No. 690,783. Patented Jan. 7, 1902.

T. L. SMITH.

MIXING MACHINE.

(Application filed Oct. 1, 1900.)

(No Model.)

3 Sheets—Sheet 1.

Fig. 1.

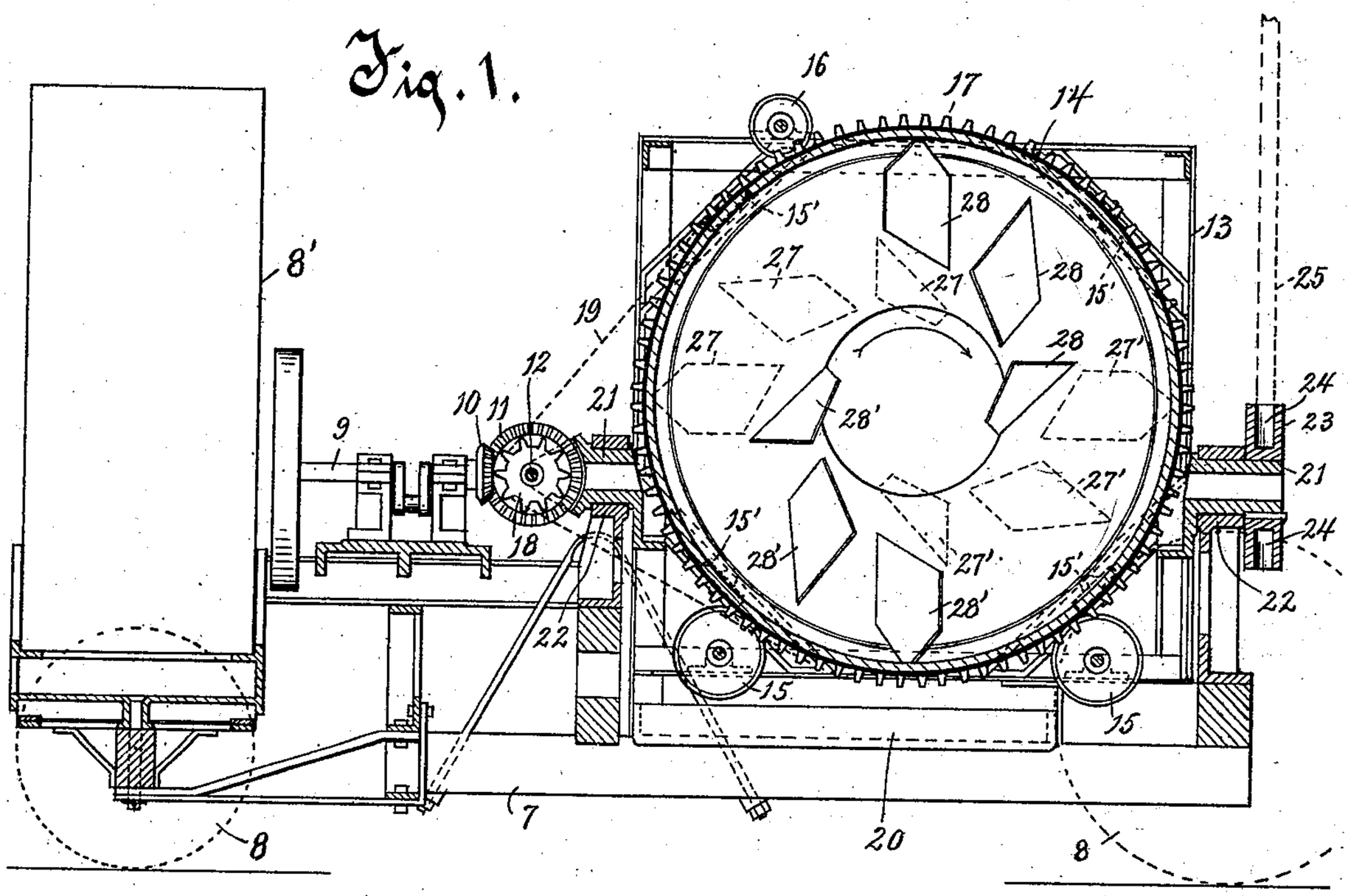
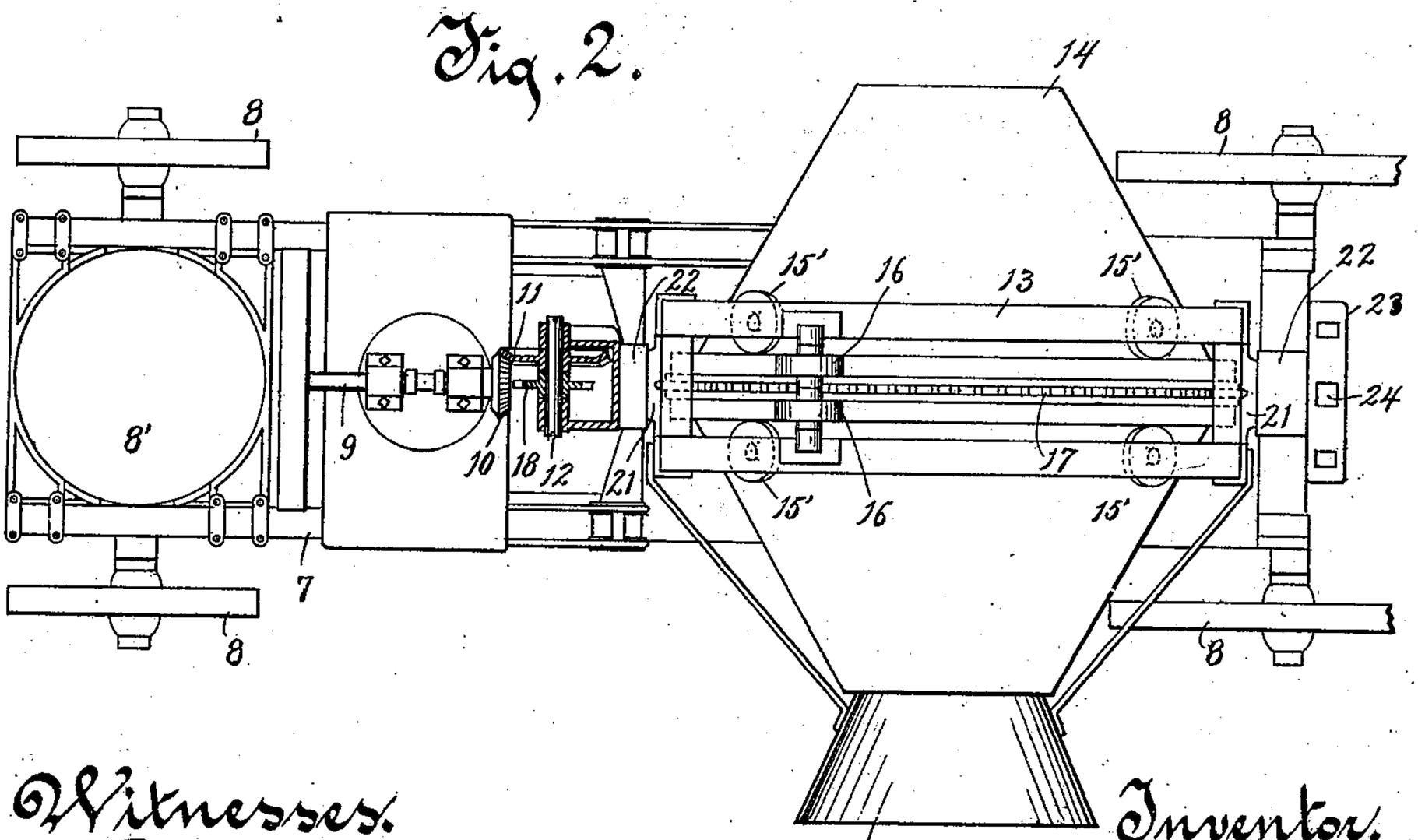


