

Aug. 28, 1923.

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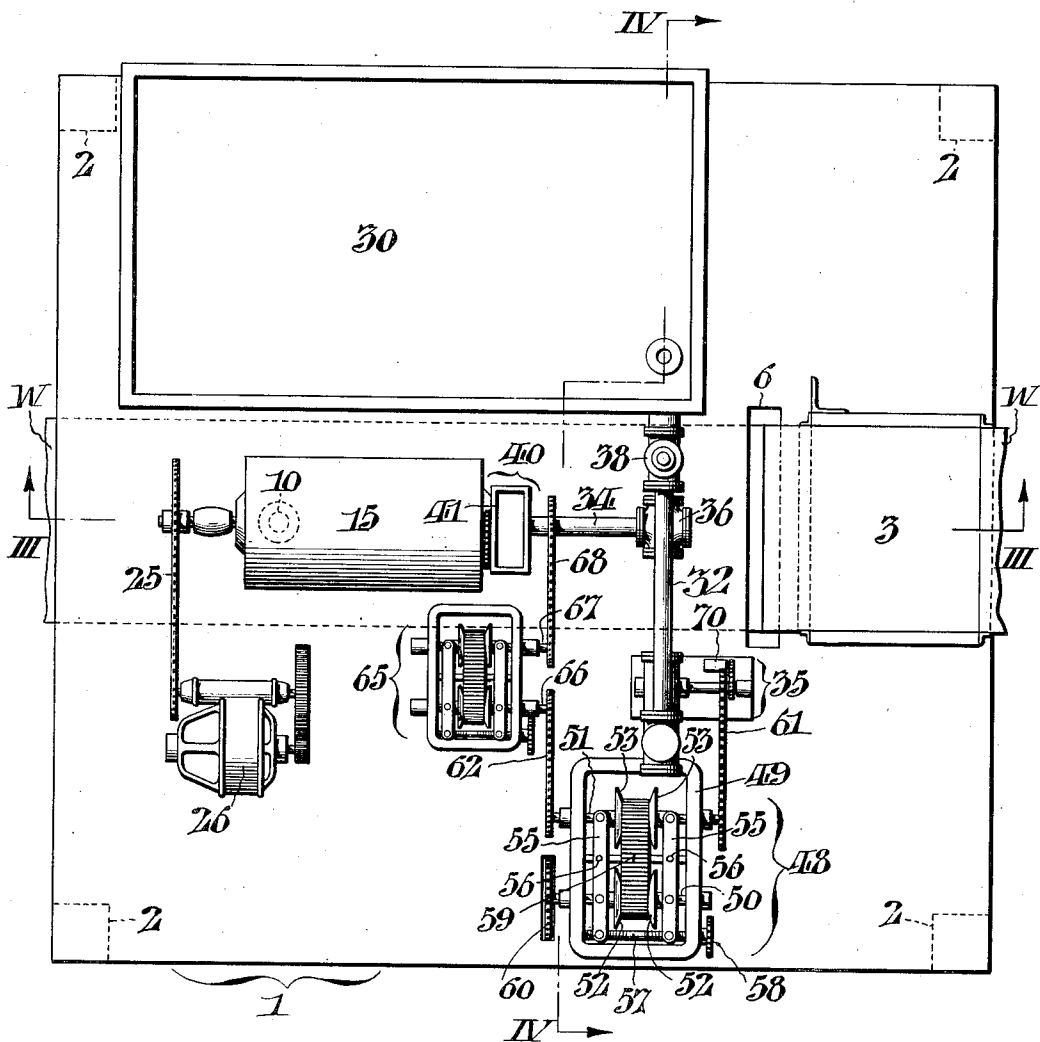
F. A. BROWNE

MIXING APPARATUS

Filed May 9, 1922

7 Sheets-Sheet 1

FIG. 1.



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Aug. 28, 1923.

