Dec. 21, 1943. F. COREY ET AL 2,337,453

APPARATUS FOR GRAINING

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Fig. 1

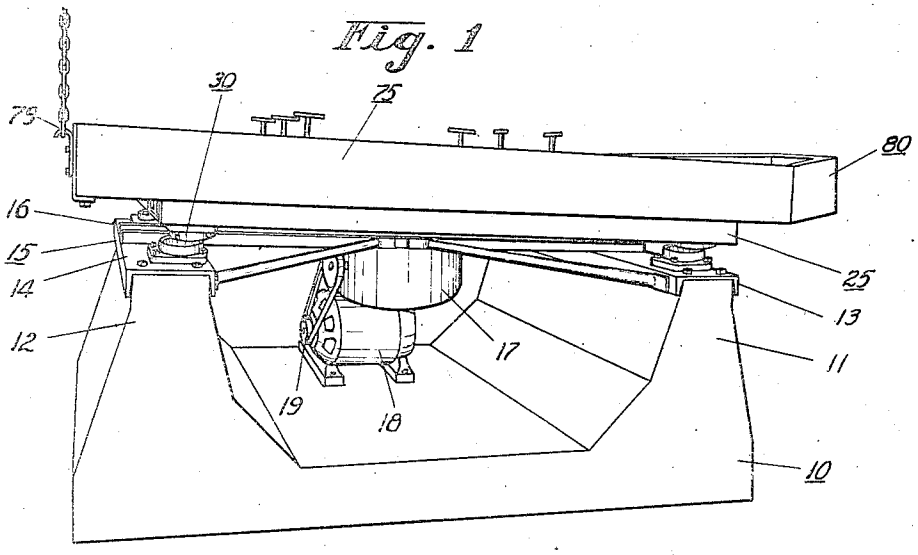
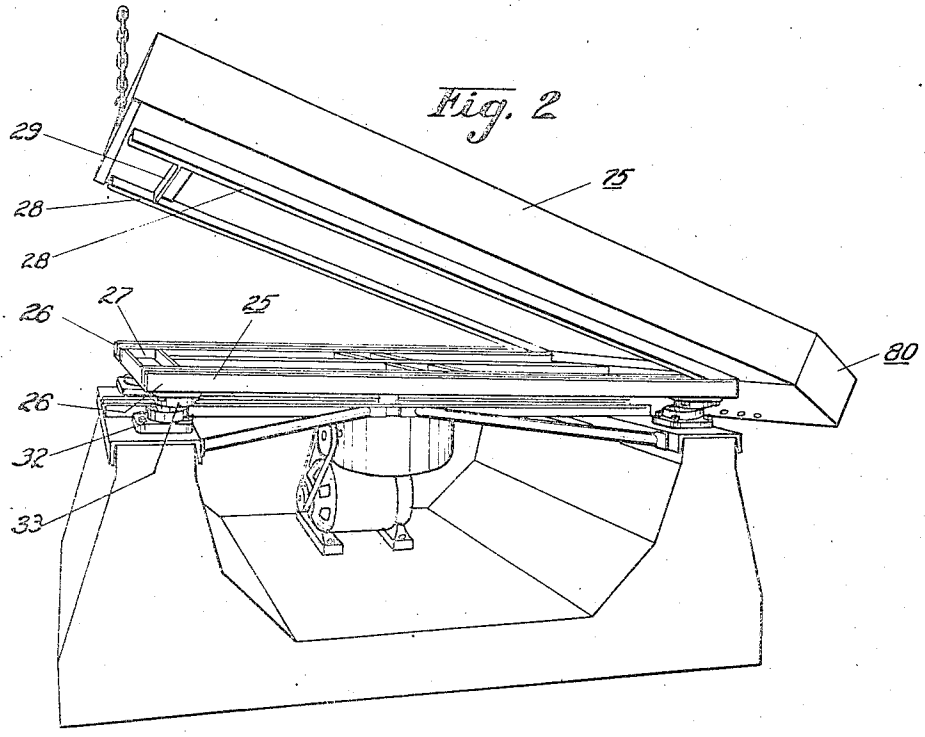