Fig. 2.



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(No Model.) 3 Sheets—Sheet 2.

Fig. 3.

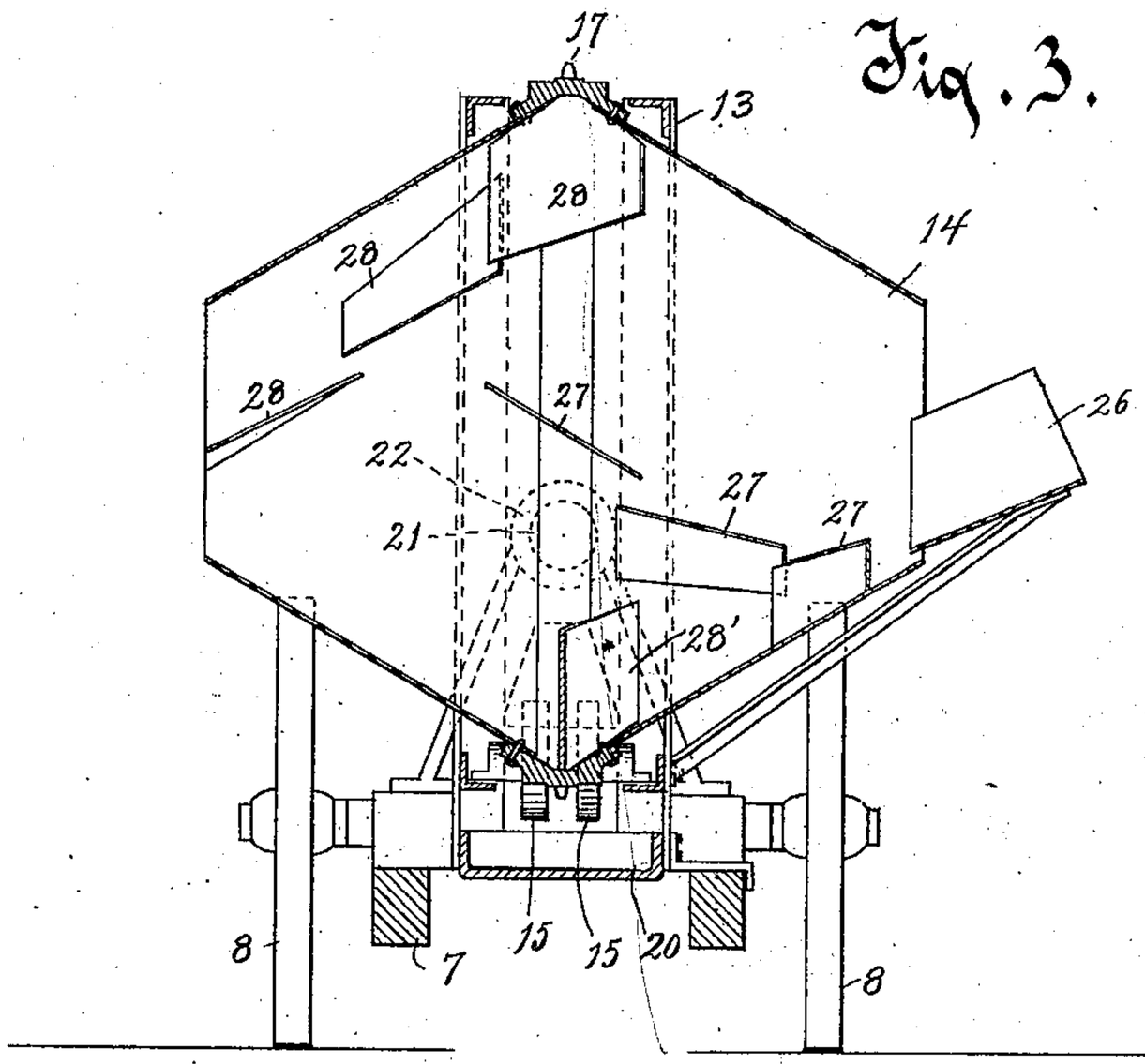
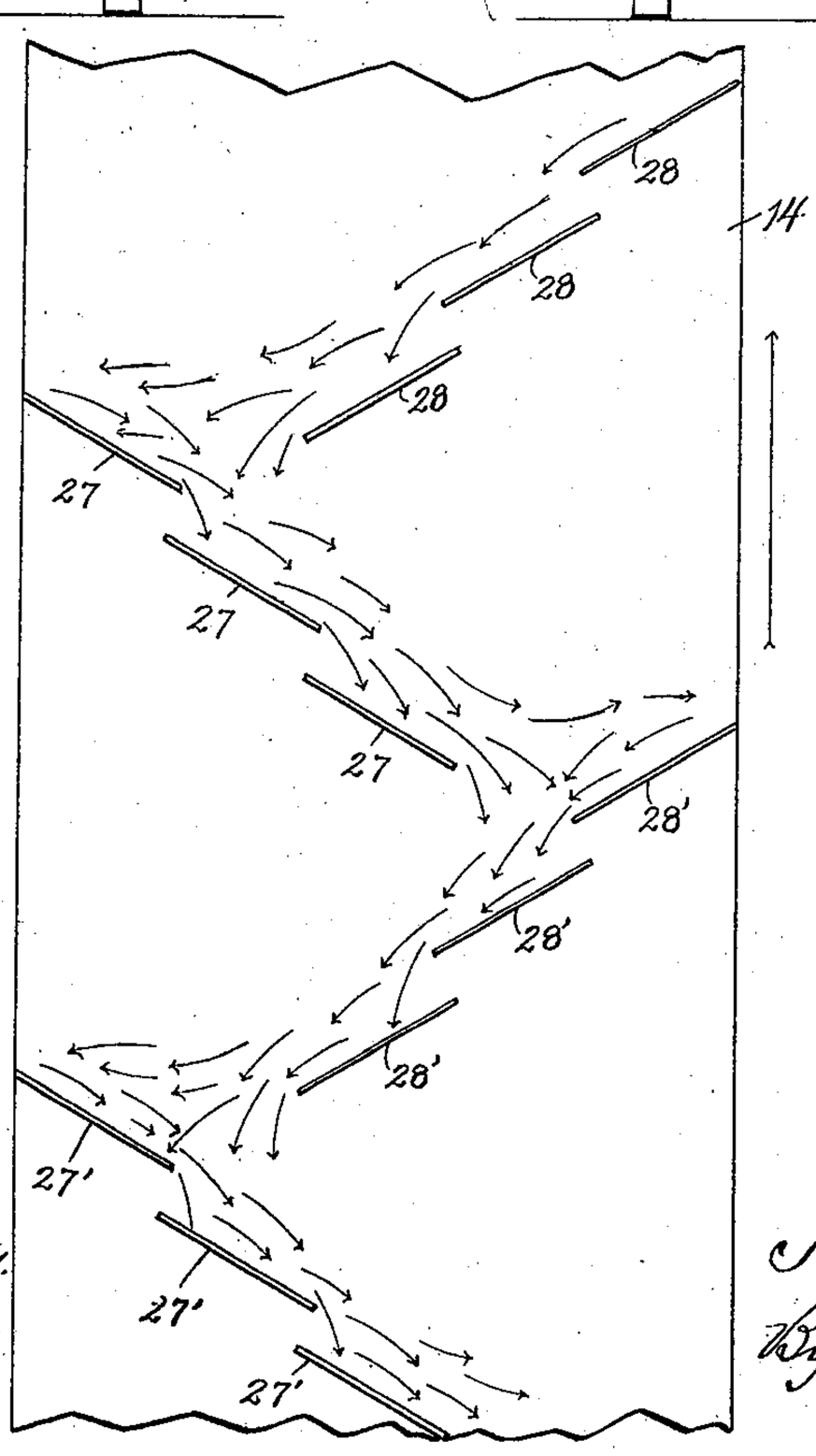


Fig. 4.



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(No Model.)

