

June 5, 1945.

D. BROWN

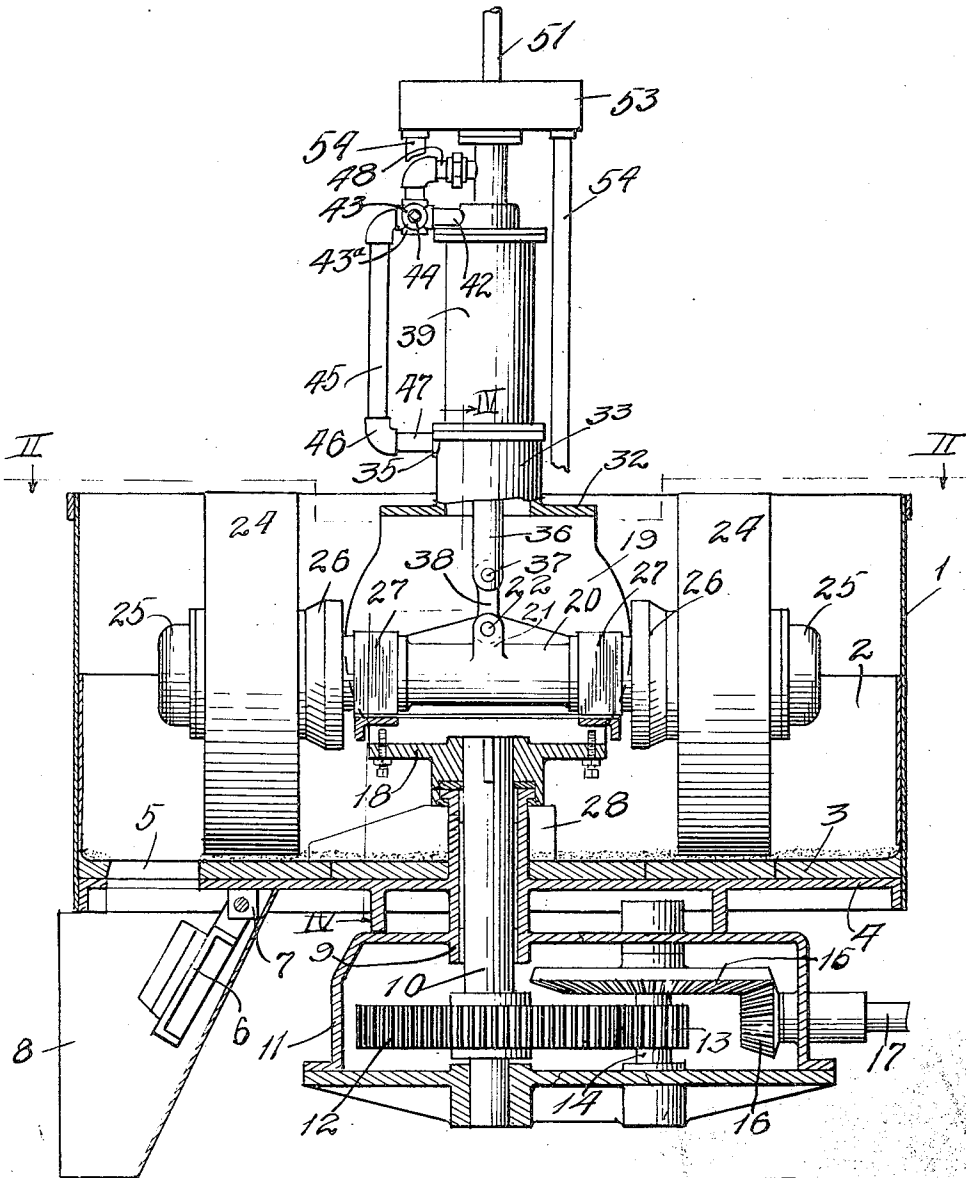
2,377,307

MIXER WITH PRESSURE CONTROLLED MULLERS

Filed July 20, 1942

2 Sheets-Sheet 1

Fig. 1



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Fig. 2

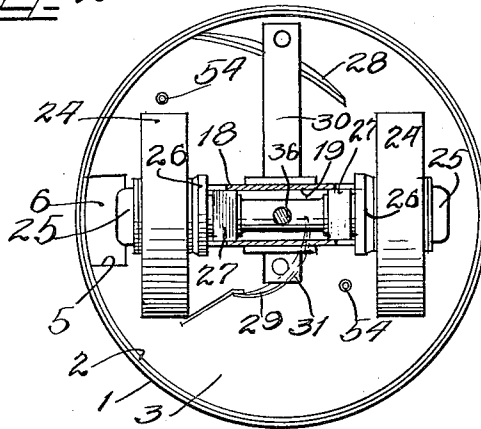


Fig. 3

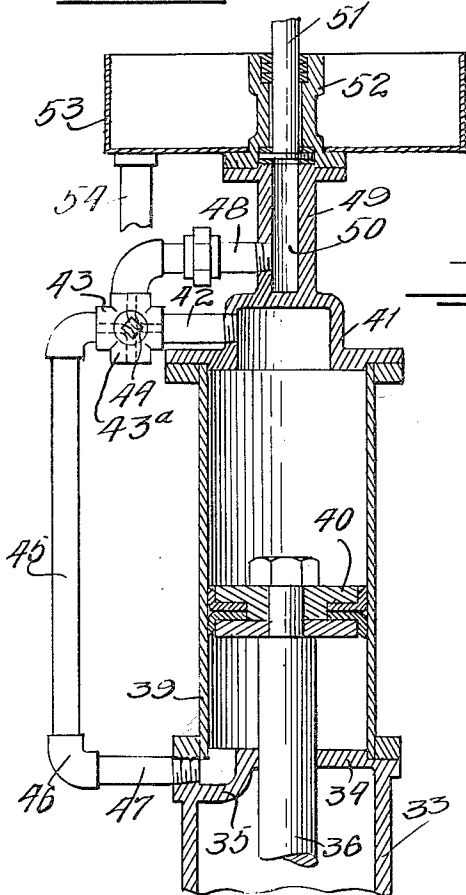
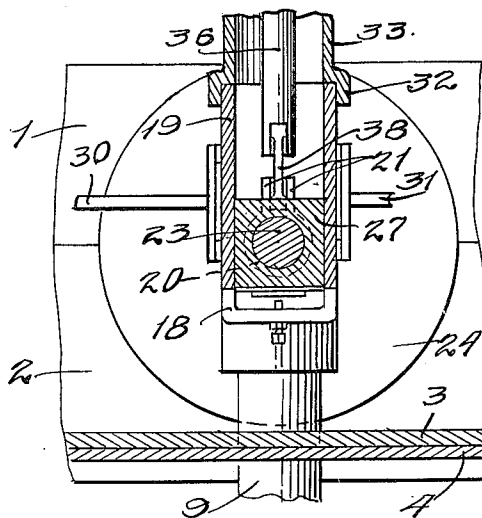


Fig. 4



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UNITED STATES PATENT OFFICE

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MIXER WITH PRESSURE CONTROLLED
MULLERS

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12 Claims. (Cl. 241—124)

In foundries and similar establishments the sands which are used are made up of silica grains with bonding agents such as clay, cereal binders, pitch, cement, oil and the like, which materials are tempered with sufficient moisture to develop the strength of the binders and to render the sand in a condition ready to be molded. This conditioning of the sand is produced in a mixer which operates on a so-called mulling principle of mixing produced by the combined action of mullers and plows by applied pressure and slippage produced by the weight of the mullers usually carried by rocker arms supported on a rotatable head within a mixing crib within which the mullers rotate and travel to treat the sand and other ingredients which are lined up in the path of the mullers by the action of the plows. In the types of mixers referred to the pressure exerted by the mullers on the materials is substantially constant making it necessary to replace the mullers by mullers of different sizes and weights when it becomes necessary to change the pressure exerted on the materials which are to be conditioned within a mixing crib.