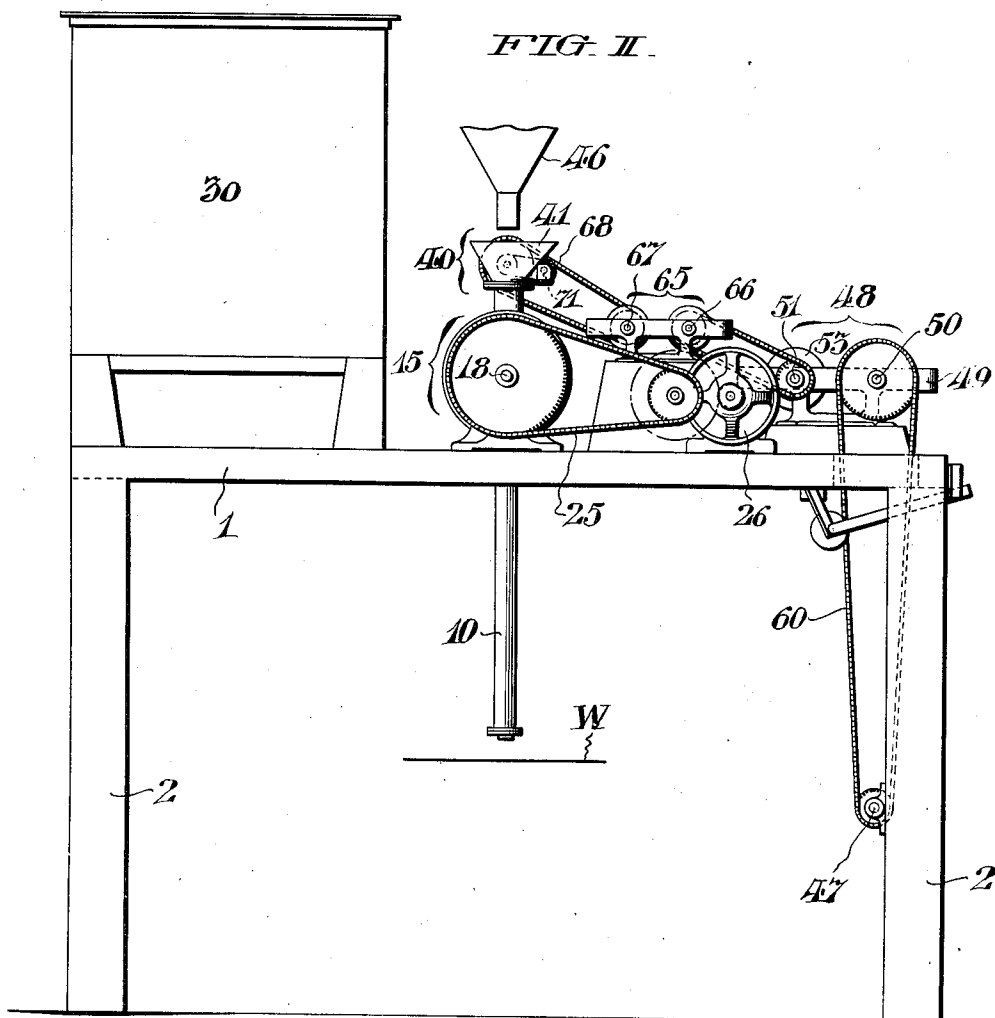
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MIXING APPARATUS

Filed May 9, 1922

7 Sheets-Sheet 2



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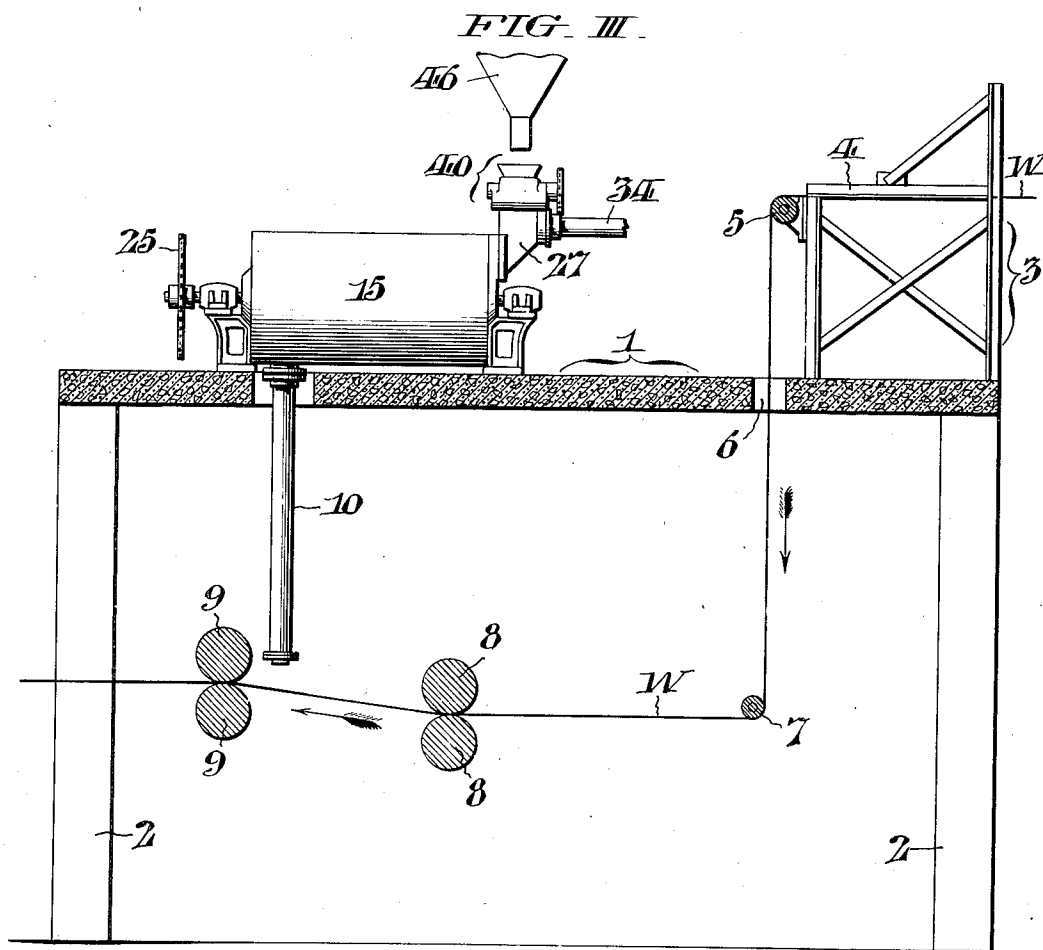
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MIXING APPARATUS

