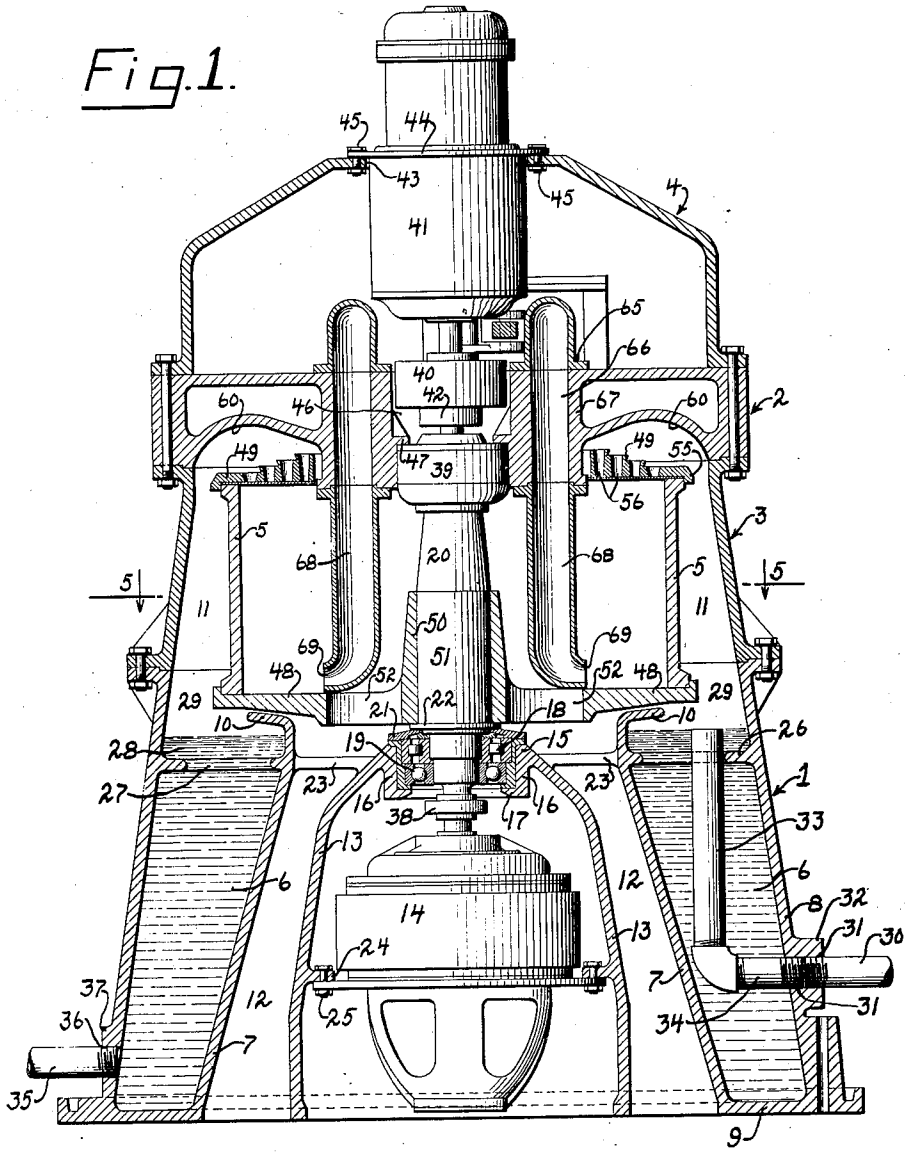
Oct. 6, 1936. J. S. PECKER 2,056,888

CENTRIFUGAL SEPARATING MACHINE

Filed April 12, 1934 6 Sheets-Sheet 1

Fig. 1.



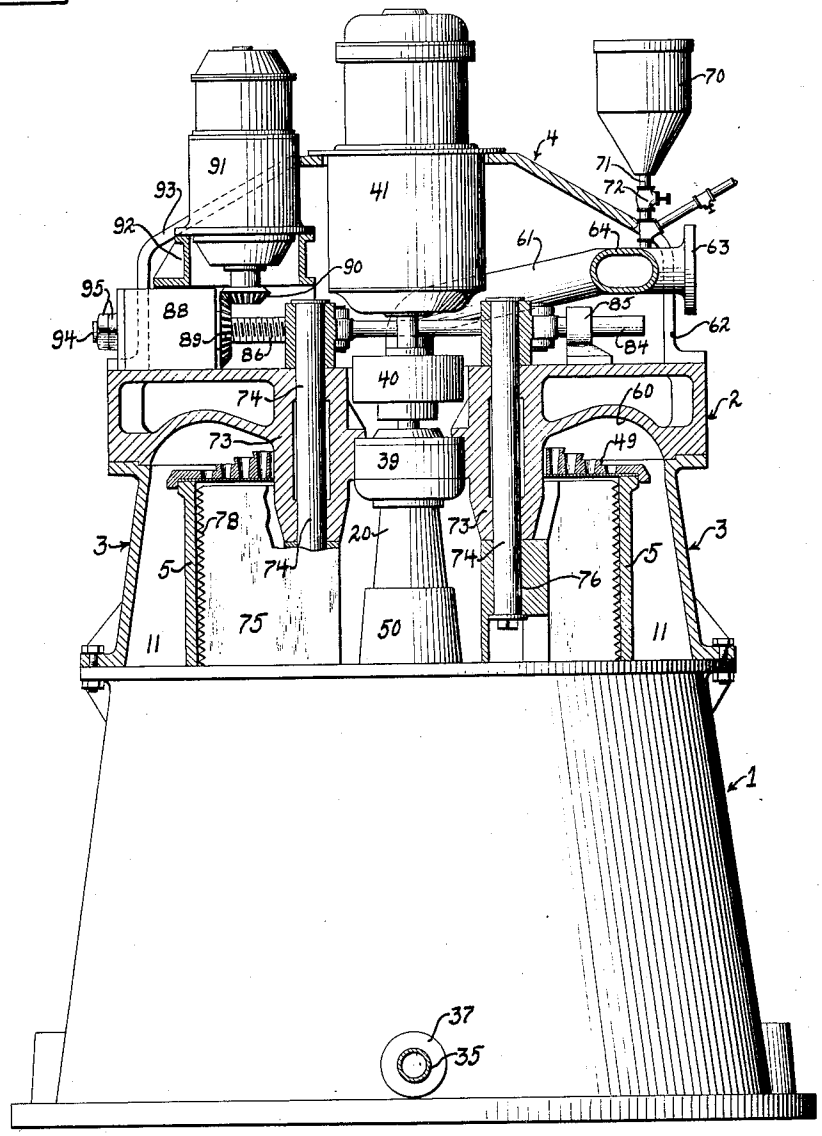
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CENTRIFUGAL SEPARATING MACHINE

Filed April 12, 1934 6 Sheets-Sheet 2

Fig. 2.



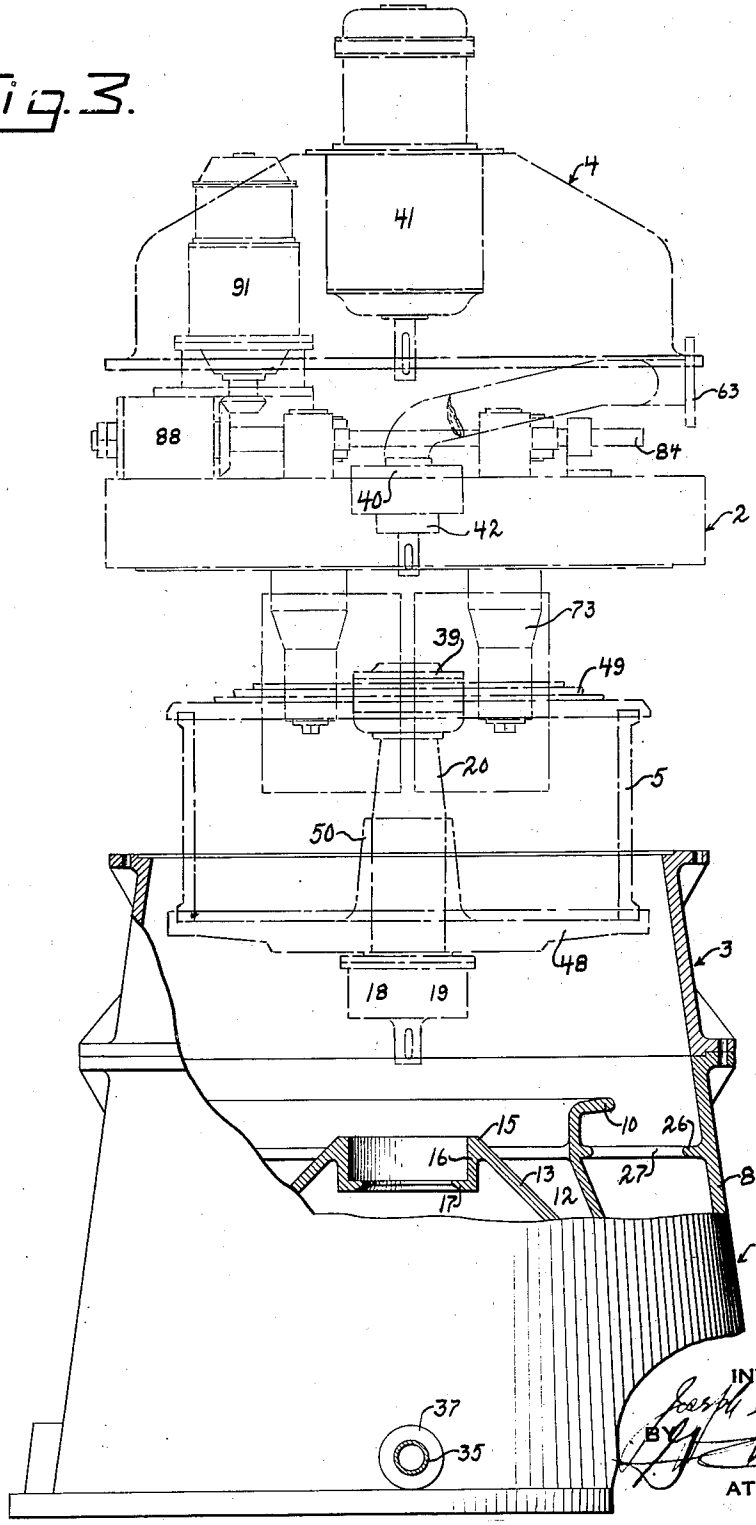
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CENTRIFUGAL SEPARATING MACHINE

Filed April 12, 1934 6 Sheets-Sheet 3

Fig. 3.



