Jan. 11, 1938. R. A. STEPS 2,105,059

AUTOMATIC CENTRIFUGAL APPARATUS

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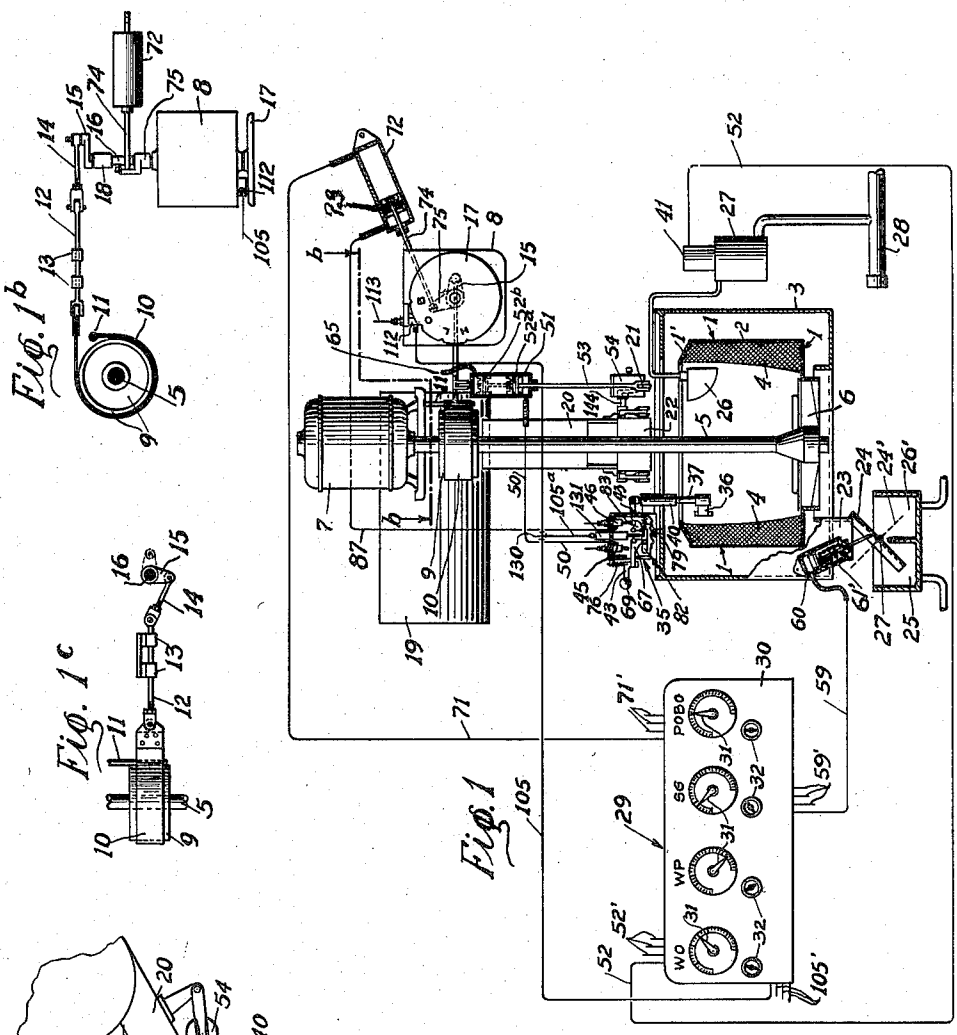


Fig. 1

Fig. 1b

Fig. 1c

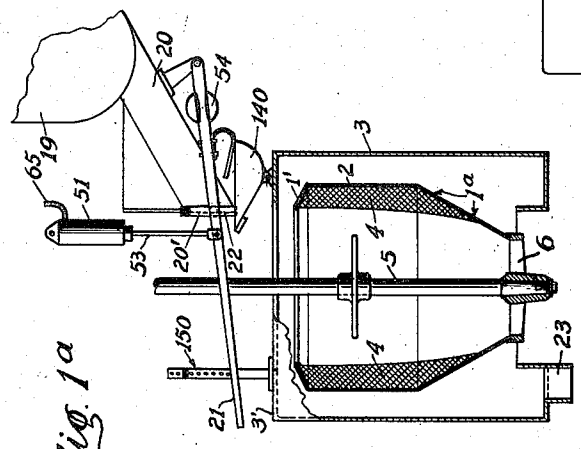


Fig. 1a

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Fig. 2

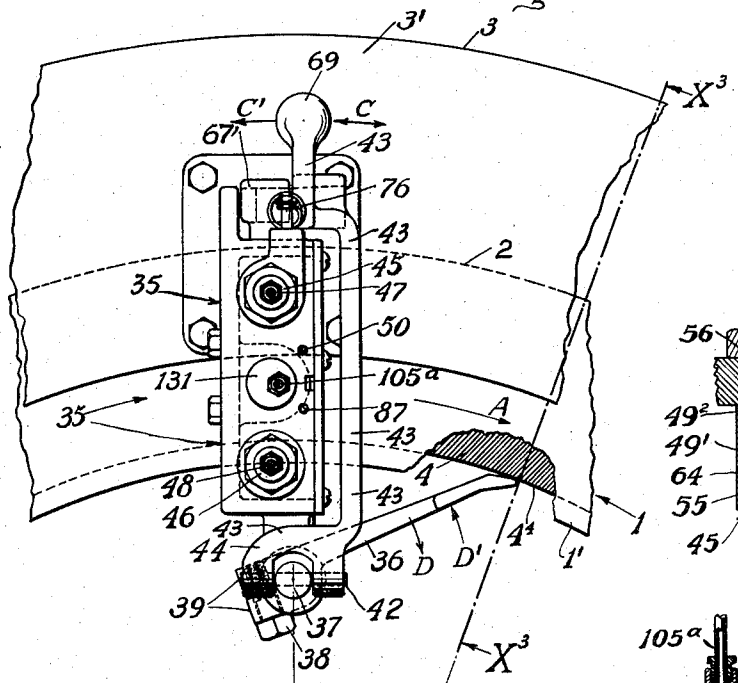


Fig. 3c

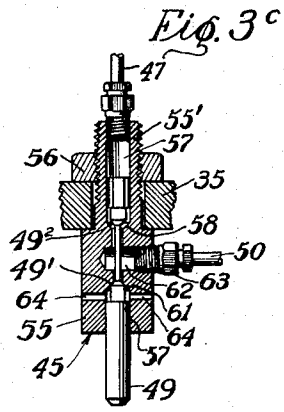


Fig. 3b

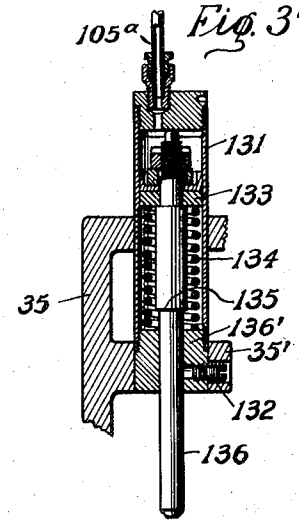


Fig. 1e

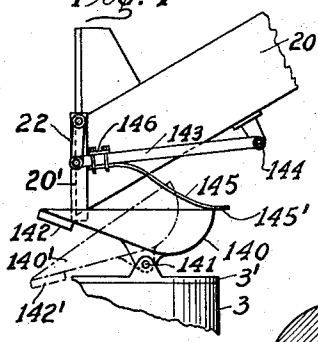
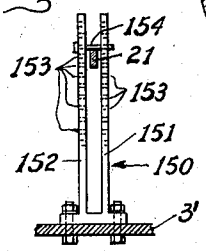


Fig. 1d



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Fig. 3a

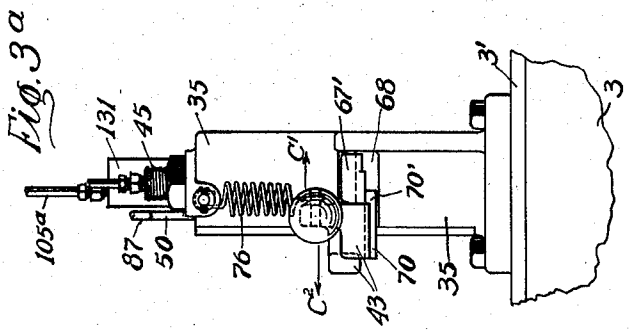
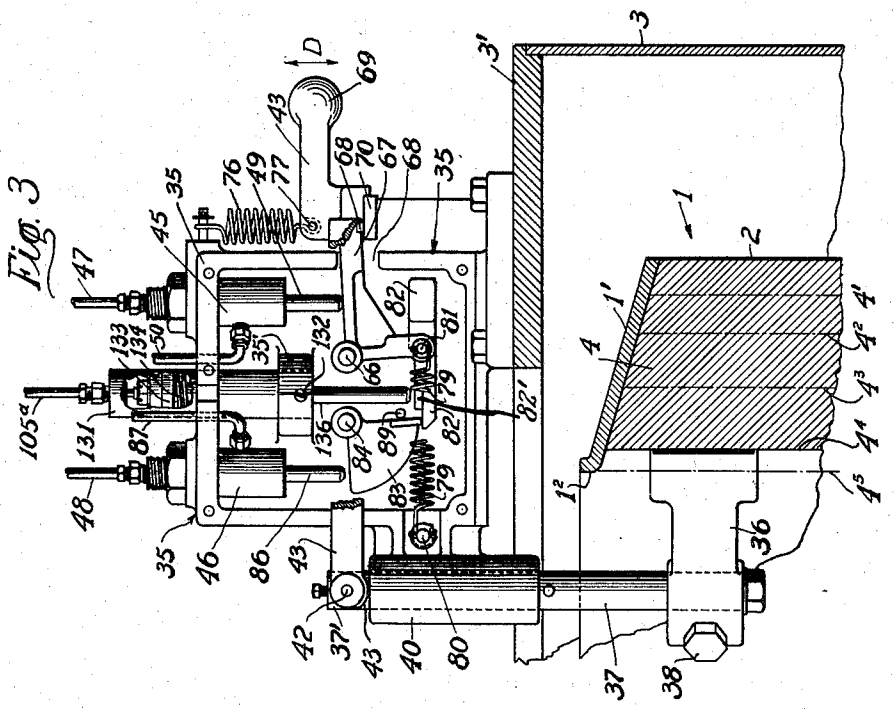


