M. A. POPKESS.

CONVEYING AND MIXING MACHINE.

APPLICATION FILED MAY 14, 1917.

1,370,764.

Patented Mar. 8, 1921.

5 SHEETS—SHEET 1.

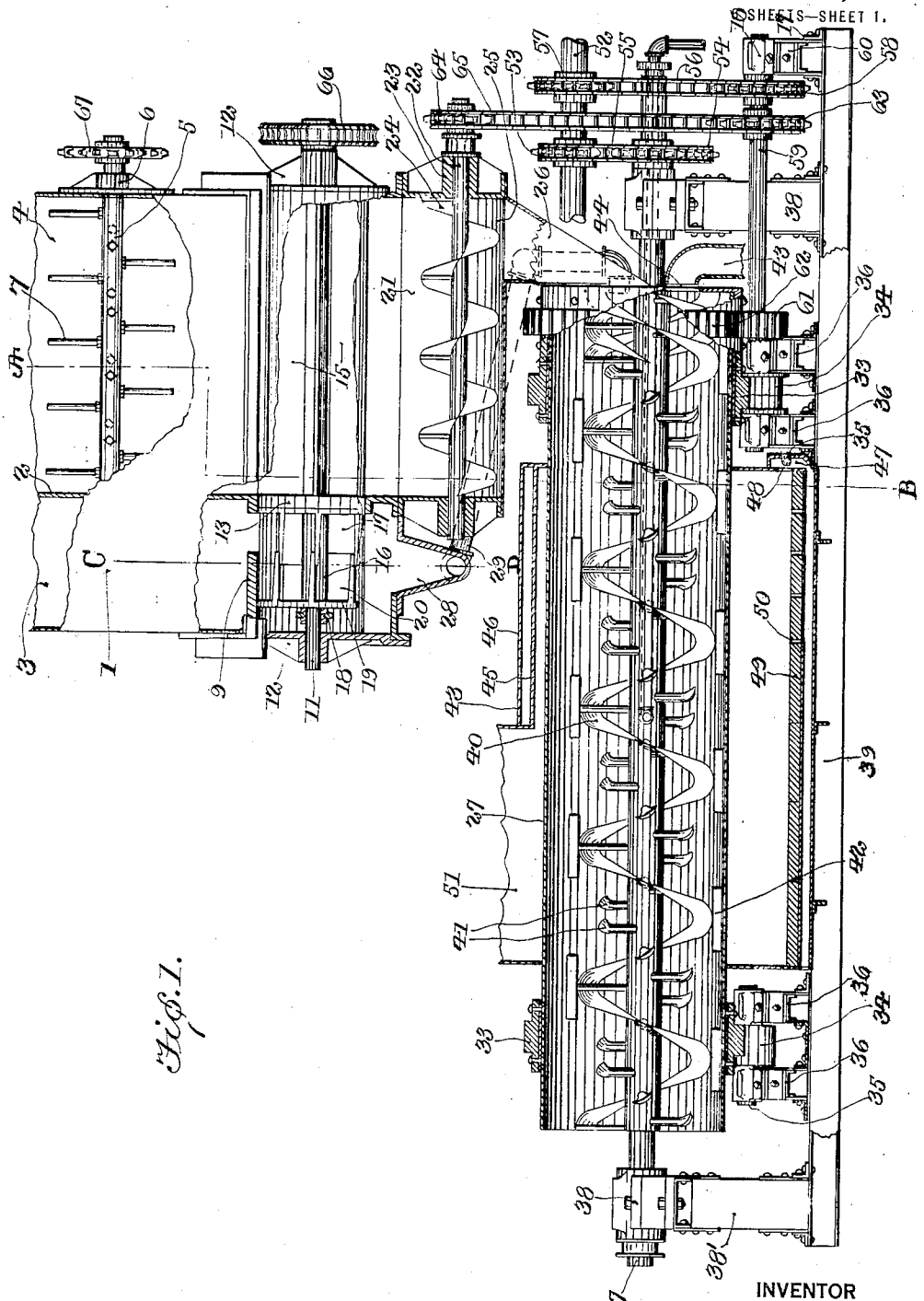


Fig. 1.

INVENTOR

Michael A. Popkess

BY K. O. McElroy

his ATTORNEY

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6 SHEETS—SHEET 2.

Fig. 2.

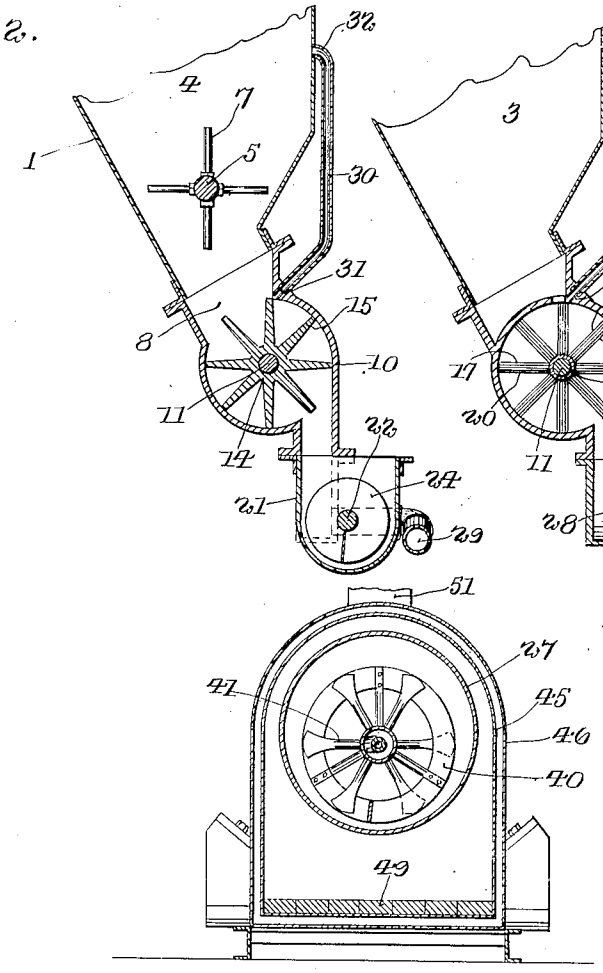


Fig. 3.