This invention pertains to a mulling and mixing machine for conditioning new or reconditioning used inert molding sands or for the treating and mixing of other materials by placing the materials in a crib or pan, adding the necessary bonding agents and liquid and then subjecting the ingredients to the action of plows which shovel and turn the materials into the paths of mullers carried by a variable pressure control unit actuable by air or hydraulic pressure means for determining the degree of pressure which is to be exerted on the materials by the pressure controlled mullers and also operable for varying the vertical position of the entire muller unit within a rotatable guide cross-head of the mixer.

It is an object of this invention to provide a material mixer including an air or liquid control mulling unit which is adjustable for varying the degree of pressure to be exerted on the materials by the mullers of said unit.

Another object of the invention is to provide a foundry sand mixer wherein the mulling means is pressure controlled for governing the degree of pressure to be exerted on the materials being treated in the mixer.

It is also an object of this invention to provide a foundry sand or material conditioning machine wherein the mullers are mounted on the same shaft which in turn is slidably mounted in a rotatable cross-head to cause rotation of the shaft and the mullers carried thereby and also permit-

ting pivotal movement of the shaft in the guide cross-head about a pivotal point of connection between the shaft and an air or liquid pressure controlled piston shaft which not only supports the muller unit when the mullers are raised off the bottom of the machine crib, but also serves as a means for varying the pressure exerted by the mullers without changing the size or weight of the mullers.

A further object of the invention is the provision of an improved type of foundry mixer wherein the mulling means includes a muller supporting shaft slidably and pivotally supported in a rotatable cross-head and connected with an air or liquid pressure control means which may act to cause the downward pressure of the mullers to be varied or which may be operated to raise the mulling unit for reducing the pressure of the mullers below the normal pressure which is produced by the actual weight of the mulling unit.

It is furthermore an object of this invention to provide an improved foundry sand conditioning machine or a material mixer wherein a stationary crib encloses a rotatable cross-head in which a mulling unit is slidably and pivotally supported to be rotated with the cross-head, said mulling unit being connected with a pressure varying mechanism whereby the pressure of the mulling unit on the materials being treated in the machine may be increased or decreased without varying the weight of the mullers by means of weights or replacing the mullers by mullers of different sizes or weights.

It is an important object of this invention to provide a material mixer or mulling machine including a crib enclosing a power driven cross-head which not only carries scrapers or plows but also carries and rotates a slidably and pivotal muller carrying shaft which is adjustable by a fluid pressure control means on the cross-head which also supports a liquid supply mechanism for supplying liquid to the materials in the crib during a reconditioning or mixing operation by the machine.

Other and further important objects of this invention will be apparent from the disclosures in the specification and the accompanying drawings.

The invention (in a preferred form) is illustrated in the drawings and hereinafter more fully described.

In the drawings:

Figure 1 is a fragmentary elevational and sectional view of a material conditioning mixer em-

bodily the principles of this invention with parts omitted.

Figure 2 is a reduced horizontal view taken on line II—II of Fig. 1.

Figure 3 is an enlarged vertical sectional view of the pressure control unit and the liquid supply means with parts shown in elevation.

Figure 4 is a fragmentary vertical sectional view taken on line IV—IV of Fig. 1.

As shown in the drawings:

The improved material mixer or sand conditioning or reclaiming machine of this invention comprises a crib or pan consisting of a cylindrical wall 1 provided with a lining section 2, the lower end of which terminates at a removable sectional floor lining 3 supported on a crib bottom 4.

Both the floor or bottom 4 and the floor lining 3 are provided with openings which register with one another to provide a discharge opening 5 which is adapted to be closed by means of a door 6 pivotally supported on a shaft 7 to which either a manually operable or an automatic door control mechanism may be connected for opening and closing the door 6 of the crib. Mounted beneath the crib bottom 4 below the opening 5 is a material discharge chute 8. The supporting base for the crib has been omitted and may be of any selected construction.