Fig. 3



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Fig. 5

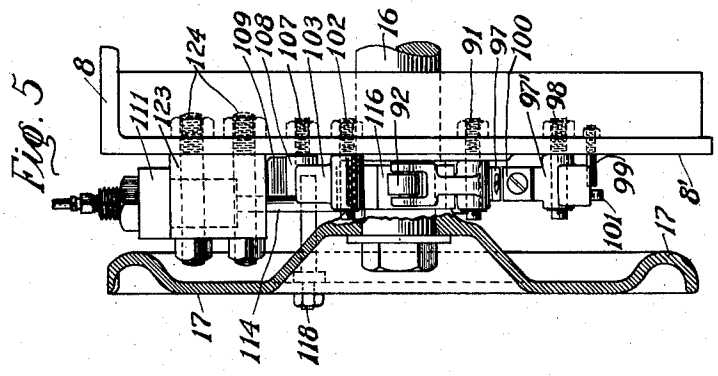


Fig. 4

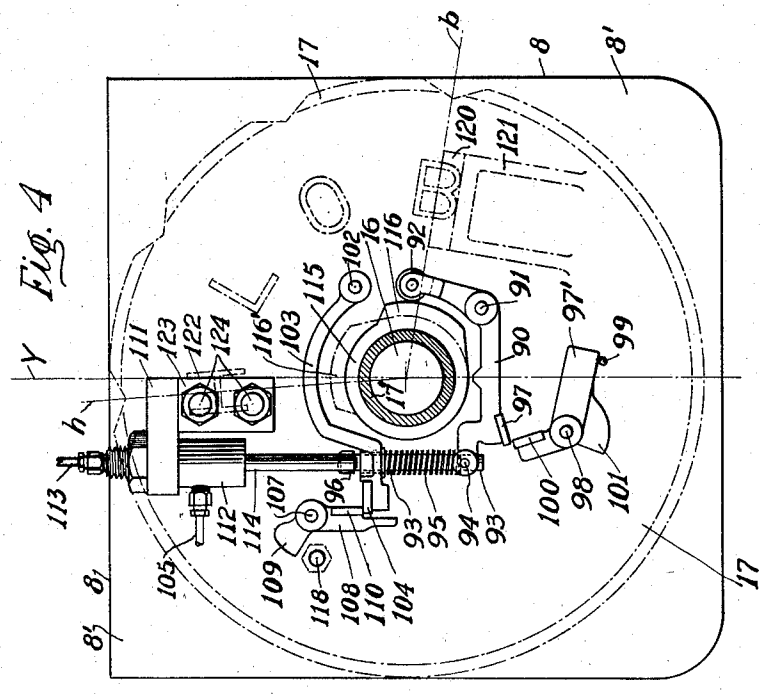
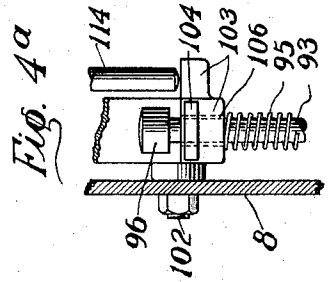


Fig. 4a



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Patented Jan. 11, 1938

2,105,059

UNITED STATES PATENT OFFICE

2,105,059

AUTOMATIC CENTRIFUGAL APPARATUS

Robert Alexander Steps, Los Angeles, Calif.

Application September 29, 1931, Serial No. 565,751

17 Claims. (Cl. 210—71)

My invention relates to various automatic equipment which has proven useful in connection with centrifugal machines, as used in sugar factories, and also other industries, and although this invention relates to the coordination of various parts of such automatic equipment, it also adds new apparatus for automatically charging centrifugals, whereas this function heretofore has usually been manually performed.

Amongst other objects of this invention, one is to reduce the labor expended in operating centrifugal machines, and to remove some of the harder and more burdensome tasks from the shoulders of the men, and to put these duties onto the new equipment parts which my invention involves. Naturally, this results in lightening the work of the men, and each operator can therefore handle a larger number of centrifugals than before, resulting in cheaper factory operations, and less daily fatigue for the men.

Broadly conceived my invention is subject to extensive modification and alteration without departing from the spirit thereof, and amongst other changes that will occur to those skilled in the art, I desire to point out that although the particular embodiment which I am about to describe as illustrative of this invention, operates entirely on pneumatic principles, nevertheless I am aware that electric operation, or also hydraulic operation, could easily be substituted either in whole or in part for the pneumatic operation which I will illustrate.

In the accompanying drawings Fig. 1 is a front elevation, partly in section, illustrating a centrifugal equipped with one form of my automatic apparatus, some portions of the equipment shown in this figure being distorted from their usual positions as found in practice, this being for the purpose of more clearly illustrating the same herein; Fig. 1*a* is a side view of part of the equipment shown in Fig. 1, and in this Fig. 1*a*, which is partly in section, I have taken the liberty of substituting a centrifugal basket of the self-discharging type for the flat bottom type shown in Fig. 1, in order to indicate that my invention is equally applicable to both of these types, and also any other types of baskets, which fact will be rather self-evident anyway to those skilled in the art. Fig. 1*b* is a sectional view along line *b*—*b*, Fig. 1, taken in the direction of the indicating arrows, and showing rather diagrammatically, a portion of the equipment immediately below this line *b*—*b*. Fig. 1*c* is a diagrammatic view indicating the toggle and lever arrangement commonly used for setting the centrifugal brake. Fig. 1*d* is a detailed view of an adjuster for opening the mouth of the charging spout by various amounts. Fig. 1*e* is a detailed view of the charging spout, the drip pan and its associated mechanism. Fig. 2 is a plan view of a portion of the centrifugal curb, basket and spindle, showing a portion of my automatic equipment, or rather one form thereof, as operatively mounted with reference to these parts. Fig. 3 is a side view, partly in section, taken along line X^3—X^3, Fig. 2, looking in the direction of the arrows. Fig. 3*a* is an end view of the apparatus shown in Fig. 3, looking at same from the right hand side in Fig. 3. Fig. 3*c* is an enlarged view of a particular type of air valve which I use. Fig. 3*b* is an enlarged view of a kick-off cylinder, which I will refer to in greater detail later. Fig. 4 is an enlarged view of the starter switch box shown in Fig. 1, some of the parts being shown in phantom in order to illustrate other parts below. Fig. 4*a* is a fragmentary enlarged view of a portion of the starter switch box mechanism. Fig. 5 is a side view, partly in section, of the equipment shown in Fig. 4, the view being taken from the right hand side in Fig. 4.

It will be understood that the usual centrifugal equipment illustrated in the drawings is standard, and is well known in the art, the same constituting no especial part of my invention, except as the various features common to all centrifugals are naturally combined and associated with my invention when the latter is applied thereto. As a starting point in this description, I will therefore briefly describe a centrifugal proper, referring only broadly to the parts thereof, as there is no need of minutely describing what is well known and common; and I also wish to state that I intend this description to be typical of all types of centrifugals, even though only one particular type is illustrated, as the average mechanic can readily understand how my automatic equipment can be attached to the other types and makes of centrifugals found on the market.

Essentially the centrifugal consists in a basket, shown as a flat bottom basket 1 in Fig. 1, and as a self-discharging basket 1*a* in Fig. 1*a*. The side cylindrical wall 2 of the basket is made of foraminous material, covered with fine screen, so that when the basket is rotated liquids will rapidly pass through the screened side walls 2 under the influence of centrifugal force. The basket is surrounded by the stationary curb 3 which collects the liquid spun out of the basket, while the solid matter such as sugar, etc. collects inside the basket, this being indicated by reference nu-

meral 4, Fig. 1, it being understood that this solid matter collects in this manner because it is too coarse to pass through the screened side wall 2 of the basket. The basket is rotated by spindle 5, which is attached to the basket through spider 6; and the spindle in turn is driven by any suitable means such as electric motor 7, Fig. 1, the starting switch for the latter being enclosed in a switch box 8, the latter being diagrammatically illustrated in Figs. 1, 4, and 5. The electrical connections between motor 7 and switch box 8 are not shown, as they are usually concealed in practice anyway, and are simple standard connections with which all centrifugal mechanics are familiar. For the purpose of rapidly stopping the centrifugals after the power has been cut off of motor 7, there is provided braking apparatus in connection with spindle 5, this consisting of brake drum 9, Figs. 1 and 1*b*, also brake band 10 surrounding this brake drum. The drum, of course, is solidly keyed to spindle 5 to rotate therewith. The brake band 10, as is best seen in Fig. 1*b*, has one end anchored to the stationary post 11, which is rigidly mounted in place in any suitable manner, and the other end of the brake band is fastened to a draw bar 12 which moves horizontally back and forth in bearings 13. As indicated in Figs. 1*b* and 1*c*, this draw bar 12 is connected through link 14 to a toggle lever 15, one end of which is solidly keyed to the switch box shaft 16, to turn therewith. This switch box shaft 16 passes through the switch box 8. It operates the switch mechanism therein, and is fastened at the front to the hand wheel 17, or any lever equivalent thereof. Shaft 16 is not only supported in bearings concealed in switch box 8, but also by bearing 18, Fig. 1*b*, which supports the rear end of shaft 16. It will be obvious from Figs. 1, 1*b*, and 1*c*, that when hand wheel 17, and shaft 16, as viewed in Figs. 1 and 1*c*, are rotated counterclockwise, the toggle lever 15, and link 14 will pull draw-bar 12 toward the right as viewed in Figs. 1*b* and 1*c*, and this will set the brake band 10 against brake drum 9 to stop the centrifugal. On hand wheel 17, as seen principally in Fig. 1, but also in phantom in Fig. 4, are noticed the large indicating letters H, L, O, and B, and in Fig. 1, the hand wheel 17 has been turned so that the B is in vertical line passing centrally through shaft 16. This position of the B means that the brake is set on brake drum 9, or in other words that the centrifugal is stopped, or in the process of stopping. When hand wheel 17 is rotated clockwise from its position shown in Fig. 1, first the O, then the L, and finally the H on the hand wheel, will successively pass through the central vertical line rising from shaft 16, or in other words these other letters will successively occupy the position in which the B happens to be shown in Fig. 1. The O indicates the "off" position of the hand wheel and switch box, meaning that the brake is off and also that the power is off of motor 7, so that this may be termed also the neutral position of the centrifugal. The L indicates low speed for the centrifugal, and the H indicates high speed, the interconnections between switch box 8 and motor 7 being such that two speeds can be realized according to the position in which the hand wheel is set. Therefore in rotating hand wheel 17 from its position shown in Fig. 1, clockwise, until H takes the position which B is shown to occupy, the successive steps will be, first, when O reaches the vertical position immediately above shaft 16, both the brake and power will be off, second, when the L reaches this position, the motor 7 will run and drive the centrifugal at low speed, and third, when the H reaches this position, the motor and centrifugal will run at high speed. At the end of the centrifugal cycle, this hand wheel 17 can be rotated counterclockwise until the B again reaches the vertical position above shaft 16, as shown in Fig. 1, and in this position, the power will be cut off and the brake will be set to stop the centrifugal.