INVENTOR

Michael A. Popkess

BY A. P. McElroy

his ATTORNEY

M. A. POPKESS.

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6 SHEETS—SHEET 3.

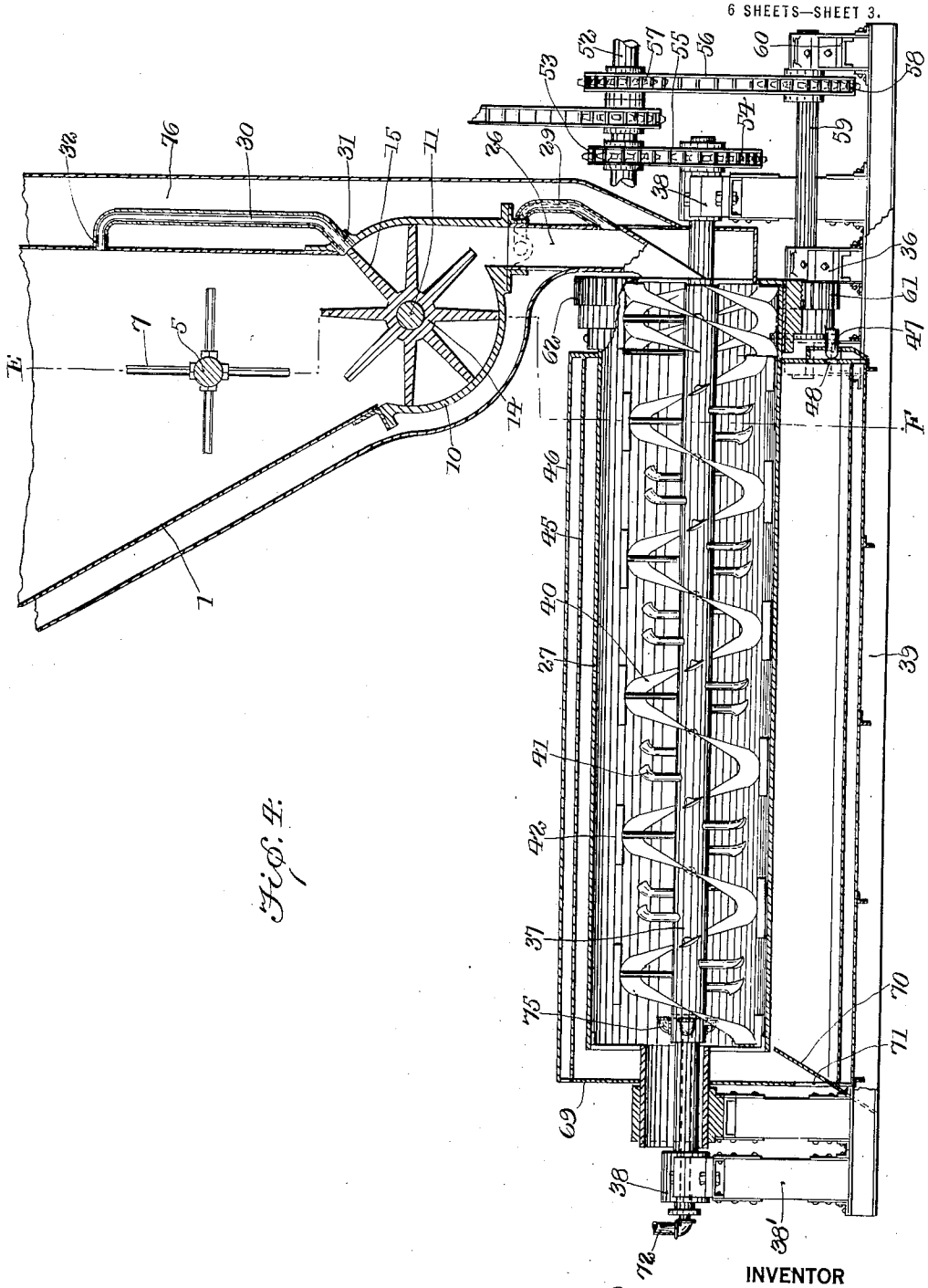


Fig. 4.

