direction of rendering the depressions active will cause an earlier disengagement of one roll 11 from its wheel 10, and thus seemingly tend to swing the machine, the completion of the rod operation is rapid with the result that no material swing will be provided; the same is true when passing from the depressions to the low point position.

The forward portion of the frame also carries a pair of arms 30 which serve to permit the operator to steer the machine.

The frame 13 also carries a cross member 13b located in advance of brush 14, this member being L-shaped in cross section. The member is designed to carry (1) a plurality of downwardly-extending rods or fingers 31 arranged to simulate the positions of rake teeth, and are designed to detect and advance any large objects, such as castings, etc., which may be buried within the unconditioned heap, and (2) a leveling plate 32 which extends vertically across the instrumentality with its lower edge at a desired height. The plate 32 serves to level off the unconditioned heap, thus tending to provide substantially uniform conditions for brush operation. Both fingers and plate are capable of adjustment vertically, the fingers by thread and nut mountings, and the plate by the use of rows of openings making it possible to adjust to various heights.

The frame also carries at each side a forwardly extending arm 33 the forward end of which is bent outwardly at an angle and carries a vertical member 33a, this being located well in advance of the brush. Members 33a, which are positioned to operate only in connection with the unconditioned portion of the heap, form directing faces which tend to funnel side edge contents of the heap into the brush zone, thus enabling the use of a shorter brush and less spacing of wheels 10.

Each side of the frame also carries a footed element 34a at the front, which can ride on the ground surface, if desired, and which will tend to prevent rocking of the instrumentality in the undesired direction; the element also serves as a rest for the instrumentality, if the machine is stopped with the instrumentality in service position.

The frame also carries a pair of vertically extending members 34 at opposite sides and slightly forward of the position of the power unit. The outer ends of members 34 are connected by a cross member 34a of extended length and which carries at an intermediate portion an element 35 swingable on and about cross member 34a, the latter having a pair of openings 34b, either of which can be brought into registration with an opening 35a of element 35; element 35 carries an elongated member 36, which, due to the swingable relationship can be swung into the plane of members 34, or at right angles thereto—in either of these positions one of the openings 34b will register with opening 35a, and a suitable pin inserted into the alined openings will retain the element in a desired position. This assembly is designed primarily to form (1) a means for aiding in moving the machine about manually when the instrumentality is swung to inactive position—in the latter position members 34 will extend horizontally, as in Figure 3—and (2) to support the machine stationary in inactive position, in which case element 36 is swung to its angular position to serve as the support.

The frame additionally carries a drag unit 37—an articulated structure which, in service, is located directly in rear of the brush 14, riding on the ground surface. The drag unit is made up of a drag element 37a having each end mounted at the outer end of a link 37b which is pivotally supported by the frame. Pivotally connected with one of the links is a control member 37c which extends upwardly in an inclined direction toward the rear; said member carries a pair of notches 37d and 37e designed to cooperate with a pin 37f carried by the frame, member 37c having a suitable handle at its free end to permit manipulation of the member to engage either notch with the pin; notch 37d is of greater length than notch 37e, and is designed to engage the pin when the machine is in service—the lost motion effect thus set up permits the drag 37a to move swingingly about the pivots of links 37b to meet inequalities of ground surface, etc.; a spring 37g connecting member 37c with the frame, tends to retain the drag in its lower positions but permitting yielding. Notch 37e is designed to support the drag unit in an inactive position when the instrumentality is to be swung to its inactive position—drag 37a extends beyond the radial limits of wheels 10, and must therefore be shifted in order to permit the instrumentality to swing. The drag 37a may be of any desired configuration, the form shown being that of an inclined plate 37h to which the links are connected, and a pair of downwardly inclined trailing fingers 37j which form the riding surface for the drag.

The drag unit has a dual function. In service, plate 37h forms a directive face for sand being thrown by the brush 14, the plate tending to throw the sand in the direction of length of the screen. However, the drag additionally serves as a protective agency to prevent accidental material swinging of the conditioning instrumentality. For instance, should one or both wheels 10 meet an obstruction during service and come to rest, the rolls 11 will continue to operate; since the drive is of friction type, the stalled wheel or wheels 10 do not continue to rotate, the tendency being for the rolls to tend to rotate the instrumentality toward its inactive position; such movement is not desired at this time, and is resisted by the drag; the elongated notch 37d will permit a small movement in this direction, and thus afford time for the operator to swing the cams 28 to bring the depressions 28c into action, thus breaking the drive engagement and preventing any damage to the machine. When member 37c is shifted to disengage notch 37d and engage notch 37d, each link 37b is swung on its pivot to raise the drag and carry it within the major radius of the wheels 10, thus permitting the instrumentality to swing; since the drag unit is a part of the instrumentality, it swings bodily with the instrumentality when the latter is swung between its service and inactive positions.

