H. G. BOUGHTON.

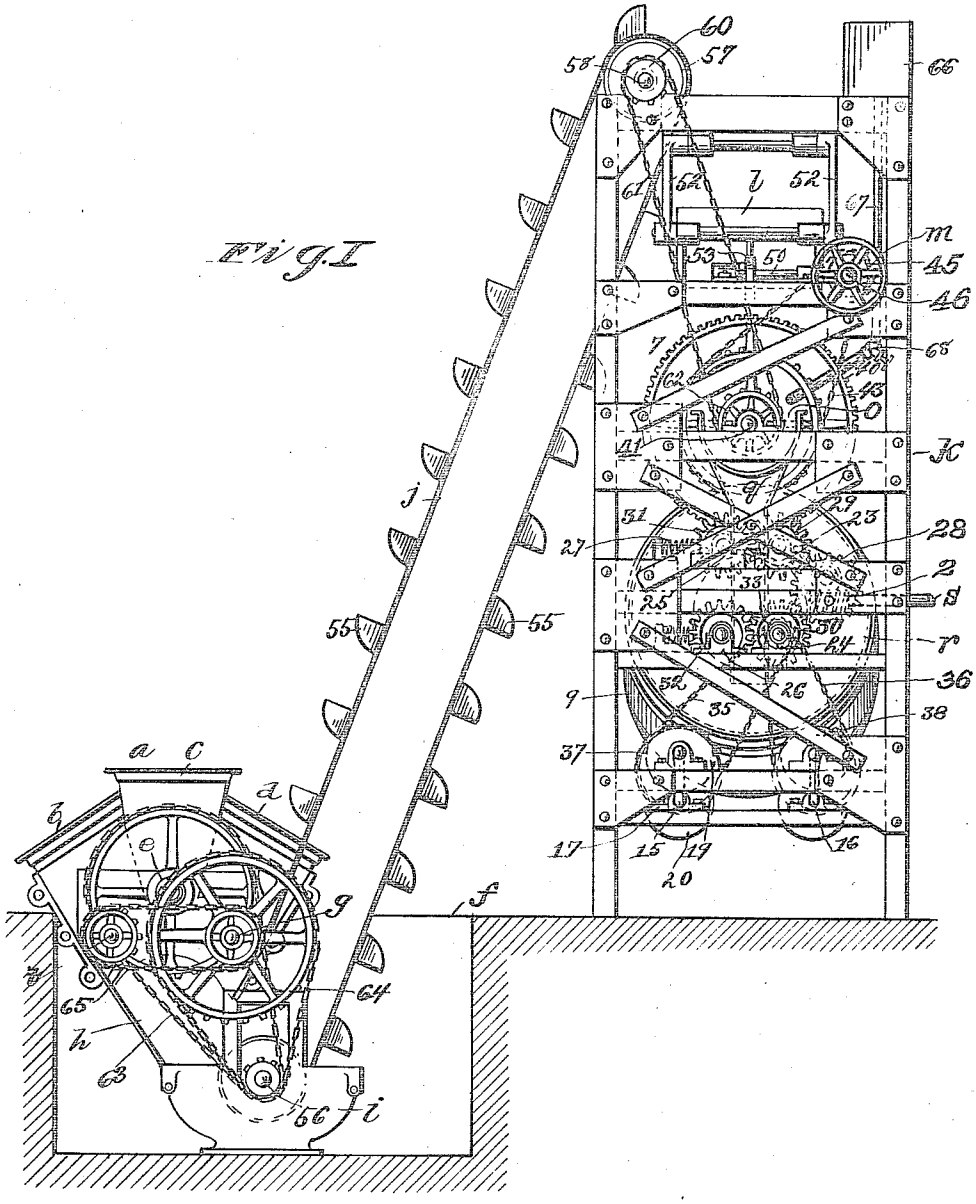
MIXING AND BLENDING MACHINE.