Fig. 2



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APPARATUS FOR GRAINING

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Fig. 3

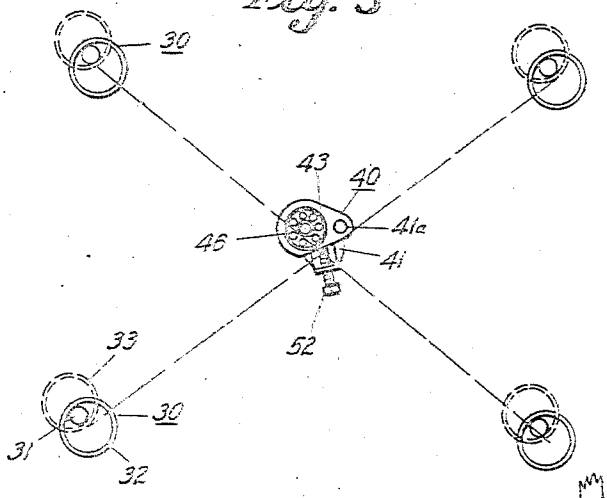


Fig. 7

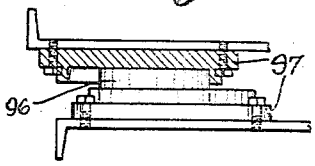


Fig. 4

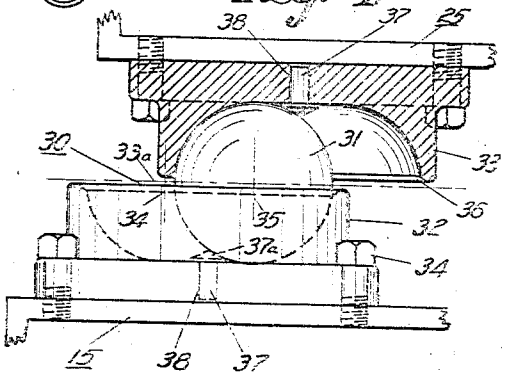


Fig. 6

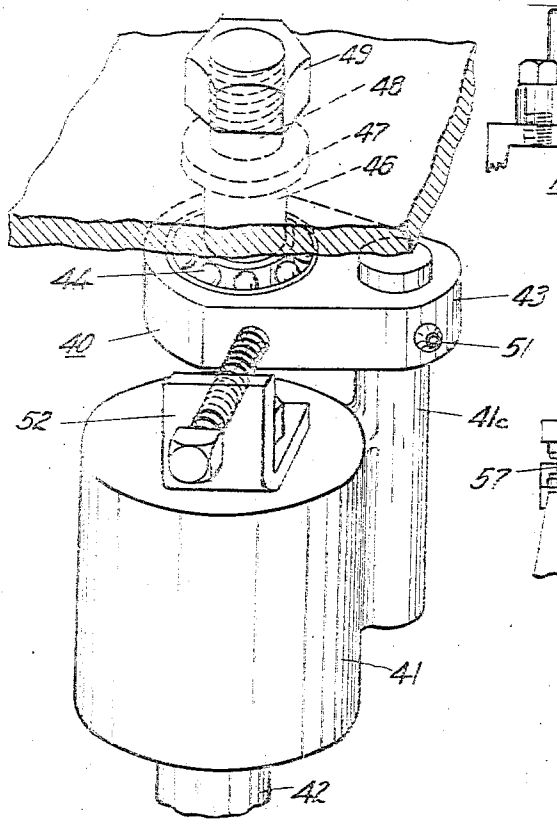
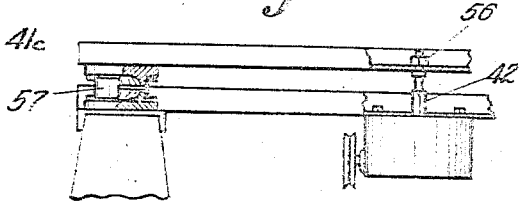