Filed May 9, 1922

7 Sheets-Sheet 3



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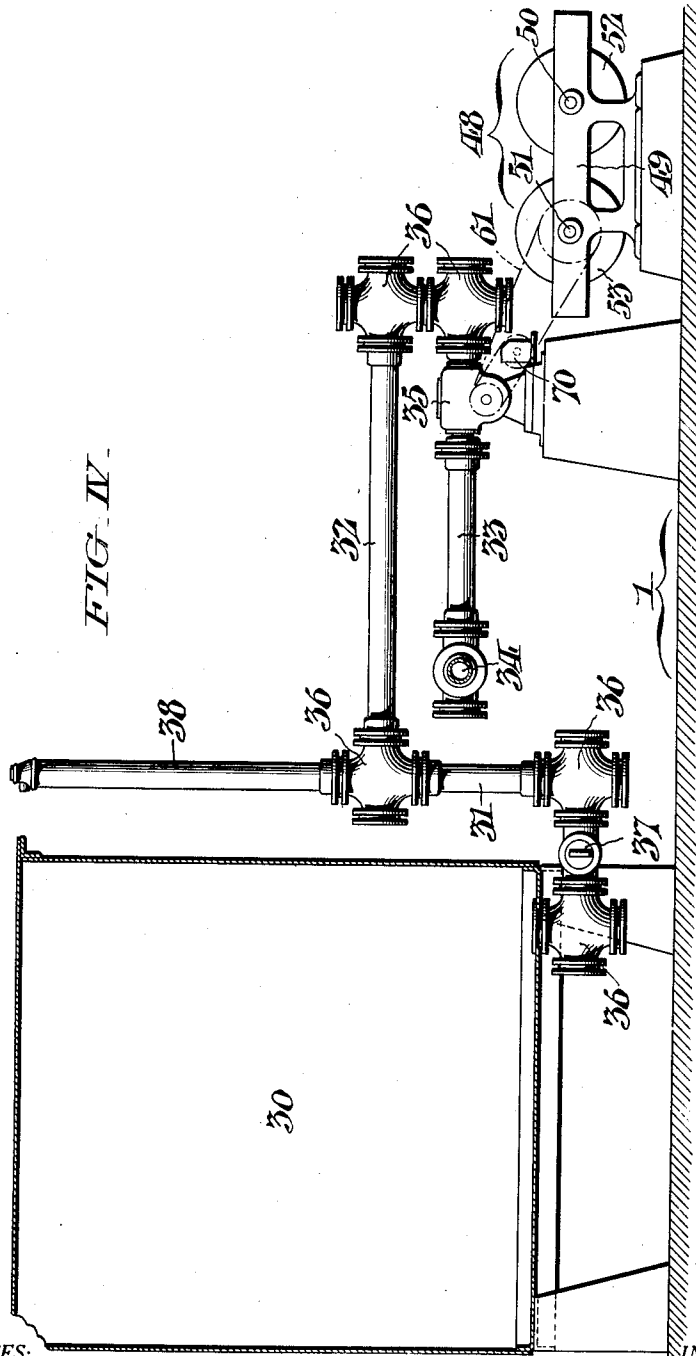
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MIXING APPARATUS

Filed May 9, 1922

7 Sheets-Sheet 4



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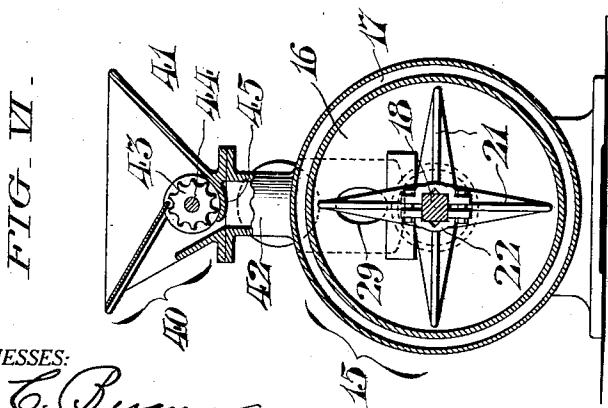
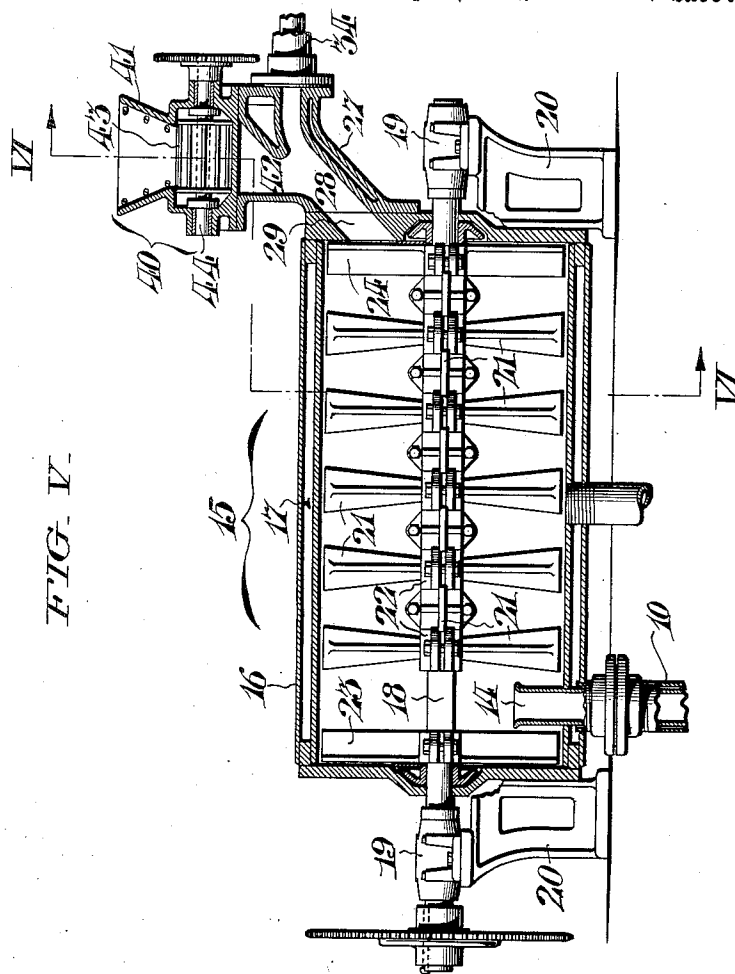
1,466,639