Projecting upwardly through the center of the crib floor 4 and the lining 3 is a vertical turret 9 in which a vertical driven shaft 10 is journaled in suitable heavy duty bearings. The driven shaft 10 projects downwardly through an oil tight gear housing 11. Keyed or otherwise secured on the driven shaft 10 within the gear housing 11 is a large gear 12 which is driven by a small gear or pinion 13 which is secured on an intermediate or secondary vertical shaft 14 which is journaled in suitable bearings forming a part of the gear housing 11. Also secured on the intermediate or auxiliary shaft 14 is a bevel gear 15 which is driven by a bevel driving pinion 16 disposed within the gear housing 11 on the inner end of a driving shaft 17 which may be driven by a motor or other suitable driving source.

The driven shaft 10 projects upwardly through the turret 9 and into the lower portion of the crib 1. Keyed or otherwise secured on the upper or inner end of the shaft 10 is a channel shaped cross-head 18 which is open at both ends and at the top and provides a vertical guide channel or recess 19 in said cross-head 18 which is rotatable by the shaft 10.

The cross-head 18 serves as a guide means and as a guide for a mulling unit which is vertically slidable in the guide channel or recess 19 and is also permitted pivotal movement within the cross-head as hereinafter more fully described. The mulling unit comprises a cylindrical sleeve or collar 20 having two parallel spaced arms 21 projecting upwardly therefrom and supporting a pivot pin 22. Projecting through the sleeve or collar 20 is a muller supporting shaft 23 (Fig. 4). Rotatably journaled on the end portions of the muller shaft 23 are reversible types of mullers 24 which are rotatably held in place between outer caps 25 and inner collars 26. Secured or mounted on the muller shaft 23 between the inner collars 26 and the flanged ends of the sleeve 20 are rectangular guide blocks 27 which are disposed within the guide space or recess 19 of the cross-head 18 as clearly illustrated in Fig. 1. It will thus be noted that when the cross-head 18 is rotated by the shaft 10 that the entire mulling unit

is also adapted to be simultaneously rotated through the medium of the guide blocks 27 so that the mullers 24 are caused to follow circular paths around the interior of the crib 1 permitting the mullers to rotate on their bearings and ride over any materials which are disposed within the crib 1 to impart an intensive mulling, rubbing, kneading or smearing action to the materials during the process of conditioning new foundry sand or reconditioning inert used foundry sand in the crib.

The materials deposited in the crib are subjected to the action of an outer scraper or plow 28 and an inner scraper or plow 29 which are respectively mounted on a long arm 30 and a short arm 31 which are supported on the cross-head 18 and move the respective scrapers or plows through predetermined paths to impart a shoveling and turning action to the materials and to move the materials in front of the mullers for a mulling treatment.

During the mixing and mulling process by the action of the plows and the mullers, the mullers roll over the materials. The mullers rolling over the material cause the entire mulling unit to slidably move upwardly within the recess 19 of the cross-head 18 and normally produce a pressure on the materials being mulled in an amount equal to the weight of the mullers in addition to the weight of the other members forming part of the mulling unit. In the treatment of certain materials or mixtures it may become necessary to increase the pressure on the materials or to decrease the pressure of the mulling unit. To accomplish this requirement the present invention is provided with a means for varying the pressure of the mulling unit.

The improved mixer of this invention therefore includes an air or liquid controlled pressure regulating mechanism which is supported on the cross-head 18 and consists of a top plate or cover 32 which is secured on the top of the cross-head 18. Integrally formed on the cross-head cover 32 is a cylindrical turret 33, the upper end of which is closed by means of a top wall 34 (Fig. 3) which is centrally apertured or provided with an opening to serve as a guide for a piston shaft 36 which slidably projects through the wall 34 and through the turret 33 into the recess 19 of the cross-head 18. Pivotaly connected to the lower bifurcated end of the piston rod 36 by means of a pivot pin 37 is the upper end of a connecting link 38, the lower end of which is pivotaly connected to the pivot pin 22 of the mulling unit. The upper closed end of the turret 33 is formed with a pipe elbow 35, one end of which opens out through the side of the upper portion of the turret 33 while the other end of said elbow opens up into the bottom of a cylinder 39 which is rigidly supported on top of the turret 33. Slidably mounted within the pressure cylinder 39 is a piston head 40 which is supported on the upper end of the piston rod 36 and is provided with suitable packing rings or collars to insure a tight sliding fit within the pressure cylinder 39.