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Filed April 12, 1934 6 Sheets-Sheet 4

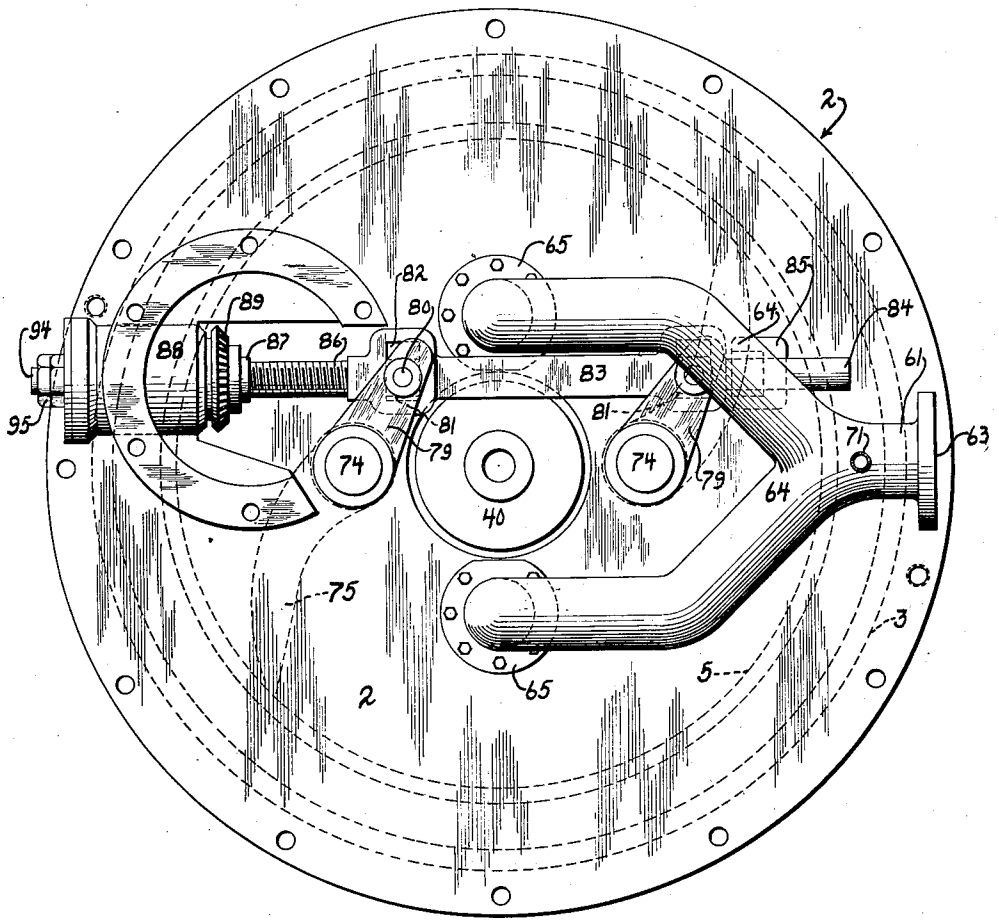


Fig. 4.

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CENTRIFUGAL SEPARATING MACHINE

Filed April 12, 1934 6 Sheets-Sheet 5

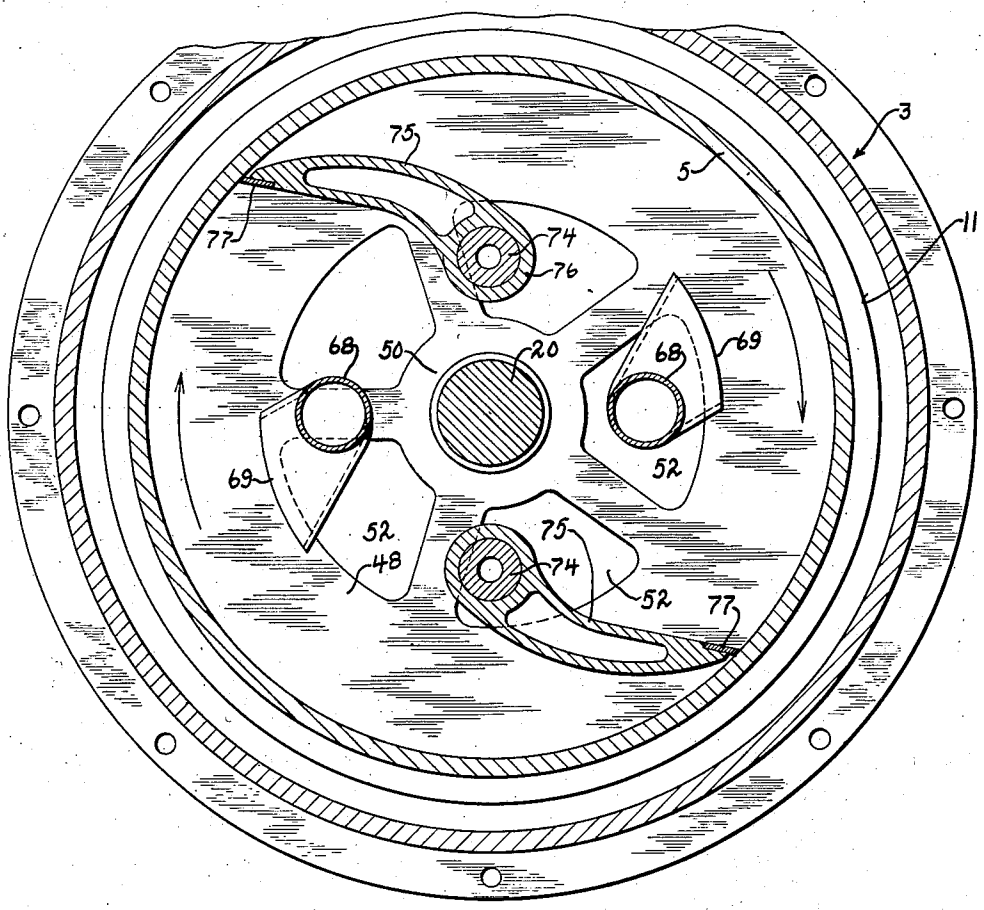


Fig. 5.

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CENTRIFUGAL SEPARATING MACHINE

Filed April 12, 1934 6 Sheets-Sheet 6

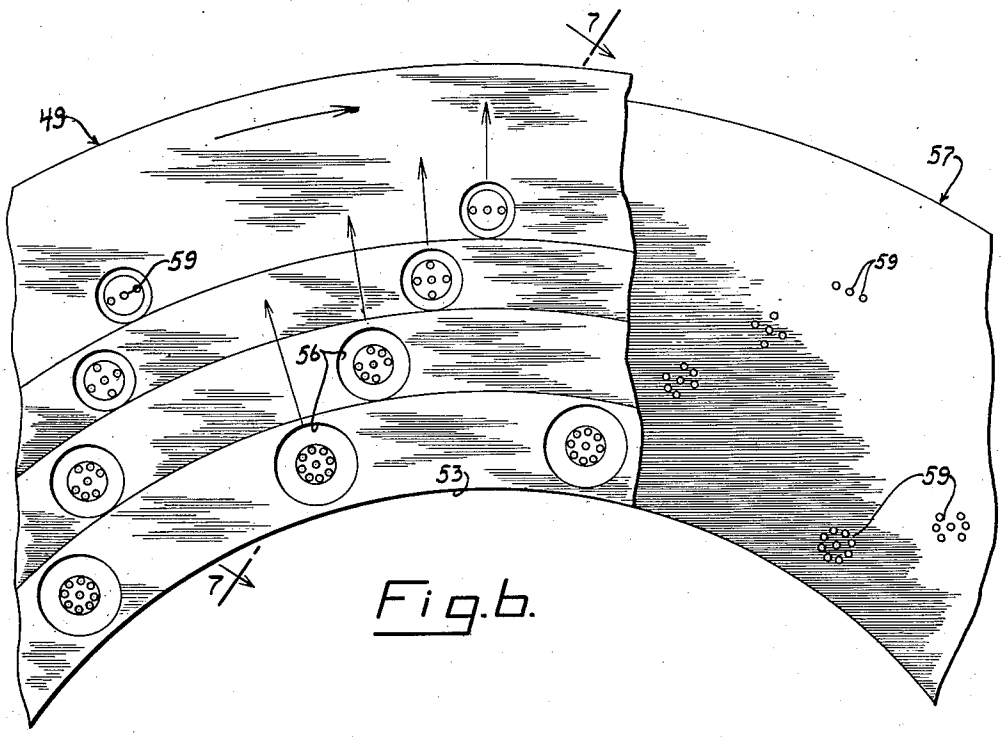


Fig. 6.