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MIXING APPARATUS

Filed May 9, 1922

7 Sheets-Sheet 5



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1,466,639

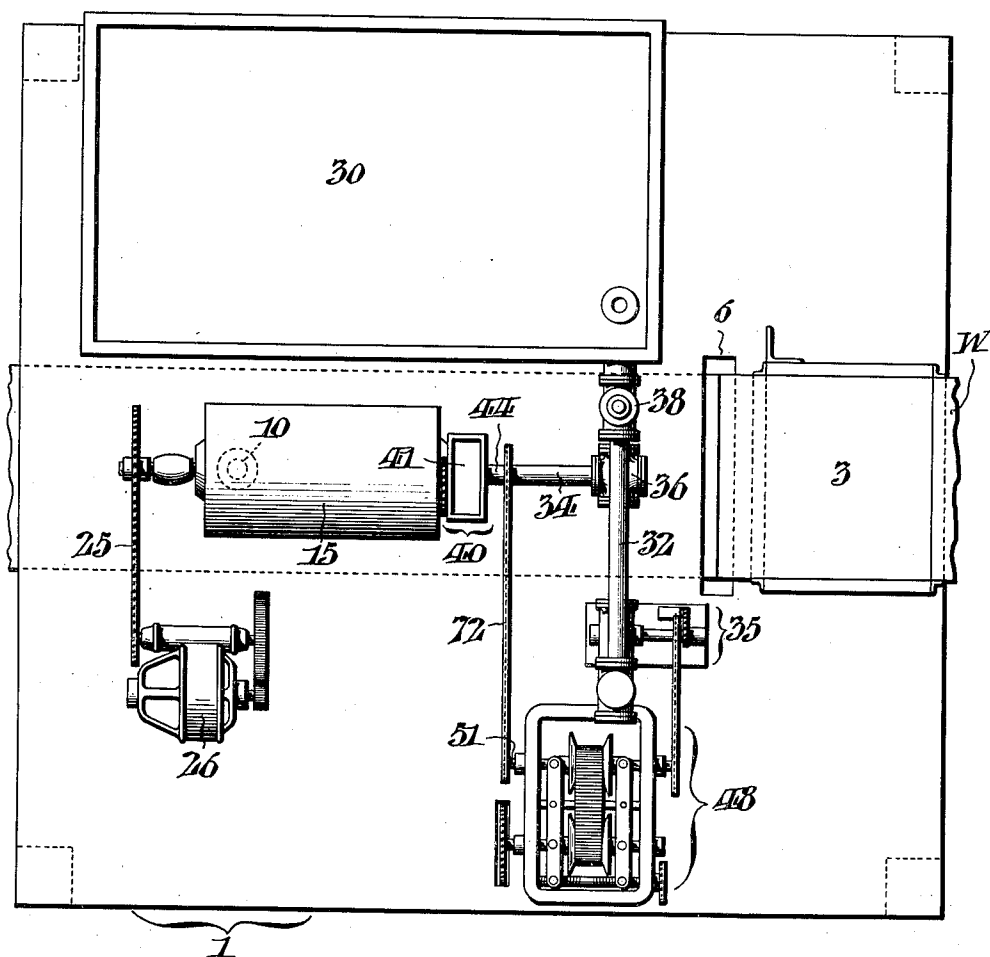
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MIXING APPARATUS

Filed May 9, 1922

7 Sheets-Sheet 6

FIG. VII.