The material to be centrifugally separated in basket 1, is stored in a large tank 19, Fig. 1, from which batches are periodically charged into the basket through the mixer spout 20, see Figs. 1 and 1*a*. Whenever the hand lever 21 is lifted, its link connections with the cover cap 22 are such that the latter is lifted and the material from tank 19 freely pours down through spout 20, and out of the mouth of same, into basket 1, to supply the charge to the latter. Similarly when hand lever 21 is lowered, the cover cap 22 again closes the mouth of charging spout 20, and the material ceases to flow from supply tank 19 into basket 1. This material, in tank 19, usually consists of a mixture of solid matter with liquid matter, the nature and texture of each depending on the industry in which the centrifugal is operating, and for illustration, if the industry is a sugar factory, the solid material will be sugar crystals and the liquid material will be syrup. These enter basket 1, from tank 19 and spout 20, as a perfect mixture, the charging of same into the basket occurring either when the basket is at rest or turning at low speed, and when the basket is then driven to high speed, by turning hand wheel 17 to its H position, centrifugal force will drive the syrup outward through the screened cylindrical wall 2 of the basket, and the massed sugar crystals will collect in the basket as indicated at 4, Fig. 1. When the separation is complete, the centrifugal will be stopped by rotating hand wheel 17 counterclockwise to its B or braking position, and when the basket thus comes to rest, the solid material 4 will be discharged therefrom, and a new charge of the mixed material from tank 19 will be taken into the basket by lifting lever 21, as previously described.

At this point I would like to remark, that not only is the centrifugal proper, as just described, old and well known equipment, but also it is old and well known to attach automatic timer equipment to such centrifugals for the purpose of timing various cycle steps as required in the centrifuging of different products. In so far as the apparatus that constitutes the basis of this present invention, is in some respects combined and associated with this automatic timer control for centrifugals, I will now briefly describe the latter, but will do so only broadly, and with omission of all details, as the details constitute no part of this present invention. The timer control apparatus can assume many different forms, to all of which my present invention can be readily applied or attached with simple or suitable modifications to whatever extent may be required, but for the purposes of this description I have selected the type of timer control apparatus which is fully shown and described as to all its details in my co-pending application Serial No. 515,011, filed February 11th, 1931, and entitled "Master cycle control apparatus," to which co-pending application reference should be made for all details not mentioned herein.

The basis of such timer control is that it auto-

matically measures the time intervals for different cycle steps, and according to the particular industry the cycle steps may be very few or they may be many. In the sugar industry as an example, these steps often consist of the following: When basket 1 has been started turning with its freshly received charge of material therein, and after a certain time has elapsed to permit the mother syrup to spin out of the basket into curbing 3, from which it is drained through opening 23, Fig. 1, and diverted by gutter 24 into trough 25, it is desirable to apply a water spray against material 4 in the basket, and this spray is emitted from nozzle 26. The purpose of the water is to wash the last traces of syrup out of the revolving sugar mass 4, and the water is supplied to nozzle 26 from an automatic wash water valve 27, the latter being located between nozzle 26 and supply header 28, the latter supplying the water under constant pressure so that the quantity of water emitted through nozzle 26 will depend on the length of time the valve 27 is held open. In other words, up to this point there are two timed cycle steps, namely the timed interval before the water commences to flow from nozzle 26, and second, the timed interval during which the water flows from this nozzle, this being terminated by closing of the valve 27. The next timed cycle step is often the shifting of syrup gutter 24, from its full line position shown in Fig. 1, to its dotted line position 24', where this gutter diverts the liquor drained from the curbing, into trough 26', instead of trough 25. The object of thus shifting gutter 24 about its shaft 27', is to permit a separation between the original mother syrup which collects in trough 25, and the more pure wash liquor which collects in trough 26'. For various reasons this shifting of trough 24 should occur at a fixed time with reference to the starting and stopping of the spray through nozzle 26, and therefore the shifting of this trough, when automatically performed in manner which I will soon briefly describe, constitutes another timed step in the spinning cycle. In like manner, and without going into details, it is well understood that after the spray stops at nozzle 26, a definite timed period should elapse before the power is cut off and the brake applied to stop the centrifugal.

In other words, in the sugar spinning cycle just described, there are four intervals, or cycle steps, that in modern practice are being accurately timed as it is found that this improves the character of the products handled by the centrifuge. To summarize, these four steps, or timed intervals, are, first, the interval preceding the turning on of the spray from nozzle 26; second, that preceding the turning off of the spray; third, that preceding the shifting of syrup gutter 24; and, fourth, that preceding the stopping of the centrifugal. Of course, more timed steps can be added, and some of those mentioned in the preceding example can be omitted, all depending on the nature of work, and product. In modern industry today, when these cycle steps are thus timed, it is customary to also perform these steps automatically, as this is the easiest way to impress the accurate time intervals upon the mechanism, and for this purpose there is used some sort of centrifugal timer control, one form of which I have indicated diagrammatically by reference numeral 29 in Fig. 1, and from this timer control there are connections of a type depending on the nature of the timer, to the various parts which are to be automatically actuated at the centrifugal when the respective time intervals are completed. As previously indicated, I am illustrating herein only one type of timer with its particular kind of connections to the centrifugal, but this is intended only as an illustration, as any other type or kind of cycle timer, whatsoever, can be substituted therefor, at least as far as concerns its association and combination with this present invention.

The cycle timer 29 is seen to consist of a cabinet 30 having four dials thereon, which for convenience have been respectively designated as WO, WP, SG, POBO. These dials are graduated in any suitable way, preferably to show periods of time, and on each dial there is a pointer 31 to indicate the particular time interval for which each dial is set. Also for each dial and pointer there is an adjusting knob or lever 32, which is internally associated and connected not only with its corresponding pointer, but also with the control parts in the cabinet, so that the turning of this knob 32 changes the time period corresponding to its dial, this change being indicated by the movement of its pointer to the new time setting to which adjustment is made. As previously indicated, this particular cycle timer happens to work pneumatically, and I will therefore describe its operations on this basis, but I wish to point out again that this is only illustrative, and other types of cycle timers operating, either partly or entirely, either on electrical principles, or pure mechanical principles, or hydraulic principles, could be substituted for this pneumatic cycle timer, all within the province of the present invention. The pneumatic operation of this cycle timer is however as follows.

The moment for starting the time cycle corresponding to any particular basket charge, may be taken as the moment when the charging of the mixture into the basket through chute 20 ceases, as evidenced by the closing of the cover cap 22 over the mouth of this chute or spout, or else it may be taken as the moment when the centrifugal speed controller is turned to its high running speed position. Prior to this moment, the timer parts, not shown, but located in cabinet 30, and corresponding to this centrifugal, are at rest, and are not performing any timing function for the centrifugal; but when this moment for starting the timing cycle is reached, compressed air is supplied through copper tube 105, in a manner that I will subsequently describe, but this admission of the compressed air through this tube 105, to the cabinet 30, causes the timer parts in the cabinet to commence timing off the cycle periods for this centrifugal. When these parts have timed off the period for which pointer 31 is set on the first dial marked WO, and meaning "water on", compressed air is released from the cabinet through tube 52, into the upper cylindrical portion 41 of the water valve 27, and through suitable plunger mechanism not shown, but located in cylinder 41, the wash water valve 27 is opened and the liquid spray commences to flow upon product 4 in basket 1, this operation commencing at the time period for which the first dial WO is set. The centrifugal continues to spin, and the timer parts in cabinet 30 continue to move and measure time, and when the period elapses for which pointer 31 is set on the second dial marked WP, meaning "washing period", the compressed air from cylinder 41 is released through tube 52, and the wash water valve 27 automatically closes, thereby terminating the washing period, and the wash fluid ceases to flow from nozzle 26. Similarly, when the period

elapses for which the pointer 31 is set on the third dial, marked SG, meaning "syrup gutter", compressed air is released through tube 59, into cylinder 60, which through its connections, in an obvious manner shifts syrup gutter 24 from its full line position shown in Fig. 1, to its dotted line position 24', for purposes previously described. And finally, when the last time period elapses for which the pointer 31 is set on the fourth dial marked POBO, meaning "power off and brake on", compressed air is released through tube 71 into the upper part of cylinder 72, above the double-acting piston 73, and through piston rod 74 and crank 75, the latter being rigidly keyed to switch box shaft 16, this shaft 16 is rotated counter-clockwise, and as previously set forth this results in shifting hand wheel 17 from its H position to its B position shown in Fig. 1, which cuts off the power and applies the brake to stop the centrifugal, thereby terminating the timed cycle impressed by the timer control 29. After this, and in manner which I will presently describe, the compressed air is released from tube 105, and in view of the automatic actions thereby caused in the parts within cabinet 30, all these parts corresponding to this centrifugal automatically reset themselves at zero, and the compressed air is released from tubes 59 and 71, the spring 61' in cylinder 60 automatically retrieves syrup gutter 24 to its full line position as shown in Fig. 1, and also the compressed air is exhausted from cylinder 72, freeing the same so that hand wheel 17 can be freely operated to start the next cycle by turning to its L position. In other words, the last cycle is finished so far as timer 29 is concerned, and all the parts are reset to initial position in readiness for the next cycle. In Fig. 1, I have shown additional tubing outlets 105', 52', 59', and 71', as entering the cabinet 30, but this is rather immaterial to the present invention, as these last-named tubing outlets are intended to connect to other centrifugals not shown, but expected to operate in the same group with the particular centrifugal shown in Fig. 1. These other tubing outlets to the other centrifugals, are peculiar to the particular type of timer control which I have elected to illustrate for purposes of example, but no further discussion of the other centrifugals or of the other tubing outlets thereto, is necessary, because any simple timer control, of any sort, and individual to a single centrifugal, is sufficient for the purposes of this present invention, as will appear from subsequent description.

