July 14, 1925.

1,546,292

E. H. LICHTENBERG

CONCRETE DISTRIBUTING MACHINE

Original Filed July 19, 1920 5 Sheets-Sheet 1

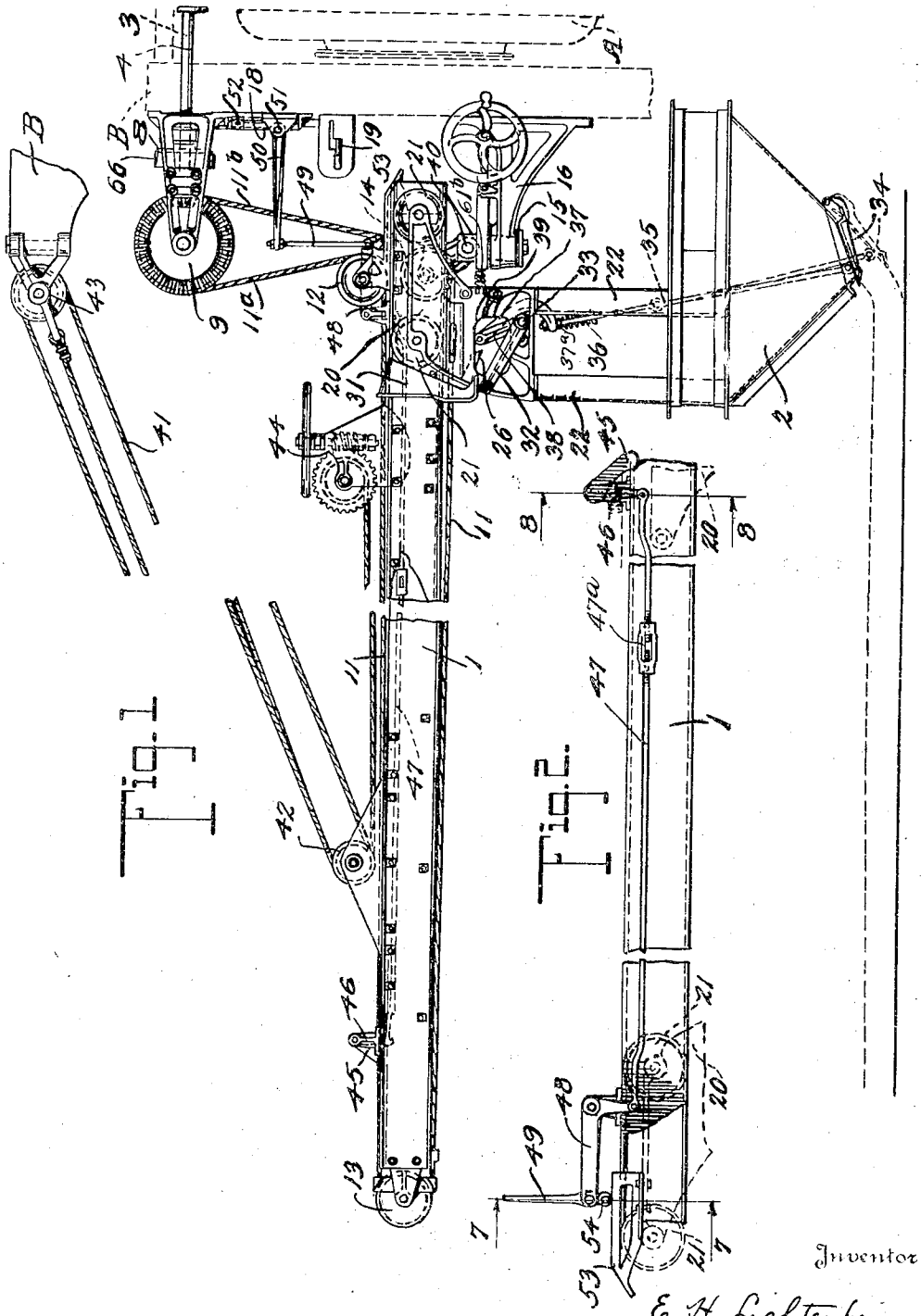

Fig. 1.