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MIXING APPARATUS

Filed May 9, 1922

7 Sheets-Sheet 7

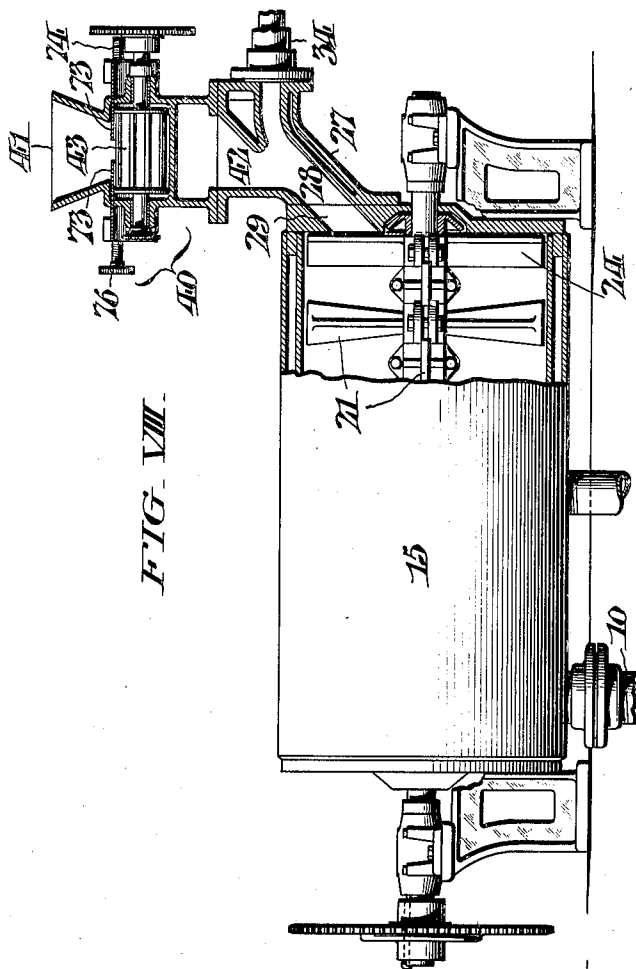


FIG. VIII.

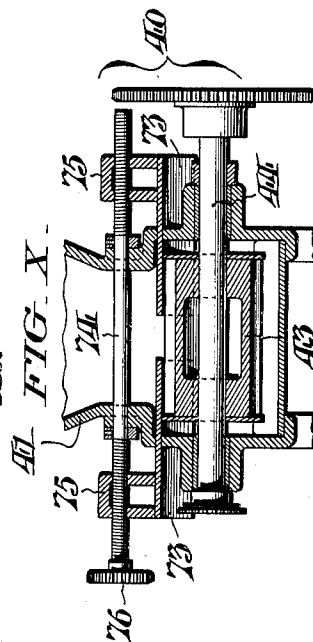


FIG. IX.

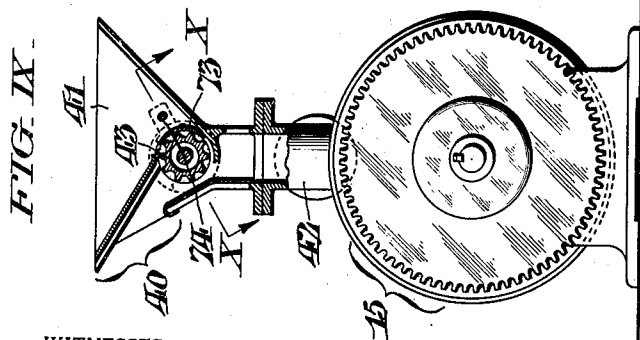


FIG. X.

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UNITED STATES PATENT OFFICE.

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MIXING APPARATUS.

Application filed May 9, 1922. Serial No. 559,559.

To all whom it may concern:

Be it known that I, FRANK A. BROWNE, a citizen of the United States, residing at Wayne, county of Delaware and State of Pennsylvania, have invented certain new and useful Improvements in Mixing Apparatus, of which the following is a specification, reference being had to the accompanying drawings.

My invention relates to mixing apparatus having as one of its objects the continuous preparation and delivery of fluent aggregates composed of several different ingredients either all liquids, all solids in a finely divided state, or combinations of both; and without necessitating interruptions in the mixing process, to vary the relative flowing proportions of the ingredients entering into the mixtures, or to simultaneously vary the continuing quantities of the ingredients supplied to effect an increase or decrease in the rate of delivery of the aggregate without affecting the quality thereof.

While a mixing apparatus possessing the characteristics mentioned has many applications generally, it is especially useful in connection with the manufacture of asphalt products, for example, asphalt cements consisting of a mixture of combination of liquid asphalt with a suitable liquid flux, or again in the production of prepared roofing where a preservative coating usually consisting of a mixture of asphaltum and a pulverulent or granular filler such as sand, talc, limestone dust, pebbles, etc., is applied to a sheet or web of paper or felt which forms the base of the roofing.

For convenience, I have herein shown in the drawings the manner in which a mixing apparatus of my invention may be advantageously employed in the latter of the two instances mentioned above; and the advantages accruing from such use will become readily apparent from the detailed description which follows.

Referring to the drawings, Fig. I is a plan view, more or less diagrammatically represented, of an organization adapted for coating roofings.

Fig. II is an elevation of the same viewed from the left of Fig. I.

Fig. III is a sectional view of the structure taken as indicated by the arrows III—III in Fig. I.

Fig. IV is a staggered section, on an enlarged scale, along the plane IV—IV in Fig. I.

Fig. V is a longitudinal section of the mixer in which the ingredients of the coating material are worked into a homogeneous mass.

Fig. VI is a cross section of the mixer taken as indicated by the arrows VI—VI in Fig. V.

Fig. VII is a view in top plan of an assembly of elements similar to that shown in Fig. I, but illustrating a slightly modified means for mixing the ingredients.

Fig. VIII is a view in side elevation, partly in section of the mixer used in the assembly of Fig. VII showing the details of construction.

Fig. IX is a view in end elevation of the mixer showing the receiving hopper in section; and

Fig. X is a detail view in section on an enlarged scale taken on the line X—X of Fig. IX.