I have now described the general nature of a centrifugal machine, with ordinary automatic timer control applied thereto, all this being conceded to be old and well known prior to this present invention, and from this point on I will now describe my added automatic centrifugal apparatus and will indicate its connection and cooperation with the usual centrifugal parts, and with the timer control, all of which thereby broadly becomes a portion of the present invention.

One of the objects of this new automatic apparatus is to provide for the automatic charging of the centrifugal, this to take the place of the manual charging which was the usual practice prior to this invention. Broadly speaking automatic charging consists in moving some part or member from one position to another, which through suitable interconnection, or else directly, opens the mouth of some sort of charging chute or spout, equivalent to spout 20 in the appended drawings, and when the mixture has then flowed in accurate sufficient quantity into basket 1, the mouth of the charging spout is again automatically closed, thereby completing the automatic charging referred to. In the particular kind of centrifugal illustrated in Figs. 1 and 1a, this result can be accomplished by automatically lifting lever 21, which opens the mouth of charging spout 20 by lifting the cover cap 22 off of same, and then when sufficient charge has entered basket 1, lever 21 is again automatically lowered to close cover cap 22 over the mouth of charging spout 20. Obviously however the arrangement would be somewhat different in other centrifugals where the details of the charging spout, etc. are different.

In the subsequent description it will be noticed that this measuring of the correct amount of charge into the basket, is not accomplished on a time basis, i. e., by measuring the time that the charging spout is open. In other words, this charging operation is not, and probably cannot be handled on a time basis by simply adding an additional function or time period to the timer control 29. The cycle steps that this timer control governs are all of a nature that depend for their accuracy and effectiveness, on time principles, but time cannot be used as the basis for measuring the correct charge into the basket. This is because a fixed and desired volume of charge must each time be taken into the basket, in order to completely fill it, but not waste any by throwing it over the top of the basket into curb 3, as would occur if too large a charge were taken. That the accurate charge cannot be taken on a time basis, is apparent from the fact that the height of the mixture in tank 19 varies incessantly, so that the pressure, and consequently the speed of the charge as it leaves spout 20 will vary with the level of the mixture in tank 19, and with such varying speed the volume of charge would obviously not be constant for a constant time period such as is given by time controller 29. In fact the variations in the charging would be prohibitive because sometimes tank 19 is full and the mixture flows very rapidly from spout 20, whereas at other times this tank is practically empty and the mixture flows but slowly from the spout. Besides in most industries, the nature and viscosity of the mixture in tank 19 varies considerably, so that this would also affect the velocity of flow through spout 20, even if the mixture level in tank 19, and therefore the pressure, remained more constant than it does. This illustrates why a constant volume of charge cannot be taken into the basket by measurement of a time interval, such as could be easily realized by expanding the timer control 29 to include another dial. The timing principle for measuring the volume of charge, being impracticable, I have adopted a principle of volumetric measurement which gives much better and more accurate measurements for the charge under any and all conditions of variations of tank pressure and viscosity as indicated above.

Figs. 1, 2, 3, and 3a indicate quite clearly one type or form of equipment embraced in my invention for accurately measuring the amount of charge taken into the basket, and this equipment automatically opens the charging spout 20, and again automatically closes it when the correct amount of charge is in the basket. The charge measuring equipment may take on various forms as to detail and construction, but in general consists of some sort of housing or container 35 fastened preferably to the stationary

top member 3' of curbing 3, and overhanging the top or cap member 1' of basket 1. In some way associated with this housing 35, is a thickness measuring shoe 36, which during the process of taking the charge is pressed upon by the sugar or material 4 in the basket, which revolves in direction of arrow A, see Fig. 2. It will be understood that when automatic charging equipment is used, the basket 1 is in some way caused to rotate at moderately low speed while the charge is being taken in, and in view of the centrifugal force of such rotation, the charge instantly climbs up on the cylindrical screen or wall 2, first lying along a vertical line 4', Fig. 3, when the amount of charge is only slight, and as the charge continues to flow into the revolving basket, the line 4', representing the inner surface of the charge, advances successively to 4^2, 4^3, and 4^4, and when it gets to about line 4^5, corresponding quite closely to the inner perimeter 1^2 of the basket cap 1', the full charge is in the basket, and no more should be entered. Obviously, as this thickening of the charge wall proceeds from screen 2 inward, the charge will drag against the thickness measuring shoe 36, and press the latter away from screen 2, and by suitably hanging or suspending this thickness measuring shoe 36, the movement of the latter under the increasing thickness of the charge can be taken advantage of to automatically close the charging spout when the correct charge is in the basket. For this purpose the thickness measuring shoe 36 can be hung in various ways, and the parts, or mechanism, in container 35, for coacting with shoe 36, to cut off the charging, can also vary considerably.

However, I have found that the construction illustrated, comprehensively covers many requirements, and operates with good satisfaction and practically constant dependability. In this arrangement of my invention shoe 36 is clamped to the vertical shaft 37 by means of nut 38 acting through the split hub 39, see Fig. 2, of the shoe casting. The relative circumferential position at which shoe 36 is fastened to shaft 37 can be changed by loosening nut 38, rotating shoe 36 to its desired position on shaft 37, and then reclamping by means of nut 38. It is this shifting of the position of shoe 36 on shaft 37, that comprises the adjustment that I resort to in this form of the equipment, for controlling the particular thickness of wall charge 4, taken into the basket. Vertical shaft 37 is free to rotate in bearing 40, which comprises part of container 35, and to the upper extremity 37' of the shaft, is fastened by means of pin 42 a handle, or charging lever 43, having the yoked end 44, this lever being best seen in Figs. 2, 3, and 3a. This lever, because of its connection with shaft 37, and the latter's freedom to revolve in bearing 40, can move in either direction as indicated by arrow C, Fig. 2, and because of its being fastened to shaft 37 by pin 42, this lever can also move up or down as indicated by arrow D, Fig. 3; or in other words this lever has the possibility of compound movement, as just indicated. In container 35, as viewed in Figure 3, are located electrical switches, or air or water valves, according to the design and desires of the builder or user of this equipment, the purpose of these parts being to co-act with the other elements for producing, or terminating the charging or other functions; but having elected to illustrate the equipment as pneumatically operated, these parts are represented in the drawings as air valves 45 and 46. Compressed air is supplied to both of these valves through their top inlet openings, by means of supply connections 47 and 48 attached thereto, and coming from a compressor or supply tank not shown. The purpose of the first valve 45, is, upon lifting of its valve stem 49, to release compressed air through tube 50, into the lower end of cylinder 51, see Fig. 1, for lifting piston 52^a and piston rod 53, the latter being fastened to charging lever 21, to thereby lift this lever, and its interconnected cover cap 22, thereby permitting the mixture to flow from spout 20 into the slowly revolving basket, to charge the same, as previously described. So long as the valve stem 49, of valve 45, is held in its lifted position, the valve 45 will be held open, and the compressed air will hold piston 52^a, in cylinder 51, in an upper position, approximately as indicated by dotted lines, at 52^b, in Fig. 1. When valve stem 49 is released however, the supply of air is cut off by valve 45, and the air under piston 52^a instantly exhausts backward through tube 50 and valve 45, and because of the weight of lever 21, together with the weight of cover cap 22, and the interconnected links, plus the added force, if necessary, of counterweight 54, the lever 21, piston 52^a, and cover cap 22 rapidly fall, to close the mouth of spout 20, and thereby terminate the charging of the mixture through same into basket 1. In other words, the lifting of valve stem 49, of valve 45, opens the charging spout to start and continue the charging so long as valve stem 49 is held upward, but as soon as it is released, this valve stem drops in the valve body, and the cover cap 22 promptly lowers and closes the charging spout, to thereby terminate the charging.