INVENTOR

Michael A. Popkess

BY A. P. M. Ebey

his ATTORNEY

M. A. POPKESS.

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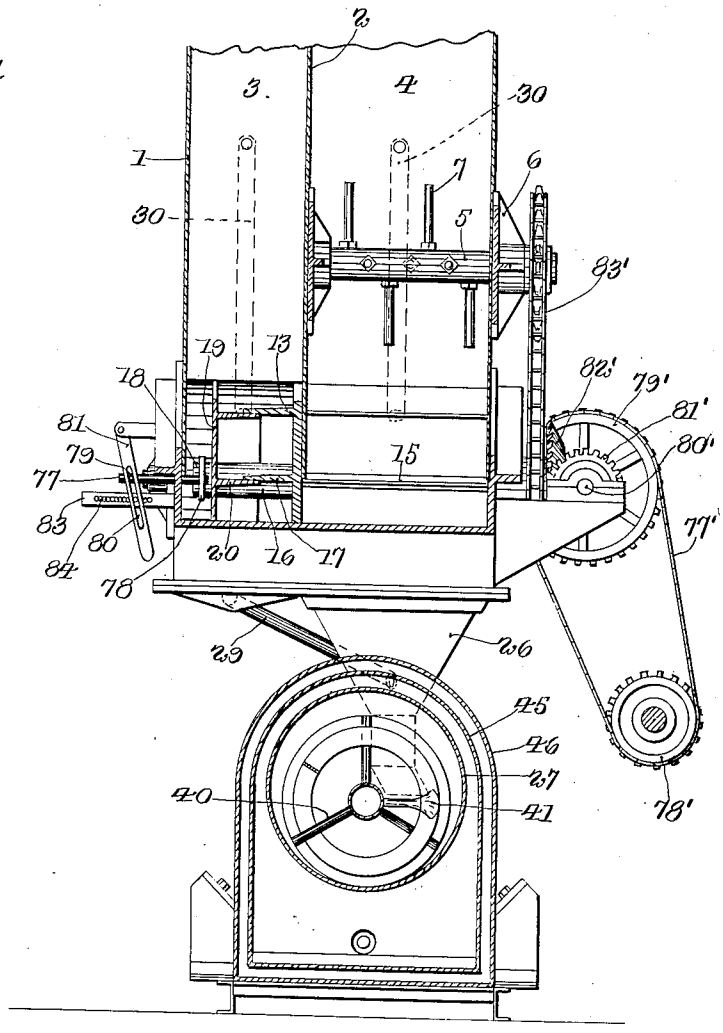
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6 SHEETS—SHEET 4.

Fig. 5.



INVENTOR

Michael A. Popkess

BY A. P. McElroy

his ATTORNEY

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6 SHEETS—SHEET 5.

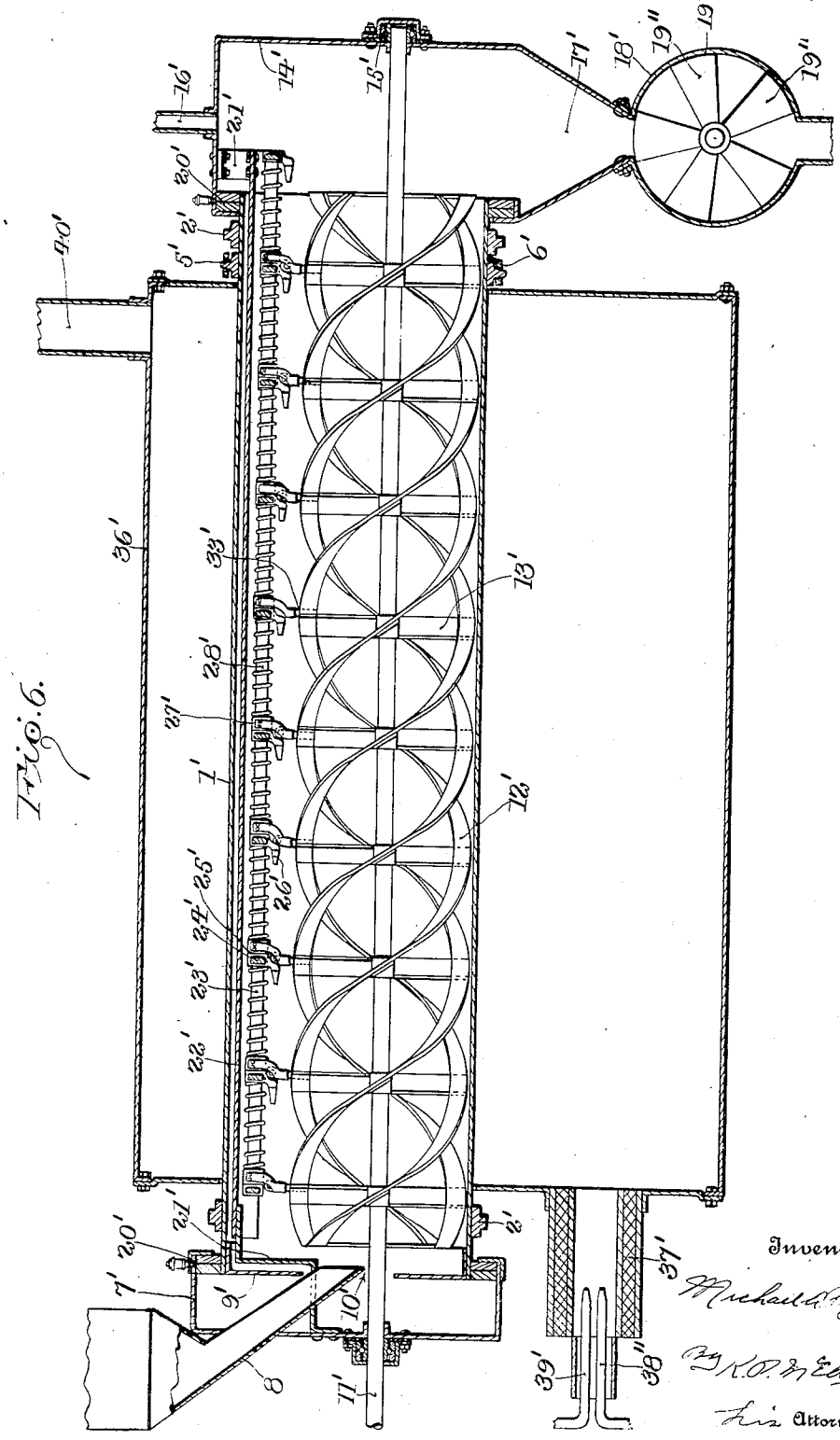


Fig. 6.