In the organization herein represented in Figs. I to VI, the various devices employed in preparing the protective or preservative surface coating for the roofing material are supported on a rectangular platform 1, which, in practice is preferably constructed of concrete and sustained at the desired height from the ground level under support of a number of columns 2—2. The web "W" of paper or felt which is to form the base of the roofing is first passed horizontally over the top of a table 3 supported centrally of the right hand end of the platform 1, as considered in Figs. I and III, and incidentally subjected to the action of a weighted plate 4 which induces the necessary drag for maintenance of the proper tautness. The web next passes about a guide roll 5 and downward through an opening 6 in the platform 1 to a second guide roll 7 whereby it is redirected to pass horizontally between co-operative draft rollers 8—8. From thence, the web passes between spreader rollers 9—9 which serve to distribute the surface coating material which is continuously discharged, through a tube or spout 10, from a mixer 15 supported by the platform 1. From Fig. III it will be observed that in the interval between the rollers 8—8 and 9—9, the travel of the web is at a slight up-

ward inclination so that gravitational flow of the coating material is induced in a direction counter to the movement of the web which facilitates more uniform distribution and prevents the excess from clogging the spreader rollers. In practice suitable means are of course provided in the space beneath the platform 1 both for supporting and positively driving the rollers 8—8 and 9—9.

Referring now more especially to Figs. V and VI, the mixer 15 will be observed to comprise a receptacle in the form of a horizontally disposed cylinder 16 with an enveloping jacket 17 for circulation of a suitable heating medium whereby the contents of the receptacle are maintained in a molten condition. A stand pipe 14 serves to maintain sufficient material in the receptacle 16 at all times to insure thorough mixing effected in a manner to be presently explained. Said stand pipe is directly communicative with the spout 10 as best seen in Fig. V. Extending axially through the receptacle 16 is a shaft 18 which is supported for rotation in bearings 19—19 mounted on pedestals or standards 20—20 at the exterior. Fixed to the shaft 18 at intervals lengthwise of the same are agitating elements 21—21 each having paddle blades extending outward in diametrically opposite directions from a common central hub 22. The elements 21 are preferably arranged alternately at right angles so as to increase the effectiveness of the paddles. In addition to the elements 21, I have mounted upon the shaft 18, directly adjacent the end walls of the receptacle 15, propellers 23 and 24 respectively. These propellers are operative in opposition to one another and constantly throw or direct the ingredients of the mix toward the center of the receptacle into the field or province of the agitating elements 21. The shaft 22 is driven, through the medium of a sprocket chain 25, from an electric motor, conventionally represented at 26 in Figs. I and II of the drawings.

The molten asphaltum or other liquid ingredient of the coating material is introduced into the receptacle 15 through a fitting 27 with an inclined duct 28 aligned with an opening 29 in the right hand wall of said receptacle. A tank 30 supported, as best shown in Fig. I at the rear of the platform 1 is provided for storage of the asphaltum. The latter is conducted to the mixer 15 through a conduit system 31, 32, 33, 34, under the action of a rotary measuring pump 35 interposed in the branch 33. Said conduit system, including the discharge spout 10 of the mixer 15, is preferably jacketed throughout for circulation of heating fluid so that coagulation is prevented while the asphaltum is in transit. The conduit fittings 36, 36, it is to be especially noted, are pur-

posely made large, and, in all cases, are in the form of crosses so that the various branches are rendered readily accessible for cleaning. While performing the latter operation, flow from the tank may be shut off by means of a stop cock 37 installed for this purpose. In order to permit drainage of the whole system, I provide for admission of air into the top of a stand pipe 38, shown in Fig. IV as extending above the level of the top of the tank 30.

The fitting 27 of the mixer previously referred to is surmounted by a measuring means or filler feeder 40 capable of controlling introduction of any pulverulent or granular material which is to be mixed with the asphaltum. Said filler feeder comprises a hopper 41 whose outlet 42 communicates directly with the duct 28 and has horizontally disposed across it, a fluted or corrugated measuring roll or rotor 43. Said roll or rotor is secured to a shaft 44 journaled in appropriate bearings in opposite walls of the structure and actuated in a manner to be explained later. With a view to securing better control in the measurement of the pulverulent or granular material, the bottom 45 of the hopper is carried well across the outlet beneath the rotor 43 as clearly shown in Fig. VI. The hopper of the filler feeder 40 is constantly charged by gravitation from an overhead bin or chute shown at 46 in Figs. II and III.

In order that the rate of continuous delivery of the ingredients of the coating material to the mixer may be individually varied to alter the proportions of the mixture, or simultaneously varied to increase or decrease such delivery, and correspondingly the rate of discharge of the material from the spout, I have devised a unique driving mechanism for actuation of the pump 35 and the filler feeder 40. This mechanism includes a power shaft 47 (Fig. II) and variable speed transmission devices 48 and 65 which are interposed between said power shaft and the pump and filler feeder. The variable speed transmission devices are of standard construction, but in order that their special use in the present connection may be thoroughly understood, it is deemed advisable to describe their operation briefly. Except as to consideration of size, said devices are identical so that the description of one will hold for the other, and attention will therefore be directed, for convenience, to the larger of the two, numbered 48 in Fig. I. This device comprises a rectangular frame or housing 49 which affords bearings for parallel shafts 50 and 51, which for purposes of distinction, I will hereinafter term the "primary" and "secondary" shafts respectively. Said shafts carry pairs of opposed conical disks 52—52 and 53—53 which are respectively slidable toward and away

from each other on key ways and shiftable by mechanism which includes levers 55, 55 fulcrumed to swing about fixed pivots 56, 56 located centrally between the shafts under control of an oppositely threaded screw 57, the latter provided with a hand wheel 58 for manual operation. As a result of such arrangement the separation of one pair of disks will be attended by approach of the other pair and vice versa while the endless belt indicated at 59 adjusts its position automatically with respect to the cone faces to bring about variation in the relative speeds of the two shafts.