One of the important features of the instrumentality assemblage is the fact that the power source and the brush are located on opposite sides of the axle and generally symmetrical to a plane through the axle. In the service position of the machine such plane extends vertically so that the weight factor provided by the two units is not disturbing even though the entire machine is practically poised on the two points represented

by the zone of the wheel treads in contact with the ground. When the instrumentality is in inactive position, this plane extends substantially horizontal, and the weight of the two units become of value due to their location relative to the axle, since they not only tend to counterbalance one another, but tend to steady the machine when the latter is being moved about with the instrumentality in inactive position—simulating somewhat the conditions of a balancing pole. This fact is especially valuable at such time since the machine is then generally being moved manually, and the balance reduces the need for watchful care in preventing undesired swinging. In addition, this balance condition is of value during the swinging movements, since it tends to reduce the effect of the weight being moved, making it easier to swing the instrumentality about the axle.

In foundry practice, the molders generally have their activities on opposite sides of a central or intermediate aisle, each molder generally having an individual aisle or zone in which he fashions his molds, the latter aisles generally extending at approximate right angles to the central aisle. The molding aisles are spaced apart by rows of sand which form the normal sources of sand supply for the molding operations; the rows or "heaps" of sand generally extend from the central aisle to the vicinity of the sides of the foundry, with an aisle (parallel to the central aisle) left at the ends of the heap adjacent such foundry side, the latter aisles being relatively narrow while the central aisle is of considerable width; the aisles permit the ready movement of the workmen when pouring the metal. After the poured metal has cooled, the flasks of the molds are dumped on to the adjacent heap, the castings removed, etc., leaving the heap made up of a mixture of sand unused in making the molds and the sand which had been used in the completed casting operation; as the latter has been subjected to the casting temperatures, etc., and may contain small castings, nails, etc., used in molding, the resultant heap is unsuitable for the succeeding molding operation without being conditioned. At this time, moisture, new sand and/or bond may be added to the heap. The machine herein described is designed to provide the conditioning.

In service, the machine is positioned relative to the wall end of the heap with the arms **30** in advance, and with the wheels in position to straddle the heap, the directing faces **33***a* being in position to direct sand toward the path of advance of the brush, the heap generally being of greater width than the distance between the wheels. Assuming the power source to be active, the control lever is operated to bring the "low" faces **28***b* of the cams in contact with rollers **26***a*, causing the wheels **10** to be driven clockwise in Figure 1, at a speed of from ten to twenty feet per minute, dependent on the power speed and the speed reduction employed. The activity of the power source causes the brush **14** to be rotated at high speed—possibly 1000 R. P. M.—in a clockwise direction in Figure 1. The faces **33***a* serve to limit the width of the unconditioned heap in the brush zone, with the result that the sand content is thrown rearwardly onto and through the screen, when present, and with the hood limiting the spread of the "shower" produced; larger size materials and articles will be thrown over the face of the screen into the basin, as pointed out. During the advance, the operator guides the machine by arms **30**, but the power for the advance is from the power source.

When the center aisle end of the heap is reached, the hood is removed or folded up into its position between the brush and axle, the screen is removed if needed, after the control lever **29***a* has been moved to bring depressions **28***c* into activity with rollers **26***a* (thus disconnecting the traction wheel drive). The conditioning instrumentality is then swung bodily about the axle—counter-clockwise in Figure 1—through approximately 90°, placing the instrumentality in the position of Figure 3, excepting that arm **26** normally extends in the plane of arms **34**. If the machine is to rest at this point, arm **36** is swung to the position of Figure 3—otherwise, it remains horizontal and offers an additional grasping element for operators during the manual movement. As is apparent this places the brush, leveling plate, fingers, and drag in positions where the machine can be returned over the next unconditioned heap without materially disturbing the latter. Since shift of control lever **29***a* has rendered the drive rolls **11** inactive, the machine can then be drawn manually over an unconditioned heap to return the machine to the wall end of the heap—the assembly **34**, **34***a*, **35**, and **36** being in advance during this latter movement. The machine is then positioned relative to another unconditioned heap and the operation repeated.