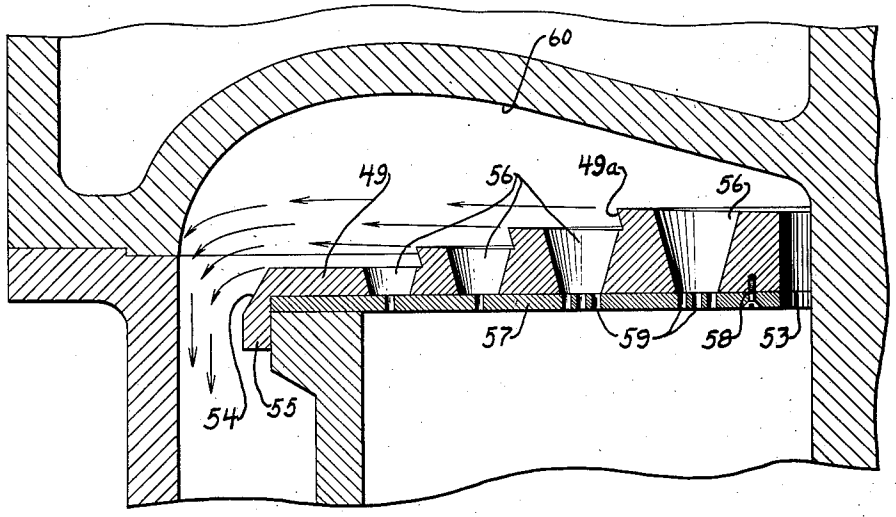


Fig. 7.

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Patented Oct. 6, 1936

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UNITED STATES PATENT OFFICE

2,056,888

CENTRIFUGAL SEPARATING MACHINE

Joseph S. Pecker, Philadelphia, Pa., assignor to American Centrifugal Corporation, New York, N. Y., a corporation of Delaware

Application April 12, 1934, Serial No. 720,334

34 Claims. (Cl. 210—63)

The invention relates to a centrifugal machine for separating liquids from solids by centrifugal action.

The object of the present invention is to provide a centrifugal separating machine of the type shown and described in my co-pending application filed February 21, 1934, Serial No. 712,390, and operating in substantially the same manner and possessing the advantages of the machine of the said application, and at the same time eliminate the gearing for connecting the rotary centrifugal basket with the high and low speed motors for rotating the centrifugal basket at a high purging speed and at a low cleaning speed.

A further object of the invention is to provide in a centrifugal machine characterized by a centrifugal separating basket rotating on a vertical axis for dewatering sludge, high and low speed motors located one above and the other below the centrifugal basket and coupled directly to the vertical shaft of the basket for rotating the same without the use of gearing for transmitting motion from the motors to the centrifugal basket.

It is also an object of the invention to enable the dewatered sludge to be discharged through the bottom of the basket as in the aforesaid application and at the same time fully protect from such sludge the motor which is located below the basket.

It is also an object of the invention to provide in a machine of this character a settling or sedimentation tank of the type shown and described in my co-pending application filed February 28, 1934, Serial No. 713,333, and to equip the machine with means for enabling the clarified effluent of the sedimentation and settling tank and the sedimentation sludge within the same to be separately removed without producing in the sedimentation and settling tank a turbulence materially affecting the operation of the same in purifying and clarifying the effluent so that the latter may be removed from the tank in as clear and pure condition as may be desired or required and in a manner similar to that shown and described in my application filed April 12, 1934, Serial No. 720,333.

Another object of the invention is to provide a continuous automatic centrifugal separating machine having convenient means for enabling the sludge as it is fed into the machine to be treated with chemicals, inert material, steam, or currents of air, so that the sludge delivered to the centrifugal rotary basket will be in the desired condition for insuring the best performance of the machine on the character of sludge to be dewatered.

Another object of the invention is to provide a centrifugal separating machine designed primarily for the separation of sludge in which there is material in suspended or colloidal solution with another liquid and capable of being utilized for the separation or dewatering of all kinds of sludges.

Green sludge coming from the mains is usually screened so that large pieces of wood, rag, stones, and the like are screened out and sewage then flows through grid chambers where the heavy particles of sand, stone, etc. quickly settle and are eliminated. The sewage then flows into settling tanks wherein the sludge in suspension settles to the buttoms of the tanks and the clarified water or effluent is conducted off. The settled sludge is called primary sludge.

The effluent from the primary tank then takes one of several courses depending on the character of the plant. In what is known as a primary treatment plant the effluent is permitted to flow back into rivers, streams, lakes, etc. Where this disposal of the effluent is not permitted by State or local authorities the effluent is further treated by causing it to return into another settling tank where the effluent is agitated in the presence of injections of air to cause the coagulation of fine particles held either in suspension or in colloidal state. The coagulated material is known as activated sludge. The material may be then permitted to flow into another tank termed a final settling tank in which the coagulated material drops to the bottom of the tank and the effluent from this settling tank is extremely clean water. The settled solids in this tank are also called activated or aerated sludge but of a more concentrated character than sludge in the aerating tank.

The sludge collected from the primary tank, activating tank and final settling tank is fed to digestion tanks where the material through biological action decomposes. The effluent from the digestion tanks is reasonably clear and the residue is termed digested sludge.

There are other systems known as chemical treatment plants in which the incoming sewage is treated chemically in order to eliminate the activation or aeration of the sludge as well as in the digestion process.

It will thus be seen that there is primary or raw sludge, activated sludge, final settling tank sludge, digested sludge and chemically treated sludge. All of these sludges have a water content of approximately 85% to 98% and in order

to facilitate the handling of this material and the final disposition of the sludge it is essential that the material be dewatered to at least 70% of its moisture so that the material may be handled with a spade or shovel and utilized or burned in incinerators.

It is an object of the invention to provide as a single unit a continuous automatic centrifugal separating machine adapted to handle raw, activated, or digested sludge, and as the same is fed into the machine to subject the sludge to the action of chemicals, inert material, steam or air, or any other similar or desired treatment so that the effluent resulting from the dewatering of the sludge may be as clear and unobjectionable as desired and will meet with all requirements and regulations as to disposal in order that the effluent may be discharged into rivers, streams, lakes or other bodies of water without infringing any regulations concerning the contamination thereof.

It is still further designed to provide a rotary centrifugal basket for centrifugal separating machines having imperforate side walls and an annular top plate secured to the basket and provided with exterior annular stepped portions graduating downwardly from approximately the center of the basket to the periphery thereof and having seepage openings formed in the stepped portions leading from the interior of the basket and arranged in a manner to facilitate the outward or radial discharge of seepage from the basket through the seepage openings.

A further object of the invention is to provide improved seepage means having seepage openings circumferentially staggered around the top of the basket so that the seepage from each opening will have a free passage outwardly in a substantially radial direction without interfering with the discharge of seepage from the other openings.

A further object of the invention is to provide seepage openings which through centrifugal action will drain completely and which will increase in area or size from the periphery of the basket towards the center of the same proportionate to the decrease in pressure of the effluent through the centrifugal action so that a uniform and maximum discharge of seepage from the basket will be effected.

With these and other objects in view, the invention consists in the construction and novel combination and arrangement of parts hereinafter fully described, illustrated in the accompanying drawings and pointed out in the claims hereto appended, it being understood that various changes in the form, proportion and minor details of construction, within the scope of the claims, may be resorted to without departing from the spirit or sacrificing any of the advantages of the invention.

In the drawings:—

Figure 1 is a central vertical sectional view of a centrifugal separating machine constructed in accordance with this invention.

Fig. 2 is a similar view taken at right angles to Fig. 1, the lower section and base of the casing being in elevation.

Fig. 3 is a vertical sectional view of the lower portion of the casing partly in elevation and illustrated in dotted lines, the manner of removing the separable units carrying respectively the scrapers and the feeding means, and the rotary centrifugal basket.

Fig. 4 is a plan view of the upper intermediate or supporting section of the casing illustrating the arrangement of the feed pipe and the scraper operating means.

Fig. 5 is a horizontal sectional view taken substantially on the line 5—5 of Fig. 1.

Fig. 6 is an enlarged plan view of a portion of the seepage plate and the screen.

Fig. 7 is an enlarged detail sectional view illustrating the construction of the seepage means.

In the accompanying drawings in which is illustrated the preferred embodiment of the invention, the centrifugal separating machine comprises in its construction a casing composed of a lower section 1, upper and lower intermediate sections 2 and 3 and a top section 4 which are detachably bolted together, as explained in the aforesaid applications, to permit the removal of the feeding unit and other parts carried by the upper intermediate supporting section and the rotary centrifugal basket 5, as illustrated in dotted lines in Fig. 3 of the drawings, and as fully described and explained in the said applications. The bottom section 1 which constitutes the base of the machine and which forms a sedimentation and settling tank 6 is preferably circular in cross section and tapered upwardly, as clearly illustrated in Figs. 1 and 2 of the drawings, but the form of the bottom section may, of course, be changed, as will be readily understood. The bottom section is composed of inner and outer walls 7 and 8 and an integral connecting bottom wall or portion 9. The outer wall 8 is extended above the plane of the top of the inner wall and is flanged at its upper edge to receive and support the lower intermediate section 3 which is preferably circular and tapered upwardly to form an extension of the tapered or conical form of the base.