3 Sheets—Sheet 3.

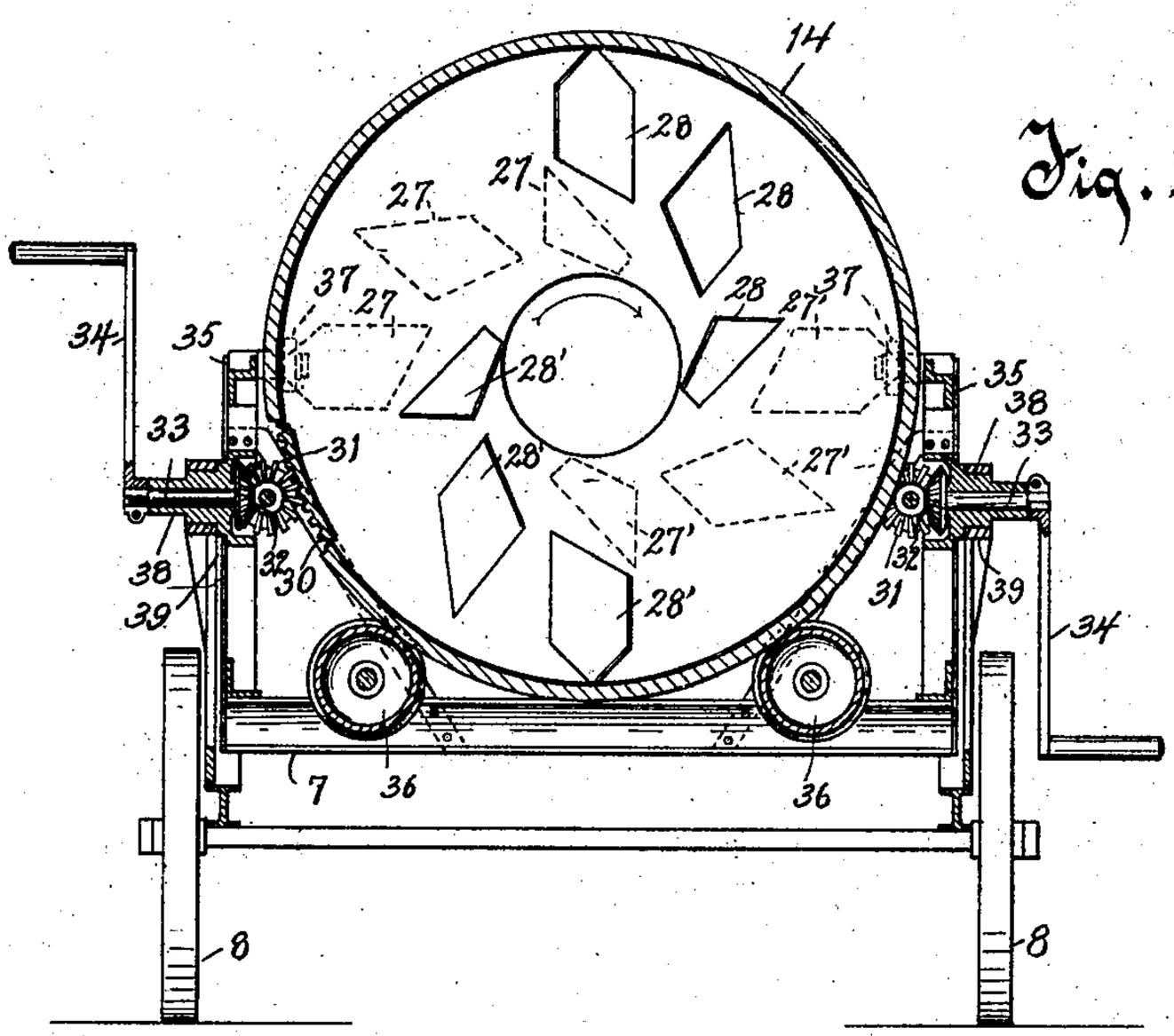

Fig. 5.

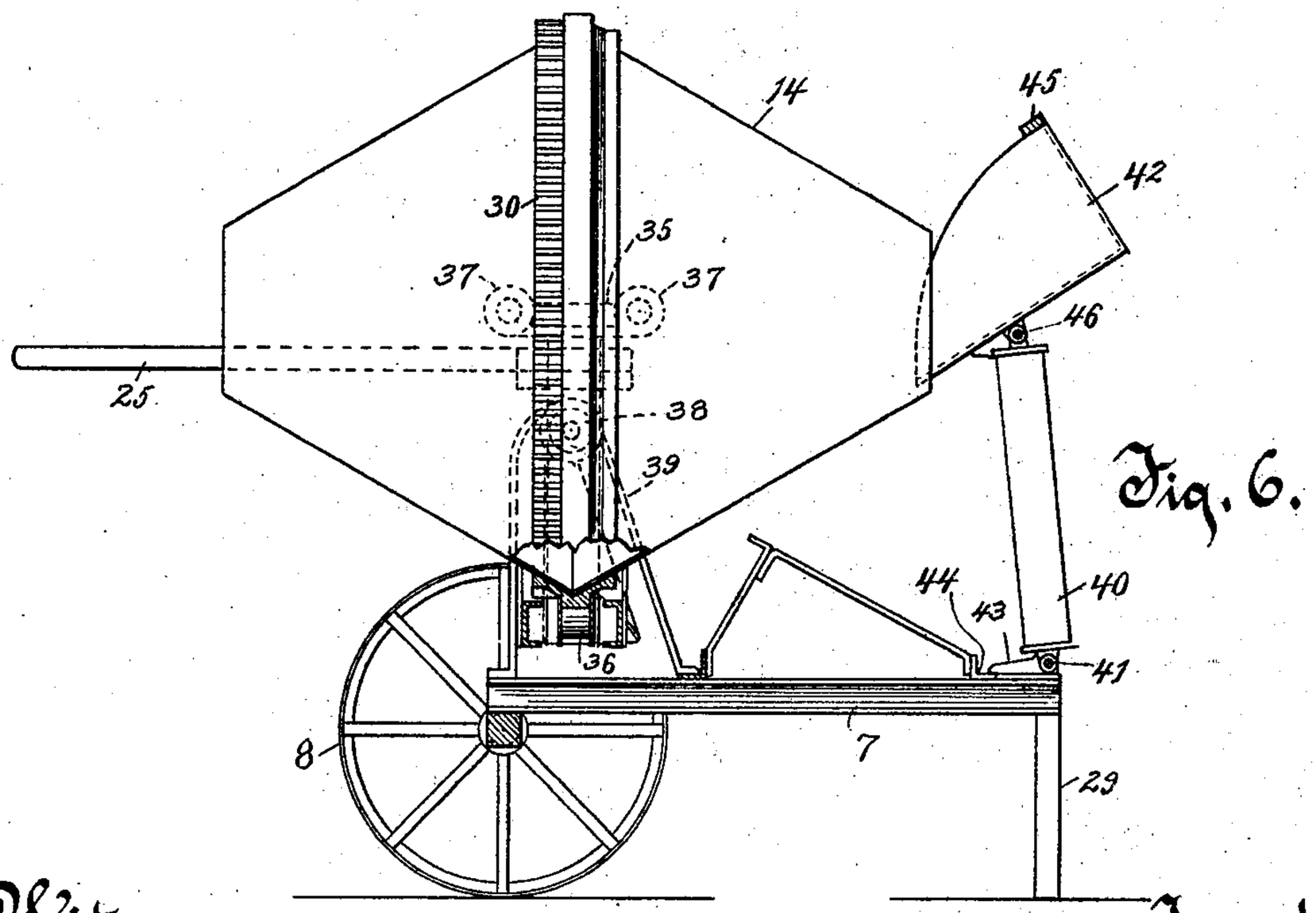

Fig. 6.