The detailed construction of valve 45, and also in fact of air valve 46, because these are identical, is clearly indicated in the sectional view shown in Fig. 3c, and description of same will now be given. This valve consists of a valve body 55, preferably cylindrical in shape, and having an upper necked portion 55', of reduced diameter, and threaded as indicated, this neck portion passing through the top of container 35, and being fastened thereto by nut 56, as indicated in Figure 3c. A hole 57 of variable diameter, passes entirely through this valve body along the axis of same, and as part of this hole or bore there is located at 58 an upwardly facing valve seat, and at 61 a downwardly facing valve seat. Between these two seats the valve body is provided with a side outlet opening 62, to which tube 50 is connected through the usual compression fitting 63, this tube 50 being the one that connects with cylinder 51 as previously described. Also below valve seat 61, the valve body is provided with two exhaust openings 64, the function of which will presently be described. In the valve bore 57 rides a stem previously defined by reference numeral 49, and at 49' this stem has an upwardly pointing valve face adapted to register with valve seat 61, and above this the valve stem also has a downwardly pointing valve face 49^2 adapted to register with valve seat 58. As indicated in Fig. 3c the distance between the valve faces 49' and 49^2 on the stem is slightly larger than the distance between valve seats 58 and 61 in the body, so that valve stem 49 is free to move a short distance up and down in valve bore 57, the upward movement being limited when valve face 49' butts against seat 61, and the downward movement being limited when valve face 49^2 butts against seat 58. In other words, when the valve

stem 49 is lifted to its uppermost position, as shown in Fig. 3c, this valve is closed at seat 61 and is open at seat 58, and in this position the compressed air supplied through tube 47 into the upper inlet end of bore 57, freely passes down through the valve past seat 58 and out through tube 50 to lift piston 52a in cylinder 51, and permit the charging of the basket to continue so long as valve stem 49 is held in this position. But as soon as the upward push on valve stem 49 is released, this member or mechanism being obviously of the type that may be described as normally self-retrieving to its initial or normal position, instantly falls in bore 57, closing the valve at seat 58, and opening it at seat 61, by which action the charging of the basket instantly ceases because the compressed air under piston 52a, immediately exhausts itself by passing backward through tube 50 into valve 45, this air escaping downward past valve seat 61, now open, and thence outward through the two exhaust openings 64. The compressed air being thus released from under piston 52a in cylinder 51, the interconnected parts drop under their own weight as previously described, including the cover cap 22, and the charging into the basket ceases, as described before. I might add that if the weight of the parts connected with the cover cap 22 is not sufficient to quickly close the same when the compressed air is released from beneath piston 52a, then this can be compensated for by making piston 52a double acting, and supplying either a lower air or water pressure into the top of cylinder 51, through connection 65, shown in Fig. 1, and if this back pressure be created by water from an open tank, then the restrictive influence of the water, which flows much slower than air, introduces a nice dampering action, which in some designs is desirable, in case a tendency of the compressed air is noted to throw the parts up and down too swiftly.

I will now describe how valve stem 49, in container 35, Fig. 3, is automatically raised to open the charging spout 20, and is later automatically released or dropped to close the charging spout and terminate the charging, when the correct amount of charge has been taken into basket 1 as determined by the thickness measuring shoe 36. Referring to Fig. 3, there is pivotally mounted on pin 66 a lever 67 which passes out through an opening 62 in the side wall of container 35. When the right hand end of this lever, as viewed in Fig. 3 is lifted, it lifts the valve stem 49, of valve 45, and puts it in the position shown in Fig. 3c, and when this lever 67 is lowered at its right hand end, it drops, by slight rotation around the pin 66, until the lever rests on the ledge comprising the bottom of opening 68 in Fig. 3. In this latter position, not actually shown in the figures, the lever 67 falls sufficiently away from valve stem 49 so that the latter completely closes at the upper valve seat 58, and there is a little clearance to boot between lever 67 and valve stem 49. This lever 67 is lifted at its right hand end, to engage and lift valve stem 49, in the following manner.

When the man operating the centrifugal has started the latter turning at moderately slow speed and desires to start the charging action, he takes hold of the outer balled end 69 of lever 43 and swings it downward, and also inward toward container 35, in the direction of arrow C', Figs. 2 and 3a. In the last-named figures, and in particular in Fig. 3a, the outer extremity 67', of lever 67, is noticed, and it is also noticed that a hardened steel clip member 70, fastened to the bottom of lever 43, and carried thereby, hooks under the outer extremity 67', of lever 67, as indicated at 70', Fig. 3a. The lever 43 being vigorously pulled in an upward direction by spring 76, fastened to the outside of container 35 as indicated in the drawings, and also fastened to lever 43 by pin 77 driven into the latter, naturally imparts this vigorous upward pull to the outer lever extremity 67', thereby lifting this lever 67 to raise the valve stem 49, and hold this valve stem lifted, under the strong action of tension spring 76. From descriptions previously given, it is now self-evident that this movement of lever 43 in this direction C', finally results in opening cover cap 22 off the mouth of the charging spout 20, and the charge flows into the basket so long as the steel clip 70, of lever 43, remains under the outer lever extremity 67', as indicated at 70', Fig. 3a. As the charge flows into the slowly revolving basket however, the wall thickness of the charge passes through the successive positions $4'$, 4^2, 4^3, and 4^4, Fig. 3, as previously indicated, and when the last-mentioned position 4^4 is reached, the revolving charge wall in the basket, revolving in direction of arrow A, Fig. 2, reaches and contacts with the thickness measuring shoe 36, and thereafter as the wall thickness in the basket continues to increase, because of continued flow of the charge into the revolving basket, the charge obviously rotates shoe 36 in direction of arrow D, Fig. 2, the vertical shaft 37 rotating with it, and obviously causing lever 43 to rotate, or move away from container 35, in direction opposite to arrow C' in Fig. 2, or in other words in direction of arrow C^2 in Fig. 3a, until the steel clip 70 passes completely out from under lever extremity 67', and releases this lever 67 from the upward pull of spring 76. This disengagement of the lever extremity 67', occurs at approximately the point where the thickness measuring shoe 36 has been rotated outward to correspond with the full charge thickness 4^5, which just charges the basket nice and full, as previously indicated, so that when the shoe 36, and the wall thickness, reaches this limit 4^5, the lever 67 has been released from the upward pull of spring 76, and being so released, this lever 67 drops away and frees valve stem 49, of valve 45, which valve stem drops in the valve body, and as previously described this results in closing the charging spout, and terminates the charging action, when and because the thickness measuring shoe 36 reached the limiting position 4^5, for which it was set. Obviously the thickness of the charge in basket 1, at which the steel clip 70 fastened to lever 43, just snaps out from under lever extremity 67', depends upon the setting of shoe 36 on its shaft 37, and as previously indicated this setting can be easily changed by loosening nut 38, swinging the shoe to any desired position on shaft 37, and then reclamping by means of nut 38. It is in this manner that the adjustment for wall thickness, can be changed to suit any desired amount of charge, of course not exceeding the maximum that the basket can hold. Also, for the purpose of quickly pulling lever 67 away from under valve stem 49 as soon as the lever is released from the steel clip 70, and also for other purposes to be presently described, I supply spring 79, see Fig. 3, a portion of same being broken away in this figure to uncover parts below. The left end of this spring is anchored to container 35 by means of pin 80 driven therein, and the right end of this spring is fastened to pin 81, driven into the lower end of lever 67,

and thereby constantly pulling same in a clockwise direction with reference to pin 66, on which lever 67 rides. This spring 79, therefore, aids in positively pulling lever 67 clear from valve stem 49, when lever 67 is released for this purpose. This spring 79 however also has additional functions which will be presently referred to. In concluding the description of this portion of the automatic charging equipment, I particularly desire to point out that the apparatus thus far disclosed is a typical example of a larger class of automatic charging devices, all of which are subject to my invention, and which are characterized by the fact that at the place where the measuring shoe 36 is swung inward to its limiting position in direction of arrow D', Fig. 2, the connection, whatever its nature may be, is made, that automatically opens the charging spout to start the charging. In the example of my equipment shown in the figures, the shoe 36 is swung inward, toward screen 2, in direction of arrow D', by manual manipulation of lever 43, and the previously described connection with valve 45 for thereby opening the charging spout 20 is effected when shoe 36 is at or near its limiting position in the direction of arrow D', but in other forms of this invention I intend to move the thickness measuring shoe towards the screen in other ways, and to make contact for automatically opening the charging spout in different manner than herein illustrated, but always by virtue of the thickness measuring shoe approaching its limiting position by movement toward screen 2 in direction of arrow D', Fig. 2. The form of my invention herein illustrated however, is sufficient to support the broad claims hereto appended, covering the feature just referred to, and I consider the same important in its possibilities and development.

With a two-speed motor 7, and switch box 8, of the type previously described, which causes the motor and centrifugal to run at a relatively low speed when starting wheel 17 is turned to its low position, and then causes it to rotate at a higher speed when starting wheel 17 is turned to its H or high position, it is usual for the automatic charging operation thus far described to have occurred with the motor and centrifugal running on the low or L speed. But as soon as the charging spout 20 is closed, to terminate the charging, two things are desirable, namely, that the timer control 29 should commence timing off the cycle steps that will ensue, and also the switch control 8 should be promptly shifted from its low speed to its high running speed position to effectively centrifuge the product. With the particular form of equipment that I have illustrated in the drawings, both of these operations are performed automatically, but by simple modification of this equipment, one or the other of these operations could be omitted if the same is not needed, as for instance if the type of centrifugal is such as to have only one speed, namely a high speed, and no low speed, then the feature of automatically cutting from low speed to high speed can be omitted, but the other feature of automatically putting the centrifugal under the influence of the cycle timer 29, at the moment when the charging action terminates, can be retained, and in addition other modifications, to suit other special circumstances, can readily be made. I will now describe however the form of the equipment which I have selected for herein illustrating the more complex form of my invention, wherein both of the foregoing functions are automatically performed, namely, the automatic cutting of the centrifugal from low to high speed, and also the automatic starting of the cycle timer 29, at the instant when the charging of the basket ceases.

When spring 79, Fig. 3, pulls lever 67 clockwise around pin 66, at the moment when the charging action closes down, the following actions, not previously described, also occur. By means of pin 81, carried in the depending leg of lever 67, as illustrated in Fig. 3, there is attached to this lever 67 another member 82, which is free to rotate both clockwise and counterclockwise, at least a small amount, on pin 81, and therefore on the lever 67 which carries it. When the charging action terminates by lever 43 releasing lever 67 as previously indicated, so that spring 79 pulls member 82 toward the left as viewed in Fig. 3, the shoulder 82', of member 82, butts against the bottom lip of weighted member 83 which is mounted to freely rotate, within rather narrow limits, about pin 84, which is driven into the container 35. The weight distribution in member 83 is such that when free it normally rotates counterclockwise, being arrested however by stop pin 85 driven into container 35, and serving to normally hold member 83 in its position shown in Fig. 3. When spring 79 however pulls member 82 slightly to the left, the shoulder 82' obviously engages the bottom lip of member 83, and rotates the latter clockwise around pin 84, thereby engaging the bottom extremity of valve stem 86, of the air valve 46, and this air valve is thereby opened in the same manner as was previously described for the opening of valve 45 by the lifting of its stem 49. The valve 46 being thus opened by the pull of spring 79, the compressed air supplied through tube 48 to valve 46, is instantly released and transmitted through tube 87, into the lower end of cylinder 72, as seen in Fig. 1, and the compressed air thus entering below the double-acting piston 73 in this cylinder, obviously pulls crank 75 clockwise, thereby rotating switch shaft 16, and as a result the controller wheel 17, which as previously described, was standing on its L, or low speed running position, is swung around clockwise to its H, or high speed running position, and the centrifugal rapidly accelerates to its maximum high running speed.