APPLICATION FILED MAR. 13, 1909.

957,646. Patented May 10, 1910.

3 SHEETS—SHEET 1.

Fig. 1.



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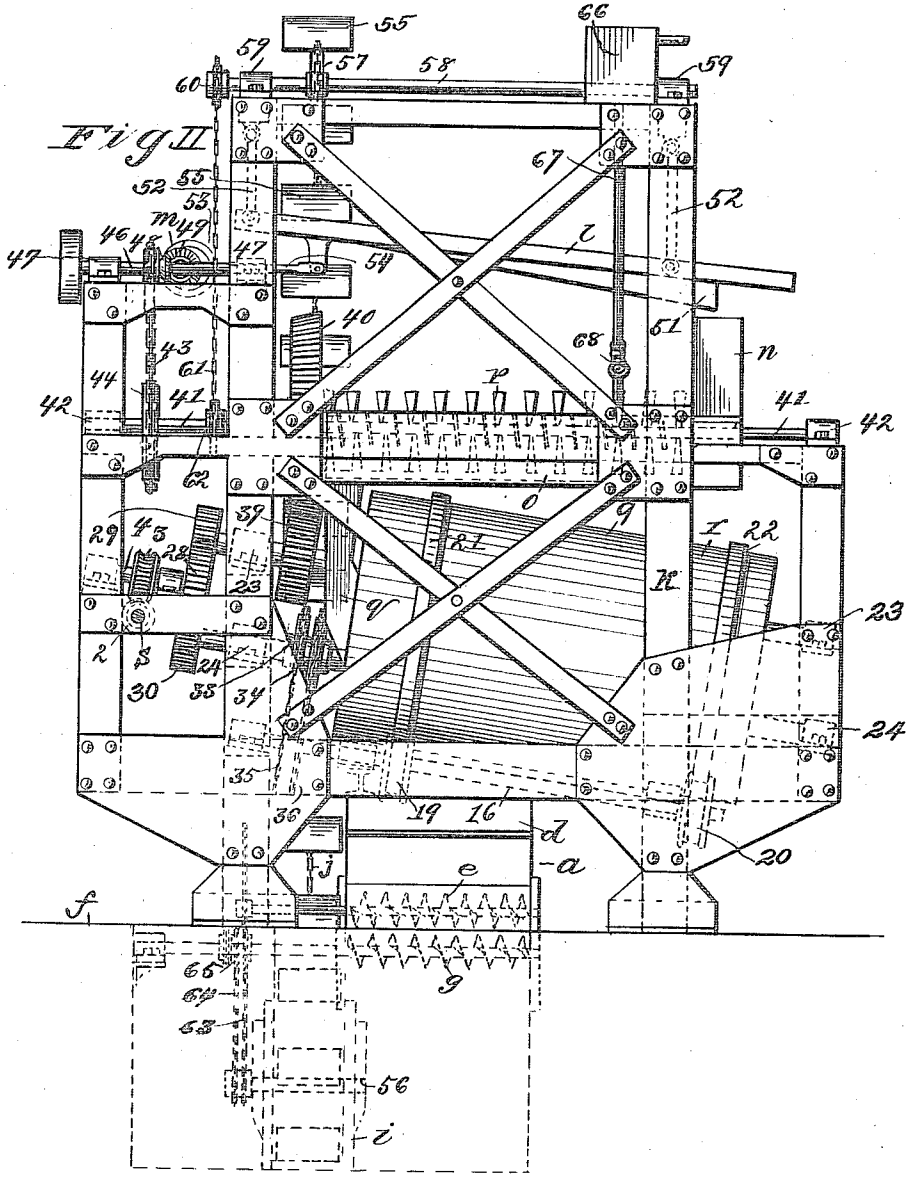
3 SHEETS—SHEET 2.

Fig II



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3 SHEETS—SHEET 3.