Fig. 5



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APPARATUS FOR GRAINING

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Fig. 9

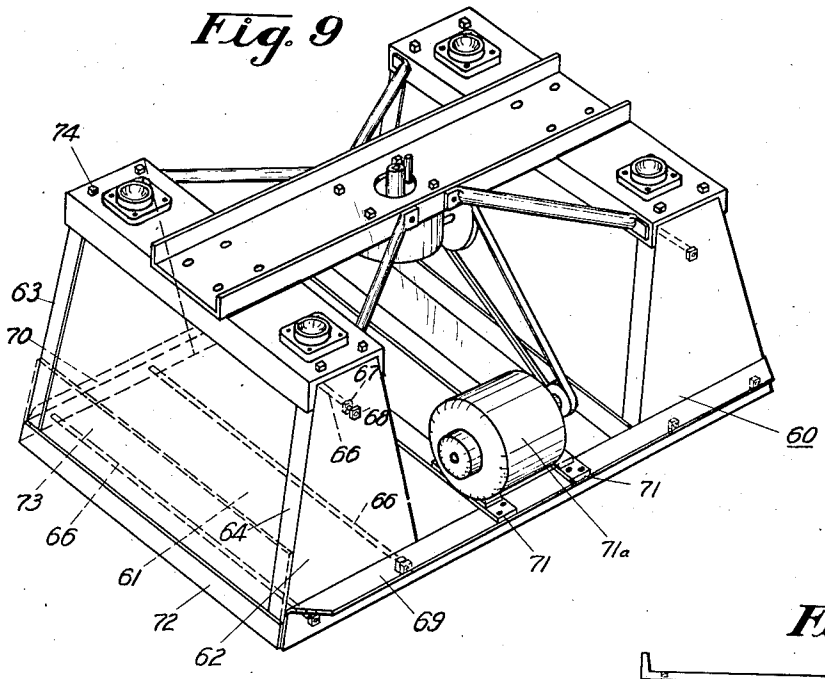


Fig. 8

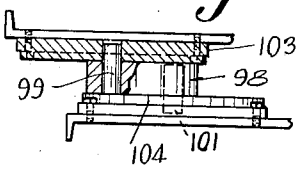
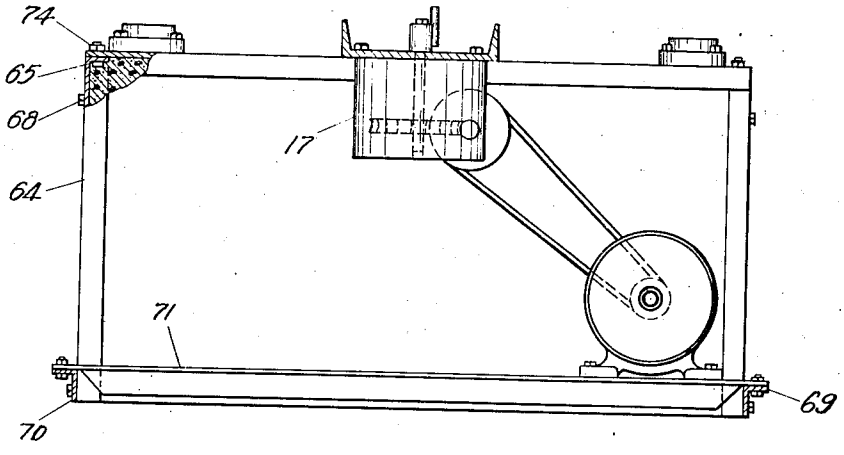


Fig. 10



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Fig. 13

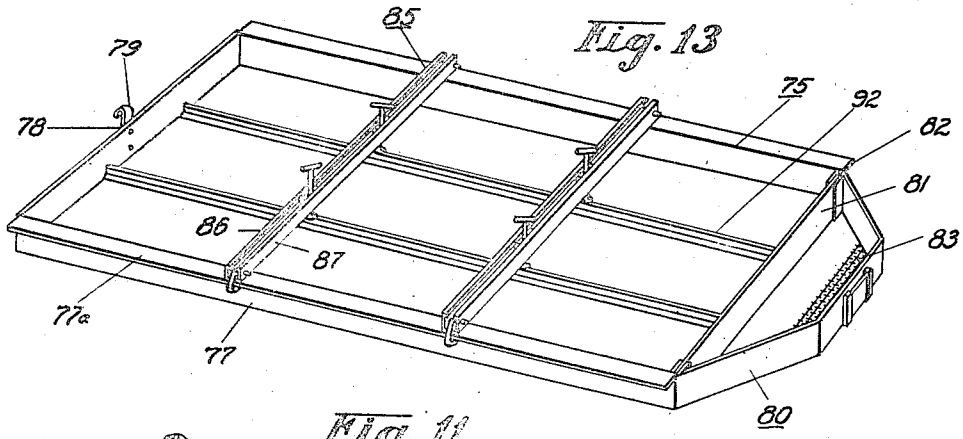


Fig. 11

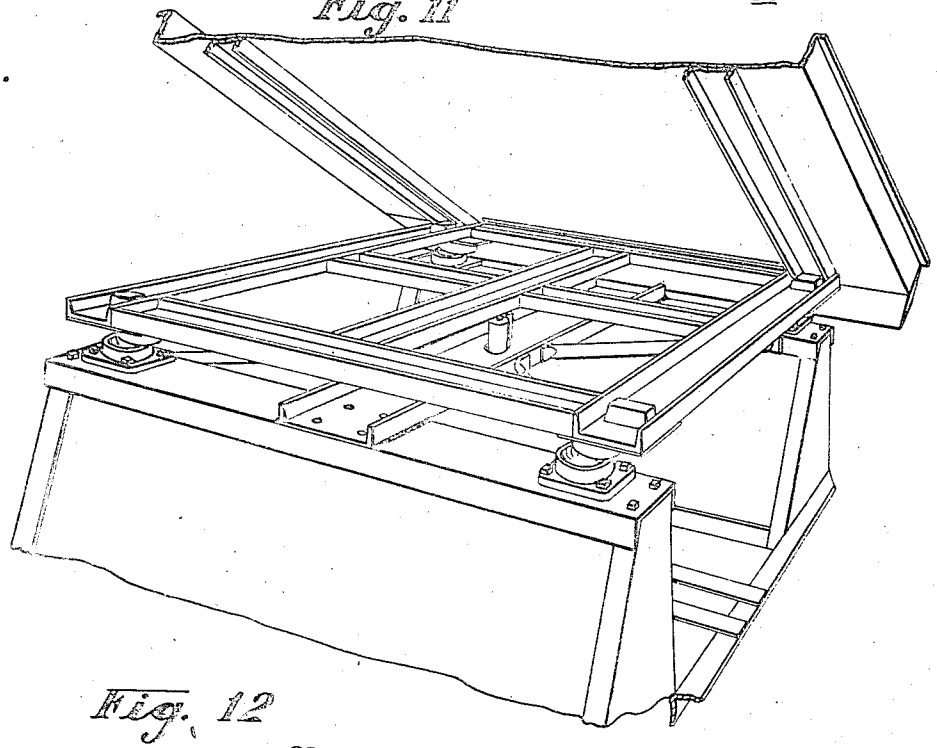
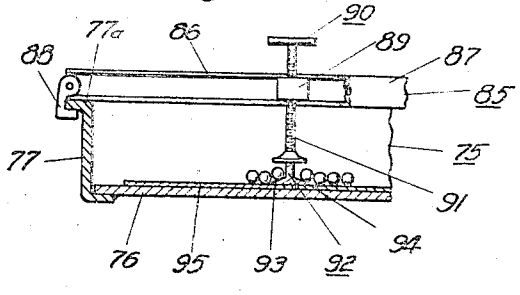


Fig. 12



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UNITED STATES PATENT OFFICE

2,337,453

APPARATUS FOR GRAINING

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Application August 3, 1940, Serial No. 350,636

14 Claims. (Cl. 51—6)

This invention relates to equipment and machines for preparing and graining plates of metal, glass and the like and is particularly concerned with equipment and machines used in offset lithography.