Fig. 2.

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Fig. 3.

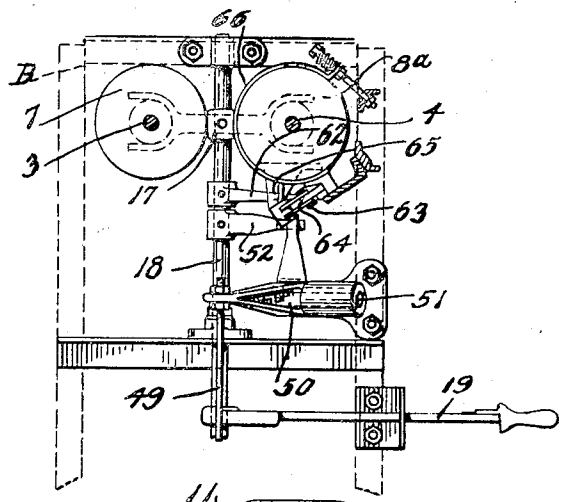
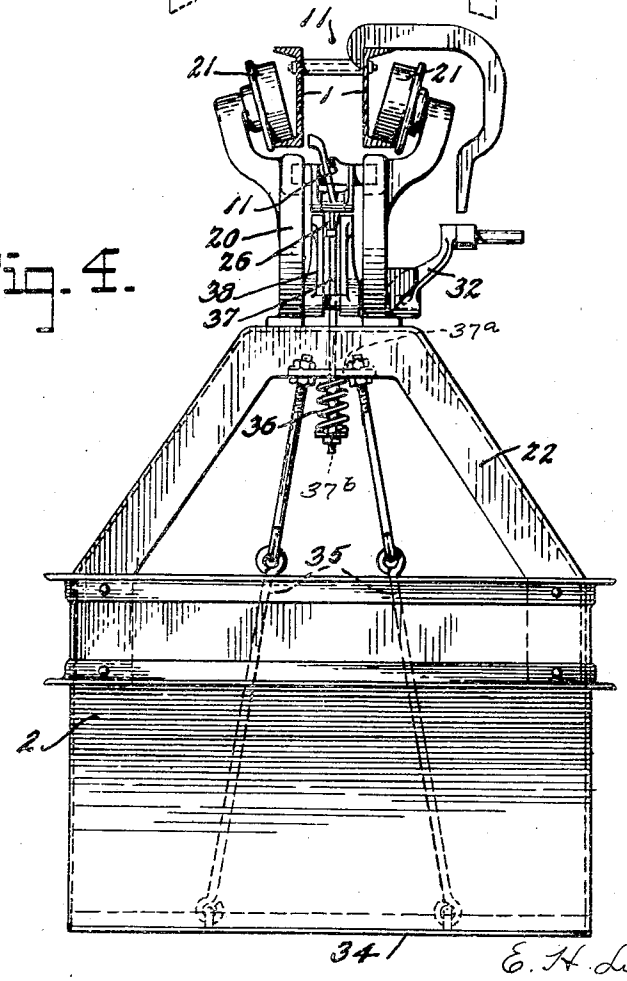


Fig. 4.



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Original Filed July 19, 1920 5 Sheets-Sheet 3

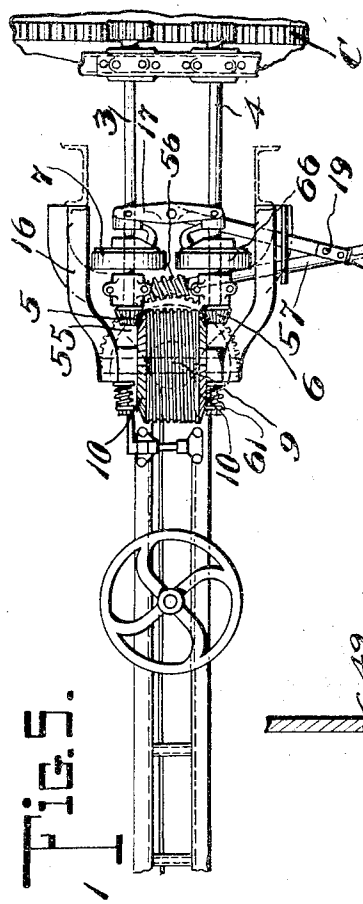


Fig. 5.