The inner wall 7 is provided at the upper edge with an annular flange 10 arranged at a slight inclination and extending upwardly and outwardly over the inner portion of the tank 6 which is of annular formation and has said flange 10 spaced from the outer wall 8 of the bottom section 1 to provide an open annular mouth to the tank to permit effuent from the rotary centrifugal basket to flow downwardly through the intervening space 11 between the basket and the lower intermediate section 3 of the casing into the tank 6. The flange 10 is adapted to prevent any of the seepage or effluent flowing into the tank from splashing over the inner wall 7 and entering the open space 12 formed by the inner wall 7. The open space 12 which is located beneath the basket is of annular formation being formed by the said inner walls 7 and an upwardly tapered approximately semi-spherical shell 13 which houses a lower vertically disposed high speed motor 14 and effectually prevents any of the sludge or refuse discharged from the basket accumulating on the lower motor 14. The casing is designed to be mounted upon and suitably secured to a wall or foundation of a pit into which the sludge may be discharged. The sludge may be discharged on a conveyor (not shown) or otherwise fed to an incinerator or otherwise disposed of.

The shell 13 has a central bearing receiving opening 15 in its top and it is provided with a depending bearing supporting ring 16 formed integral with the shell 13 and extending downwardly from the opening 15 and provided at its lower end with an inwardly extending annular flange 17 which forms a supporting ledge for the lower bearings 18 and 19 of a central vertical shaft 20 upon which the rotary centrifugal basket is

mounted. The lower bearings which may be of any preferred construction are preferably of the construction shown and described in said application Serial #712,390, and are provided with a cover or closure plate 21 extending beneath an integral collar or flange 22 of the shaft 20 and adapted to prevent sludge or liquid matter from entering the bearings 18 and 19. The shell 13 is preferably cast integral with the bottom section of the casing and is connected therewith by suitable braces 23 located at the top of the shell and formed integral with the same and with the inner wall 7 of the tank, as clearly illustrated in Figs. 1 and 3 of the drawings, but the braces may be located at various other points and may be of any desired number to afford the required strength and rigidity to the shell 13. The shell 13 is provided with an interiorly arranged horizontally disposed annular supporting flange 24 to which the high speed motor 14 is secured by bolts 25 or other suitable fastening devices. Any other suitable mode of supporting means may, of course, be provided for the motor 14.

The tank or the bottom section of the casing is provided at its upper portion with an integral horizontal partition 26 provided with openings 27 for the passage of the effluent 28. The partition 26 divides the tank into upper and lower chambers or compartments, the upper compartment 29 constituting the open mouth to the tank 6 and the lower compartment constituting the body of the tank 6. The horizontal partition 26 is adapted to prevent the effluent discharged in the mouth of the tank from creating any turbulence which might materially interfere with the settling of the effluent in the tank 6. In addition to the chemicals or other material supplied to the sludge as the same is fed into the machine the effluent in the tank may be treated chemically or otherwise to purify and clarify the same to the desired degree and the clear effluent is removed from the tank by an effluent drain pipe 30 designed to be connected with vacuum means such as is described in the said application Serial Number 713,383. The effluent pipe 30 is preferably threaded into an opening 31 defined by an annular boss 32 formed integral with the outer wall 8 of the bottom section of the casing. The effluent pipe is provided with a stand pipe 33 arranged within the tank and having an arm 34 at its lower end preferably threaded into the said opening 31. The stand pipe extends through one of the openings 27 into the upper compartment of the tank and it determines the level of the liquid within the tank, the overflow being drained off through the stand pipe section 33 of the effluent drain pipe 30.

Instead of employing vacuum means the clarified effluent may be permitted to drain through the stand pipe 33 and through the effluent pipe 30 to any means for the disposal of the effluent. While only one effluent pipe 30 is illustrated in the accompanying drawings it will be clear that any desired number of effluent drain pipes may, of course, be employed. The tank 6 is also provided with a sludge drain pipe 35 threaded into an opening 36 defined by an integral annular boss 37 and designed to be connected with vacuum means for removing the sedimentation sludge and precipitate from the lower portion of the tank. Vacuum means such as is disclosed in said application Serial Number 713,383 is designed to be employed for this purpose, but any other suitable means may, of course, be used and one or more of the sludge drain pipes may be provided, as will be readily understood.

The lower high speed motor 14 is connected with the lower end of the central vertical shaft 20 by a suitable clutch 38 of any desired construction. The upper portion of the central vertical shaft is journaled in suitable bearings 39 and is connected by a free wheeling clutch 40 with an upper vertically arranged low speed motor 41. A suitable brake 42 of any desired construction is designed to be connected with the upper end portion of the central vertical shaft 20 for reducing the speed of the basket when necessary or desirable to enable the rotary centrifugal basket to be operated as fully explained in my aforesaid application Serial No. 712,390.

The top section 4 of the casing is tapered at the upper portion to form a cap for the mechanism supported by the upper intermediate supporting section 2, and it is provided at the top with a central opening 43 through which the upper low speed motor 41 extends and the said low speed motor 41 is provided with an attaching flange 44 arranged upon the top section 4 and secured to the same adjacent the opening 43 by bolts 45. Any additional supporting means for the upper motor may, of course, be provided, and the upper and lower motors which are adapted respectively to rotate the centrifugal basket at a low cleaning speed and at a high purging speed are directly coupled to the upper and lower ends of the central vertical shaft 20 of the basket and gearing which is necessary when the high speed motors are arranged in a horizontal position is eliminated and the consumption of power for rotating the centrifugal basket is reduced to a minimum. Also, the elimination of gearing for connecting the high and low speed motors with the rotary centrifugal basket materially minimizes the cost of manufacturing the centrifugal separating machine. The free wheeling clutch 40 which is designed to be constructed as shown and described in said application Serial No. 712,390 is preferably located in a centrally arranged opening 46 in the upper intermediate supporting section 2 which is provided within the said opening 46 with a horizontal annular flange 47 located at a point intermediate of the top and bottom of the opening 46 and forming an abutment for the bearings 39 for the upper end portion of the central vertical shaft 20.

The centrifugal basket 5 consists of a cylindrical body portion, a circular bottom plate 48 and an annular top plate 49, the top and bottom plates being bolted or otherwise secured to the body portion of the basket 5, as fully explained in the aforesaid applications. The body portion of the basket 5 is cylindrical and forms imperforate vertical walls or sides, and the bottom plate 48 which has a horizontal upper face is provided with a central hub 50 which is mounted on a cylindrical portion 51 of the central vertical shaft 20, as clearly illustrated in Fig. 1 of the drawings. The bottom plate 48 is provided with a plurality of radial openings 52 surrounding the hub for the discharge of cut sludge and refuse from the basket. The said bottom plate forms an imperforate annular bottom portion upon which the sludge to be dewatered is fed by the means hereinafter described.

The annular top plate 49 is provided with a central opening 53 and it is of stepped formation and gradually decreases in thickness from the central opening 53 to the outer periphery of the top plate which is exteriorly beveled at 54 and

provided with a depending flange **55** which embraces the top of the body of the basket, as clearly illustrated in Fig. 7 of the drawings. The stepped formation of the top is formed by successively decreasing the thickness of the top plate and the plurality of steps or portions of different thickness have flat upper faces and are provided with groups of inverted truncated conical openings **56** which are staggered circumferentially of the annular top plate, as clearly illustrated in Fig. 6 of the drawings.

The inverted substantially conical openings provide for the discharge of seepage from the rotary centrifugal basket, the said top plate **49** constituting a seepage plate and the staggering of the upwardly flaring seepage openings permitting flow of the seepage from each of the seepage openings without the flow from one opening interfering with the flow from another opening, as indicated by the arrows in Fig. 6 of the drawings, so that turbulence and interference with the discharge of the seepage is reduced to a minimum. The inverted conical openings **56** increase in diameter inwardly from the body portion of the basket to the inner periphery of the annular top plate. The pressure incident to the centrifugal action of the rotary basket decreases inwardly from the walls of the basket and the increase in the diameter or size of the opening **56** is proportional to the decrease in the pressure of the effluent.

The basket is provided at the lower face of the top or seepage plate **49** with a screen **57** consisting of an annular plate interposed between the top plate **49** and the upper edges of the body portion of the basket and secured in place by the means for securing the top plate to the body portion of the basket and also by screws **58** which pierce the seepage plate adjacent its inner periphery and are threaded in the top plate **49**, as clearly shown in Fig. 7 of the drawings.