The pressure cylinder 39 is provided with a cap or closure head 41 having an opening in one side thereof communicating with the upper chamber of the pressure cylinder 39 as clearly illustrated in Fig. 3. One end of a pipe 42 is secured in the opening in the cylinder cap 41 while the other end of the pipe 42 is connected to a standard type of four way control valve 43 which is provided with a valve stem 44 to permit operation of the two passaged plug of the valve. One of the arms 43a of the valve 43 is

open to serve as a pressure release or exhaust for one chamber of the cylinder 39 when a pressure medium enters the other chamber on the opposite side of the piston head 40. Also connected to the control valve 43 is one end of a pipe 45, the lower end of which is connected through an elbow 46 to the pipe 47 which connects with the elbow 35 in the turret 33.

The control valve 43 also has connected therewith one end of an air or liquid feed pipe 48, the other end of which projects into an opening formed in one side of a sleeve 49 which is integrally formed on top of the cap 41 and is provided with an air or liquid feed chamber 50 to receive a pressure controlling fluid such as air or a liquid such as water for governing the operation of the piston 40 within the pressure control cylinder 39. Communicating with the upper end of the sleeve 49 is the lower flanged end of an air or water supply pipe 51. The pipe 51 is connected up with any suitable type of air or liquid pressure regulator for supplying the required air or hydraulic pressure for governing the operation of the piston mechanism so that the pressure exerted by the mulling unit connected to the end of the piston shaft 36 through the link 38, may be varied to cause the mullers to exert different degrees of pressure on the materials being worked on within the crib 1 without necessitating replacement of the mullers by mullers of different weights or sizes or without requiring the addition or subtraction of weights from the mullers which expedient sometimes has been employed in certain types of mixers and mulling machines.

As clearly illustrated in Fig. 3, the air or water supply pipe 51 is stationary and projects upwardly through suitable packing members within a rotatable sleeve or collar 52 which is rigidly supported upon the upper end of the sleeve 49. Supported on a flanged portion of the collar or sleeve 52 and surrounding the same is a water or liquid supply tank or funnel 53. Connected to the bottom of the tank or funnel 53 are two liquid supply pipes 54 which extend downwardly and project into the crib 1 to supply the necessary liquid, such as water or oil to the ingredients within the crib to facilitate proper moistening of the mixture to uniformly coat the sand grains with the required thin film of the bonding material to produce a properly conditioned or reconditioned, as the case may be, sand which may be used for molding purposes and the like.

The improved mixer hereinbefore described is of a type wherein a pressure exerted by the mulling unit on the material within the crib 1 may be varied as desired by either the use of air or water as a medium for operating the piston mechanism which is connected with the mulling unit of the machine. By operating the control valve 43 the pressure producing medium may be permitted to flow from the pipe 51 and chamber 50 through the pipe 48 into the pipe 42 to enter the pressure cylinder 39 above the piston 40 thereby causing the same to move downwardly to exert a predetermined pressure on the mulling unit within the crib.

If it is desired to ease up or reduce the pressure exerted by the mulling unit, the entire mulling unit may be lifted a predetermined amount by operating the control valve 43 to shut off the entrance of the pressure producing medium through the pipe 42 and causing the pressure producing medium to flow downwardly

from the pipe 48 through the valve and the pipes 45 and 47 into the pressure cylinder 39 through the elbow 35 into the bottom chamber of the cylinder 39 beneath the piston head 40 to cause elevation of the piston head and the entire mulling unit within the crib.

With either the downward pressure control movement on the mulling unit or the lifting movement of the mulling unit, said unit is guided in the cross-head recess 19 and is permitted to pivot on the pivot pin 22 in case one of the mullers encounters a greater depth of material than the muller on the opposite end of the muller carrying shaft. By means of the pressure control mechanism which may be operated either by air pressure or by hydraulic means, the piston mechanism within the pressure cylinder 39 may be moved downwardly to cause pressure to be exerted on the mulling unit to a selected degree. With the arrangement described light weight mullers may be used so that the pressure exerted thereby may be increased or decreased by a proper operation of the control valve 43 which governs the operation of the pressure supplying mechanism connected with the mulling unit.