Fig. III

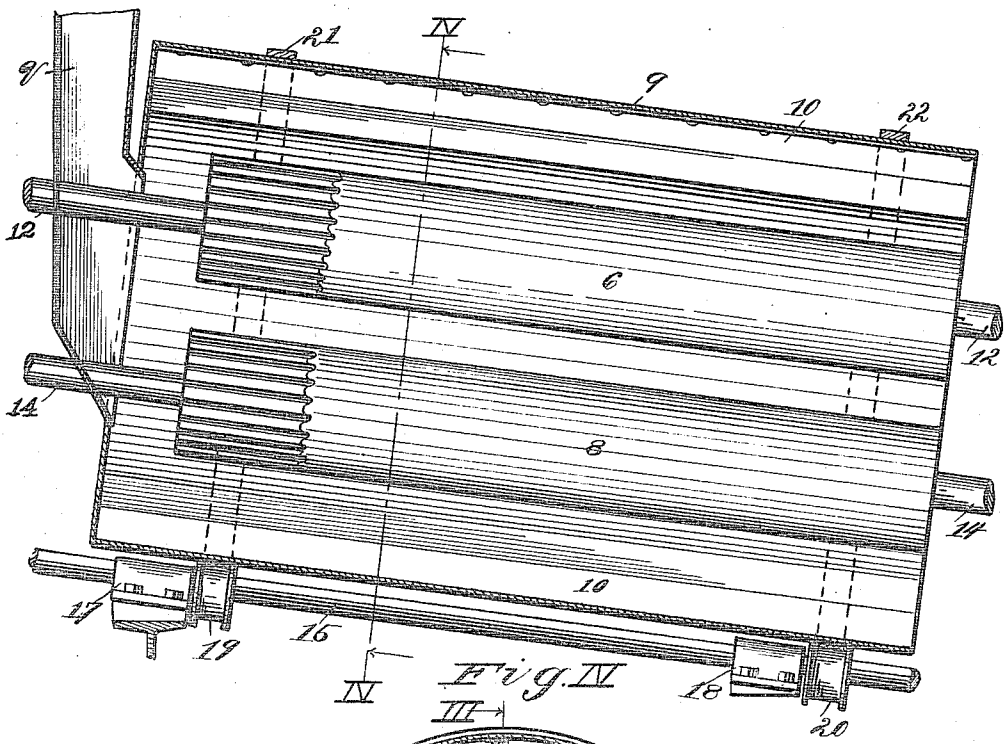
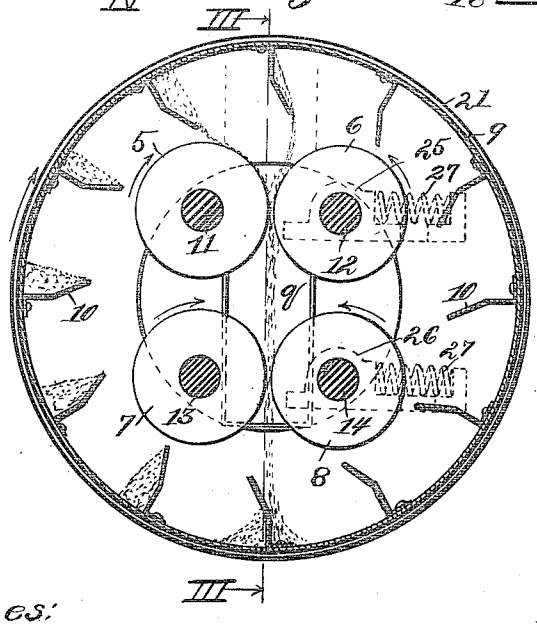


Fig. IV



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UNITED STATES PATENT OFFICE.

HORACE G. BOUGHTON, OF CLEVELAND, OHIO.

MIXING AND BLENDING MACHINE.

957,646. Specification of Letters Patent. Patented May 10, 1910.

Application filed March 13, 1909. Serial No. 483,333.