Any other suitable fastening means may, of course, be employed for securing the screen plate to the top plate and the said screen plate is provided at the seepage openings **56** with groups of perforations **59** which increase in number from the outermost opening **56** of each group to the innermost opening **56** of the same. The seepage holes in the screen plate are definitely spaced from one another in order to avoid small threads, fibers, and the like straddling or stapling through any two holes and causing the same to clog. The number of holes increase towards the center to increase the seepage area in proportion to the reduced pressure developed by centrifugal force, the pressure increasing with the distance of the openings from the center of rotation. Each conical or flared opening is common to a group of seepage holes. The tapered or flaring openings insure complete drainage of the effluent as the machine is slowing down. It is obvious that the outer diameters of the holes in the stepped portions of the upper plate being larger in diameter will at a point in the periphery furthest from the center of rotation provide for a development of centrifugal force greater than at any other peripheral portion of the opening and, therefore, all of the water which may be contained in the openings of the top plate will tend to seek the point of greatest force and, therefore, insure effective drainage of the seepage. The arrangement indicates two plates, the top plate and the screen, one stepped and built sufficiently rugged to insure rigidity to the centrifugal basket and the other of a comparatively thin section having the seepage holes enables the changing of a relatively inexpensive thin plate for another similar plate should the size and number of the seepage holes require change due to the various materials being dewatered.

The top seepage plate **49** has its steps gradually increasing in width from the outermost step towards the center of the basket and the openings **56** gradually increase in diameter and also in length from the periphery of the basket towards the center of the same and the walls **49a** formed by the successive steps are arranged at an inclination or undercut and extending upwardly and outwardly, as learly illustrated in Fig. 7 of the drawings, for facilitating the outward or radial discharge of seepage from the seepage openings. The groups of seepage openings, as clearly illustrated in Fig 6 of the drawings, are arranged in a line which is disposed at an acute angle to a radius intersecting the center of the innermost or larger seepage opening of the group or series and the angle is sufficient to provide complete clearance or free passage of the seepage substantially radially of the basket without interference of the seepage of each group or with the seepage of the openings of the adjacent groups.

The top seepage plate **49** is located below and adjacent the lower face of the upper intermediate supporting section **2** which is provided at its lower face with an annular dome shaped surface **60** which inclines upwardly and outwardly from a point slightly above the inner periphery of the top seepage plate, the inclined portion of the surface extending to a point slightly beyond the center of the annular dome-shaped surface and the latter being curved downwardly and outwardly at its outer portion for deflecting and directing the seepage downwardly into the annular intervening space **11** between the rotary centrifugal basket and the lower intermediate section **3** of the casing. The vertical dimension of the annular space above the seepage plate gradually increases from the inner periphery of the seepage plate to the outer periphery thereof and a free discharge of the seepage from the centrifugal basket is afforded by the said construction.

The sewage or other material to be dewatered is fed to the centrifugal machine through a feed pipe **61** arranged in substantially a horizontal position above the upper intermediate supporting section **2** and located substantially within the top section **4** which is provided with an opening **62** through which the outer end of the feed pipe **61** extends. The outer end **63** of the feed pipe is flanged as shown for connection with suitable means similar to that shown and described in said application Serial #712,390 for controlling the feed of the material to the machine.

As any suitable means may be employed for this purpose illustration thereof is deemed unnecessary. The feed pipe **61** is provided with a Y-branch **64** having vertical flanged terminals **65** which are suitably secured to the upper face of the supporting section **2** at vertical feed passages **66** thereof forming sections of the feed pipe. The supporting section **2** of the casing of the machine is preferably hollow as shown and it is provided with integral feed pipe sections **67** which provide the passages **66** and to which are bolted or otherwise secured lower vertically disposed nozzle sections **68** depending from the supporting section **2** of the casing and having lower laterally deflected flattened discharge nozzles **69**

forming outlets for the sewage and extending slightly beyond the outer ends of the radial openings 52 in the bottom plate of the rotary centrifugal basket for discharging the material upon the annular imperforate portion of the bottom plate lying beyond the said radial openings 52, as clearly illustrated in Fig. 5 of the drawings. The upper ends of the lower nozzle sections 68 of the twin feed pipes are flanged to enable them to be readily secured to the lower ends of the integral pipe sections of the supporting section 2 of the casing. The twin feed branches or pipes are designed as explained in the said application, Serial No. 712,390 to have the same cross sectional area throughout their entire length and the material is divided by the twin feed pipes and is discharged into the centrifugal basket at substantially diametrically opposite points and is adapted to be fed uniformly and with great rapidity and with less danger of any of the material leaving the bottom plate and falling through the radial openings 52 thereof than is the case where a single feed pipe is employed for discharging material into the basket at a single point.

Where the mouths of the twin branches of the feed pipe are flattened they are simultaneously widened so as to preserve the said uniform cross sectional area of the branch feed pipe throughout their entire length. The cross sectional area of the twin feed pipes may, of course, be varied if desired. The material discharged into the centrifugal basket by the twin branches of the feed pipe is carried outwardly through centrifugal action of the rotary basket and collects in the angle formed by the bottom plate 46 and the vertical walls of the centrifugal basket. The dewatered sludge collects in a built-up wall of solids on the imperforate vertical wall of the rotary basket while the water or other liquid purged from the material is carried upwardly through the centrifugal action of the rotary basket and is caused to flow through the seepage holes and openings of the screen and the top plate and is discharged from the basket at the top thereof.

The feed pipe 61 is provided with a vertically disposed chemical receiving hopper or receptacle 70 located above and exteriorly of the top section 4 of the casing and consisting preferably of an upper cylindrical portion and a lower tapered portion which is connected by a short vertical pipe 71 with the feed pipe 61. The pipe connection 71 is provided with a regulating valve 72 of any suitable construction for controlling the feed of a chemical or other sludge treating material to the feed pipe 61 and if desired steam or currents of air may be injected into the sludge through the feed pipe 61.

The chemical tank and the feed pipe 61 will enable the sludge to be treated prior to the passage of the sludge to the rotary centrifugal basket, but if desired, the effluent within the sedimentation and settling tank may be also treated for further clarification and purification as explained in the said application Serial 713,383. The upper intermediate supporting section 2 of the casing is provided at opposite sides of the center with vertical hubs 73 depending from the supporting section and extending into the upper portion of the centrifugal basket and having mounted within them hollow vertical shafts 74 which project above and below the supporting member 2 of the casing. Mounted upon the lower end portions of the vertical shafts 74 are curved scrapers 75 tapered outwardly from the shafts 74 and provided at their inner ends with openings 76 to receive the shafts and suitably fixed to the same. The scrapers 75 which are hollow and arranged vertically are curved from the shafts 74 to their outer vertical edges and tapered outwardly and present convex rear faces and concave front faces. The curvature of the scrapers from their shafts to their outer vertical edges permits the scrapers to fold substantially concentrically at the center of the machine within the inner periphery of the imperforate annular portion of the bottom plate 48 so as to be out of the way of the material carried by the basket, as clearly shown and described in said application Serial #712,390.

This permits the centrifugal basket to be rotated at high speed for purging the material without the scrapers retarding or in any wise interfering with the rotation of the centrifugal basket at high speed. Also the folding of the scrapers into this small diameter facilitates the maximum filling of the centrifugal basket. Furthermore, the compact folding of the curved scrapers centrally of the machine enables the scrapers to be readily removed through the central opening of the top plate of the basket when disassembling the machine and also enables the upper intermediate section, the top section and the parts carried thereby including the said scrapers to be constructed as a single unit and to be removed as a single unit from the machine without removing or disturbing any of the other parts of the machine.

The centrifugal basket rotates in the direction of the arrow in Fig. 5 of the drawings, and when the scrapers 75 swing outwardly to their open position shown in Fig. 5 of the drawings, their opening movement is in the direction of the rotation of the centrifugal basket. The rotation of the centrifugal basket is thereby utilized in assisting the opening movement of the scrapers and the cutting action of the scrapers which are progressively moved outwardly in cutting or scraping, the dewatered material out of the basket.

The scrapers are provided at their outer vertical edges with vertical plates 77 suitably secured to the scrapers and projecting at the outer edges thereof for engaging and cutting or scraping material from the basket during the slow rotation of the same by the low speed motor 41 as fully described in the said applications. The projecting engaging edges of the blades are preferably provided with tapered teeth 78 but cutting edges of any preferred form may, of course, be employed and the scrapers are limited in their outward movement to prevent the cutting edges of the blades from coming in contact with the vertical walls of the basket. The sludge cut and scraped from the centrifugal basket is fed inwardly by the curved scrapers as fully described in the aforesaid applications, and is discharged from the basket through the radial refuse openings 52 in the bottom plate thereof. Also the scrapers and the hollow shafts may be provided with a means shown and described in the said application Serial No. 712,390 for cleaning the blades and the basket.

The scraper operating mechanism for moving the scrapers inwardly and outwardly is designed to be substantially the same as that shown and described in said application Serial No. 712,390. The upper ends of the hollow shafts are provided with operating arms 79 located above the sup-

porting member 2 of the casing and provided at their outer ends with pins 80 which are connected with blocks 81 slidably mounted in transverse openings 82 of a longitudinally slidable connecting bar 83.

The longitudinally slidable connecting bar 83 which is arranged transversely of the supporting member 2 of the casing of the machine is spaced from the center thereof, as clearly shown in Fig. 4 of the drawings. One end portion 84 of the slidable connecting bar is arranged in a suitable guide 85 and the other end of the connecting bar 83 is suitably connected with a screw 86 engaged by an interiorly threaded horizontally disposed sleeve 87. The sleeve 87 is mounted in a suitable bearing 88 and is provided at its inner end with a vertically disposed bevel gear 89 keyed, formed integral or otherwise fixed to the interiorly threaded sleeve 87 and meshing with a horizontal bevel gear 90 of a vertically disposed electric cleaner motor 91 adapted to be operated for swinging the scrapers outwardly and inwardly. The guide 85 and the bearing 88 are mounted upon the supporting section 2 of the casing at opposite sides thereof, as clearly illustrated in Fig. 2 of the drawings, and they are carried by the said supporting section when the latter is removed from the lower intermediate section 3 of the casing for removing as a unit the scrapers and the feeding means.