In case it is desired to lighten the pressure exerted on the material within the crib, the control valve 43 is operated to shut off the air pressure entrance to the pipe 42 and open the entrance to the pipe 45, thereby permitting the pressure medium to enter the bottom of the pressure cylinder 39 beneath the piston head 40 to raise the same and thereby elevate the mulling unit so that the entire weight of said unit is not exerted upon the material being treated within the crib 1. When the air pressure is shut off to the pipe 42 by the operation of the passaged plug of the valve 43, the air above the piston head 40 is permitted to exhaust through the valve arm 43a.

While the mixer herein described has been primarily designed and perfected to provide an improved means for processing or conditioning foundry sand or for the treatment of previously used inert foundry sand to recondition the same, it is to be understood that the mixer may be used for making battery paste and other mixtures.

It will, of course, be understood that various details of construction may be varied through a wide range without departing from the principles of this invention and it is, therefore, not the purpose to limit the patent granted hereon otherwise than necessitated by the scope of the appended claims.

I claim as my invention:

1. In a mixer, a material carrying crib, a power driven recessed cross-head rotatably mounted therein, a muller shaft projecting through the recess in the cross-head, mullers journaled on the ends of said shaft, a bearing unit on said shaft between said mullers and vertically movable in the recess of said cross-head, a piston mechanism connected with the bearing unit for raising and lowering the same, and pressure means for operating the piston mechanism for varying the degree of pressure exerted by the mullers on the material in the crib.

2. A foundry sand mulling and mixing machine comprising a crib for receiving a quantity of foundry sand and bonding materials, a door for controlling the discharge of materials from the crib, a gear unit beneath the crib, means for operating the gear unit, a driven shaft connected with the gear unit and projecting into

the crib and rotatable by the gear mechanism, a cross-head in the crib supported on the driven shaft to be rotated thereby, said cross-head having a guide recess therein, plow means supported on the cross-head and rotatable therewith, a shaft housing movably mounted in the recess of the cross-head, a muller shaft supported by and projecting through the shaft housing and through the cross-head, mullers journaled on the ends of the muller shaft, a liquid controlled pressure unit supported on the cross-head, a link pivotally connected thereto and to the shaft housing to raise or lower the mullers for varying the pressure exerted by the mullers, a liquid supply container supported on the fluid controlled pressure mechanism, and liquid feed pipes connected to the container and projecting into the crib for delivering liquid to the sand and bonding agents in the crib to produce a properly conditioned molding sand by the mulling and mixing actions of the plows and mullers on the materials within the crib.

3. A material mixing and mulling mixer for conditioning foundry sands and the like, said mixer comprising a crib, means for emptying the crib, a recessed cross-head in the crib, power driven means for rotating the cross-head, mixing means carried by the cross-head, a mulling unit slidably and pivotally engaged in the cross-head and rotatable thereby, a piston mechanism supported on the cross-head, means connecting the piston mechanism with the mulling unit, a source of pressure fluid connected with the piston mechanism, and a control valve in the pressure fluid system for actuating the piston mechanism downwardly against the mulling unit to increase the normal weight pressure exerted thereby, said piston mechanism also operable by the pressure fluid with a manipulation of the control valve to cause the piston mechanism to raise the mulling unit in the cross-head to reduce the normal weight pressure adapted to be exerted by the mulling unit upon materials being treated in the crib.

4. A material treating machine comprising a crib, a cross-head therein having a guide recess, means for rotating the cross-head in the crib, a muller shaft housing in the cross-head, a muller shaft projecting through the housing and through the cross-head, guide blocks on the muller shaft adjacent the ends of the housing and contacting opposite walls of the cross-head, mullers journaled on the muller shaft to the outside of the guide blocks, a double acting pressure fluid controlled piston mechanism supported on the cross-head and connected with the muller shaft housing for raising and lowering the same with respect to the cross-head, and a control valve for governing the flow of the pressure fluid into and out of the piston mechanism to cause increase of the normal pressure exerted by the mullers and further adapted to cause elevation of the mullers to reduce the normal weight pressure of said mullers.