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UNITED STATES PATENT OFFICE.

THOMAS L. SMITH, OF MILWAUKEE, WISCONSIN.

MIXING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 690,783, dated January 7, 1902.

Application filed October 1, 1900. Serial No. 31,625. (No model.)

To all whom it may concern:

Be it known that I, THOMAS L. SMITH, of Milwaukee, in the county of Milwaukee and State of Wisconsin, have invented a new and useful Improvement in Mixing-Machines, of which the following is a description, reference being had to the accompanying drawings, which are a part of this specification.

My invention has relation to improvements in mixing-machines intended more especially for mixing concrete or other compounds used in paving materials and also adapted for mixing asphalt, mortar, and other materials, wet or dry.

The primary object of the invention is to provide a machine not only capable of mixing dry materials with great rapidity and thoroughness, but also of mingling dry and liquid materials to any consistency or mixing liquids and discharging any desired quantity while the agitating process is going on.

With the above primary object and other incidental objects in view the invention consists of the devices and parts or their equivalents, as hereinafter set forth.

In the accompanying drawings, Figure 1 is a central longitudinal section of the machine. Fig. 2 is a plan view, parts broken away. Fig. 3 is a central section through the drum. Fig. 4 is a view of the drum flattened, as if the drum were of true cylindrical form and not of the double-conical form shown, the view being shown in order to illustrate the theory of the operation of the drum and the interior mixing-blades thereof. Fig. 5 is a transverse section of a modified form of construction, and Fig. 6 is a side elevation of Fig. 5 with parts broken away.

Referring particularly to Sheets 1 and 2 of the drawings, the numeral 7 indicates a truck mounted upon front and rear wheels 8, so as to make the machine portable. Upon the front end of the truck is mounted an ordinary form of boiler 8′ for an engine mechanism. (Not shown.)

The numeral 9 indicates the crank-shaft of the engine mechanism, and on the rear end of this shaft is mounted a beveled pinion 10, which meshes with a bevel-gear 11, mounted on the short transverse shaft 12.

Mounted above the truck is a tiltable frame 13, said frame consisting of front and rear uprights and top and bottom connecting-pieces. Within this frame is supported a mixing-drum 14, said drum being preferably in the form of a double truncated cone with open ends, the bases of the cones being innermost and joined to each other to form a continuous drum and the truncated apices of said cones being outermost. The drum is supported and guided entirely by rollers bearing against the outside surfaces of the central ring provided for that purpose. The lower rollers 15 15 carry the weight of the drum and contents, the side rollers 15′ 15′ 15′ 15′ keep the ring and drum in proper relation to the tilting frame, and the top rollers 16 16 are for safety to prevent the drum from being accidentally thrown upward. It will be seen that the drum itself and its load are about balanced by reason of the rollers 15 being at or near the center, whereby the strain on the side or guide-rollers 15′ is reduced to the minimum. The bases of the cones are connected by an annular ring or band, said band having sprocket-teeth 17 arranged thereabout. The sprocket-teeth 17 are connected to a sprocket-wheel 18, mounted on the shaft 12, by means of a sprocket-chain 19. The ring or band therefore not only serves as a driving-ring, but also as a guiding-ring.

In the lower portion of the frame 13 is carried a box or receptacle 20, adapted to contain a counterbalancing weight or weights. The front and rear uprights of the frame have projecting therefrom trunnions 21 21, which trunnions are mounted in bearings 22 22, extending upwardly from the bed-plate of the truck. One of the trunnions is extended outwardly a slight distance, and on this extended end is mounted a wheel 23, said wheel provided peripherally with a series of recesses 24, into any of which a tool 25 may be inserted, and which tool when operated will cause the frame, together with the drum carried thereby, to be tilted in one direction, and hence cause the contents of the drum to be discharged through the discharge end of said drum. I do not, however, wish to be understood as confining myself to this particular method of tilting, as any other desirable means may be substituted therefor. After the drum is emptied of its contents it is read-

ily swung back to normal position, its return movement being limited by contact with a suitable stop. In the axis of the two trunnions is the engine or driving shaft 9, hereinbefore referred to, adapted for rotating the drum, said shaft carrying the bevel-wheel 10, which is enabled to drive when the tiltable frame is tilted as well as when in its normal position.

For the purpose of feeding the material into the drum I provide a trough 26, leading to the end thereof opposite the discharge end. The material may be carried up to this trough in any desirable manner—as, for instance, by a suitable conveyer for that purpose.

The trunnions are placed below the axis of the drum at the approximate center of gravity of the drum and its load. When the drum is empty, there will be a surplus of weight above the trunnions. The counterbalancing weight or weights, however, which are placed in the box or receptacle 20, serve to hold the frame of the drum normally in upright position and at the same time permits said frame and drum to be readily tilted and the discharging accomplished with but the necessity of a slight degree of tilting.