When the motor is rotated rotary motion is communicated through the bevel gears 89 and 90 to the interiorly threaded sleeve 87 and the screw 86 is moved either inwardly or outwardly according to the direction of the rotation of the sleeve 87 to slide the connecting bar 83 longitudinally and thereby swing the arms 79 and partially rotate the vertical shafts 74 upon which the scrapers are mounted.

The pivotal connection between the arms 79 and the slidable connecting bar 83 permits the arcuate movement of the pivot pins 80 which connect the arms with the slidable connecting bar 83. The vertically arranged motor 91 is supported in a bracket 92 secured to the supporting member 2 of the casing of the machine and constructed and arranged substantially as shown and described in said applications. The motor 91 which actuates the mechanism for operating the scrapers may be mounted in any other desired manner as will be readily understood, and when the said motor 91 is arranged vertically in the supporting bracket 92 the top section 4 of the casing is provided with an opening 93 through which the vertical motor 91 and the bearing 88 extend.

The outer end 94 of the screw 86 is reduced and threaded for the reception of adjustable jam nuts 95 which are adapted to engage the outer end of the interiorly threaded gear actuated sleeve 87 for limiting the inward movement of the scrapers to prevent the same from coming in contact with the imperforate vertical wall of the rotary centrifugal basket. The adjustable jam nuts will enable the actuating mechanism of the scrapers to be adjusted so as to permit the blades of the scraper to approach the imperforate vertical walls of the rotary centrifugal basket as near as desired without liability of the cutting teeth or cutting edges of the blades of the scrapers coming in contact with the centrifugal basket.

By adjusting the jam nuts the scrapers may be adjusted so that when at the limit of their outward movement they will operate to scrape the inner faces of the vertical walls of the centrifugal basket and remove all accumulation therefrom without the blades actually coming in contact with the said walls of the basket.

By removing the bolts which secure the supporting section 2 of the casing to the lower intermediate section 3, the top cap section 4 and the mechanism mounted on the supporting section or member 2 including the means for feeding the material to the centrifugal basket and the means for cleaning or unloading the basket may be removed from the machine as a unit, and the centrifugal basket with its vertical shaft may be removed as a unit, as clearly illustrated in dotted lines in Fig. 3 of the drawings.

In operation the entire machine as explained in connection with the operation of the machine shown and described in application Serial No. 712,390, is designed to be controlled by an electric switch board so that the complete cycle of operation will be automatic and continuous. When the high speed motor is rotating the basket for purging the low speed motor is at rest. When the purging is completed the current of the high speed motor is shut off and, the current is reversed acting as a brake by means of which the speed of the basket is reduced to approximately the speed for cleaning the basket, and at that point the slow speed motor is put in operation picking up the rotation of the basket before it comes to rest.

While the low speed motor is operating the high speed motor is permitted to die down. The brake 42 may or may not be employed and when provided, which is preferable when the free wheeling clutch 40 is used, will enable the speed of the basket to be checked when desired. The operation of the scrapers, which constitute the cleaning arms, is designed to be intermittent so that the cleaning arms will swing outwardly in a definite period of time towards the vertical imperforate wall of the centrifugal basket. When the cleaning arms or scrapers have reached the limit of their outward travel and the centrifugal basket has been cleaned to the desired extent, the cleaner motor will be reversed and will return the scrapers or cleaning arms to their initial starting position. The centrifugal basket is rotated by the low speed motor during the operation of the scrapers and after the scrapers have been returned to their initial position it is designed to continue to operate the low speed motor for a predetermined period regulated by a special timer, not shown. As soon as the low speed motor stops, the high speed motor will start and operate for a predetermined period.

When the high speed motor has attained its maximum speed the valve (not shown) for controlling the flow of the material into the machine is opened for a predetermined period of time and is then closed.

The high speed motor may run in periods from a few minutes to a comparatively long period to suit the character of the material operated on by the machine and the chemical tank 70 which is connected with the feed pipe 61 will enable the material to be treated chemically or otherwise before the material is introduced into the centrifugal basket. This will enable chemical action or other treatment of the material to be effected during the purging operation and the operation of the settling or sedimentation tank may thereby be facilitated by decreasing the time necessary for the precipitation and settling of matter in solution and suspension in the effluent separated from the sludge by the purging action

of the rotary centrifugal basket and permitted to flow into the sedimentation and settling tank. The clarified or purified effluent in the upper portion of the sedimentation and settling tank is removed therefrom separately from the sedimentation sludge collecting in the lower portion of the tank by any suitable means, preferably by vacuum means such as is disclosed in my pending application, Serial No. 720,333.

In the purging operation the seepage is permitted to flow freely through the seepage plate through outlets proportionate to the pressure resulting from the centrifugal force developed by the rotary basket and the outlets are staggered circumferentially of the basket so that the streams of seepage substantially radially of the basket from the outlets to the intervening space 11 between the basket and the casing of the machine do not interfere with one another and produce any turbulence which might interfere with the free continuous flow of the seepage from the basket to the sedimentation and settling tank.

The outlets of the seepage plate are arranged vertically and increase in diameter upwardly so that the outer ends of the outlets are of greater diameter than the inner ends which permits the seepage through centrifugal action to flow outwardly in an unobstructed path and then radially to the intervening space between the centrifugal basket and the casing. The flaring inverted conical shape of the outlets by permitting the seepage to move in the direction of the outer portions of the peripheries of the tapered outlets insures a complete drainage of the seepage and the annular dome-shaped wall of the supporting member of the casing above the seepage openings facilitates the passage of the seepage to the said space 11 between the basket and the casing and directs the seepage downwardly into the said space.

The vertical arrangement of the high and low speed motors at the top and bottom of the casing enables the rotary centrifugal basket to be operated at high and low speeds without the use of gearing for connecting the motors with the centrifugal basket and the expenditure of power for rotating the basket is thereby reduced to a minimum and at the same time the basket is adapted to be operated in the cycle of operations explained in the aforesaid application, and the removal of the parts of the machine as separate units as explained in said application Serial No. 712,390 is not interfered with or affected by the vertical arrangement of the motors and the direct connection of the same with the shaft of the centrifugal basket and the high speed motor which is located below the centrifugal basket does not interfere with the discharge of either the effluent or the sludge cut from the basket and at the same time the said high speed motor is fully protected from the sludge and effluent.

While the machine may be operated to purge at a high speed and clean at a low speed, it may be found desirable to raise the speed of the low speed motor and reduce the speed of the high speed motor to where the speed of the motors are almost of equal valve and purge and clean at or near substantially the same speed. Also it is possible with the present machine to purge at high speed and clean at high speed as well as purge at high speed and clean at low speed.

What is claimed is:

1. A centrifugal separating machine for dewatering sludge including a rotary centrifugal basket having imperforate side walls and provided at the top with means operating at right angles to the direction of the centrifugal force for permitting seepage of liquid from the basket, said seepage means including vertically disposed approximately inverted conical seepage openings having the greatest diameter at their discharge ends and permitting radial movement of the seepage, whereby complete drainage of the seepage openings is effected.

2. A centrifugal separating machine for dewatering sludge including a rotary centrifugal basket having imperforate side walls and provided at the top with means operating at right angles to the direction of the centrifugal force for permitting seepage of liquid from the basket, said seepage means including vertically disposed inverted approximately conical openings arranged in groups, the groups of openings being staggered circumferentially around the basket to permit the seepage to be discharged from each of the groups of openings without interfering with the discharge and radial movement of seepage from the other groups of openings.

3. A centrifugal separating machine for dewatering sludge including a rotary centrifugal basket having imperforate side walls and provided at the top with means operating at right angles to the direction of the centrifugal force for permitting seepage of liquid from the basket, said seepage means including vertically disposed inverted approximately conical openings arranged in groups, the groups of openings being staggered circumferentially around the basket to permit the seepage to be discharged from each group of the openings without interfering with the discharge and radial movement of seepage from the other groups of openings whereby turbulence is eliminated, and a screen arranged at the inner ends of the seepage openings and provided with groups of seepage holes, the members of each group of seepage holes being spaced sufficiently to prevent fibers straddling the holes and clogging the same.

4. A centrifugal separating machine for dewatering sludge including a rotary centrifugal basket having imperforate side walls and provided at the top with means operating at right angles to the direction of the centrifugal force for permitting seepage of liquid from the basket, said seepage means including vertically disposed groups of inverted approximately conical openings, the groups of openings being staggered circumferentially around the basket to permit the seepage to be discharged from each group of openings without interfering with the discharge and radial movement of seepage from the other groups of openings whereby turbulence is eliminated, and a screen arranged at the inner ends of the seepage openings and provided with groups of seepage holes, the number of the holes of the groups increasing inwardly from the periphery of the basket towards the center of the same substantially proportionate to the decrease in the pressure resulting from the centrifugal action of the basket.

5. A centrifugal separating machine for dewatering sludge including a rotary centrifugal basket having imperforate side walls and provided with means operating at right angles to the direction of the centrifugal force for permitting seepage of liquids from the basket, said means including a seepage plate constituting the top wall of the basket and successively reduced in thickness outwardly to provide a plurality of steps, said steps being provided with substantially inverted

conical seepage openings having their greatest diameter at their discharge ends whereby complete drainage of the openings is assured.