To all whom it may concern:

Be it known that I, HORACE G. BOUGHTON, a citizen of the United States, residing at Cleveland, in the county of Cuyahoga and State of Ohio, have invented certain new and useful Improvements in Mixing and Blending Machines, of which the following is a specification.

This invention relates to machines for mixing and blending granular and powdered materials.

The primary object of my present invention is to provide apparatus capable of receiving various granular or powdered materials, and accomplishing a more uniform and intimate mixture thereof with less power and with greater output than has been known heretofore.

The apparatus shown herein is particularly adapted to the proportioning, mixing and blending of silica sands and clays for use in steel foundries; also for tempering, proportioning, mixing and blending sands and compounds for cores and facings in foundry practice; but it may also be employed for the intimate mixture of any granular or powdered materials whatever.

A further object of the invention is to provide mechanism capable of increasing the output of dry or damp mixtures to the extent of two or three volumes with an expenditure for power and attendance of not more than one fourth, as compared with the well known dry pan apparatus.

To these ends my invention consists in the features, arrangements and combinations hereinafter described and claimed, an embodiment thereof especially arranged for mixing sands and clays being illustrated in the accompanying drawings in which—

Figure I is an end elevation of the apparatus with the base sectioned to show the multiple hopper and auger feeds, and the lower end of the elevator. Fig. II is a side elevation of the machine. Fig. III is a longitudinal section of the blender drum, or finishing device of the mixing apparatus, taken on line III—III of Fig. IV. Fig. IV is a cross section of the blender taken on line IV—IV of Fig. III.

Briefly stated, the apparatus comprises an auger feed proportioning device *a*, having three hoppers *b*, *c* and *d* for receiving the materials to be mixed. In the bottom of each of said hoppers is a screw conveyer, as shown at *e*, *g* and *t*, Figs. I and II, which reduce the lumps in said material and gradually carry the same to the forward ends of the hoppers, where the latter communicate with a chute *h* leading down into the boot *i* of the elevator *j*. Said elevator boot is placed below the main floor *f*, as shown, so that the materials to be mixed may readily be introduced into the hoppers.

The balance of the apparatus is supported above the floor *f* in a suitable structural framework *k*, upon the top of which the upper wheel of the elevator *j* is mounted. A screen *l* disposed to receive material from the elevator is suspended from the upper part of the frame *k*, and is agitated by a shaking mechanism *m*. A chute *n* leads from the screen to a mixing trough *o* in which is a shaft 41 provided with mixing paddles *p*. From the other end of said mixing trough a chute *q* leads down into the higher end of the inclined rotatable blender *r*, in which the material is most thoroughly mixed and blended together before it falls from the lower end of said blender ready for use.

The general arrangement of the mechanism should now be understood, but I will proceed to describe it in detail.

The entire apparatus is operated by power applied to the rotatable drive shaft *s*, which is supported in the frame *k*, and has a worm gear 2 fixed thereon engaging the worm wheel 3 on shaft 4 mounted in the frame above said drive shaft. The blender *r* comprises two sets of pressure rolls, the upper pair 5, 6, and the lower pair 7, 8, which are surrounded by a parallel cylindrical shell 9 having a number of lifting plates 10 extending lengthwise of its interior, as plainly shown in Figs. III and IV. Said lifting plates are preferably bent in the direction of the revolution of the cylinder, as shown, so that they act as buckets for raising material from the bottom to the top sides of the cylinder 9, and for discharging it between the upper pair of rolls 5 and 6. The cylinder 9 is inclined so that the material gradually traverses it by gravity, its upper forward end being closed in, except for a large central opening communicating with the chute *q;* and its lower discharging end is preferably left open, as shown, but may communicate with any sort of chute for guiding the finished material to any place desired. Two trundle shafts 15 and 16 are rotatably mounted beneath the drum 9 in suitable bearings 17 and 18 on the frame *k*,