When the machine is not required for service, it remains in the inactive position of Figure 3, arm **36** forming a support to retain the parts in such position; the machine then occupies its minimum floor space and can be stored in such condition. When it is desired to again place the machine in service, it is moved manually to the desired unconditioned heap, after which the conditioning instrumentality is swung about the axle to the position of Figure 1—the power source having been made active—the screen and hood placed in position, after which the control lever **29***a* is operated to move cams **28** to the low points **28***b*, thus starting the advancing movement of the machine.

As is apparent, a number of advantages are present. Among these is the fact that the machine can be placed in either service or inactive position without disturbing the relationship of the instrumentality other than the manipulation of the screen and hood, with the movement of the instrumentality readily provided manually although the machine is comparatively heavy; this is due to the balanced character of the instrumentality and the arrangement which permits the instrumentality to swing on and about the axle; this enables the machine to be of a desirable service length, and at the same time makes it possible to be moved into the inactive position within the smaller limits of the side aisles and without disturbing the conditioned heap.

Another advantage is found in the simple arrangement which controls the drive between the power source and the traction wheels, and which permits dirigibility during service and yet frees the drive during manual operation.

Another advantage lies in the simplicity of the screen and hood mountings which provide for efficiency in service, and at the same time permits ready removal and/or manipulation.

Another advantage is found in the brush construction by means of which the structure is re-

tained rigid despite the severe and onerous conditions under which it operates.

Another advantage lies in the fact that the machine can serve as a heap conditioning means regardless of the particular form of molding sand being used; if the latter be of the natural type the complete "shower" action may not be needed—in such case the screen may be omitted from the instrumentality and the hood alone used; if the sand be of the synthetic type, the presence of the screen enables the desired distribution admixture to be obtained. When the screen is omitted, the machine has some of the characteristics of the usual power "cutting" machines, excepting that the present machine provides a superior milling action; because of this condition, the arrangement by which the conditioning instrumentality is movable between an active service position and an inactive position by swinging of the instrumentality on and about the axle, which is a fundamental of the present invention, is considered as falling within the scope of the present invention whether the instrumentality be used with or without the screen, thus including "cutting" instrumentalities.

Other advantages are found in the simplicity of construction and arrangement and the detail advantages pointed out in the above description.

While I have herein pointed out a particular structure and arrangement of parts and various ways of utilizing them, it will be readily understood that changes or modifications therein may be found desirable or essential in meeting the exigencies of use and the individual desires of the user, and I therefore desire to be understood as reserving the right to make any and all such changes or modifications as may be found desirable or essential in meeting such conditions, insofar as the same may fall within the spirit and scope of the invention as expressed in the accompanying claims, when broadly construed.

I claim:

1. In a machine for conditioning sand for foundry molding service, wherein the unconditioned sand is in "heap" location and the machine conditions the "heap" sand within such location, a pair of spaced traction wheels connected by an axle to form a traction unit in which the wheel spacing is sufficient to straddle a heap, and a power-operated conditioning instrumentality supported by the axle and mounted to swing bodily thereon between service and inactive positions and with the swing provided on and about the axle to constitute the axle as the swing axis, said instrumentality including a power source, a rotatable sand conditioning unit driven from said source, said source being positioned on the opposite side of the axle from the position of the conditioning unit, the locations and weights of source and unit being such that a plane extending through both and through the axle will extend substantially vertical when the machine is in service and substantially horizontal when the instrumentality is in its inactive position to thereby provide approximate balance of the instrumentality in the vicinity of such plane in either position, a frame carried by the axle for supporting the source and rotating conditioning unit and for forming a semi-enclosed space within which the rotating conditioning unit is located, said frame having a zonal configuration in rear of such service position vertical plane such as to present a maximum radial distance from the swing axis within the zone as less than that of a radius of the traction wheels to thereby permit bodily swing of the instrumentality between said service and inactive positions, removable means in rear of the conditioning unit for receiving the sand from such unit and for controlling the deposit of the sand in its conditioned heap formation, and controllable means for operably connecting the power source and the traction wheels at will to thereby provide power traction of the machine during service and permit manual traction when the instrumentality is in inactive position.