Within each cone-section of the drum are a series of mixing-blades. In order to make the action of these blades clear, reference is hereby made particularly to Fig. 4. The blades are shown as divided into sets; but it will be understood that this is not absolutely essential, being only preferably adopted for convenience in construction. Each blade of each set may be flat, although, if preferred, a slight spiral formation may be given thereto. At all events the three blades shown as composing each set should be so arranged that if composed of a single continuous blade said continuous blade would have a spiral formation. The action of the drum is to give a rolling-over movement to the material and the blades deflect from the ends toward and past the middle, the rolling-over and alternating transverse motion being simultaneous and effecting a thorough commingling of the materials without spilling from the ends. There may be as many blades provided in each set as desired; but I prefer to employ three blades to each set, or each so-called "set" of blades could be a single continuous blade, as hereinbefore stated. The blades in two sets, as will be seen by reference to Fig. 4, are correspondingly slanted, the blades in one of these sets being indicated by the numeral 27 and the correspondingly-slanted blades in the other set by the numeral 27′. There are also shown in Fig. 4 two other sets of blades which are correspondingly slanted. The blades in one of these sets are indicated by the numerals 28 and the blades in the corresponding set by the numerals 28′, or in case each so-called "set" of blades is a continuous blade then there will be two of said blades which will correspondingly slant in one direction and two other blades which will correspondingly slant in the opposite direction. All the blades are at the same angle, or approximately so, to the element of the cone which passes through the centers or approximately the centers of the blades. It will also be observed that, as shown in the drawings, when there is a plurality of blades in a set each successive blade is a slight distance from the preceding blade and begins where the preceding blade leaves off, thereby forming a step-by-step arrangement. It will further be observed that the inner end blades of the set or the inner end of a blade, as the case may be, passes beyond the middle of the drum, whereby the mixture is thrown back and forth.

In the operation of the machine the different ingredients of concrete—such as sand, cement, stone, and water—or the different ingredients of any other material to be formed are fed into the drum through the feed-trough 26, and said ingredients settle in the bottom of the drum. These materials may be poured in either while the engine mechanism is stationary or is running. The engine mechanism of course will, through the connection herein shown and described, cause the drum to be rotated. If, for instance, the drum is rotating in the direction of the arrow, Fig. 4, the blades of a set as they successively pass through the material or a single blade, as the case may be, scoop or lift up a quantity thereon. It will be supposed that the blades 28 are passing through the material. As these blades ascend the material scooped up thereby is constantly slipping thereoff from one of said blades to the other, and after it passes off of the last blade of said set it thence flows onto the blades 27, thence from said blades 27 to the blades 28′, and from blades 28′ to blades 27′, it being understood that the material at one period of the revolution of the drum will go through the movement just described and at other periods of the revolution will go through exactly the reverse movement as the different blades of the sets are brought into engagement with the material in the drum, so that the result is that with the continuous revolution of the drum the material is being constantly thrown from one cone-section of the drum to the other and back again, and at the same time, owing to the inclination of the different blades, the material is thrown at an angle toward the center of the drum, thereby resulting in a most thorough commingling of the ingredients, whereby the material is mixed into a homogeneous state before its discharge.

The modification illustrated on Sheet 3 shows a smaller form of machine which I desire to employ under certain conditions and circumstances, and in this form the truck 7 is preferably only mounted upon one set of wheels 8 at one end thereof, while at the opposite end of the truck are provided supporting-legs 29. When this form of machine is being transported, the end thereof carrying the legs 29 is secured to the rear end of a

wagon and the machine carried along in that manner. In this modified construction I also desire to employ a different mechanism for rotating the drum 14, and instead of providing said drum peripherally with sprocket-teeth 17, as in the other form of construction, I employ spur-teeth 30, arranged annularly therearound, and these teeth are engaged by spur-teeth on the peripheries of intermediate wheels 31, which are at once spur and beveled, the beveled teeth being in mesh with beveled pinions 32 32, carried on shafts 33 33. Rotation may be imparted to the shafts 33 in any desirable manner. In the drawings I show hand-cranks 34 34 for that purpose. In this form of construction I also do not employ exactly the same form of frame 13 as shown on Sheets 1 and 2 of the drawings, but instead thereof a frame 35 of considerably less vertical height, and which frame merely serves as bearings for the parts and also carries sets of rollers, the lower supporting-rollers being designated by the numerals 36 36 and the upper rollers by the numerals 37 37, the latter being arranged a suitable distance above the lower rollers and said several sets of rollers adapted to perform the same function as the rollers 15 and 15′ in the other form of construction. This frame 35 is also provided with laterally-projecting tubular trunnions 38 38, in which the shafts 33 have their bearings, and these trunnions in turn are supported in suitable bearings 39 39, so as to provide for the tilting of the frame 35 and the drum carried therein, said tilting being accomplished by means of the tool 25, which is made to engage any suitable part of the frame 35.

In Fig. 6 of the modified construction I show an improved means for elevating the material to the feed end of the drum. This consists of a standard 40, pivoted at its lower end on the pivot-pin 41. The upper end of this standard pivotally carries a hopper 42. Projecting from the lower end of the standard is a foot 43, and this foot is adapted to contact with a stop 44. Normally the standard is turned downwardly on its pivot, so that the hopper 42 rests on the ground. When it is desired to feed the material into the drum, the standard is raised to the position shown in Fig. 6. It is conveniently raised by means of a handle 45 at the top of the hopper, and the pivot 46 of the hopper is also extended laterally slightly to also provide a convenient handle. It is obvious that when the hopper is thus thrown upwardly, as shown in Fig. 6, the contents thereof are discharged into the drum.

While I prefer to employ a drum having the double-conical form shown, yet I do not wish to be understood as restricting myself specifically thereto, inasmuch as a drum of any other desirable form or a drum having a uniform diameter longitudinally throughout might be provided and successful results obtained. The form shown, however, is preferable, for the reason that the narrow tapering receiving end provides for the ready feeding of the material to the bottom of the drum, and the narrow tapering discharging end provides for the ready discharge of the material. It is also of course obvious that the mechanism need not necessarily be mounted on a portable truck; but the uprights for supporting the tiltable frame and other parts may extend upwardly from a flooring or other suitable stationary support.