and each of said shafts has two flanged trundle wheels 19 and 20 fixed thereon which support and drive the rings 21 and 22 attached to and encircling the drum 9. The rolls 5, 6, 7 and 8 are preferably corrugated for a short distance at their forward ends, Fig. III, so as to grip and reduce whatever coarse material may have reached them, and they are secured respectively on the rotatable shafts 11, 12, 13 and 14, which shafts extend out of both ends of the drum 9 and are supported in bearings in the frame *k*. The bearings 23 and 24 for the shafts 11 and 13 are fixed to the frame; but the bearings 25 and 26 for the shafts 12 and 14 are arranged to slide a little way horizontally and transversely, being normally held by springs 27 at their inner position, so that the roll 6 is pressed by the springs against the roll 5, and the roll 8 against the roll 7, but each pair of rolls may separate sufficiently to permit the material to pass under pressure of the springs. On the shaft 4 is fixed a spur gear wheel 28 which engages the gear wheels 29 and 30 secured respectively on the roll shafts 11 and 13. Said gears 29 and 30 mesh respectively with gears 31 and 32 secured on the spring-roll shafts 12 and 14. Two sprocket wheels 33 and 34 on the roll shaft 13 are fitted with chain belts 35 and 36 passing respectively over the chain wheels 37 and 38 on the respective trundle shafts 15 and 16. Thus it will readily be seen how the two pairs of blender rolls are driven, and also how its shell 9 is revolved. A spur pinion 39 on the roll shaft 11 meshes with a bevel gear wheel 40 on the shaft 41 which carries the mixing paddles *p*, and this serves to rotate said paddles in their trough *o*, the shaft 41 being mounted in bearings 42 on the frame *k*. The mixing paddles *p* are set at different angles, but the greater number of them are arranged to work the material gradually toward the discharging end of the trough *o*.

The shaker *m* for the screen *l* is driven from the shaft 41 preferably by a chain, or belt, 43 passing over the wheels 44 on shaft 41 and 45 on the drive shaft 46 of the shaker, the latter shaft being rotatably supported in bearings 47, and provided with a bevel gear 48 in mesh with the gear 49 on the shaker shaft 50. The screen *l* is a trough slightly inclined, as shown, having a perforated or woven wire bottom, as may be most suitable for the kind of material to be handled, and carrying a catching and discharging chute 51 beneath it to catch the screened material and lead it to the chute *n*. Said screen is suspended from the upper part of the frame *k* by the four depending arms 52, so that it may be shaken by swinging it lengthwise. An eccentric 53 on the shaft 50 is operatively connected with the screen *l* by a connecting rod 54, which arrangement swings the screen back and forth. A tank 66 for water, or other liquid, may be placed on the frame *k*, having a pipe 67 leading to the entrance end of the mixer *o*, and a suitable valve 68 should be interposed in said pipe to regulate the amount of liquid fed to the mixer. By this means the dry mixture may be dampened, or tempered as foundrymen express it, or worked up with any liquid.

The elevator *j* may be of any well known type having an endless belt or chain with buckets 55 secured thereto and dipping into the boot *i* where said belt passes around a pulley on the shaft 56 rotatably mounted in said boot. At its upper end the elevator *j* is driven and upheld by a pulley 57 on the shaft 58 rotatably mounted in bearings 59 on the frame *k*, and provided with a sprocket wheel 60. A chain 61 drives the wheel 60 from a chain wheel 62 on the mixer shaft 41.

It will be obvious to those skilled in the art that the screw conveyers *e*, *g* and *t* in the bottoms of the receiving hoppers *b*, *c* and *d* in the auger feed device *a* are driven by the endless chains 63, 64 and 65 from the shaft 56, as plainly shown in Figs. I and II. The driving means of the entire apparatus should now be understood, bearing in mind that a motor, pulley, or other means for rotating the shaft *s* is all that is required to effect the necessary movements of the whole machine.