Inventor

Witnesses

Attorney

M. A. POPKESS.

CONVEYING AND MIXING MACHINE.

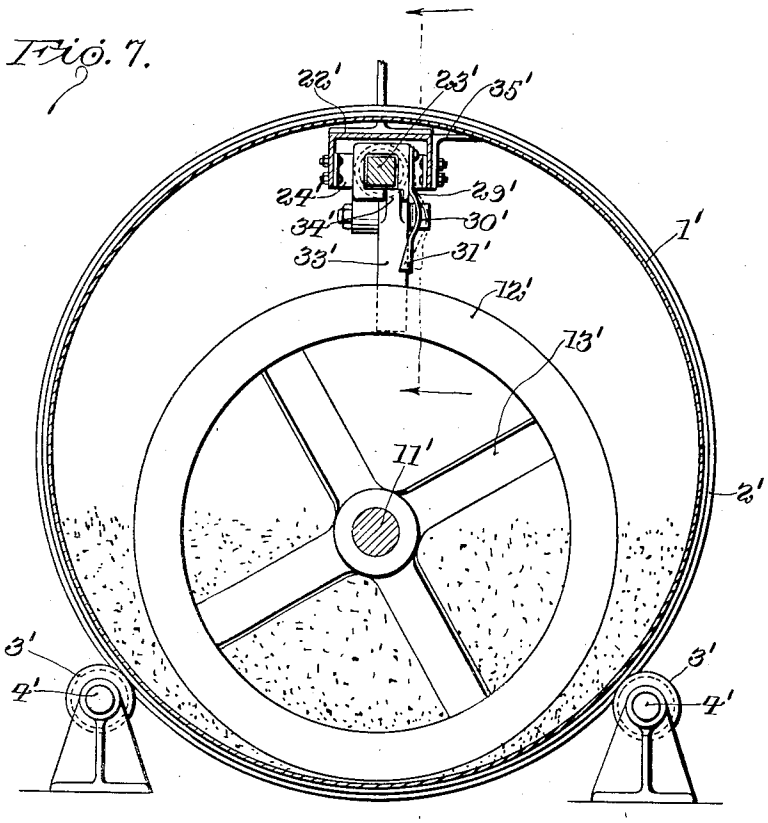
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6 SHEETS—SHEET 6.

Fig. 7.



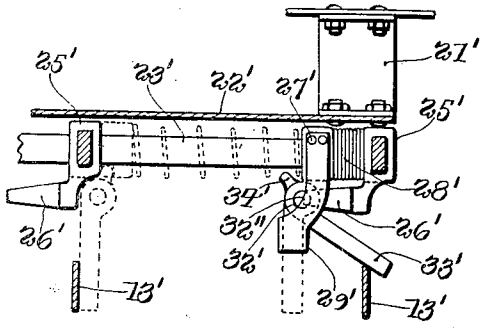


Fig. 8.

Inventor

Michael A. Popkess

By O. M. Elroy

Attorney

UNITED STATES PATENT OFFICE.

MICHAEL A. POPKESS, OF KANSAS CITY, MISSOURI, ASSIGNOR TO BITUMINIZED ROAD COMPANY, A CORPORATION OF ARIZONA.

CONVEYING AND MIXING MACHINE.

1,370,764. Specification of Letters Patent. Patented Mar. 8, 1921.

Application filed May 14, 1917. Serial No. 168,549.

To all whom it may concern:

Be it known that I, MICHAEL A. POPKESS, a citizen of the United States, residing at Kansas City, in the county of Jackson and State of Missouri, have invented certain new and useful Improvements in Conveying and Mixing Machines, of which the following is a specification.

This invention relates to conveying and mixing machines; and it comprises a conveying and mixing machine having a receptacle with separate compartments to receive the materials, agitating means within one of the compartments, means for feeding the materials from such receptacle in a continuous stream and in predetermined proportions; a revolving drum or casing into which said materials pass, combined conveying, scraping and mixing means within the drum, means for cleaning the scraping, conveying and mixing means; means for heating the interior and exterior of the drum or casing, and means for heating the exterior of the feeding mechanism and the receptacle, all as more fully hereinafter described and as claimed.

In a prior patent (No. 1,008,433), I have disclosed a process of preparing paving materials from earth, clay, loam or the like, in which the earth, etc., is disintegrated and then thoroughly mixed with liquid, or liquefied asphalt. In Patent No. 1,240,481, dated September 18, 1917, I have shown a machine for carrying out this process using the earth or clay from a roadway and incorporating liquid or liquefied asphalt with it after such earth has been pulverized. This machine, while advantageous, for work on a large scale, is relatively expensive, and I have found it advisable to construct a machine, which is less expensive, and which may be advantageously employed for mixing disintegrated earth and a binder.