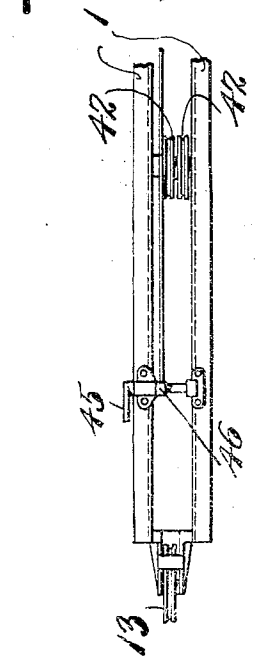


Fig. 6.

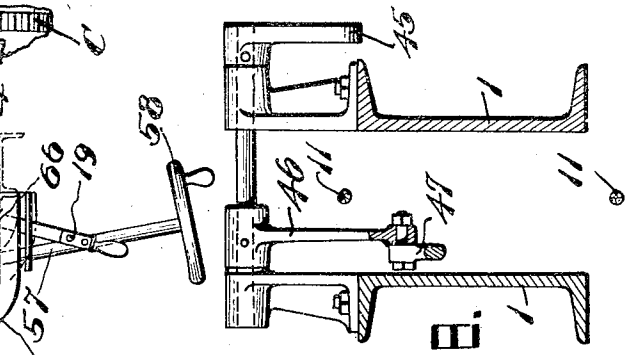


Fig. 8.

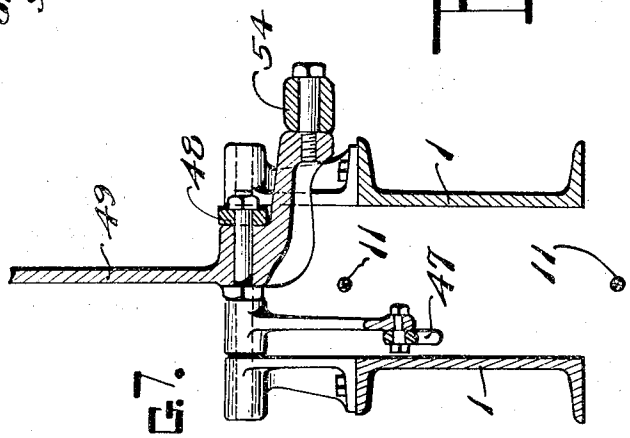
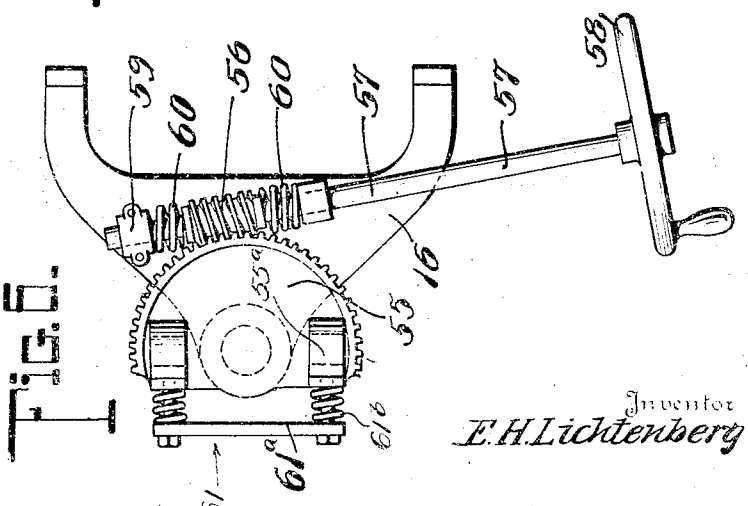


Fig. 7.