By referring now to Figs. 4 and 5, I will describe how this action of turning the switch shaft 16 from the L to the H position, also results in releasing compressed air to tube 105 to start the timer parts in the timer control 29 upon their duty of timing the cycle steps of the centrifugal. Fig. 4 shows the controller wheel 17 in phantom, together with some other parts, most of which are in some way operatively carried by the front wall 8' of switch box 8, see also Fig. 5. A bell-shaped lever 90 is free to rock on pin 91, the latter being bolted to the front face 8' of switch box 8, as indicated in Fig. 5. At one end this lever 90 has a roller 92 carried therein, and at the other end it is fastened to the vertical pin 93 by means of the smaller pin 94. The vertical pin 93 has a spring 95 encircling the same, and also it terminates at the top in an enlarged head member 96. Lever 90 also has a hardened steel clip 97 attached thereto. Below lever 90 there is another member 97' free to swivel back and forth on pin 98, which is also permanently fastened and bolted to the front wall 8', of switch box 8, as indicated in Fig. 5. This member 97' is so weighted by virtue of its heavy body portion extending out toward the right, as viewed in

Fig. 4, that this member always tends by its weight to turn clockwise about pin 98, this tendency however being arrested because it normally contacts with, and rests upon, a small stop pin 99, fastened to wall 8' of the switch box. Member 97' is also equipped with a hardened steel clip 100, adapted to co-act with steel clip 97 of lever 90, in a manner and for a purpose that will be presently described; and projecting from its lower portion this member 97' also has a tripper fin 101, the purpose of which will also presently become clear. Mounted on the pin 102, which is permanently bolted to the front face 8' of the switch box, as seen in Figs. 4 and 5, is another lever 103, free to rotate within moderate limits around this pin 102. At its opposite end, this lever is equipped with the hardened steel clip 104, and as seen in Fig. 4a, the vertical pin 93 passes freely through an aperture 106 in this lever, the head 96 of this pin being of sufficient diameter to prevent the pin from dropping through this aperture 106. The compression spring 95, which encircles pin 93, presses upward against the bottom of lever 103, because this spring is restrained between this lever 103 and the cross pin 94 which fastens the vertical pin 93 to lever 90. To the left of lever 103, as viewed in Fig. 4, is another pin 107 securely bolted and fastened to the front face 8' of the switch box, as indicated in Fig. 5; and on this pin 107 is carried a member 108 having the heavily weighted tripper lug 109, which constantly tends to rotate this member 108 counter-clockwise. To this member is also fastened the hardened steel clip 110, which co-acts with clip 104 of lever 103, in a manner and for a purpose that will presently be described. Above lever 103 is mounted on bracket 111 another air valve 112, the construction and operation of which is in all respects identical with the previously described air valve 45, illustrated in Fig. 3c. Compressed air is supplied into the top inlet end of this valve 112 through supply connection 113, and when the valve stem 114 is raised to open the valve, the compressed air is instantly turned on and passes outward through tube 105, this tube being connected as previously described, to the cycle timer control 29, the connection being best seen in Fig. 1. When compressed air is thus released from valve 112 to timer 29, the latter commences to time off the respective cycle periods for the centrifugal, as has been previously described. I might add at this point that it is the automatic lifting of lever 103, against the bottom extremity of valve stem 114, as indicated in Fig. 4a, that thus opens the valve 112 and puts the centrifugal under the timing influence of the timer 29 for pacing the centrifugal automatically through its various cycle steps as previously described. Before describing how this all occurs by rotation of the shaft 16 and hand wheel 17, I should first state that the annularly shaped cam member 115, having the radially enlarged cam hump 116, is securely fastened to the neck 17' of hand wheel 17, and since this neck is itself securely fastened to the switch shaft 16, it follows that this cam 115 rotates back and forth as a unit with the shaft 16 and hand wheel 17. The relative position indicated in Fig. 4, between this cam 115, and the various hand wheel markings H, L, O, and B, is the correct position as maintained in practice. To the hand wheel proper there is also bolted an inwardly projecting actuating pin 118, shown in Figs. 4 and 5, the purpose of which will presently appear.

Fig. 4 shows the various levers and parts in the position which they occupy just prior to the instant when the hand wheel reaches its full high speed running position. The latter will be reached when the radial line *h*, passing centrally through H, exactly reaches the vertical line Y passing upward through the center of shaft 16. In other words, hand wheel 17 is shown in Fig. 4, in an intermediate position, having left its L or low speed running position, and presumably being rotated in a clockwise direction under the influence of cylinder 72, and the full H, or high speed running position, having not quite been reached. In this position it will be seen that the tripper pin 118, carried by wheel 17, has not quite engaged the tripper lug 109, of member 108, but is about to do so in the course of the clockwise rotation of wheel 17. At this present instant, the cam hump 116, by acting against roller 92 or lever 90, has lifted the left hand end of the latter up in its illustrated position, and this in turn has lifted pin 93 upward through lever 103, and has vigorously compressed the compression spring 95 up against the bottom of lever 103. At this moment lever 103 cannot rise however above its position shown in Fig. 4, because clip 110 on member 108 butts against clip 104 of lever 103, obviously preventing spring 95 from lifting lever 103. In the next instant however, during the clockwise rotation of hand wheel 17 to its full high speed running position, the tripper pin 118 will contact with tripper lug 109 or member 108, and by rotating this member clockwise around its supporting pin 107, will release the engagement between clip 110 and clip 104, and this will permit spring 95 to instantly push lever 103 upward, and in view of the relationship between this lever and the bottom of valve stem 114, as shown in Fig. 4 and Fig. 4a, this valve stem 114 will be instantly lifted, and by valve actions previously described, the compressed air will immediately pass out through tube 105, and start the cycle timer 29, on its timing operations as previously described. This it will be seen occurs not only at the moment when the charging action terminates, as governed by the slipping of clip 70, fastened to lever 43, see Fig. 3a, off of lever extremity 67', but it also occurs practically simultaneously with the moment when the switch shaft 16, and controller wheel 17 has reached its full high speed running position. The parts shown in Fig. 4 will remain in exactly the position there indicated, and compressed air will continue to be applied through tube 105 all through the period that the centrifugal is spinning, and while the timer control 29 is measuring off the successive time intervals and automatically performing the various steps previously indicated, up to the instant when compressed air is finally released from timer control 29, through tube 71, to cylinder 72, which as previously indicated automatically rotates switch shaft 16, and controller wheel 17, counterclockwise, from the H position to the B position, the latter being effected when radial line *b*, Fig. 4, lies exactly in the vertical line Y passing through the center of shaft 16. I might add that the limiting position in this direction is when the rubber bumper 120 fastened to the rear of wheel 17 by bracket 121, bumps against the stop surface 122 of stop member 123, which is securely bolted to the front face 8', of the switch box, by means of bolts 124, see Figs. 4 and 5. During this automatic swinging of control wheel 17 from its H to its B position, the cam hump 116, and the tripper pin 118, are of course carried around counterclockwise with wheel 17. Before the full B position is reached,

the cam hump 116 has taken up its dotted line position 116', as shown in Fig. 4, and since the cam hump has fully receded from under roller 92 of lever 90, the lever 90 would naturally drop at its left hand end (if otherwise unrestrained), and this would permit lever 103 to drop away from under valve stem 114, and close valve 112, which, according to the previously described valve action, would exhaust the compressed air backwards from the timer 29 through tube 105 and valve 112, thereby permitting the timer parts in timer 29 to instantly reset themselves to their initial position as previously described. It is important however that these timer parts should not so reset themselves prior to the moment when cylinder 72 has fully swung controller wheel 17 to the B position, because if such resetting occurred a little prematurely, so that the compressed air through tube 71 was not held on cylinder 72 till the latter has fully rotated wheel 17 to its complete B position, the latter might never reach there, and the brake may never be fully set against brake drum 9 for promptly stopping the centrifugal, in the manner previously indicated in connection with Figs. 1b and 1c. Therefore, for the purpose of not releasing valve stem 114, of valve 112, from the vigorous upward thrust of spring 95, until controller wheel 17 has reached its full B, or braking position, the hard steel clip 100 of member 97', Fig. 4, by engaging the similar clip 97 of lever 90, holds the left hand end of this lever 90 in its position indicated in Fig. 4, irrespective of the fact that the cam hump 116 has rotated away from under roller 92, and has taken up its dotted line position at 116'. In other words, after this cam hump has withdrawn its support from roller 92, the spring 95 nevertheless does not force the left end of lever 90 downward to release valve stem 114, because clip 100 of member 97', prevents this. However, within a very few degrees of the place where the wheel 17 reaches its full B, or braking position, the tripper pin 118, carried by this wheel, contacts with the tripper fin 101 of member 97', and by then slightly rotating this member 97' counterclockwise about its supporting pin 98, clip 100 obviously slips out from under clip 97, and then, when wheel 17 has just about reached its full B position, lever 90 falls, and by thus releasing and dropping lever 103, the support is taken away from the bottom of valve stem 114, to thereby close valve 112 and automatically reset the timer parts in the cycle timer 29 to their initial position. Member 97' therefore insures that this resetting occurs never prematurely, but only when and as the full B position of wheel 17 is reached, which also insures that the brake toggle lever 15 is fully set to hold the brake in its "on" position, until wheel 17 is again rotated to its L position, the When, at the beginning of the next cycle, this wheel 17 is again rotated to its L position, the various levers and parts shown in Fig. 4 will have been reset to the positions which they are shown to occupy in this figure, and the interactions of the respective parts will be repeated as previously described.