6. A centrifugal separating machine for dewatering sludge including a rotary centrifugal basket having imperforate side walls and provided with means operating at right angles to the direction of the centrifugal force for permitting seepage of liquids from the basket, said means including a seepage plate constituting the top wall of the basket and successively reduced in thickness outwardly to provide a plurality of steps, said steps gradually increasing in width from the periphery of the basket inwardly towards the center and having approximately inverted conical seepage openings having their greatest diameter at their discharge ends to insure complete drainage of the openings, the seepage openings increasing in size from the periphery towards the center of the basket.

7. A centrifugal separating machine for dewatering sludge including a rotary centrifugal basket having imperforate side walls and provided with means for permitting seepage of liquids from the basket, said means including a seepage plate constituting the top wall of the basket and successively reduced in thickness outwardly to provide a plurality of steps, said steps being provided with substantially inverted conical seepage openings having their greatest diameter at their discharge ends whereby complete drainage of the openings is assured, the circumferential edges of the steps at the inner sides of the openings being inclined upwardly and outwardly.

8. A centrifugal separating machine for dewatering sludge including a rotary centrifugal basket having imperforate side walls and provided with means for permitting seepage of liquids from the basket, said means including a seepage plate constituting the top wall of the basket and successively reduced in thickness outwardly to provide a plurality of steps, said steps being provided with substantially inverted conical seepage openings having their greatest diameter at their discharge ends whereby complete drainage of the openings is assured, the steps of the seepage plate increasing in width and height inwardly from the periphery of the basket towards the center of the same and the seepage openings increasing in diameter and length from the periphery of the basket towards the center of the same.

9. A centrifugal separating machine for dewatering sludge including a rotary centrifugal basket having imperforate side walls and provided with means for permitting seepage of liquids from the basket, said seepage means comprising an annular top plate of stepped formation having a plurality of steps increasing in width and height inwardly from the periphery of the basket towards the center of the same and provided with inverted substantially conical seepage openings increasing in size from the periphery of the basket towards the center of the same, and a screen plate arranged at the lower face of the top plate and provided with groups of definitely spaced seepage holes located at the lower ends of the seepage openings, the number of the holes of the groups increasing from the periphery towards the center of the basket.

10. A centrifugal separating machine for dewatering sludge including a rotary centrifugal basket having imperforate side walls and provided with means for permitting seepage of liquids from the basket, said seepage means comprising an annular top plate of stepped formation having a plurality of steps increasing in width and height inwardly from the periphery of the basket towards the center of the same and provided with inverted substantially conical seepage openings increasing in size from the periphery of the basket towards the center of the same, and a screen plate arranged at the lower face of the top plate and provided with groups of definitely spaced seepage holes located at the lower ends of the seepage openings, the number of the holes of the groups increasing from the periphery towards the center of the basket, said seepage openings and groups of seepage holes being staggered circumferentially around the basket to permit free discharge of seepage from the seepage openings without the discharge from one opening interfering with the discharge seepage from another opening.

11. A centrifugal separating machine for dewatering sludge including a casing having a basket receiving chamber and provided at the top thereof with a stationary annular dome-shaped wall presenting a lower concave surface, and a rotary centrifugal basket having imperforate side walls and provided with means for permitting seepage of liquids from the basket, said seepage means comprising a seepage plate constituting the top wall of the basket and provided with approximately vertical seepage openings located beneath and arranged to discharge effluent against the concave surface of the annular dome-shaped wall of the casing, the latter tending to direct the seepage radially and downwardly.

12. A centrifugal separating machine for dewatering sludge including a casing having an upwardly tapered circular side wall and provided at the top thereof with an annular dome-shaped wall, a rotary centrifugal basket of substantially cylindrical formation located within the tapered portion of the casing and spaced therefrom to provide an effluent passage, said basket having imperforate side walls and provided with an annular top plate of stepped formation provided with approximately inverted conical seepage openings located below the annular dome-shaped wall of the casing, the latter being adapted to direct the seepage radially and downwardly into the effluent space.

13. A centrifugal separating machine for dewatering sludges including a rotary centrifugal basket having imperforate side walls and provided at the top with seepage means comprising vertically disposed upwardly flared openings having their greatest diameter at their upper discharge ends and permitting an upward discharge of seepage simultaneously with radial movement of the same, and a casing having a basket receiving chamber having a stationary substantially dome shaped top wall extending over the upwardly flared openings and presenting a fixed concave surface against which effluent impinges.

14. A centrifugal separating machine for dewatering sludges including a rotary centrifugal basket having imperforate side walls and provided at the top with seepage means comprising vertically disposed upwardly flared openings having their greatest diameter at their upper discharge ends and permitting an upward discharge of seepage simultaneously with radial movement of the same, and a casing having a basket receiving chamber provided with side walls and having a stationary substantially dome shaped top wall extending over the upwardly flared openings and

presenting a fixed concave surface against which effluent impinges, the outer marginal portion of said fixed concave surface merging into the inner surface of the side walls of said basket receiving chamber.

15. A centrifugal separating machine for dewatering sludges including a rotary centrifugal basket provided at the top with seepage means comprising vertically disposed upwardly flared openings having their greatest diameter at their upper ends and permitting an upward discharge of seepage simultaneously with radial movement of the same, and a plurality of relatively small perforations located at the lower ends of the flared openings and communicating with the same and with the interior of the basket and adapted to screen the effluent discharged from the centrifugal basket by the seepage means.

16. A centrifugal separating machine for dewatering sludges including a rotary centrifugal basket provided at the top with seepage means comprising vertically disposed upwardly flared openings having their greatest diameter at their upper ends and permitting an upward discharge of seepage simultaneously with radial movement of the same and a plurality of relatively small perforations located at the lower ends of the flared openings and communicating with the same and with the interior of the basket and adapted to screen the effluent discharged from the centrifugal basket by the seepage means, and a casing having an upwardly tapered chamber receiving the basket and forming inwardly inclined side walls and provided with an annular substantially dome shaped top wall presenting a lower fixed concave surface to the seepage means and having its outer marginal portion merging into the inner faces of the inclined side walls of the basket receiving chamber.

17. A centrifugal separating machine including a casing having an upwardly tapered basket receiving chamber forming inwardly inclined side walls and having an annular substantially dome shaped wall at the upper portion thereof presenting a fixed concave lower face, said casing being also provided with an upwardly tapered hollow base forming a sedimentation and settling tank having inclined inner and outer walls and open at the top adjacent the bottom of the basket receiving chamber, the inner walls of the tank defining a central space for the passage of dewatered sludge, a rotary centrifugal basket mounted for rotary movement on a vertical axis within the basket receiving chamber of the casing and provided at the top with seepage means including vertically disposed upwardly flared openings having their greater diameter at their upper ends and permitting an upward discharge of seepage simultaneously with a radial movement of the same, said basket being also provided at the bottom with a sludge discharge opening located directly above the central space of the hollow base for discharging dewatered sludge into the same.

18. A centrifugal separating machine for dewatering sludge or the like including a rotary centrifugal basket having imperforate side walls and provided at the top with means for permitting seepage of liquid from the basket, said seepage means including vertically disposed annular groups of openings leading from the interior of the basket, the outer ends of the openings of each group being arranged successively at higher elevations from the periphery towards the center of the basket, the annular groups of openings being staggered with relation to one another circumferentially around the top of the basket, and an annular wall between the adjacent annular groups of openings protecting the openings of the respective annular groups from a next higher up group whereby to permit the seepage to be discharged from each of the groups without interfering with the discharge and radial movement of seepage from the other groups.

19. A centrifugal separating machine for dewatering sludge or the like, including a casing provided with a transversely disposed wall, a rotary centrifugal basket located within the casing immediately beneath said wall and spaced therefrom to provide an effluent passage, the basket having imperforate side walls spaced from the walls of the casing to provide an interspace having communication with said passage, a top plate secured to the top of the basket and having exterior stepped formation graduating downwardly from approximately the center of the basket to the periphery thereof and provided with seepage openings leading from the interior of the basket into the said passage, the walls formed incident to the stepped formation being undercut and means for rotating the basket to separate liquids from solids and effect discharge of the liquids out of the basket through said seepage openings and through said passage into said interspace.

20. A centrifugal separating machine including a casing provided with a hollow base, a hollow shell having imperforate side walls and mounted in the hollow base and spaced from the side walls thereof to provide a passage leading to and through the bottom of the base, a rotary centrifugal basket arranged within the casing above the hollow shell and provided with a vertical shaft, the basket having seepage openings at the top thereof and having a sludge discharge opening in its bottom operable over the aforesaid passage, said basket shaft extending downwardly through the bottom of the basket and below the same and having its lower end journaled in the top of said hollow shell, a motor supported by and confined within the hollow shell and protected thereby from sludge and liquids and operatively coupled to the basket shaft to rotate the basket at a high rate of speed to separate the liquids from the solids to discharge the liquids by centrifugal force from the basket through said seepage openings and collect the solids in the basket, and a low speed motor mounted above the basket in substantially vertical alignment with the basket shaft and the aforesaid high speed motor to rotate the basket at low speed to permit of discharge of solids from the basket through the bottom opening of the latter and through said passage.