Such so-called "graining" machines comprise, in general, a stationary base on which a tray is mounted for gyratory movement. Lithograph plates, which are generally thin sheets of zinc or aluminum are placed in the bottom of the tray and firmly clamped in place. The plates are then covered with balls of steel, glass, lignum-vitae, or other material, which are caused to rotate or roll over the entire surface of the plates due to the gyratory movement of the tray.

In a preferred type of machine, the speed of the tray may be regulated. Grit, such as sand, quartz, or the like, of the proper grade and having the desired abrasive qualities, is placed in the tray along with a sufficient quantity of water. The graining of the plates is accomplished by the abrasive action of the grit on the plates due to the weight and the sliding or rolling effect of the marbles.

The majority of the devices of the prior art have made use of a pair of eccentrics, one located near each end of the tray for imparting the gyratory motion to the tray. These have been simultaneously rotated, as a general rule, by means of a cross shaft and the necessary bevel gearing.

One of the greatest troubles encountered with a machine of this type of construction is the wearing and consequent misalignment of the pair of eccentrics. It is necessary that they be in perfect alignment and that they operate in synchronism. Furthermore, in the devices of the prior art it has been necessary to make these eccentrics sufficiently large and strong to withstand the centrifugal forces exerted upon them by the considerable weight of the graining tray and the marbles while being rotated at the speed we have found to be most desirable for graining, which is generally about 175 R. P. M.

Our invention advances a new concept of a graining machine in that a single eccentric is employed and the graining tray is gyrated by this eccentric by pure rotation and centrifugal force much as a bucket of water may be swung in a horizontal circle at the end of a rope. The single eccentric has no part in supporting the tray or absorbing the centrifugal force set up, but merely imparts a rotary movement to the tray.

Other means, well adapted for the purpose, are provided for supporting the tray, for determining the circle of travel of the tray, and for absorbing and meeting the centrifugal forces set up in the tray.

It is, therefore, a primary object of our invention to provide an improved structure of this type utilizing only a single eccentric, and one making use of cupped guiding and retaining members on both the base and the tray in conjunction with ball-shaped members or cylindrical plates to both guide the tray perfectly in its proper orbit, and also to take care of the centrifugal forces exerted by the weight of the tray.

It is another object of our invention to provide such a structure as will be simple and positive in operation and, further, to provide a simple and positive means of aligning the required parts of the device.

It is a further object of our invention to provide a structure that will eliminate the necessity of counterweights and the like.

It is a further object of the invention to provide a base for such a structure which may be taken apart, moved at a minimum of expense, and reassembled if necessary, while at the same time, to provide a base of sufficient weight to furnish the required solidity and freedom from vibration necessary for the proper operation of a device of this kind.

It is a still further object of our invention to provide a means for automatically taking up the wear in the supporting and guiding means in a device constructed in accordance with my invention.

Another and further object of our invention is the provision of means especially adaptable for clamping small lithograph plates in the bottom of the tray of such a graining device.

Other and further features and objects of the invention will be more apparent to those skilled in the art upon a consideration of the accompanying drawings and following specification, wherein are disclosed exemplary embodiments of the invention, with the understanding, however, that such changes may be made therein as fall within the scope of the appended claims, without departing from the spirit of the invention.

In said drawings:

Figure 1 is a view in perspective of a device constructed in accordance with one embodiment of our invention, with the tray of same in position for use.

Figure 2 illustrates the same machine with the graining tray lifted for the removal of the marbles.

Figure 3 illustrates, schematically, the prin-

ciple of supporting and guiding the tray on large balls in guide cups.

Figure 4 is a view in elevation, and partly in section, illustrating a pair of guide cups constructed and used in accordance with one embodiment of our invention.

Figure 5 illustrates a method of aligning such cups with each other and with the drive shaft.

Figure 6 is a view in perspective to illustrate an automatic take-up or over-ride device for driving the tray from the single driving eccentric and as constructed in accordance with our invention.

Figure 7 is a view, partly in elevation and partly in section, of supporting and guiding members constructed according to a modified form of our invention.

Figure 8 illustrates another modified form of supporting and guiding means.

Figure 9 illustrates a base for such a graining machine as constructed in accordance with one embodiment of our invention.

Figure 10 is an elevational view of one of the piers of the base shown in Figure 9, partly broken away and partly in section to more clearly illustrate the construction.