In mixing asphalt or bitumen with other materials for producing paving compositions, and especially in mixing earth, clay or the like with asphalt, in a drum or mixer, having revolving blades, such as employed at present, I find the mixture is apt to adhere to the walls of the conveyer trough and to the blades of the conveyer, and as this mixed material quickly hardens, it is desirable to devise some method for keeping clean the walls of the drum and the blades of the conveyer or mixer. Great difficulty is occasionally encountered when the material becomes hardened and cakes on the parts of the machine.

In the present invention, I have devised an improved and simplified mixing apparatus of this character for mixing earthy material and liquid or liquefied bitumen or asphalt. The finely pulverized or disintegrated earth or earthy material and the liquid or liquefied bitumen or asphalt are fed to a mixer in predetermined quantities and in a continuous stream. The earthy material may be disintegrated in any suitable machine, and shipped to the place where it is to be used. In the mixing operation, the materials are conveyed through the mixing drum, and thoroughly mixed, and are also retarded in their flow to cause a more complete mixture. Any material adhering to the walls of the drum, or to the conveying means is removed by scrapers. Heat is applied to the exterior of the drum and also to the exterior of the receptacle containing the unmixed materials and to the exterior of the feeding apparatus maintaining the asphalt in a liquid condition and preventing congealing. In some instances the heat is passed to the interior of the mixing drum and draft means are provided to draw the heated air and gases into the drum.

In the present apparatus I provide a receptacle having two compartments one for asphalt and one for dust or disintegrated earthy material. The bottom of the receptacle is in communication with a measuring apparatus which delivers the earthy material and asphalt into the mixer in a continuous stream. The measuring apparatus is constructed in two sections. One section of the measuring apparatus is adjustable permitting the operator to vary the proportions of the unmixed materials. Means are provided for freeing the materials of air as they pass into the measuring apparatus. The materials are fed from the measuring apparatus into the drum which comprises a revolving casing and a shaft, best positioned eccentrically within the casing and revolving in the opposite direction. Means are provided within the drum for mixing the materials and conveying the product to the outlet end of the machine, and further means are provided for scraping the mixed material from the interior wall of the casing and from the parts of the conveying and

mixing means. The revolving drum may be provided with a heating jacket in which is arranged an oil burner or other source of heat. A suitable outlet is provided through which the products of combustion pass through the outlet into the atmosphere. In some instances the heating jacket surrounds the drum, the measuring apparatus and the receptacles for the unmixed materials and the products of combustion together with heated air are fed into the interior of the drum by means of steam jets or similar apparatus.

In one form of the invention, in which the heated air and products of combustion do not pass into the drum, I provide means for maintaining a vacuum within the drum. This reduces the heat radiation and maintains the temperature of the drum at the desired point.

In the accompanying drawings, I have shown more or less diagrammatically several embodiments of this invention.

In this showing—

Figure 1 is a central longitudinal view of one form of the invention, some of the parts being shown in elevation;

Fig. 2 is a transverse vertical sectional view on the line AB of Fig. 1;

Fig. 3 is a transverse sectional view on the line CD of Fig. 1;

Fig. 4 is a central longitudinal sectional view of a form of the invention in which the products of combustion and heated air are passed through the interior of the drum;

Fig. 5 is a vertical transverse sectional view on the line EF of Fig. 4;

Fig. 6 is a central longitudinal sectional view of another embodiment of the invention;

Fig. 7 is a central longitudinal sectional view of the form shown in Fig. 6; and

Fig. 8 is a detail view of the scraping mechanism shown in Figs. 6 and 7.

Referring to Figs. 1, 2 and 3 of the drawings, 1 designates, as a whole, the receptacle for the unmixed materials. This receptacle is provided with a partition 2 dividing the interior into compartments 3 and 4. Compartment 4 which may be called the dust compartment, has arranged therein a shaft 5, mounted in bearings 6 in the vertical walls of the compartment and carrying agitating blades 7. The bottom of the dust compartment is open, as at 8 and is in communication with the measuring apparatus. The other compartment which may be called the bitumen or asphalt compartment is partially closed by a plate 9. The measuring apparatus comprises a cylindrical casing 10 which is provided with a shaft 11 arranged in bearings 12 carried by the end walls of the casing. The measuring apparatus is provided with a division wall 13 in alinement with the partition of the receptacle. Within the dust section of the measuring apparatus a sleeve 14 is arranged upon the shaft and is provided with a series of radial blades 15 extending to the walls of the casing, each pair of blades being adapted to form pockets for reception of the unmixed material. The sleeve is keyed to the shaft to cause the blades to revolve therewith. A second sleeve 16 is arranged within the asphalt section and carries similar blades 17 which however do not extend throughout the entire length of the asphalt section. A collar 18 is keyed to the shaft beyond the ends of the blades and carries a plate 19 which is of the same diameter as the interior of the casing. A second series of blades 20 equal in number to the blades (17) are secured to this plate and are adapted to lie beside the blades (17). The dust section communicates with a casing 21 in which is mounted a shaft 22 secured in bearings 23. This shaft carries a worm conveyer 24, or other conveying means for feeding the dust toward an opening 25 through which the dust passes into a hopper 26, passing therefrom into the interior of the revolving drum 27. The asphalt section communicates with a trough 28 having an outlet pipe 29 which conveys the asphalt to the interior of the drum. In each of the dust and asphalt compartments there is arranged a vent pipe 30 having communication with the measuring apparatus through opening 31 and feeding the air freed from the material into the upper part of the receptacle through opening 32.