2. A machine as in claim 1 characterized in that the conditioning unit includes a rotatable brush having a plurality of rows of bristle-like elements brought into activity with the unconditioned sand by the bodily advance of the machine and operative to throw the sand rearwardly into the depositing zone under comparatively high velocity conditions by the speed of rotation of the brush.

3. A machine as in claim 1 characterized in that the conditioning unit includes a rotatable brush having a plurality of bristle-like elements with the brush rotating at high peripheral speed, the instrumentality also carrying a removable screen positioned in rear of the brush and inclined upwardly and rearwardly, said screen being cooperative with the brush in conditioning the sand by the movement of the brush-delivered sand over and through the screen to create a "sand-shower" effect in rear of the screen and within the sand depositing zone.

4. A machine as in claim 1 characterized in that the conditioning unit includes a rotatable brush having a plurality of bristle-like elements with the brush rotating at high peripheral speed, the instrumentality also carrying a removable screen positioned in rear of the brush and inclined upwardly and rearwardly, said screen being cooperative with the brush in conditioning the sand by the movement of the brush-delivered sand over and through the screen to create a "sand-shower" effect in rear of the screen and within the sand depositing zone, said screen being located within the radial dimensions of the traction wheels when in service.

5. A machine as in claim 1 characterized in that the conditioning unit includes a rotatable brush having a plurality of bristle-like elements with the brush rotating at high peripheral speed, the instrumentality also carrying a removable screen positioned in rear of the brush and inclined upwardly and rearwardly, said screen being cooperative with the brush in conditioning the sand by the movement of the brush-delivered sand over and through the screen to create a "sand-shower" effect in rear of the screen and within the sand depositing zone, said screen being curved in its direction of length and having its upper end formed to provide a basin effect for the reception of unscreened material advanced over the screen by brush action, the depth of the curvature facing in the direction of the traction unit axle.

6. A machine as in claim 1 characterized in that the sand deposit-controlling means is in the form of a shaped hood of flexible material positioned to receive sand delivered from the rotating conditioning unit and permit its deposit in conditioned sand heap form.

7. A machine as in claim 1 characterized in that the sand deposit-controlling means is in the form of a shaped hood of flexible material positioned to receive sand delivered from the rotating conditioning unit and permit its deposit in con-

ditioned sand heap form, said hood being removably supported by the instrumentality and being foldable for housing within the instrumentality when the latter is moving to and in inactive position.

8. A machine as in claim 1 characterized in that the traction control means includes a shaft driven from a power source, a pair of drive rolls carried by the shaft and positioned individual to the traction wheels, a pair of bearings for the shaft with each bearing mounted for fore and aft movement with respect to the frame, a yieldable plunger for each bearing, and means for selectively controlling the position and movements of the plungers individually at will to permit concurrent activity or inactivity of both rolls with the traction wheels or of activity of one roll and inactivity of the other roll with the respective traction wheels to provide machine dirigibility.

9. A machine as in claim 1 characterized in that the traction control means includes a shaft driven from a power source, a pair of drive rolls carried by the shaft and positioned individual to the traction wheels, a pair of bearings for the shaft with each bearing mounted for fore and aft movement with respect to the frame, a yieldable plunger for each bearing, and means for selectively controlling the position and movements of the plunger individually at will to permit concurrent activity or inactivity of both rolls with the traction wheels or of activity of one roll and inactivity of the other roll with the respective traction wheels to provide machine dirigibility, said selective control means being in the form of a rotatable rod, and a pair of cams carried by the rod and individual to the respective plungers, each cam having a high and a low point, with the high point of one cam oppositely related to the high point of the other cam, and with both cams having the low point presented as of zonal length, whereby concurrent location of both cams in low point position will provide concurrent contact of both rolls with their traction wheels, and rod rotation in either direction to render one of the high points active will move the plunger to break contact between the roll controlled by such cam and its traction wheel while maintaining contact of the other roll with its traction wheel, both cams having an additional face carrying a depression with such faces positioned to present the depressions as axially alined, said depression, when active with the respective plungers, serving to concurrently break the contact of both rolls with their traction wheels.

10. A machine as in claim 1 characterized in that the instrumentality includes means for preparing the content of the unconditioned heap for action by the rotary conditioning unit, with the means carried by the frame in advance of the unit and partaking in the instrumentality swing movements, said means including a pair of wings each inclined outwardly in a forward direction to provide a mouth effect with the inner faces of the wings active to direct edge zones of the unconditioned heap content into the path of travel of the rotating conditioning unit.