Figure 11 is a partial view in perspective showing, in particular, the sub-frame of a machine such as that illustrated in Figures 1 and 2 and showing the relative positions of the cup members.

Figure 12 illustrates a clamping means as constructed in accordance with our invention, and

Figure 13 is a view in perspective of a graining tray and illustrates, in particular, the clamping means devised for holding plates in the bottom of the tray.

Referring now to the drawings, and to Figures 1 and 2 in particular; these figures indicate the general appearance and construction of a graining machine built in accordance with one embodiment of our invention. A base which may be of monolithic concrete construction, and indicated generally at 10, has upstanding piers at the ends, as at 11 and 12, to the top of which are bolted channel members 13 and 14. These form the end bars or members of an H-shaped frame 15. The cross bar 16 of the H frame serves to support a gear case 17 enclosing a speed reduction mechanism which may be of the worm or bevel gear type and driven by a motor 18 and belting 19. The power take-off of the speed reduction mechanism extends upwardly through the center of the H frame. A crank, not shown in Figures 1 or 2, is mounted on the power take-off shaft, the crank pin being swingably received in a ball or roller bearing link member, the other end of which is pivotally connected to the sub-frame 25 near the center of same. The outer corners of the sub-frame are supported upon large balls, preferably of steel, in the case of the relatively large machine shown. These are rotatably received between cups, as indicated generally at 30 and described hereinafter in greater detail.

These cups and balls serve not only to support the tray in a level position and permit it to rotate, more or less in accordance with usual practice, but also serve to fix the orbit of rotation.

The sub-frame, indicated generally at 25, may be constructed of structural members, such as channel irons, with the longitudinally extending members positioned as shown at 26 to permit other longitudinal members 28 and 28 attached to the bottom of a graining tray structure, indicated generally at 75, to "jackknife" into the sub-frame. Other cross members such as those shown at 29, located transversely of the bottom plate of the tray 75, are adapted to drop within the cross member 27 of the sub-frame and also to act as a hinge at the opposite end of the tray.

The tray itself is preferably constructed of heavy sheet metal with a marble receptacle 80 at one end to receive the marbles while the machine is being loaded or unloaded.

One of the most important features of our invention, in addition to the method used, is the structure including the balls and cups, which is adapted to not only support the tray for rotation, but also to guide the tray in a perfect gyratory movement, and also to take up side thrust due to centrifugal forces set up by the rotation of the heavy graining tray.

This principle embodied in our invention is indicated schematically in Figure 3, and in Figure 4 a pair of supporting cups and a ball are shown partly in elevation and partly in section.

It is preferable, in a graining machine constructed in accordance with our invention, that each corner of the structure be provided with a pair of cups, as stated before, and as indicated generally at 30, and a ball 31 positioned between the cups so as to roll around the inner surface of the lower cup and, at the same time, support the upper cup. Each of the lower cups, 32, is mounted by means such as the bolts 34 on the upper surface of the H frame 15, previously described. Each of the upper cups 33 is attached in a similar manner to the under surface of the sub-frame 25. It is necessary that these upper and lower companion cups be in perfect vertical alignment, as will be hereinafter described in connection with Figure 5.

The balls 31 may be of any convenient size, but I have found that a ball of approximately 2½ inches in diameter is entirely suitable for use in a machine of this type and of ordinary size. It is obvious that the amount of throw to be imparted to the tray of a device constructed in this manner may be governed by the diameters of the companion cups, that is, by reducing or increasing the distance between the center lines 34 and 35 shown in connection with the lower cup 32.

It is preferable that the internal depth of each cup be slightly less than the radius of the ball supporting member 31 and as indicated at 33*a* in order to provide a slight amount of clearance between the upper and lower cup members. It is also preferable that the inner edge of each cupped surface be slightly chamfered, as shown at 36. It is advisable that the balls and cups operate with a continuous supply of lubricant and we have found that the chamfered edge of the cup member prevents the lubricant from being forced completely out of the cup.

If desired, guide members 37 may be provided in the exact center of each cup member to prevent the whipping back and forth of a graining tray during the starting or stopping period. These guides may take the form, shown in Figure 4, of the rivet-like member 37 having a more or less cone-shaped head 37*a* and adapted to be driven or threadedly received in an opening 38 at the exact center of each cup member. It will be apparent that the size of this central guide member may vary and will depend upon the re-

lation between the size of the ball and the internal diameter of the cup.

The cup-like guiding and supporting means may take other forms than that shown. For instance the balls heretofore described may take the form of flat disk-like members 96 and the cups be provided with flat saucer-like depressions 97 to receive the disks, as in Figure 7. Cranks, such as shown at 98 in Figure 8, may be substituted. These cranks may be in the form of flat supporting discs having spaced crank-pins 99 and 101 with the crank-pins received for rotation in openings 102 in the plates 103 and 104.

Referring again to Figure 3, the crank or eccentric driving means, illustrated generally at 40 is positioned in an approximately central location relative to the supporting cups. This eccentric mechanism may of course comprise a simple crank member such as the one indicated at 41, with the crank pin 41*a* thereof received for rotation in a bearing member positioned on the lower surface of the sub-frame. Such a structure, however, and with an exception which will be hereinafter described in detail, though possible, is not entirely satisfactory since the throw of the crank or eccentric must coincide exactly with the throw of the tray which is of course otherwise determined by the balls and cup members.