What I claim as my invention is—

1. In a mixing-machine, the combination with a revoluble mixing-drum consisting of two end pieces and a central ring or annulus to which the end pieces are connected, of driving means engaging the ring, and guiding means also engaging the ring.

2. A revoluble drum for a mixing-machine having open ends and spirally-arranged mixing-blades disposed in alternate sets to deflect the material or contents from the ends toward and across the central plane alternately.

3. A revoluble drum for a mixing-machine having open tapering ends and spirally-arranged mixing-blades disposed in alternate sets to deflect the material or contents from the ends toward and across the central plane alternately.

4. In a mixing-machine, a drum provided with interior blades having an approximate formation into right and left hand spirals alternately, each spiral formation beginning at or near one end of the drum and extending toward and past the central plane.

5. In a mixing-machine, the combination with a tiltable frame provided with trunnions, bearings in which said trunnions are supported, a revoluble mixing-drum, rollers supported by the tiltable frame and constructed to guide and entirely support said drum, and means for driving the drum.

6. In a mixing-machine, the combination with a tiltable frame provided with trunnions, bearings in which said trunnions are supported, a revoluble mixing-drum, a spur-gear around the drum, an intermediate spur-bevel, and a driving beveled gear in the axis of the trunnions and meshing with the beveled teeth of the intermediate spur-bevel.

7. In a mixing-machine, the combination with a tiltable frame provided with trunnions, of bearings in which said trunnions are mounted, a revoluble mixing-drum, a spur-gear around the drum, an intermediate spur-gear to drive the spur-gear of the drum, a bevel-gear on the axis of the intermediate spur-gear, and a driving bevel-gear meshing with said first-named bevel-gear, said driving bevel-gear being in the axis of the trunnion.

8. In a mixing-machine, the combination of a base provided with upwardly-extending bearings, a frame provided with projecting trunnions mounted in said bearings, one of said trunnions having a wheel mounted

thereon, said wheel provided peripherally with recesses adapted to be engaged by a tool, a revoluble drum within the frame and provided with a discharge-opening at one end, and mixing-blades arranged within the drum.

9. In a mixing-machine, the combination of a base, a frame tiltably mounted on said base, a revoluble mixing-drum carried by the frame, said drum being of double truncated conical form, the bases of the cone being innermost and joined together, and the open truncated apices being outermost, and mixing-blades arranged within the drum.

10. In a mixing-machine, the combination, with a revoluble mixing-drum, of mixing-blades within the drum, said blades being arranged in sets, the blades of two sets being correspondingly inclined or slanted, and the blades of another two sets being correspondingly inclined or slanted, but at opposite inclinations to the first referred to two sets of blades, and the blades of each set being so disposed as to give a spiral formation thereto, and each successive blade of a set starting where the preceding blade terminates, and being arranged a slight distance below so as to form a step-by-step arrangement of the blades of a set.

11. A revoluble mixing-drum, having sets of internal blades arranged to feed from the ends toward the middle of the drum, the blades of each set stepped in a general spiral.

12. A rotatable mixing-drum having sets of internal blades arranged to feed from the ends toward the middle of the drum, the blades of each set stepped in a general spiral, and the inner end blades passing beyond the middle of the drum, whereby the mixture is thrown back and forth.

13. A rotatable mixing-drum having end openings smaller than the maximum cross-sectional area of said drum, and also having sets of internal blades arranged to feed from the ends toward the middle of the drum, the blades of each set stepped in a general spiral.

14. A rotatable mixing-drum with enlarged center and tapering ends, having sets of internal blades arranged to feed from the ends toward the middle of the drum, the blades of each set stepped in a general spiral, and with the inner end blades passing beyond the middle of the drum, whereby the mixture is thrown back and forth.

15. In a mixing-machine, a drum comprising two cone-shaped parts united at their bases to an annulus, and means engaging said annulus to support and to rotate the drum.

16. In a mixing-machine, a drum comprising two cone-shaped parts united at their bases to an annulus, bearings mounted on a frame and rotatably supporting said annulus, and driving means on the frame engaging said annulus.

17. In a mixing-machine, a drum comprising two cone-shaped parts united at their bases to an annulus, a frame inclosing the drum, bearings mounted on the frame and rotatably supporting said annulus, and driving means on the frame engaging said annulus.

18. In a mixing-machine, a drum comprising two cone-shaped parts united at their bases to an annulus, roller-bearings mounted on a frame and rotatably supporting said annulus, and a driving means on the frame engaging said annulus.

19. A rotatable mixing-drum of the general form of two cones with a common base having sets of internal blades arranged to feed from the ends toward the middle of the drum, the blades of each set stepped in a general spiral.

20. In a mixing-machine, a rotatable drum, having end openings smaller than the maximum cross-sectional area of said drum, and said drum rotatable on its axis and having sets of internal blades arranged to feed from the ends toward the middle of the drum, the blades of each set stepped in a general spiral, a drum-frame supporting said drum, and means for axially tilting said drum to effect discharge.

21. In a mixing-machine, a rotatable drum having end openings smaller than the maximum cross-sectional area of said drum, and rotatable on its axis and having sets of internal blades arranged to feed from the ends toward the middle of the drum, the blades of each set stepped in a general spiral, and the inner end blades passing beyond the middle of the drum, whereby the mixture is thrown back and forth, a drum-frame supporting said drum, and means for axially tilting said drum to effect discharge.

22. A rotatable mixing-drum having end openings smaller than the maximum cross-sectional area of said drum, and having sets of internal blades arranged to feed from the ends toward the middle of the drum, the blades of each set stepped in a general spiral, a drum-frame supporting said drum, and means for tilting said drum to effect discharge.