The primary shaft 50 of the device 48 is coordinated with the power shaft 47 through a sprocket chain 60 while its secondary shaft 51 is similarly geared through a chain 61 with the pump and a chain 62 with the primary shaft 66 of the device 65. The secondary shaft 67 of the latter is chain connected with the shaft of the filler feeder 40 as indicated at 68 in Figs. I and II. By regulation of the variable speed transmission device 65 alone, the proportionate amount of pulverulent or granular material delivered to the mixer with respect to the asphaltum may be varied within wide limits and without necessitating any interruption whatever in the coating process; and likewise, by regulation of the variable speed transmission device 48 alone the quantity of both ingredients of the coating material delivered may, without affecting the proportions, be simultaneously increased or decreased to effect a corresponding increase or decrease in the rate of discharge of the material upon the travelling web "W" so that a thicker or thinner layer is applied as desired. Regulation of the speed of the pump 35 and the rotor of the filler feeder 40, as above described is facilitated by provision of associated counters indicated respectively at 70 and 71 in Figs. II and IV.

By providing a manual control for the introduction of solid material into the mixer, I may simplify the assembly of elements described above by omitting the variable speed transmission designated 65, which will result in the arrangement shown in Fig. VII wherein parts corresponding to those in Fig. I are designated by the same reference characters. It will be observed that the variable speed transmission 48 is now arranged to drive the feeding mechanism 40 directly instead of through the intermediary transmission 65, and to this end the power transmitted from the sprocket on the left hand end of the shaft 51 directly to the shaft 44 of the mixer feed by means of a chain connection 72. The remaining parts of the assembly are the same as those outlined previously and function in the same way. The manual control for the introduction of solid material is embodied in the hop-

per device 40 which, as in the mixer described above comprises the hopper 41, in the throat of which the fluted feeding roller 43 is mounted for rotation. In the present instance the upper face of the fluted roller is designed to be partially covered to a variable extent by means of a pair of curved plates 73 which operate in correspondingly formed openings in the walls of the hopper and are mounted for movement toward and away from each other through the instrumentality of a rod 74, journaled in the walls of the hopper and having oppositely threaded ends for cooperative engagement with correspondingly threaded extensions 75 of the plates. A hand wheel 76 carried by the rod permits of manipulation of the plates in the manner stated to variably cut off communication between the hopper and feed roller, thereby permitting adjustment of the parts to provide for any rate of feed required in proportion to the rate of feed of the pump 35. Obviously, any adjustment of the variable speed transmission will result in a simultaneous and like alteration in the rotative speed of the pump shaft and feed roller causing a variation in the rate of delivery of the mixture without alteration in the quality thereof. To effect a change in the relative proportions of the ingredients, after the proper rate of delivery is obtained the hand wheel 76 is rotated in one direction or the other until the rate of feed of the granular material is adjusted to the desired point with respect to the altered rate of feed of the pump.

Although the handling of but two ingredients of the coating material has been considered herein, it will be obvious that provisions may be readily made, by simple expansion of the mixing apparatus, for handling of others which may include only liquids, or a number of liquids together with several pulverulent or granular solids.

Having thus described my invention, I claim:

1. A mixing apparatus comprising a mixer adapted for continuous delivery of fluent mixtures; and means for simultaneously controlling the quantity of the respective ingredients of the mixtures in the course of being conducted to the mixer to effect increase or decrease during operation of the apparatus in the rate of discharge from the mixer.

2. A mixing apparatus comprising a mixer adapted for continuous delivery of mixed material; and means whereby the rates at which the ingredients are continuously introduced into the mixer may be relatively varied while the apparatus is running to produce changes in the quality of the resulting mixture.

3. A mixing apparatus comprising a mixer adapted for continuous delivery of mixed

material; means whereby the rates at which the ingredients are continuously introduced into the mixer may be relatively varied to produce changes in the quality of the resulting mixture; and means whereby the quantities of the respective ingredients aforesaid may be simultaneously varied during operation of the apparatus to effect increase or decrease in the rate of discharge from the mixer without affecting the quality of the mixture.

4. A mixing apparatus comprising a mixer adapted for continuous delivery of mixed material; means for individually measuring the quantities of the respective ingredients of the mixture in the course of being continuously conducted to the mixer; driving means common to the measuring means, and variable speed devices interposed between said individual measuring means and the common driving means and adapted to be adjusted while the apparatus is running to effect changes in speed whereby the quantity of the respective ingredients aforesaid may be relatively varied.

5. A mixing apparatus comprising a mixer adapted for continuous delivery of a fluent mixture; means for measuring fluid ingredients to the mixture, and means for measuring finely divided solid ingredients in course of being continuously introduced into the mixer; in combination with means for controlling the relative speeds of the several measuring means during operation of the apparatus to produce changes in the quality of the resulting mixture; and means whereby the speeds of said measuring means may be simultaneously varied to effect increase or decrease in the rate of discharge from the mixer without affecting the quality of the mixture.