It will be obvious that if the throw of the crank is less than the throw permitted by the cups, the crank itself will bear most of the radial load set up by the centrifugal forces due to the rotation of the tray. Furthermore, if the throw of the crank is greater than the throw permitted by the cup guide members, the balls will be forced to ride higher up on the sides of the cups than they would do normally.

We have, therefore, provided the automatic adjustment and wear compensation eccentric structure illustrated generally at 40 and shown in detail in Figure 6. This structure preferably includes the crank member 41 having a crank pin 41*a* upon which one end of a drag link 43 is pivotally received. The opposite end of the drag link is provided with a bearing member 44 preferably of the ball or roller bearing type, and this bearing is received on a stub shaft 46 extending downwardly from the lower surface of the sub-frame 25 and preferably at the center thereof. This stub-shaft may be in the form shown and include a shoulder 47 and a threaded portion 48, which may be mounted through a hole in the sub-frame and rigidly fixed in place by means of the nut 49. It is of course desirable that means be provided such as the grease fitting 51 for permitting all bearing surfaces to be lubricated and that cap or cover means, not shown, be provided for covering or closing the bearing race 44 in order to exclude foreign material.

If the cup structures are constructed with guide pins such as 37, the tray member will usually follow the path defined by the cup members with the supporting balls following the inner surfaces of the cups.

In case such guide pins are not used, other means such as the stop member 52 may be used for forcing the compensating link 43 outwardly to thus cause the supporting balls to ride against the outer walls of the cups during the starting and stopping periods when centrifugal force alone would be insufficient to prevent whipping.

The adjustable stop member 52 may be mounted on the top of the drive shaft 42 and adjusted to force the compensating link 43 outwardly so as to indirectly hold the cup and ball members in proper operative relation at all times.

In constructing a device in accordance with our invention, it is desirable that the companion cups be placed in perfect alignment and also that the stub shaft 46 must be in perfect alignment with the drive shaft 42. I have therefore devised the method and means for accomplishing this result, as shown in Figure 5.

A centering pin 56 is mounted in the sub-frame in place of the stub shaft 46, the lower pointed end of the centering pin being adapted to be received in a center mark or cupped recess in the center of the top end of the drive shaft 42. The cups are then mounted on the frame and sub-frame with the companion cups in perfect vertical alignment. This may be accomplished by machining the outer surfaces of the cups concentric with the inner surfaces and of such a diameter as to be snugly received within aligning rings or sleeves 57. Sleeves are of course provided for each pair of companion cups, and after placing them in position, the cups may be fixed in position by tightening all the clamping bolts 34. The aligning rings and aligning pin may then be removed and replaced by the supporting balls and the stub shaft.

It is obvious that other means may be used for aligning the parts of such a device, but we have found this method and means simple, accurate, and otherwise satisfactory.

The base or frame of a graining machine is subject to heavy bending strains, as well as to a heavy load, and must, therefore, be of substantial construction. Such a base may be constructed in accordance with any of the commonly accepted methods including building up with side, end and reinforcing members of case iron or the like, or by bolting or welding structural steel members together to form a unitary structure. We have found, however, that bases constructed in such a manner may be relatively expensive as well as lack the weight and mass we have found to be desirable.

The base member illustrated in Figures 1 and 2 is, as stated before, of monolithic concrete construction, and we have found that such a base has the weight, mass, and rigidity necessary to properly absorb the forces set up in a device of this nature.

In order to make such a base member more practical as regards portability, and ease of construction, we have devised the improved form of base illustrated in detail in Figures 9 and 10. The metal framework of the base may be filled with concrete or the like. If it is necessary to move the machine, the metal parts of the base may be stripped from the concrete, the machine moved, set up, and again filled with concrete at a minimum of expense.

Such an improved base includes, in general, a pair of shell-like metal forms held in spaced relation and into which concrete or the like may be poured to form a pair of piers.

The shell-like form for each end pier includes panels or plate-like end members 62 and 63. These members are preferably relatively wide at their bottom ends and tapered inwardly toward the top, as shown, and provided with inwardly extending flanges along all edges and as shown at 64 and at 65 in Figure 10.

These end members 62 and 63 are preferably

spaced apart by a plurality of tie rod members 66, each rod having a pair of nuts 67 and 68 at each end thereof. These nuts may be adjusted as required to properly space the end members of each form. It is desirable that two of these rod members be placed near the bottom surface of each pier to provide for detachably connecting a pair of angle members 69 and 70, which members serve to tie the lower ends of the two piers together to form a unitary base structure as will be hereinafter further described.

Angle members such as shown at 72 may be provided along the lower longitudinal edges of both piers to protect the edges of the concrete later poured into place.

The shell of the pier may then be completed by attaching sufficient planks, as illustrated at 73, to each side of each pier to complete the form, or if desired, metal plates may be permanently attached to the end members along the flanged edges 63 and 64 to provide an all metal form. The flanges 65 extending inwardly from the upper edges of the end members are provided with openings for the reception of mounting bolts 74 by which the H-shaped main frame may be mounted on the top of the piers.