The drum is provided upon its exterior with ring tracks 33 adapted to ride upon flanged rollers 34, carried by shafts 35 mounted in bearings 36. The main shaft 37 of a conveyer within the drum is mounted in bearings 38. Both these bearings (36) and (38) are mounted upon suitable frame work or support 39. The bearing (38) is advantageously mounted in a cross bar (not shown) which is supported by uprights 38′ at each side of the frame work. The main shaft carries suitable conveying and mixing means, such as the ribbon blades 40, which feed the materials through the drum and thoroughly mix them. The shaft is also provided with lugs 41 which are so arranged as to retard the flow of the material to insure thorough mixture. The ribbon blades (40) carry a series of blades 42 which are adapted to scrape the interior wall of the drum during revolution. A pipe 43 conveys heated air from any source of supply (not shown) into the drum through opening 44.

Surrounding the drum, is a heating jacket 45 which is provided with a surrounding casing 46 giving an air space therebetween. An oil or gas burner 47 is supported by the casing in opening 48. The heating jacket

may be provided with a lining 49 of fire brick or similar material extending over part of its circumference. Openings 50 are arranged in the heating jacket and the fire bricks are spaced to provide registering openings for the admission of air, which mixes with the products of combustion from the oil burner and is heated thereby. The products of combustion and the heated air pass around the drum and through the vent or outlet 51.

The entire machine is driven from the main shaft 52 which is provided with a sprocket 53 arranged in alinement with sprocket 54 upon the main shaft (37) of the drum. A chain 55 passing over these sprockets drives the shaft of the drum. A second chain 56 is arranged upon the sprocket 57 on the main shaft sprocket 58 on countershaft 59. The countershaft 59 is mounted in one of the bearings (36) and the bearing 60 and it carries a gear or pinion 61 which meshes with a circular rack or girth gear 62 upon the exterior of the drum. The countershaft is provided with a sprocket 63 in alinement with sprocket 64 on shaft (22) of the worm conveyer and drives said shaft through the medium of chain 65. Shaft (11) is provided with sprocket or gear 66 and shaft (5) is provided with sprocket or gear 67 each of which are connected in any suitable manner to shaft (22) or other revolving parts of the machine.

In the construction illustrated in Figs. 4 and 5 of the drawings the operation is similar but the machine is slightly different in construction. The receptacle for the unmixed materials and the measuring apparatus is arranged at right angles to the drum. In this embodiment the heating jacket communicates with the interior of the drum and is provided with an end wall 69. A baffle plate 70 is arranged near the outlet of the drum to guide the mixture through opening 71. A portion of shaft (37) is hollow and steam pipe 72 delivers steam from any source of supply (such as the exhaust of the engine used to run the machine) to nozzles 75. In this embodiment the fire brick lining together with the air feed is omitted and air is fed into the machine around the oil burner. A casing or jacket 76 surrounds the measuring apparatus and the dust receptacle and communicates with the interior of the drum to cause the products of combustion and heated air and steam which pass through the drum to flow around the exterior of the measuring apparatus and receptacle and prevent the liquefied or liquid asphalt from congealing.

In Fig. 5 of the drawings means for adjusting feed of asphalt from the asphalt section of the measuring apparatus is illustrated. Rod 77 is provided with fork member 78 which is connected to the collar (18). The rod carries a pin 79 engaging slot 80 of the pivoted lever 81. This lever is pivoted upon a bracket 82 carried by the end wall of the casing. An arm 83 provided with a plurality of openings 84, one of which registers with the slot at all times, allowing a padlock (not shown), or other locking means or seal, to be used in one of the openings 84 and the slot when the proper adjustment has been attained. The driving means for the drum and the main shaft of the drum are similar to the means described in Figs. 1, 2 and 3 but the measuring apparatus and the agitating shaft in the dust compartment are driven direct from the main shaft (52). A chain 77′ passing over sprocket 78′ on shaft (52) and over sprocket 82′ on stub shaft 80′, drives this stub shaft. This stub shaft carries a bevel gear 81 meshing with gear 82′ on shaft (11). Shaft (5) is driven by sprockets and chain 83′.

In the embodiment of the invention illustrated in Figs. 6, 7 and 8, the revolving drum 1′ is provided with annular or ring tracks 2′ located on its periphery near each of its ends, these tracks being adapted to travel upon rollers 3′ carried by shafts 4′ journaled in the frame of the machine. The drum is also provided with a circular rack 5′, meshing with the gear or chain 6′ which is driven from any suitable source of power.

At the inlet end of the machine there is provided a stationary hood 7′, through which a chute 8′ passes. The inlet end of the drum is provided with an annular plate 9′ having an opening 10′ therein through which the chute 8′ extends into the drum. The main shaft 11′ of the mixing and conveying means also extends into the drum through opening 10′.

The conveying and mixing means may be of any type desired and in the present embodiment of my invention I have illustrated a number of ribbon blades 12′ spirally arranged upon a plurality of spiders 13′, which are rigidly fastened to shaft 11′.

At the outlet end of the machine there is provided a second stationary hood 14′, having a bearing 15′ for shaft 11′. Pipe 16′ is connected to a vacuum pump or fan to maintain suction or partial vacuum within the machine. A hopper 17′ is arranged at the bottom of the hood, and mounted within the cylindrical casing 18′ is a shaft carrying a cylindrical member 19′ having pockets cut therein. The pockets are separated from each other by walls 19″ the thickness of which is equal to the size of the pockets. The hoods at each end of the machine are provided with packing 20′ comprising two strips of felt or other suitable material, one of which revolves with the drum and is fastened thereto, the second being stationary and fastened to the hood.