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Original Filed July 19, 1920 5 Sheets-Sheet 4

Fig. 9.

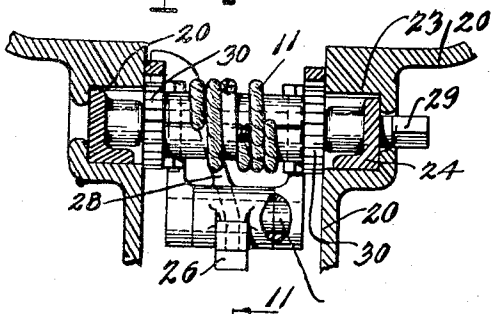


Fig. 10.

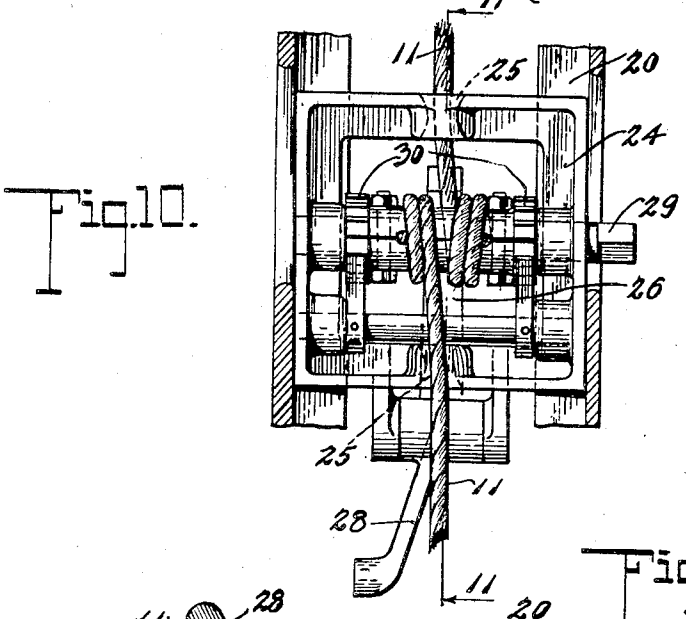
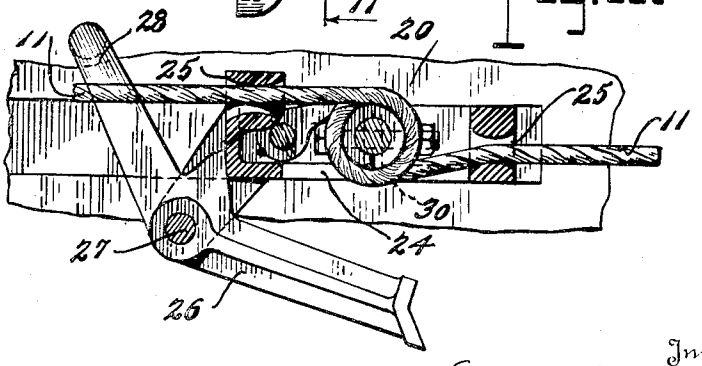


Fig. 11.



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Original Filed July 19, 1920 5 Sheets-Sheet 5

Fig. 12.

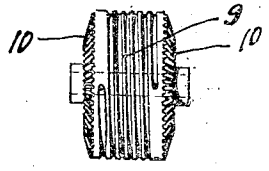


Fig. 13.