It is preferable, in a base constructed in this manner, that the shells or forms of both piers be set up on a level surface and tied together by means of the angle members 69 and 70. Both piers may then be filled with concrete or the like and the H-frame placed in position and pulled down tightly against the top surface of the concrete by means of the attachment bolts 74. When the concrete is cured, the side rails may be removed and the entire structure removed to the location where it is to be used. It may there be reassembled and blocked up until level. Cement grout may be forced under the piers to form a solid, level footing.

It will be obvious, that with such a form structure, the concrete portion of the base may be cast in place after the forms have been set up at the desired location of the graining machine, and in such case, the concrete itself will take care of any unevenness in the floor surface. It is of course necessary that the form be leveled up before the concrete is poured.

Cross rails 71—71 may be mounted between the side rails 69 and 70 for supporting an electric motor 71*a* or other suitable drive means. It is preferable that such drive means be of the variable speed type.

A graining machine including a base constructed in the manner above described may be readily disassembled and moved to another location when necessary. Means are provided for properly spacing and aligning the piers at both the upper and lower ends and serve to tie the various parts of the device together to form a substantially unitary base of sufficient weight in itself to make it unnecessary to bolt it to the floor as is necessary with most devices of this nature.

The graining tray 75 may be constructed in accordance with any of the number of different methods in standard use. The tray may include a bottom plate 76 with side members 77 attached, as shown in detail in Figure 12, to the longitudinal edges thereof as by riveting or welding. The side members 77 may be made in the shape of a Z to not only provide additional reinforcement for the plate-like bottom of the tray, but to provide a flat upper surface 77*a* on which the plate clamping bars, indicated generally at 85, may be slidably supported and to the under edge of which hook members 88, comprising part of the plate clamping bars, may be engaged.

One end of the tray is provided with an end panel 78 on which is mounted a hook member as shown at 79 to provide for lifting that end of the tray by means of a hoist or the like.

The opposite end of the tray is provided with a marble receiver 80 into which the marbles may be permitted to roll when the tray is tilted and in order to permit lithograph plates to be placed in or removed from the tray. A gate 81 may be slidably received in slide members 82, attached to the sides of the graining tray, in order to hold the balls in either the tray proper or in the ball receiver.

The bottom of the marble receiver may be provided with a number of drain holes to permit the grained plates to be washed and the used graining sand and water to be carried away. It may also be provided with a screen member 83 to keep the graining balls from passing through the drain holes. This screen may be of such a size as to permit balls which have become too small for use to pass out through the drain openings with the wash water.

The clamping bars may include a pair of channel members 86 and 87 placed so as to face each other and attached together at the ends by means of bolts or the like. Hook members, such as that shown at 88 in Figure 12, may be pivotally mounted between each pair of bars and at each end thereof in such a manner as to permit the hook portion to engage under the outwardly extending upper edge 77*a* of the side walls of the tray.

Screw clamps 90 include block members 89 which are adapted to be slidably received between the channel-shaped bar members and threaded rods 91 which may be screwed downwardly through the block 89.

I have found it desirable, in the graining of small lithograph plates, that means such as the T-shaped member 92 be provided for clamping the plates to the graining tray along the edges thereof. This T-shaped member preferably has the laterally extending portions 93 and 94 chamfered off to provide a relatively thin edge up which the graining balls may be permitted to roll when the machine is in motion. This construction permits the plates to be grained very closely to the edges and, furthermore, does not permit the balls to move in the same given path at each revolution of the tray. This substantially eliminates the series of streaks frequently noticeable along the edges of a plate mounted in a graining tray by means such as a bar having vertical sides against which the balls may slide or come to rest.

In the construction of graining machines in the smaller sizes we have found it possible to eliminate the over-ride or automatic crank compensating device 40 by utilizing semi-resilient supporting balls in place of the steel balls heretofore referred to in connection with the supporting and guiding cups. Such balls may be of very firm rubber or the like and, if desired, the cups may be made of material other than metal. We have found lignum-vitae satisfactory for the purpose.

In this modified form of our invention the throw of the crank is made to correspond as closely as possible to the throw permitted the tray by the guiding cups. The resilience of the balls is sufficient to compensate for any slight differences between the throw of the crank and the throw permitted by the cups and also serves to

compensate for any slight imperfection in the cups.

It will be obvious, of course, that such a device, utilizing semi-resilient ball members, is feasible only in smaller sizes of machines, since in larger and heavier machines, the weight of the tray and graining marbles would be sufficient to distort any ball resilient enough to serve as a compensating means.

Other means than that shown may be used for driving a device of this nature. For example, the gear case 17 may be dispensed with if desired by providing a speed reduction through the use of a large pulley on the vertical drive shaft 42. This large pulley may be driven directly from a small pulley on the electric motor.

Although we have described several specific embodiments of our invention, it is apparent that modifications thereof may be made without departing from the spirit and scope of our invention as set forth in the appended claims.

We claim as our invention:

1. In a graining machine including a tray, driving means for imparting movement to the tray in a substantially circular path, means for supporting the tray for free movement, and means separate from the driving means and substantially coincident with the supporting means for carrying the radial centrifugal load.