6. A mixing apparatus useful in connection with the manufacture of roofing material comprising a mixer adapted to continuously discharge fluent surfacing upon a travelling sheet or web of base material; means whereby the rates of introduction of the ingredients of the surfacing into the mixer may be relatively varied during the operation of the apparatus to produce changes in the quality of the resulting mixture; and means whereby the rates of introduction of said ingredients may be simultaneously varied to effect increase or decrease in the rate of discharge of the surfacing from the mixer.

7. A mixing apparatus comprising a mixer adapted for continuous delivery of a fluent mixture, a plurality of separate feeding means for delivering ingredients to the mixer, a driving means common to all of the feeding means, and a change speed mechanism interposed between the driving means and the feeding means, adjustable during operation of the apparatus to effect

simultaneous variations in the rate of feed to vary the volume rate of discharge of the mixer.

8. A mixing apparatus comprising a mixer adapted for continuous delivery of a fluent mixture, a pump for delivering a fluid ingredient to the mixer, a variable feeding means to deliver granular material to the mixer, a driving means common to the pump and feeding means, and a change speed mechanism interposed between the pump and feed and the driving means adjustable during operation of the apparatus to effect simultaneous variations in the rate of feed to vary the volume rate of discharge of the mixer.

9. A mixing apparatus comprising a mixer adapted for continuous delivery of a fluent mixture, feeding means to deliver ingredients to the mixer, a change speed driving means to effect simultaneous variations in the rate of feed of the feeding means, and consequent variations in rate of discharge of the mixer, and a driving means for the mixer independent of the feeding means to operate the mixer at a rate corresponding to or at variance with the rate of feed of the feeding means.

10. A mixing apparatus comprising a mixer adapted for continuous delivery of a fluent mixture, a plurality of separate feeding means to deliver ingredients to the mixer, a driving means common to all the feeding means, a change speed mechanism for effecting simultaneous variations in the rate of feed of the several feeding means, during operation to vary the volume rate of discharge of the mixer, and a second change speed mechanism for varying the rate of feed of one feeding means relative to the other during operation of the apparatus to vary the quality of the discharging mixture.

11. A mixing apparatus comprising, a mixer adapted for continuous delivery of a fluent mixture, means for continuously delivering a fluid ingredient to the mixer, means to variably feed granular material to the mixer, a variable speed mechanism for simultaneously driving the fluid and granular ingredient feeding means and to vary during operation of the apparatus the rate of feed to coincidentally vary the volume rate of discharge of the mixer, and a second variable speed mechanism interposed between the first variable speed mechanism and the granular material feeding means to permit relative variation during operation of the apparatus in the rate of feed of the two feeding means to vary the quality of the discharging mixture.

12. A mixing apparatus, comprising, a mixer adapted for continuous delivery of a fluent mixture, a plurality of feeding means to deliver ingredients to the mixer, and a variable speed mechanism comprising an

expansible, driven cone pulley for operating the feeding means, an expansible driving cone pulley, a flexible power transmission element connecting the pulleys, and means
5 for varying the relation of the pulleys to effect variation simultaneously in the rate of feed of the feeding means.

13. A mixing apparatus comprising a mixer adapted for continuous delivery of
10 fluent mixtures, a plurality of feeding means to deliver ingredients to the mixer, a primary variable speed device comprising a pair of adjustable cone pulley couples and a transmission belt for simultaneously driving at
15 variable rates of said feeding means, and a secondary variable speed device comprising a pair of adjustable cone pulley couples and a transmission belt, interposed between the primary variable speed device and a feed
20 control the latter relative to the other feeds to alter the quality of the discharging mixture.

14. An apparatus of the character described, comprising a support, means for
25 advancing a web of roofing material beneath the support, a mixer adapted for continuous delivery of fluent mixtures mounted on the support to discharge upon the web, separate feeding means to deliver fluid and granular
30 ingredients to the mixer, a driving means common to both feeding means, and a speed change mechanism interposed between the driving means and said feeds to simultaneously vary the rate of feed of the feeding
35 means to consequently vary the volume rate of discharge of the mixer.

15. An apparatus of the character described, comprising a support, means to advance a web of roofing material beneath the
40 support, a mixer mounted on the support to continuously deliver fluent mixtures upon the moving web, separate feeding means to

deliver fluid and granular ingredients to the mixer, a driving means common to both feeding means, a variable speed mechanism
45 adjustable during operation of the apparatus and interposed between the driving means and feeds to simultaneously vary the rate of feed of the latter to vary the volume rate of discharge of the mixer, and a second
50 variable speed mechanism interposed between the first variable speed mechanism and one feed to vary the rate of feed of the latter relative to the other to consequently vary the quality of the mixture discharged.
55

16. A mixing apparatus comprising, a mixer adapted for continuous delivery of fluent mixtures, feeding means to deliver
60 ingredients to the mixture, a variable speed means for delivering power at simultaneously variable rate to the feeds, and a manual means for controlling during operation of the apparatus the rate of discharge of one feed relative to the other.

17. A mixing apparatus comprising, a
65 mixer adapted for continuous delivery of fluent mixtures, a fluid ingredient and a granular ingredient feeding means, a driving means common to both, a variable speed mechanism interposed between the driving
70 means and feeds to simultaneously vary the rate of feed of the latter, and means associated with the granular feed and manually adjustable during operation of the apparatus to vary the rate of feed of the same
75 relative to the other feed.

In testimony whereof, I have hereunto signed my name at Philadelphia, Pennsylvania, this 5th day of May, 1922.

FRANK A. BROWNE.

Witnesses:

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E. L. FULLERTON.