23. A rotatable mixing-drum with enlarged center and tapering ends, said drum rotatable on its axis and having sets of internal blades arranged to feed from the ends toward the middle of the drum, the blades of each set being stepped in a general spiral, and the inner end blades passing beyond the middle of the drum, whereby the mixture is thrown back and forth, a drum-frame supporting said drum and means for axially tilting said drum to effect discharge.

24. In a mixing-machine, a drum having end openings smaller than the maximum cross-sectional area of said drum, and rotatably mounted, and having sets of internal blades arranged to feed from the ends toward the middle of the drum, driving means engaging said drum, and means for tilting said drum.

25. In a machine for mixing plastics, an open-ended double conical drum rotatably mounted and having sets of internal blades arranged to feed from the ends toward the

middle of the drum, driving means engaging said drum, and means for tilting said drum.

26. In a machine for mixing plastics, an open-ended double conical drum rotatably mounted, and having sets of internal blades arranged to feed from the ends toward the middle of the drum, and the inner ends of the blades passing beyond the middle of the drum, whereby the mixture is thrown back and forth, driving means engaging said drum, and means for tilting said drum.

27. In a mixing-machine, a rotatably-mounted drum open at each end and normally held in mixing position by an excess of weight, a peripheral toothed annulus around said drum, means engaging the toothed annulus for driving the drum, and tilting means constructed to overcome the excess weight in order that the drum may be freely and rapidly tilted, and the entire contents of the drum thereby quickly discharged.

28. In a mixing-machine, a rotatably-mounted drum open at each end, and normally held in mixing position by an excess of weight, roller-bearings for the drum, peripheral driving means for said drum, and tilting means constructed to overcome the excess weight, in order that the drum may be freely and rapidly tilted, and the entire contents of the drum thereby quickly discharged.

29. In a mixing-machine, a rotatably-mounted drum open at each end, and normally held in mixing position by an excess of weight, peripheral driving means for the drum, a frame, roller-bearings carried by the frame and engaging the drum, and tilting means constructed to overcome the excess weight, in order that the drum may be freely and rapidly tilted, and the entire contents of said drum thereby quickly discharged.

30. In a mixing-machine, the combination of a rotatable drum, a tiltable frame in which the drum is mounted, said frame provided with trunnions, whose axes are below the axis of the drum, and suitable supports for said trunnions.

31. In a mixing-machine, the combination with a revoluble mixing-drum, of mixing-blades arranged within the drum, said blades being arranged in sets, the blades in each set being so disposed as to give an approximate spiral formation to the set of blades, one-half of the sets of blades having a right-hand spiral formation, and the remaining sets, a left-hand spiral formation, each successive blade of a set starting where the preceding blade terminates, and arranged a slight distance below.

32. In a mixing-machine, the combination of a drum, a tiltable frame supporting the drum, the trunnions of the frame being below the axis of the drum, and a counterweight attached to the frame.

33. A mixing-machine comprising a drum open at each end, and enlarged between the ends, and means whereby the drum may be tilted.

34. A mixing-machine, comprising a drum open at each end, and having internal blades so disposed as to throw the material from the ends toward the middle, and means whereby the drum may be tilted.

35. A mixing-machine, comprising a drum having internal blades inclined relatively to the drum-axis, and means whereby the drum may be tilted.

36. A mixing-machine, having internal spirally-arranged blades inclined relatively to the drum-axis, and means whereby the drum may be tilted.

37. A mixing-machine, comprising a rotatable drum, a trunnioned frame supporting the drum, and supports on said frame engaging the drum at or near the middle of the drum-axis.

38. A mixing-machine, comprising a rotatable drum, and a frame supporting the drum, and having trunnions at or near the middle and below the drum-axis.

39. A mixing-machine, comprising a rotatable drum and a counterweighted frame supporting the drum, and having trunnions at or near the middle of and below the drum-axis.

40. A mixing-machine, comprising a drum open at one end for feed and at the other end for discharge, a trunnioned frame supporting the drum at or near the middle of the drum-axis, and means whereby the drum may be tilted.

41. A mixing-machine, comprising a drum open at each end and having internal blades so disposed as to throw the material from the ends toward the middle, a trunnioned frame supporting the drum at or near the middle of its axis, and means whereby the drum may be tilted.

42. In a mixing-machine, a drum supported at its middle on a tilting trunnioned frame, and driving connections on the tilting frame engaging the drum periphery and concentric with the trunnions.

43. A mixer for concrete and other substances, comprising a rotary, double cone-shaped mixing-drum; a tilting support for the rotary mixing-drum, with antifriction-rollers between the mixing-drum and such tilting support; means for rotating the mixing-drum and means for operating the tilting support.

44. A mixer for concrete, and other substances, comprising a rotary mixing-drum, having end openings smaller than the maximum cross-sectional area of said drum, a tilting support for the drum, with antifriction-rollers between the mixing-drum and such tilting support, means for rotating the mixing-drum, and means for operating the tilting support.

45. In a mixing-machine, the combination of a tiltable frame, a drum supported by the frame, said drum provided with open ends tapered to permit discharge by tilting, means for tilting said frame, and means for rotating said drum continuously while mixing, or while tilted for discharge.

46. In a mixing-machine, the combination of a tiltable frame, a drum supported by the frame, said drum provided with open ends tapered to permit discharge by tilting, means for tilting said frame, rollers mounted on the frame and adapted to guide and support said drum, and means for rotating the drum continuously while mixing or while tilted for discharge.

47. In a mixing-machine, the combination of a tiltable frame, a drum supported by the frame said drum provided with open ends tapered to permit discharge by tilting, means for tilting said frame, rollers mounted on the frame, and adapted to guide and support the drum at the center of said drum, and means for rotating the drum continuously while mixing or while tilted for discharge.

In testimony whereof I affix my signature in presence of two witnesses.

THOMAS L. SMITH.

Witnesses:
A. L. MORSELL,
ANNA V. FAUST.