Supported by suitable brackets 21′ fas-

tened to the hoods 7′ and 14′ is a channel bar 22′, or other suitable support for the scraping mechanism. A rod of rectilinear cross-section 23′ is arranged within the channel bar and is connected thereto by clips 24′ which pass through stationary blocks 25′, arranged at suitable intervals on the rod, the stationary blocks 25′ carrying depending wedge blocks 26′. A slidable block or bearing 27′ is mounted on the rod (23′) between each pair of stationary blocks (25′) and a spring 28′ is provided which holds the blocks (25′) and (27′) spaced from each other. The block (27′) carries the leaf spring 29′ which projects downwardly and is provided with an offset 30′ intermediate its ends, as shown in Fig. 7. The lower end 31′ of the leaf spring is curved in cross section. The slidable block (27′) carries a bearing 32′ in which is supported a stub shaft or bolt 32″ supporting the scraping blade 33′. The blade (33′) is provided with a projection 34′ extending upwardly when the blade is in its normal position.

Mounted upon the inner side of the channel bar (22′) is a scraping element 35′ bearing against the walls of the drum and extending throughout its length.

The drum is surrounded by a stationary casing 36′ which has arranged therein a combustion chamber 37′ provided with an oil burner 38″ and steam jet 39′. The oil is supplied to the burner from any suitable source and I usually employ the superheated steam from the steam boiler (not shown) which is used to run the mixing machine. The casing is further provided with a stack 40′ through which the gases of combustion or the steam pass from the machine.

In the operation of this machine earthy material which has been finely pulverized or disintegrated is placed in the dust compartment 4 of receptacle 1 and liquid or liquefied asphalt or bitumen is placed in the asphalt compartment 3. The asphalt section of the measuring apparatus is properly adjusted to attain the desired proportions and the asphalt and dust are separately fed from the receptacle by the measuring apparatus. As the unmixed material feeds into the pocket formed by each pair of radial blades it flows toward the bottom of the pocket and displaces the air. This material continually displaces the air which exhausts through the pipe 30 until the pocket is entirely filled. The asphalt and earthy material are fed into the drum where they are thoroughly mixed and fed forwardly by the ribbon blade 40. The mixing lugs 41 retard the flow of the materials. Blades 42 assist in mixing the materials and also scrape the interior wall of the drum removing any mixed material which may adhere to the wall. The products of combustion from the oil burner 47 and the heated air maintain the interior of the drum at a relatively high temperature which will check any tendency of the asphalt to solidify. The heated air fed into the machine through pipe 43 maintains a high temperature at the inlet end of the machine.

In the form of the invention disclosed in Figs. 4 and 5 the operation is essentially the same with the exception of the modification in the heating arrangement. The products of combustion and heated air within the heating jacket 45 are drawn into the interior of the drum by the draft created by steam jet 75 and pass through the drum in a direction opposite to that of the flow of the materials to be mixed. Any heat radiated from the drum is intercepted by the air in the air space between casings 45 and 46 and is delivered to the burner by suction caused by the air or steam jet of the burner used for atomizing the fuel oil. The products of combustion and heated air pass from the drum at the inlet end into casing 76 and are carried around the exterior of the measuring apparatus, and the exterior of the receptacle for unprepared materials, heating the contents of each.

In Figs. 5, 6 and 7 the materials to be mixed are fed into the machine through chute 8′, passing through opening 10′ in plate 9′ into the interior of the drum 1′. The blades 12′ of the mixer lift the material and feed it toward the outlet end of the machine, thoroughly mixing it during its progress through the machine. The mixer is of slightly less diameter than the drum and the shaft 11′ carrying the mixing blades is eccentrically mounted within the drum and best arranged so that the blades 12′ will contact with the wall of the drum at one point during its revolution, whereby the entire inner surface of the drum will be scraped by the blades as they revolve. The scraping element 35′ carried by the channel bar 22′ removes any mixed material which may adhere to the wall of the drum and drops it upon the conveyer blades, mixing it with the remainder of the material within the drum.

The slidable blocks 27′ carrying the scraping blades 33′ are each mounted upon the side of the corresponding stationary block 25′ toward the outlet end of the machine, and the spring 28′ is interposed between each of the sliding blocks and the next stationary block for maintaining them in this position. As the conveyer revolves the blades 12′ press against the scrapers 33′, as illustrated in Fig. 8, compressing the spring and carrying the block 33′ toward the next stationary block. The blade 33′ is locked by the curved end 31′ of leaf spring 29′. The wedge block 26′ enters between the offset portion 30′ of the spring 29′ and the slidable block 27′ and presses the spring to the position shown in dotted lines in Fig. 7 re-

leasing the scraper blade 33′. The slidable block is then returned to its original position by the action of the spring 28′. The projection 34′ formed upon the upper end of the blade 33′ strikes against the stationary block 25′, causing the blade to assume a vertical position and allowing the leaf spring 29′ to lock the same in its vertical position, at which time another of the blades 12′ of the conveyer will have reached the original position shown in Fig. 8, and the operation is repeated.