5. In a mixing machine including in combination a stationary material containing crib, a driving shaft journaled therein, a cross-head on said shaft within the crib, a muller unit disposed within the cross-head, means for rotating the cross-head and the muller unit to cause the muller unit to mull the materials in the crib, mixing means operated by the cross-head, and a fluid pressure mechanism on the cross-head and connected to hold the muller unit suspended in the cross-head and operable to increase the

pressure exerted by the muller unit by exerting a downward pressure thereon and furthermore adapted to reduce the normal weight pressure exerted by the muller unit by elevating the same in the cross-head and in the crib.

6. The combination with a stationary material mixing and mulling machine crib, of mixing and mulling mechanisms rotatably mounted in the crib, means for driving said mechanisms, a link pivotally connected to the mulling mechanism, a piston mechanism supporting said link and the mulling mechanism, and a double acting pressure means for operating the piston mechanism for increasing and decreasing the pressure exerted by the mulling mechanism on the material being treated in the crib.

7. In a mixer, a material carrying crib, a power driven head rotatably mounted therein, a muller shaft projecting from said head, power driven mullers journaled on said shaft, a bearing unit on and rotatable with said shaft between said mullers and vertically movable in said head, a mechanism connected with the bearing unit for raising and lowering the same, and pressure means rotatable with said shaft and head for operating said mechanism for varying the degree of pressure exerted by the mullers on the material in the crib.

8. A material mulling and mixing machine comprising a mulling and mixing crib provided with a material discharge means, a shaft projecting upwardly into the crib, means for driving the shaft, a recessed cross-head on the upper end of said shaft and rotatable thereby, a muller unit shiftably and pivotally movable in said recessed cross-head and rotatable thereby, plow means carried by the cross-head and rotatable therewith, and fluid controlled pressure operating means on the cross-head and pivotally suspending the mulling unit in the cross-head and operable for varying the pressure exerted by the mulling unit.

9. A machine of the class set forth comprising a crib for carrying ingredients which are to be mulled, in combination with a driven cross-head within the crib, a muller unit projecting through the cross-head and rotatable thereby, and a fluid operated piston means supported on the cross-head for pivotally suspending and applying pressure to the muller unit to increase the normal weight exerting pressure thereof on the ingredients as they are being mulled.

10. In a material mixer including in combination a mulling unit comprising a power driven recessed cross-head, a pivotally suspended shaft housing vertically and pivotally movable in said cross-head, a shaft projecting through the housing, mullers journaled on the ends of said shaft and movable with the shaft housing, a rotatable piston mechanism pivotally connected to and carrying the housing, and means on the cross-head for operating the piston mechanism for varying the pressure exerted by said mullers.

11. In a mixer including in combination a mulling mechanism comprising a rotatable recessed cross-head, a mulling unit slidably and pivotally movable in the recessed cross-head, and a double acting fluid operated mechanism supported on the cross-head and rotatable therewith and pivotally connected to suspend the mulling unit therein and operable to increase and decrease the normal weight pressure adapted to be exerted by the mulling unit.

12. In an apparatus for mulling foundry sand and the like to condition the same without pul-

verizing the particles of sand, means for confining and supporting in a horizontal plane a stationary batch of sand to be treated, a shaft, a slidable and pivotal support for the shaft, spaced mulling rolls on the shaft arranged vertically to engage opposite portions of the horizontally supported batch of sand, said mulling rolls being pivotally suspended for relative vertical movement in opposite directions depending upon the contour of the stationary horizontal 10

batch of sand, rotatable fluid pressure means pivotally suspending the shaft support for controlling the pressure exerted by said mulling rolls on the sand and constructed and arranged so that more or less pressure may be applied to the sand than the normal weight pressure of the mulling rolls in contact with the sand, and driven means supporting the fluid pressure means to rotate the same and the shaft support.

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