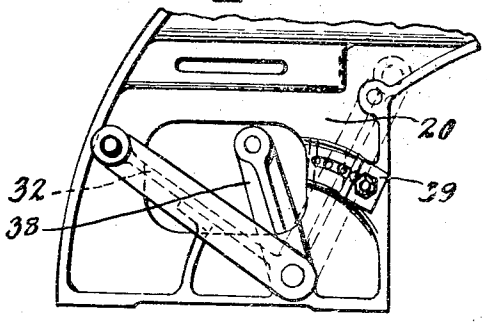
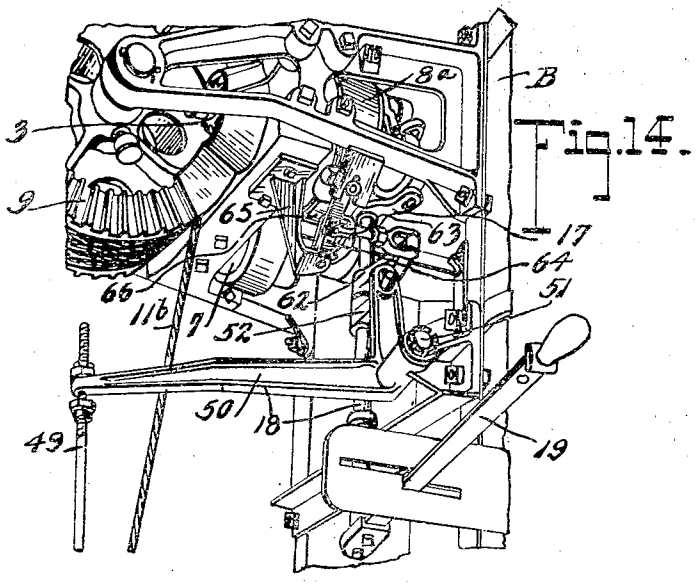


Fig. 14.



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Patented July 14, 1925. 1,546,292

UNITED STATES PATENT OFFICE.

ERICH H. LICHTENBERG, OF MILWAUKEE, WISCONSIN, ASSIGNOR TO KOEHRING COMPANY, OF MILWAUKEE, WISCONSIN, A CORPORATION.

CONCRETE-DISTRIBUTING MACHINE.

Original application filed July 19, 1920, Serial No. 397,431. Patent No. 1,411,217, dated March 28, 1922. Divided and this application filed March 24, 1922. Serial No. 546,273.

To all whom it may concern:

Be it known that I, ERICH H. LICHTENBERG, a citizen of the United States, residing at Milwaukee, in the county of Milwaukee and State of Wisconsin, have invented certain new and useful Improvements in Concrete-Distributing Machines, of which the following is a specification.

In the art of laying concrete roads, pavements and the like, there is commonly used as the most expeditious and economical method of distributing the concrete or mixed aggregates of which the pavement is composed, a machine which comprises, generally speaking, a combined mixer and boom and bucket distributing means. This machine ordinarily known as the Koehring paver, embodies a portable plant which includes the concrete mixing drum and customary appurtenant control mechanisms, together with the boom and bucket attachment operated from the same power as used for the mixing machine and controlled by the same operator.

My present improvements comprise a division of my copending application for patent Serial No. 397,431, filed July 19, 1920, now matured into Letters Patent No. 1,411,217, issued March 28, 1922, and among the principal objects of said improvements are the simplifying of the driving mechanism utilized for causing the bucket to traverse the boom by which the distribution of the concrete over a relatively large area may be performed; the provision of a more positive driving mechanism for the purpose just outlined; and the improvement of certain knock-out or clutch neutralizing devices, certain of which have been heretofore proposed by me for automatically discontinuing the traverse of the bucket upon the boom, this being timed in respect to both the outward and the inward movements of the bucket relatively to the mixing machine by which the concrete is supplied thereto.

Another feature of the present improvements resides in special braking means employed in conjunction with the driving devices for the bucket mechanism, whereby if the machine is operating in a position wherein the boom is inclined upwardly, the inward and downward movement of the bucket may be retarded as it approaches the mixer end of the boom through the action of automatic braking mechanism. The braking mechanism is useful, however, even when the bucket is traveling on the boom while the latter is adjusted to occupy a substantially horizontal position.