For the purpose of referring to another coaction of the parts not previously described, I would now like to revert to Fig. 3, and to that portion of the previous description where it was recited that at the termination of the charging, the spring 79 causes shoulder 82' of member 82, to engage member 83 for opening valve 46, by lifting its valve stem 86. This results, as previously described, by releasing compressed air through tube 87 into the bottom portion of cylinder 72, which cylinder thereupon pulls switch shaft 16, and controller wheel 17, from its L to its H, or high speed running position. If shoulder 82' however, were not now in some way released from member 83, this would hold valve 46 constantly open, under action of spring 79, and many undesirable consequences might happen. For instance, the air being constantly on the lower side of piston 73, would vigorously and forcefully hold controller wheel 17 on its H position, and if the centrifugal basket, as frequently occurs, should then begin to buck and throw itself around in curbing 3, due to uneven loading, or load distribution in the basket, it would be very difficult for the attendant to stop the centrifugal by returning wheel 17 manually from its H to its B position, because the compressed air under piston 73, in cylinder 72, would vigorously oppose this action. In some way, it is therefore necessary to kick off shoulder 82', of member 82, from member 83, in the container 35, Fig. 3, in order to release valve stem 86 and close valve 46, which will release the compressed air from under piston 73, as previously described. This kick-off action is accomplished as follows: When compressed air energizes tube 105, by virtue of wheel 17 having reached its H position, as previously described, a supplementary tube 105a, Fig. 1, branches off from the same at the T 130. This tube 105a, as is best seen in Figs. 3 and 3b, enters the kick-off cylinder 131, the latter passing through a suitable aperture in the top wall of container 35, and being vertically supported by a set screw 132, which passes through boss 35' which forms an integral part of container 35, as best indicated in Fig. 3b. Compressed air being admitted to the top of cylinder 131, through tube 105a, obviously pushes plunger 133 downward against spring 134, until the shoulder 135 on piston rod 136, bumps against the bottom cylinder head 136', which acts as a stop limiting the downward movement of the piston. As indicated in Fig. 3, this piston rod 136, during its down stroke, butts against the top of shoulder 82', of member 82, and this member being free to rotate on pin 81, does so rotate in a counterclockwise direction under the influence and pressure from piston rod 136, and in view of this limited movement, shoulder 82' slips down and clears the bottom projecting lip of member 83, thus fully releasing member 83 from the pressure of spring 79. Member 83 thereupon falls away in a counterclockwise direction, from under valve stem 86, the member 83 coming to its normal position of rest against stop pin 85 as previously described. By thus freeing valve stem 86, the valve 46 instantly closes, and within a fraction of a second after cylinder 72 had rotated, the controller wheel 17 to its H position, the compressed air is released from under piston 73, through tube 87 and valve 46, as previously described, and the cylinder 72 being thus freed from compressed air, the attendant could at the next moment, with utmost ease, turn the controller wheel 17 from its H position to its B, or braking position, to stop the centrifugal, because cylinder 72 does not now oppose this action. In other words, the previously indicated danger that the attendant could not stop the centrifugal if the basket bucked, is wholly eliminated by the action of this kick-off cylinder 131. At the end of the cycle, when the air is again exhausted from tube 105, in manner previously indicated, the compressed air above piston 133, in cylinder 131, will obviously also be exhausted therefrom through

tube 135a, and piston 133 will immediately retrieve upward, under the influence of spring 134. When this occurs, member 82 will be free to rotate back to its proper position, clockwise about pin 81, this rotation occurring because the right hand end of member 82 is heavily weighted to normally cause this clockwise movement around its supporting pin 31.

Before concluding this description, I would like to refer briefly to a detail illustrated in Fig. 1e. In this figure is shown charging spout 20, and the cover cap 22 in its lowest position closing the mouth 20' of the spout, so that no material passes out of same. When this cover cap is lowered into this position by the closing levers, or links, it frequently occurs that syrup or other liquor leaks out of the joint, and for the purpose of preventing this leakage from mussing the curb and centrifugal too much, it is customary to put a drip pan 140 immediately below the mouth 20' of spout 20, this drip pan being pivotally mounted at 141, on the curbing top 3'. In ordinary manual operation of centrifugals, the attendant cleans out this drip pan each time that he manually charges the centrifugal, but in the automatic charging it is desirable to provide for this action automatically, and this I do as follows. A fairly heavy counterweight 142 is fastened across the bottom of the drip pan at its forward end, and from link 143, pivoted at 144, which link is associated with cover cap 22 for lifting and lowering the latter, I arrange a leaf spring 145 firmly attached to the forward end of link 143, by fastenings 146. The rear end 145' of this leaf spring, in the lowermost position of link 143, presses quite hard against the rear of drip pan 140 as indicated in Fig. 1e. With this arrangement, when cover 22 is in its lowermost position, closing the charging spout, the drip pan is held in the full line position because of spring 145 pressing against the rear of the drip pan, and any drippings that leak out from the joint between the spout and cover cap 22, will collect in this drip pan. However, when cover cap 22 is lifted, at the beginning of the next cycle, the link 143 and stiff leaf spring 145 rises with it, and the rear of the drip pan being thus released from spring 145, the drip pan tilts over to its dotted line position 140', as shown in Fig. 1e, this tilting being induced by the counterweight 142. In this tilted position the collected syrup, or other liquor, that previously leaked into the drip pan will flow out, and the drip pan will in this way keep itself clean. Upon the next closing of the cover cap 22, by lowering it, spring 145 will again contact with the rear of the drip pan, and put it back to its full line position shown in Fig. 1e, in which position the leakage will again collect in this drip pan, and the operations will automatically continue as just described, without requiring attention from the attendant.

Fig. 1d also illustrates how I adjust the degree of opening of cover cap 22, for opening the mouth of the spout by various amounts. As previously indicated, this cover cap is lifted by raising lever 21, and on the front part of the curbing cap 3', I fasten the adjusting fixture 150, shown in Fig. 1d. A simple form for this fixture consists of two uprights 151 and 152, between which the lever 21 is free to raise and lower. These uprights are provided at fairly close intervals, with a series of registering holes 153, and through any pair of these holes I pass the stop pin 154. When the mixture that flows from spout 20 is very heavy and thick, so that it flows out slowly, I put pin 154 through one of the uppermost of holes 153, which permits lever 21 to be lifted practically to its maximum amount before being arrested by contact with this stop pin 154. This, in other words, permits maximum opening of cover cap 22, off the spout 20, and because of this maximum opening the mixture flows into the basket fairly fast even though it is heavy and somewhat stiff. On the other hand, when the mixture is of very light constituency, and flows very freely, I change the stop pin 154 from the upper holes, to a pair of lower holes, so that lever 21, and its connected cover cap 22, will not be lifted so high, and the free flowing mixture will be thereby restrained, and will not flow too quickly and spatter over everything. In the previous manual charging of centrifugals, the men instinctively took care of this by only lifting the lever 21 sufficiently to suit the different constituencies of mixture as encountered, but with the automatic charging involved in this invention, I find it highly desirable to add to the general combination of parts, this adjustable limit stop for adjusting the amount by which the spout is opened, to suit the different consistency of material from time to time charged from the spout into the basket.

From the previous description it is thought that a comprehensive view of this invention will be obtained, and in conclusion I wish to again emphasize that extensive modifications of the equipment can be made without departing from the spirit of my invention, which is not limited except by the recitals and limitations included in the several appended claims.

As previously indicated, the drive for some kinds of centrifugals has only one speed, and not a high and low speed as described above. In this case, I would like to explain as an illustration of the following operation, that the single speed for the drive could obviously be obtained when wheel 17 or its equivalent, is on a position equivalent to the L position shown in Figures 1 and 4. Also this single speed could be maintained with member 17 located anywhere between the L and H position shown in these figures. Under these circumstances, the equipment illustrated would start the centrifugal accelerating towards its normal single speed, when the starting member is placed on position equivalent to L in Fig. 4, and all the previously described operations could then be realized exactly as described, up to the point where the automatic closing of the charging member 22 would automatically, as described, swing member 17 clockwise from a position equivalent to L, to a position equivalent to H. The speed controller 8, being of the single speed type, however, this last mentioned movement would not set the mechanism onto a higher speed than previously, but would keep the centrifugal running only under the same speed conditions as at L, but, nevertheless, the action of automatically putting the centrifugal under the influence of the cycle timer control 29, as previously described, will occur at the moment, or very close thereto, when the charging action ceases, as based on the closing of the charging member 22.

I claim:

1. In combination, a rotatable centrifugal, a charging spout and charging member for same, automatic mechanism for automatically terminating the charging action when a pre-determined volumetrically measured volume of charge has been admitted to the centrifugal, a cycle

timer control co-operatively associated with said centrifugal for timing the cycle of same, and means interconnected with said centrifugal and said cycle timer control for automatically starting the latter to time the centrifugal cycle when the charging action terminates.

2. The combination with a rotatable centrifugal, and the charging spout and charging member for same, of a cylinder connected with said charging member for operating it, automatic charging control mechanism including a thickness measuring shoe moveably mounted in relation to said centrifugal, interconnections between said shoe and said cylinder for closing said charging member and terminating said charging action when the wall thickness of the charge admitted to said centrifugal has shifted said thickness measuring shoe to a pre-determined position, cycle timer control mechanism co-operatively associated with said centrifugal for automatically timing and actuating portions of said centrifugal mechanism at respective time periods to automatically impress a series of timed cycle steps upon said centrifugal, and means for starting said cycle timer control mechanism to measure time the last said means being influenced by the movement of said shoe to its aforesaid predetermined position to thereupon start said cycle timer approximately at the moment when said charging member is closed to terminate the charging action.