11. A machine as in claim 1 characterized in that the instrumentality includes means for preparing the content of the unconditioned heap for action by the rotary conditioning unit, with the means carried by the frame in advance of the unit and partaking in the instrumentality swing movements, said means including a heap leveling member adjustable vertically for controlling the depth of the heap to be acted upon by the rotating conditioning unit.

12. A machine as in claim 1 characterized in that the instrumentality includes means for preparing the content of the unconditioned heap for action by the rotary conditioning unit, with the means carried by the frame in advance of the unit and partaking in the instrumentality swing movements, said means including a service assemblage of vertically-extending bars in spaced relation to produce a rake-like element in advance of the unit and active to detect the presence of large objects unexposed in the unconditioned heap, said bars being adjustable vertically.

13. A machine as in claim 1 characterized in that the instrumentality includes means for preparing the content of the unconditioned heap for action by the rotary conditioning unit, with the means carried by the frame in advance of the unit and partaking in the instrumentality swing movements, said means including a pair of wings each inclined outwardly in a forward direction to provide a mouth effect with the inner faces of the wings active to direct edge zones of the unconditioned heap content into the path of travel of the rotating conditioning unit, a heap leveling member mounted rearward of said wings and adjustable vertically for controlling the depth of the heap to be acted upon by the rotating conditioning unit, and a service assemblage of vertically-extending bars in spaced relation to produce a rake-like element in rear of the leveling member and in advance of the unit, said element being active to detect the presence of large objects unexposed in the unconditioned heap, said bars being adjustable vertically.

14. A machine as in claim 1 characterized in that the instrumentality includes a drag member unit movable between active and inactive positions and having a lost-motion action in its active position, said unit being mounted rearwardly of the rotating conditioning unit and having a swingable assemblage which, in active positoin, travels on the floor surface and is yieldable within limits to compensate for inequalities, said unit being operative to prevent undesired swinging of the instrumentality in the direction of the inactive position of the latter, and for directing the milled sand from the brush through the screen into a milled heap.

15. A machine as in claim 1 characterized in that the instrumentality includes a drag member unit movable between active and inactive positions and having a lost-motion action in its active position, said unit being mounted rearwardly of the rotating conditioning unit and having a swingable assemblage which, in active position, travels on the floor surface and is yieldable within limits to compensate for inequalities, said unit being operative to prevent undesired swinging of the instrumentality in the direction of the inactive position of the latter and for directing the milled sand from the brush through the screen into a milled heap, said unit ground assemblage being swingingly mounted on a radius such as to project beyond the traction wheel radius when the assemblage is active, swinging of the assemblage to inactive position placing it within the traction wheel radius limits to permit swing of the instrumentality.

16. A machine as in claim 1 characterized in that the instrumentality includes a drag member unit movable between active and inactive positions and having a lost-motion action in its

active position, said unit being mounted rearwardly of the rotating conditioning unit and having a swingable assemblage which, in active position, travels on the floor surface and is yieldable within limits to compensate for inequalities, said unit being operative to prevent undesired swinging of the instrumentality in the direction of the inactive position of the latter and for directing the milled sand from the brush through the screen into a milled heap, said drag member unit including a floor-contacting assemblage having an inclined plate positioned in the vicinity of the rotating conditioning unit and active in directing the sand from the latter unit, and trailing feet for supporting the plate, a link connection between the assemblage and the frame, and a spring-supported operating lever connected to the link and having a supporting relation with the frame at two spaced points, one of which permits of lost-motion characteristic and is active as a support when the instrumentality is in service position, the other point providing support when the assemblage is swung to inactive position to house the assemblage within the radius limits of the traction wheels.

17. A machine as in claim 1 characterized in that the instrumentality includes a skeleton frame carried by the instrumentality frame and normally inactive when the machine is in service, said frame being rendered active as a manual draft frame when the instrumentality is moved to its inactive position, said skeleton frame including an arm swingingly mounted on the skeleton frame and movable between a position in general alinement with the frame, to form an additional manual draft element, and a position at right angles thereto with the arm in the latter position serving as a support for the instrumentality in inactive position, the skeleton frame being movable with the instrumentality during the swinging movements of the latter.

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