In the operation of the machine, the separate materials to be mixed are delivered into the respective hoppers *b*, *c* and *d* of the feeder and proportioner *a*, wherein the proper proportioning of the materials is accomplished, and a fairly uniform delivery is secured to the boot *i* of the elevator *j*. Said proportioning depends upon the comparative sizes and speeds of the screw conveyers *e*, *g* and *t*, and is automatically accomplished regardless of the quantities of material dumped into the hoppers *b*, *c* and *d*. The elevator buckets dump their loads in successive substantially uniform quantities upon the screen *l*, wherein stones or lumps too large to pass through the screen fall out over its lower end, while the finer material passes through and falls by gravity on to the catching and discharging chute 51, sliding from thence into the chute *n* through which it falls into the mixing trough *o*. The rotary paddles *p* in said trough work the material into a finer and more complete mixture, at the same time accomplishing a very uniform delivery to the chute *q*, whence the mixture falls into the upper forward end of the blender *r*. At this stage the mixture has been roughly accomplished, but, unless the materials have previously been pulverized, small lumps will remain in them. The material falls to the bottom of the upper end of the blender

drum 9, whence it is carried up by the buckets 10, and fed between the corrugated ends of the upper pair of rolls 5 and 6, falling thence between the lower pair of rolls 7 and 8, and thence to the bottom of the drum again, but further along than its entrance position on account of the inclination of the drum and rolls. The buckets 10 carry it again to the upper side and feed it between the rolls, and this operation is repeated many times until the material, now thoroughly fined, mixed and blended together finally flows out of the rearward and lower end of the drum. The shell 9 takes the place of the usual plurality of elevators for feeding material to separate pairs of rolls.

It will thus be seen that a very intimate mixing and blending together of the materials is accomplished, and that, for this reason, a smaller proportion of bonding material may be used in this process than in any other. It will also be evident that the capacity of the machine is very large, that slight attendance is required, and that the various moving parts, being of light weight and carried in outside bearings, require but a small expenditure of power to operate them as compared with well known heavy and cumbersome mixing apparatus.

I further point out and distinctly claim as my invention—

1. In a mixing apparatus, the combination of a rotatable non-perforated cylindrical shell supported upon its rotating means having lifting buckets on its interior surface, a pair of rotatable blending rolls within said shell adapted to receive material to be blended from said buckets, means for rotating said rolls, and means for revolving said shell, substantially as set forth.

2. In a mixing apparatus, the combination of a rotatable non-perforated cylindrical shell supported upon its rotating means having lifting buckets on its interior surface, a plurality of pairs of rotatable blending rolls adapted to operate within said shell and to receive material to be blended from said buckets, means for rotating said rolls, and means for revolving said shell, substantially as set forth.

3. In a mixing apparatus, the combination of a rotatable cylindrical shell having lifting buckets on its interior surface and supported by its rotating means at an axial inclination from the horizontal, rotatable inclined blending rolls within said shell disposed parallel thereto and adapted to receive material to be blended by gravity from said buckets, and means for rotating said rolls and said shell, substantially as set forth.

4. In a mixing apparatus, the combination of a rotatable cylindrical shell having lifting plates on its interior surface and supported by its rotating means at an axial inclination from the horizontal, one or more pairs of rotatable inclined blending rolls disposed within and parallel to said shell and adapted to receive repeatedly the material to be blended by gravity from said lifting plates, and means for rotating said rolls and said shell, substantially as set forth.

5. The combination of a cylindrical shell supported by rotating means at an axial inclination from the horizontal, a plurality of lifting plates projecting from the interior surface of said shell, a pair of inclined blending rolls within and parallel to said shell disposed to receive material to be blended by gravity from said lifting plates, rotatable shafts for said rolls extending out of said shell, fixed bearings for one of said roll shafts, spring bearings for the other of said roll shafts adapted to press one roll against the other, and means for rotating said rolls, substantially as set forth.