21. A centrifugal separating machine including a casing provided with a hollow base, a hollow shell having imperforate side walls and mounted in the hollow base and spaced from the side walls thereof to provide a passage leading to and through the bottom of the base, a rotary centrifugal basket arranged within the casing above the hollow shell and provided with a vertical shaft, the basket having seepage openings at the top thereof and having a sludge discharge opening in its bottom operable over the aforesaid passage, said basket shaft extending downwardly through the bottom of the basket and below the same and having its lower end journaled in the top of said hollow shell, a motor supported by and confined within the hollow shell and protected thereby from sludge and liquids and oper-

atively coupled to the basket shaft to rotate the basket at a high rate of speed to separate the liquids from the solids to discharge the liquids by centrifugal force from the basket through said seepage openings and collect the solids in the basket, a low speed motor mounted above the basket in substantially vertical alignment with the basket shaft and the aforesaid high speed motor and coupled to said shaft to rotate the basket at low speed to permit of discharge of solids from the basket through the bottom opening of the latter and through said passage, a tank in the base of the casing substantially concentric with said hollow shell and the inner wall of which defines the aforesaid passage which leads through the base, said tank having an open mouth at its upper portion to receive the separated liquid discharged through the seepage openings from the basket, the sediment from the liquid in the tank falling to the bottom of the tank, means to convey the liquid separated from the sediment from the tank, and an outlet for the discharge of sediment from the bottom of the tank.

22. A centrifugal separating machine for dewatering sewage sludge or the like, including a rotary centrifugal basket having imperforate side walls, a top plate for the basket having an upper outer stepped surface graduating downwardly from its center and undercut walls between the stepped portions, said plate having groups of upwardly extending inverted cone-shaped seepage openings in said stepped portions and leading from the interior of the basket, the discharge ends of each group of seepage openings in each stepped portion lying in successively higher planes toward the center of the plate and adjacent to said walls.

23. A centrifugal separating machine for dewatering sewage sludge or the like, including a rotary centrifugal basket, an annular plate secured to the top of the basket and having spaced groups of radially disposed seepage openings leading from the interior of the basket, the openings of each group being spaced and of inverted conical form and gradually increasing in diameter inwardly from the periphery of the plate and successively terminating at the outer ends at higher elevations inwardly from the periphery of the plate.

24. A centrifugal separating machine for dewatering sewage sludge or the like, including a rotary centrifugal basket having imperforate side walls, an annular plate secured to the top of the basket having stepped portions graduating downwardly toward the periphery and upwardly extending walls between said stepped portions and having seepage openings therein of different lengths through said stepped portions leading from the interior of the basket for the discharge of liquids from the basket as the latter rotates, and a plate disposed under the annular plate and provided with sets of perforations arranged one set at the inner end of each seepage opening to prevent solid matter from clogging the seepage openings.

25. A centrifugal separating machine for dewatering sewage sludge or the like, including a rotary centrifugal basket having imperforate side walls, an annular top plate for the basket having stepped portions graduating downwardly toward its periphery and undercut walls between said stepped portions and having spaced groups of upwardly extending seepage openings, said groups of said openings extending through said stepped portions, successively increasing in length and diameter toward the center of the top plate.

26. Means for dewatering materials including a casing, a rotary centrifugal basket in the casing, a relatively short vertical shaft on which the basket is mounted, bearings rigidly mounted in the casing against movement and receiving the ends of the shaft, one bearing being arranged above the basket bottom at the top of the basket and the other bearing being arranged below the basket bottom and close thereto, whereby to maintain the shaft operable on a true vertical axis to prevent wobbling of the basket during rotation thereof, and high and low speed motors located one above and the other below the basket and both directly connected to the basket shaft in true vertical alinement with said shaft for rotating the basket at different speeds, and whereby the motors are mounted independently of the bearings for the shaft and whereby either motor may be disconnected from the shaft without disturbing the other motor or the true vertical alinement of said shaft.

27. Means for dewatering materials including a casing comprising separable sections, a rotary centrifugal basket in the casing, a relatively short vertical shaft on which the basket is mounted, bearings rigidly mounted in the casing against movement and receiving the ends of the shaft, one bearing being arranged above the basket bottom at the top of the basket and the other bearing being arranged below the basket bottom and close thereto, whereby to maintain the shaft operable on a true vertical axis to prevent wobbling of the basket during rotation thereof, and high and low speed motors located one above and the other below the basket and both directly connected to the basket shaft in true vertical alinement with said shaft for rotating the basket at different speeds, and whereby the motors are mounted independently of the bearings for the shaft and whereby either motor may be disconnected from the shaft without disturbing the other motor or the true vertical alinement of said shaft, the casing sections being separable and the basket and its shaft and the said bearings being removable from the casing as a unit for servicing purposes.

28. Means for dewatering sludges including a casing composed of separable sections, a rotary centrifugal basket in the casing and provided with an opening in its bottom, a relatively short vertical shaft on which the basket is mounted, bearings mounted in the casing against movement and receiving the ends of the shaft, high and low speed motors located one above and the other below the basket and both directly connected to the basket shaft in true vertical alinement with said shaft for rotating the basket at high purging speed and at a low cleaning speed, means supported by one of the casing sections for the delivery of the material to the basket, said section having bearings extending into the basket, shafts extending through the last mentioned bearings, scrapers connected to the last mentioned shafts to remove separated solids from the basket through the opening in the bottom of the latter, and means for operating the scrapers.

29. Means for dewatering sludges including a casing composed of separable sections, a rotary centrifugal basket in the casing and provided with an opening in its bottom, a relatively short vertical shaft on which the basket is mounted, bearings mounted in the casing against movement and receiving the ends of the shaft, high and low speed motors located one above and the other below

the basket and both directly connected to the basket shaft in true vertical alinement with said shaft for rotating the basket at high purging speed and at a low cleaning speed, means supported by one of the casing sections for the delivery of the material to the basket, said section having bearings extending into the basket, shafts extending through the last mentioned bearings, scrapers connected to the last mentioned shafts to remove separated solids from the basket through the opening in the bottom of the latter, and means for operating the scrapers, the specifically mentioned section of the casing being separable from other casing sections therebeneath and removable together with said material feeding means, the upper motor, the scraper means and the operating means for the latter as a unit for servicing purposes and the basket and its shaft being separately removable as a unit from the casing for servicing purposes.

30. Means for dewatering sludge material including a casing, a rotary centrifugal basket in the casing, a relatively short shaft on which the basket is mounted, bearings rigidly mounted in the casing against lateral or longitudinal movement and receiving the ends of the shaft, one bearing being disposed above the basket bottom and the other bearing being arranged below the basket bottom and close thereto, whereby to maintain the shaft operable on a true vertical axis to prevent wobbling of the basket during rotation thereof, motors located one above and the other below the basket close thereto in true vertical alinement with said shaft and directly connected with the latter for rotating the basket at a high purging speed and at a low cleaning speed, a clutch device interposed between the lower motor and the lower bearing, a clutch device interposed between the upper motor and the upper bearing, and a brake device interposed between the upper bearing and the upper clutch device for reducing the speed of the basket.

31. Means for dewatering sludge material including a rotary centrifugal basket, a relatively short vertical shaft on which the basket is mounted, bearings rigidly supported, one above and the other below the basket and close thereto and in which the opposite ends of said shaft are journaled and whereby the shaft is mounted on a true vertical axis to prevent wobbling of the basket during rotation thereof, high and low speed motors located one above and the other below the basket and both directly connected to the basket shaft in direct vertical alinement with said shaft for rotating the basket at different speeds, and a free wheeling mechanism associated with the basket shaft including a clutch device connected with the shaft and connected with the low speed motor for automatically connecting the basket shaft with the low speed motor when the speed of the basket shaft is reduced to or below the speed of the low speed motor.

32. Means for dewatering sludge material including a casing, a rotary centrifugal basket in the casing, a relatively short vertical shaft on which the basket is mounted, bearings rigidly mounted in the casing against movement and in which the ends of said shaft are journaled, one bearing being arranged above the basket bottom and the other bearing being arranged below the basket bottom and close thereto, whereby to maintain the shaft operable on a true vertical axis to prevent wobbling of the basket during rotation thereof, vertically disposed motors located one above and the other below the basket close thereto and directly connected to the respective ends of the basket shaft and in direct alinement with said shaft for rotating the basket at a high purging speed and at a low cleaning speed, and a free wheeling mechanism having operative connection with the basket shaft including a clutch device connected with the shaft and connected with the low speed motor for automatically connecting the basket shaft with the low speed motor when the speed of the basket shaft is reduced to or below the speed of the low speed motor.

33. A centrifugal separating machine for dewatering materials including a rotary centrifugal basket having imperforate side walls and an annular top plate having an upper exterior stepped formation graduating downwardly from its inner periphery to the outer periphery thereof and provided with openings extending therethrough from the interior of the basket, the openings gradually decreasing in length in the stepped formation from the inner periphery of the top plate to the outer periphery of the latter, the outer ends of said openings being disposed in the horizontal planes of the top faces of the respective stepped formations.

34. A rotary centrifugal basket provided with axial seepage means including an annular member shouldered annularly along different annular portions of the annular member to provide stepped formations graduating downwardly from the inner periphery of said annular member to the outer periphery thereof and provided with seepage openings opening at their outer ends through the stepped formations and at their inner ends communicating with the interior of the basket, the openings gradually decreasing in length in the stepped formation from the inner periphery of said annular member to the outer periphery of the latter, the outer ends of said openings being disposed in the horizontal planes of the top faces of the respective stepped formations.

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