The vacuum obtained within the machine assists in the mixing of the materials and prevents, to a certain extent, any heat escaping by radiation. The pockets formed in the cylindrical block 19′ deliver the mixed material from the machine. The separating walls 19′ are so arranged, that the outlet from casing 18′ will be closed when one of the pockets is being filled, and the inlet closed when one of the pockets is discharging its contents. This permits the discharge of the mixture and prevents air from being drawn into the machine through the discharge opening. A similar arrangement can be employed in the chute 8′ at the inlet end of the machine. By providing means for heating the drum through the provision of an oil burner or by admitting exhaust steam into the casing through the steam jet, a ready mixture of the material is more easily effected as the liquid asphalt generally used will solidify when cooled and will not be readily incorporated with the earthy material.

The measuring apparatus shown in Figs. 1 to 5, can be employed in the form shown in Figs. 6 to 8 if desired.

Either form of this invention is particularly adapted for use by small towns, counties and private companies, which are unable to afford the expense of a larger machine containing the disintegrating means. The disintegrated material can be shipped from a central source of supply to the point of use, mixed with a binder, and applied to the road.

Of course, it will be understood that this machine is susceptible of use with other materials than those specified, the selection being illustrative, and not restrictive.

What I claim is:—

1. In a machine of the class described a drum, a revolving bladed mixer and conveyer within the drum, a plurality of scraping blades slidably supported within the drum and adapted to engage the blades of the conveyer, and means for returning the scraping blades to normal position.

2. In a machine of the class described a drum, a revolving bladed mixer and conveyer within the drum, a supporting member mounted in the drum, a plurality of scraping blades slidably mounted thereon and adapted to engage the blade of the conveyer, and move along said supporting member, and means for returning said scraping blades to normal position.

3. In a machine of the class described, a drum, a revolving bladed mixer and conveyer within the drum, a supporting member mounted in the drum, a plurality of hinged scraping blades slidably mounted thereon, and engaging the blades of the conveyer, said scraping blades being adapted to move on said supporting member when in engagement with said conveyer blades, means for disengaging said scraper blades from said conveyer blades, and means for returning said blades to normal position.

4. In a machine of the class described, a drum, a revolving bladed mixer and conveyer within the drum, a supporting member mounted in the drum, a plurality of hinged scraping blades slidably mounted thereon, and engaging the blades of the conveyer, said scraping blades being adapted to move on said supporting member when in engagement with said conveyer blades, a plurality of wedge blocks mounted on said supporting member and arranged to disengage said scraper blades from said conveyer blades, and means for returning said blades to normal position.

5. In a machine of the class described, a drum, a revolving bladed mixer and conveyer within the drum, a supporting member mounted in the drum, a plurality of hinged scraping blades slidably mounted thereon, and engaging the blades of the conveyer, said scraping blades being adapted to move on said supporting member when in engagement with said conveyer blades, means for disengaging said scraper blades from said conveyer blades, and springs arranged on said supporting member and adapted to return said scraping blades to normal position.

6. In a machine of the class described, a revolving drum, a revolving bladed conveyer and mixer within the drum, a stationary supporting member extending through the drum, scraping means for said conveyer blades arranged thereon, and means carried by said supporting means to scrape the interior of the drum.

7. In a machine of the class described, a revolving drum, a revolving bladed conveyer and mixer within the drum, a stationary supporting member extending through the drum, scraping means for said conveyer blades arranged thereon, and a scraping element carried by said supporting member and engaging the interior wall of said drum.

8. In combination with a mixing machine, of a delivery apparatus comprising a receptacle having a plurality of compartments, a measuring apparatus in communication with each of said compartments, means within the measuring apparatus to permit the

escape of gases, said measuring apparatus comprising a plurality of sections, certain of said sections being adjustable to vary the proportion of the materials.

9. In a machine of the class described a revolving drum, a revolving bladed mixer and conveyer within the drum and means to scrape the blades of the mixer.

10. In a conveying and mixing device, a revolving drum having conveying and mixing means within the drum revolving in the opposite direction, the conveying and mixing means being eccentrically mounted within the drum and adapted to scrape the interior walls of the drum at one point in its revolution.

11. In a machine of the class described, a revolving drum, mixing and conveyer means within the drum, a combustion chamber surrounding the drum and an air jacket surrounding the combustion chamber to intercept the radiated heat and to deliver the heated air to a burner.

12. In a machine of the class described, a revolving drum, mixing and conveyer means within the drum, a combustion chamber surrounding the drum and in communication with the interior thereof, and an air jacket surrounding the combustion chamber to intercept the radiated heat and to deliver the heated air to a burner.

13. In a conveying and mixing device, a revolving drum having conveying and mixing means within the drum revolving in the opposite direction, the conveying and mixing means being eccentrically mounted within the drum and adapted to scrape the interior walls of the drum at one point in its revolution, and means for retarding the flow of the material through said drum.

14. In a conveying and mixing device, a revolving drum having conveying and mixing means within the drum revolving in the opposite direction, the conveying and mixing means being eccentrically mounted within the drum and scraping blades carried thereby and adapted to scrape the interior walls of the drum during one point in its revolution.

15. In a conveying and mixing device, a revolving drum having conveying and mixing means within the drum revolving in the opposite direction, the conveying and mixing means being eccentrically mounted within the drum and adapted to scrape the interior walls of the drum at one point in its revolution, and means for scraping the conveying and mixing means.

16. In a conveying and mixing device, a revolving drum having conveying and mixing means within the drum revolving in the opposite direction, the conveying and mixing means being eccentrically mounted within the drum and adapted to scrape the interior walls of the drum at one point in its revolution, a stationary supporting member arranged in the drum, said scraping elements arranged thereon and adapted to scrape said conveying and mixing means.

In testimony whereof, I affix my signature hereto.

MICHAEL A. POPKESS.