3. The combination with a rotatable centrifugal, having high and low speed driving mechanism and also having a basket, a charging spout and charging member for same, of automatic charging mechanism including a cylinder for opening and closing said charging member, a thickness measuring shoe moveably mounted to measure the thickness of charge admitted to said basket, valve mechanism interconnected between said thickness measuring shoe and said cylinder for opening said charging member when said shoe is moved to one position and for closing said charging member to terminate the charging action when the thickness of wall of the charged material admitted to the basket has moved said thickness shoe to a pre-determined position, and means cooperatively associated with said thickness measuring shoe and influenced thereby for automatically shifting said centrifugal drive mechanism from its low speed to its high speed position when the charging action is terminated under the influence of said thickness measuring shoe.

4. The combination with a rotatable centrifugal basket high and low speed driving mechanism and also having a basket, a charging spout, a charging member for same, an automatic cycle timer control co-operatively associated with said centrifugal, automatic mechanism including a cylinder for opening and closing said charging member, a thickness measuring shoe moveably mounted to measure the thickness of charge admitted to said basket, valve mechanism interconnected between said thickness measuring shoe and said cylinder for opening said charging member when said shoe is moved to one position and for automatically closing said charging member to terminate the charging action when the thickness of wall of the charged material admitted to the basket has moved said thickness measuring shoe to a pre-determined position, and means co-operatively associated with said thickness measuring shoe and influenced thereby for automatically shifting said centrifugal drive mechanism from its low speed to its high speed position, and for also starting said cycle timer control to measure time for the centrifugal cycle operations when the charging action is terminated under the influence of said thickness measuring shoe.

5. In combination, a rotatable centrifugal, two speed drive for same, automatic cycle timer control co-operatively associated with said centrifugal to automatically stop the same after a predetermined period of time, valve mechanism co-operatively associated with said drive mechanism and with said cycle timer control to start the latter upon its timing action when said centrifugal drive mechanism is moved to its high speed running position and to automatically release and re-set said cycle timer control from said centrifugal when said centrifugal is automatically stopped by said cycle timer control.

6. In combination, a rotatable centrifugal, a moveable speed controller for said centrifugal, said speed controller in one position being adapted to drive the centrifugal and at another position to stop the centrifugal by setting the brake of same, an automatic cycle timer control associated with said centrifugal to automatically stop the same by setting the brake after a pre-determined period of time, valve mechanism co-operatively associated with said drive mechanism and with said cycle timer control to start the latter upon its timing action when said speed controller is moved to the position where it drives the centrifugal and to automatically release and re-set said cycle timer control from said centrifugal when said centrifugal is automatically stopped by said cycle timer control having shifted said speed controller to the position where it sets the brake for stopping the centrifugal.

7. The combination with automatic charging means for a centrifugal, including a charging spout and a charging member, and automatic means for moving the latter, of a drip pan mounted beneath the mouth of said charging spout and adapted to catch the drip that leaks from said spout after said charging member has closed the same, and means interconnected between said charging member and said drip pan for releasing said drip pan when the charging member is opened, and for retrieving said drip pan to its drip collecting position when said charging member is closed.

8. In combination with automatic charging means for centrifugals having a charging spout and charging member, and automatic means for moving the latter, of a pivotally mounted drip pan beneath the mouth of said charging spout and adapted to catch the drip that leaks from said spout after the charging member closes the same, and means interconnected between said charging member and said drip pan for releasing said drip pan and permitting it to swing on its pivotal mounting to position where it can discharge its drip when said charging member is opened to charge the centrifugal, and for retrieving said drip pan to its drip collecting position when said charging member is closed.

9. In automatic charging mechanism for centrifugals, the combination of a valve for opening and closing the charging spout of said centrifugal, a second valve for shifting the drive control mechanism of said centrifugal from low speed to high speed when said charging spout is closed, and trip-off mechanism co-ordinated to close the second said valve upon shifting said drive control mechanism onto high speed position.

10. A loading control mechanism for a sugar

centrifugal comprising a delivery conduit, a cut off gate, means for opening said gate, and means controlled according to the amount of material delivered by said conduit to close said gate, and means coordinated with the gate closing control means for effecting the setting of the centrifugal driving means to high speed position.

11. A loading control mechanism for a sugar centrifugal comprising a delivery conduit, a cut off gate, means for opening said gate, and means controlled according to the amount of material delivered by said conduit to close said gate, means coordinated with the gate closing control means for effecting the setting of the centrifugal driving means to high speed position, a cycle timer, cooperatively associated with said centrifugal for automatically timing and actuating portions of said centrifugal mechanism at respective time periods controlled by said timer, for automatically impressing a series of timed cycle steps upon said centrifugal, and means for starting said cycle timer to measure time, the last said means being interconnected with said gate closing control means to start the cycle timer, at approximately the moment when said gate is closed to terminate the charging action.

12. In a centrifugal machine, a rotating basket, driving and braking means therefor, a delivery conduit for feeding material to said basket, a cut off gate for said conduit, means controlled according to the amount of material delivered by said conduit to close said gate, means coordinated with said gate closing control means for effecting the setting of the centrifugal driving means to high speed position, timing means adapted to cut off said drive and apply said brake after a predetermined period, and means coordinated with said gate closing control means to start the operation of said timing means at approximately the moment when said gate is closed to terminate the charging action.

13. The combination with a rotatable centrifugal basket and a charging gate therefor, of automatic gate opening and closing means, power control means cooperatively connected with said automatic gate opening and closing means to effect actuation of the latter for opening and closing said gate, a pivotally mounted shaft, a thickness measuring shoe associated with said shaft and adapted to contact with the upbuilding charge in said centrifugal basket during the charging thereof, and a lever fastened to said shaft to rotate therewith and also free to have a supplementary movement at right angles to the rotation of said shaft, the said lever through actuation in the path of its said supplementary movement being adapted to actuate said power control means to open the charging gate, and said thickness measuring shoe through contact with the upbuilding charge in said basket being adapted to swing said lever to actuate said power control means to effect the closing of said charging gate.

14. The combination with a rotatable centrifugal basket and a charging gate therefor, of a cylinder cooperatively associated with said charging gate to co-operate in effecting the opening and closing thereof, a control valve connected with said cylinder, said control valve when open being adapted to supply a pressure fluid to said cylinder to open said charging gate and said control valve when closed being adapted to release said pressure fluid from said cylinder thereby to co-operate in effecting the closing of said charging gate, a thickness measuring shoe mounted to move in said basket upon contact with the upbuilding charge in said basket, a spring controlled lever cooperatively associated with said thickness measuring shoe but having a motion independent of said thickness measuring shoe, said spring controlled lever being adapted to open said control valve and hold it open by energy of said spring to thereby automatically open said charging gate by supplying a pressure fluid to said cylinder, said thickness measuring shoe being cooperatively connected with said spring controlled lever to move the latter to effect closing of said control valve to thereby co-operate in effecting the closing of said charging gate when the upbuilding charge in said basket has moved said thickness measuring shoe to a predetermined position.

15. In combination, a rotatable centrifugal basket, a charging gate therefor, power actuated gate opening and closing means for said charging gate, power control means co-operatively connected with said gate opening and closing means to supply power thereto and to release power therefrom to thereby co-operate in the opening and closing of said charging gate, a movably mounted thickness measuring shoe in said basket adapted to contact with and to be moved by the up-building charge in said basket, a manually operable lever mounted to have movement in two different planes, said lever when moved in one of said planes being adapted to engage said power control means and to actuate the latter to supply power to said gate opening means to thereby open said charging gate, said lever when moved in the second of said planes being adapted to be disengaged from said power control means to thereby effect the closing of said charging gate, and means co-operating with said thickness measuring shoe and with said lever for moving the latter in the second said plane to disengage said lever from said power control means when said thickness measuring shoe is moved to a predetermined position by contact with the up-building charge in said basket.

16. In combination, a rotatable centrifugal basket, a charging gate therefor, power actuated gate opening and closing means for said charging gate, shiftable power control means having a power release position and a power supply position, means co-operatively connecting said power control means with said power actuated gate opening and closing means, said power control means being organized to be normally self-retrieving to its said power release position where it releases power from said gate opening and closing means to close said charging gate, but said power control means being shiftable against its said normally self-retrieving action to its said power supply position where it supplies power to said gate opening and closing means to open said charging gate, manually operable means for shifting said power control means to its said power supply position to thereby open said charging gate, releasable latch mechanism for retaining said power control means in its said power supply position against its said normally self-retrieving action to thereby retain said charging gate in its open position, a movably mounted thickness measuring shoe adapted to contact with and to be moved by the up-building charge in said rotating centrifugal basket, means controlled by said thickness measuring shoe and co-operating with said latch mechanism for releasing said latch mechanism to free said power control means when said thickness measuring shoe is

moved to a predetermined position by contact with the up-building charge in said basket, said normally self-retrieving power control means thereupon retrieving to its power release position to close said charging gate.

17. In combination, a rotatable centrifugal basket, a charging gate therefor, a cylinder associated with said charging gate and adapted to open said charging gate when a pressure medium is supplied to said cylinder and adapted to co-operate in closing said charging gate by release of said pressure medium from said cylinder, shiftable valve mechanism having a pressure medium release position and a pressure medium supply position and connections from said valve mechanism to said cylinder, said valve mechanism being normally self-retrieving to its said release position where it releases said pressure medium from said cylinder to thereby close said charging gate, but said valve mechanism being shiftable against its said normally self-retrieving action to its said supply position where it supplies the pressure medium to said cylinder to open said charging gate, manually operable means for shifting said valve mechanism to its said supply position to open said charging gate, releasable latch mechanism for retaining said valve mechanism in its said supply position against its said normally self-retrieving action to thereby retain said charging gate in its open position, a movably mounted thickness measuring shoe adapted to contact with and to be moved by the up-building charge in said rotatable centrifugal basket, means controlled by said thickness measuring shoe and co-operating with said latch mechanism for releasing said latch mechanism to thereby free said normally self-retrieving valve mechanism when said thickness measuring shoe is moved to a predetermined position by contact with the up-building charge in said centrifugal basket, said self-retrieving valve mechanism thereupon retrieving to its release position to close said charging gate.

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