2. In a device of the character described including a base member and a movable member, a plurality of pairs of supporting and guiding cups, a movable separating member between each pair of cups, eccentric means for driving the movable member in a circular path limited by the cups and separating members, and compensating means operatively connecting the movable member and the eccentric means whereby the movable member may be slung outwardly by centrifugal force to the full extent permitted by the guiding cups.

3. In a device of the character described including supporting and guiding cups and movable supporting members therebetween, eccentric drive means, and means actuable by centrifugal force for regulating the throw of the said eccentric drive means to coincide with the circle of rotation of the device as determined by the guiding cups.

4. In a device of the character described, a plurality of pairs of cup members and ball members received therebetween, each of said cup members having an inside diameter greater than the diameter of the ball members, and having an inside depth somewhat less than one-half the diameter of the ball, and guide pins positioned in the vertical axis of at least one cup of a pair of cups, said guide pins extending inwardly from the bottom of the cup a sufficient distance to cause the ball to roll against the periphery of the cup.

5. In a device of the character described, a base including two pair of shell-like end panels, means for spacing the panels apart to define the ends of a pair of piers, means for closing the open spaces between the edges of the end panels to provide box-like forms for receiving concrete, means for spacing and aligning in parallel position the form members thus formed, said means comprising rigid rails detachably connected to the end panels near the bases thereof, mounting plate members, means for joining said plates to form a rigid frame, and means for mounting said frame on the upper surfaces of the end panel members.

6. In a device of the character described including a rotatable tray, a pair of piers in parallel relation, flanged plate-like members received over the top surfaces of the piers, a rigid cross member connecting the plate-like members to form an H-shaped frame, means for reinforcing the H-shaped frame, eccentric drive means for the tray positioned centrally of the cross member, and tray guiding and supporting means substantially coincident with one another positioned near the ends of the flanged plate-like members.

7. In a graining machine, a graining tray having the longitudinal side walls thereof flanged outwardly at the upper edges thereof, clamping bars adapted to rest on the upper surface of the flanged side walls, clamps slidably engaged in the clamping bars, and hook members pivotally mounted in the ends of the clamping bars and adapted to be hooked under the flanged portion of the side walls.

8. In a graining machine, a frame, a graining tray, single eccentric drive means mounted on the frame and operatively connected with the tray for imparting motion to the tray in a circular path, other means for supporting and guiding the tray including a plurality of cup members mounted on the frame, companion cup members attached to the tray, and semi-resilient ball members positioned between the cups on the frame and the cups on the tray.

9. In a graining machine including a tray, driving means for imparting motion to the tray in a substantially circular path, a plurality of means spaced from the driving means for supporting the tray for free movement, said means comprising opposed cup-like members, and guide means, circular in horizontal cross section and of smaller diameter than the cup-like members, disposed between the said cup-like members and adapted to be rolled about between the inner peripheries of the opposed cups for taking the radial centrifugal thrust of the tray.

10. In a graining machine including a tray, the combination of eccentric driving means for imparting motion to the tray in a substantially circular path, a plurality of means spaced from the driving means for supporting the tray for free movement, said means comprising opposed cup-like members, and guide means, circular in horizontal cross-section and of smaller diameter than the cup-like members, disposed between the said cup-like members and adapted to be rolled about between the inner peripheries of the opposed cups for taking the radial centrifugal thrust of the tray, the said eccentric means including means operable by centrifugal force for increasing the radius of throw of the eccentric to correspond with the circle of movement of the tray as determined by the cup and guide members.

11. In a graining machine including a tray, the combination of a plurality of spaced pairs of supporting and guiding cup members, an eccentric for imparting motion to the tray in a horizontal plane and in a substantially circular path, and drag-link means operatively connecting the tray and the eccentric whereby the throw of the eccentric is free to adapt itself to the circle of movement of the tray as determined by the guiding cups.

12. In a graining machine including a tray, a single driving eccentric operatively connected to the tray near the horizontal midpoint of the mass of the tray to impart a gyratory motion to that

portion of the tray to which it is connected, and means operative by reason of the centrifugal forces set up by the eccentric for causing all other portions of the tray to describe a circular path, said means including flat surfaces, balls to support the tray and annular guide members disposed about the flat surfaces to control and limit to a circular movement the motion imparted to the tray by the centrifugal force acting thereon.

13. In a graining machine including a tray for holding plates, driving means for imparting a substantially circular movement to one part of the tray to thus provide centrifugal rotating forces in the tray, and rotatable guiding means, having a fixed radius, for controlling the further movement of the tray due to the centrifugal forces set up by the driving means.

14. In a graining machine including a tray for holding plates, a single power driven eccentric having connecting means for operatively connecting it to the tray to furnish a circular movement of rotation to that part of the tray to which the eccentric is operatively connected and other eccentric means at spaced intervals about and operatively engaged to the tray for limiting and defining the movement of the tray at the portions of the tray to which the other eccentric means are engaged in a circular path, whereby all the elements of the tray are caused to move in a circular path by reason of the centrifugal force set up by the power driven eccentric.

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