6. The combination of a cylindrical shell supported by rotating means at an axial inclination from the horizontal, a plurality of lifting plates projecting from the interior surface of said shell, a plurality of pairs of inclined blending rolls set one pair above another within and parallel to said shell so disposed that material from said lifting plates is cascaded by gravity upon and between the upper pair of said rolls, rotatable shafts for said rolls extending out of said shell, fixed bearings for one of each pair of said roll shafts, spring bearings for the other of said roll shafts adapted to press one roll of each pair against the other, and means for rotating said rolls, substantially as set forth.

7. The combination of an inclined cylindrical shell supported by rotating means, a plurality of longitudinally disposed lifting plates upon the interior surface of said shell, means for feeding material to be blended into the higher end of said shell, one or more pairs of inclined blending rolls within and axially parallel to said shell adapted to receive said material by gravity from said lifting plates, rotatable shafts carrying said rolls and extending out of said shell, fixed bearings for one of each pair of said roll shafts, movable bearings for the others of said roll shafts, springs operating upon each of said movable bearings so as to press its roll against its mate, and means for rotating said rolls, substantially as set forth.

8. In a mixing machine, the combination with an inclined cylindrical shell having lifting buckets upon its interior surface and provided with rotating means, and one or more pairs of blending rolls operatively disposed within said shell, of a mixing trough above said shell, rotatable mixing and conveying means in said trough, and a chute connecting the outlet of said trough with

the inlet of said shell, substantially as set forth.

9. In a mixing machine, the combination with an inclined cylindrical shell having lifting buckets upon its interior surface and provided with rotating means, and one or more pairs of blending rolls operatively disposed within said shell, of a mixing trough above said shell, a liquid supply pipe for said trough having a suitable regulating valve therein, means for supplying substantially dry material to said trough, rotatable mixing and conveying means in said trough, and a chute connecting the outlet of said trough with the inlet of said shell, substantially as set forth.

10. In a mixing machine, the combination with an inclined cylindrical shell having lifting buckets upon its interior surface and provided with rotating means, and one or more pairs of blending rolls operatively disposed within said shell, of a mixing trough above said shell, a rotatable shaft in said trough provided with projecting paddles adapted to stir and convey along the trough material to be mixed, an outlet in said trough, an inlet in the higher end of said shell, and a chute connecting said outlet with said inlet, substantially as set forth.

11. In a mixing machine, the combination with an inclined cylindrical shell having lifting buckets upon its interior surface and provided with rotating means, and one or more pairs of blending rolls operatively disposed within said shell, of a mixing trough above said shell, rotatable mixing and conveying means in said trough, a chute from said trough to said shell, a screen and means for agitating it mounted above said trough, and suitable chutes adapted to convey material from the under side of said screen to the inlet end of said trough, substantially as set forth.

12. In a mixing machine, the combination with an inclined cylindrical shell having lifting buckets upon its interior surface and provided with rotating means, and one or more pairs of blending rolls operatively disposed within said shell, of a screen and means for agitating it mounted above said shell, and means for conveying material to be mixed from the under side of said screen to the inlet at the higher end of said shell, substantially as set forth.

13. In a mixing machine, the combination with an inclined cylindrical shell having lifting buckets upon its interior surface and provided with rotating means, and one or more pairs of blending rolls operatively disposed within said shell, of a screen suspended by swinging arms above said shell, an eccentric on a rotatable shaft near said screen, operative connections between said eccentric and said screen adapted to swing the latter, and suitable chutes disposed to receive material falling through said screen and convey the same to the inside of said shell, substantially as set forth.

In testimony whereof I affix my signature in the presence of two subscribing witnesses at Cleveland, Ohio, this 12th day of March, 1909.

HORACE G. BOUGHTON.

Witnesses:
MARGARET KEANE,
HOMER C. CAMPBELL.