In the present design of boom and bucket distributing mechanism there is also proposed an improved device for causing the swinging of the boom in a horizontal plane to effect the proper distribution of the aggregates over different portions of the subgrade. This feature of my invention is of importance and involves the worm and worm gear contrivances originally proposed in the Letters Patent Reissue No. 13,617 issued September 16, 1913, to Philip A. Koehring, said patent covering the basic machine improved by the features of my Letters Patent No. 1,141,470 and No. 1,113,661 issued June 1, 1915 and October 13, 1914 respectively. In the operation of the worm and worm gear boom turning means, there has been a tendency heretofore to cause locking of the engaged worm and worm gear contrivances, owing to the momentum of the boom once the horizontal movement is imparted thereto. I merely mount my worm in a resilient manner as regards end-wise movement, in respect to the engaged worm gear, and in this way eliminate the possibility of the disadvantageous locking of the parts as referred to, at the same time rendering more easy the operation of the boom by said parts manually in respect to initiating as well as stopping said boom movement.

The present invention furthermore involves a novel improved connection intermediate the trip mechanism on the carriage and the doors of the bucket, the said connection involving resiliently acting parts. Additionally the invention involves a new form of resilient bumper means intermediate the carriage and the bracket means supporting the boom swinging worm gear.

A full comprehension of the improvements of this invention will be had upon an understanding of the machines of the Letters Patent previously set forth herein in connection with the following description and the accompanying drawings in which:—

Figure 1 is a side view showing particu-

larly the boom and bucket attachment as designed with the present improvements, dotted lines indicating in a general way the adjacent end portion of the mixing machine upon which the boom and bucket mechanism is mounted.

Figure 2 is a fragmentary view showing more particularly the automatic stop mechanism at opposite ends of the boom for co-operation with the driving gearing to render the latter inactive at proper times.

Figure 3 is a view looking toward the delivery or discharge end of the mixer and bringing out more clearly the controlling lever and clutch shifting mechanism and adjacent driving mechanism above the inner end of the boom.

Figure 4 is a vertical sectional view through the boom and looking toward the outer side of the bucket, bringing out more fully the mounting of the carriage on the boom and bucket-door closing device.

Figure 5 is a plan view showing primarily the parts illustrated in Fig. 1, the bucket and certain of the parts beneath the boom being omitted.

Figure 6 is a plan view bringing out clearly the worm and worm gear turning device as improved, also the bumper co-operative with the carriage to limit the inward movement of the bucket on the boom.

Figure 7 is a vertical sectional view taken about on the line 7—7 of Fig. 2.

Figure 8 is a similar section taken about on the line 8—8 of Fig. 2.

Figure 9 is a vertical section taken through a portion of the carriage showing the shuttle or slide of the tripping device.

Figure 10 is a plan view of the same including a trip member.

Figure 11 is a section on the line 11—11 of Fig. 10.

Figure 12 is a front view showing more clearly the winding drum of the driving mechanism.

Figure 13 is an enlarged view showing more clearly the adjustable stop on the carriage; and

Figure 14 is a perspective view showing more clearly the arrangement of the lever arms and links of the clutch shifting and knock-out devices.

Referring to the drawings in which the same reference characters are used to designate corresponding parts in different views, and describing the improvements thereof in detail, A denotes the portion of the mixing drum of the mixing machine illustrated in conjunction with the boom and bucket mechanism, B the frame work of said machine, and C the toothed gear rings carried by said drum A and by which it is rotatably operated in a well known manner. The boom and bucket mechanism embodies as its primary features the boom 1 and the bucket 2, the latter spaced from the ground, power operated, and being normally non-discharging in its body construction.

The driving mechanism by means of which the bucket is caused to traverse the boom 1 comprises a pair of shafts 3 and 4 having pinions at one end meshing with the gear-ring C of the drum A whereby motion is transmitted constantly to the shafts while the drum A is in operation. The shafts 3 and 4 are equipped with normally idle bevel gears 5 and 6 respectively, adapted to be operatively connected to turn with said shafts by means of clutches 7 and 8 respectively. The bevel gears 5 co-operate with the winding drum 9 formed with a spirally grooved winding surface, said drum having at opposite ends large bevel gears 10 with which the gears 5 and 6 mesh. The opposite ends 11^a and 11^b of an operating cable 11 wind around the drum 9 in opposite directions, and have the extremities thereof fixedly attached to the drum as shown best in Fig. 12 of the drawings. The said cable 11 extends from the end portion 11^a down under a sheave journaled on top of the boom 1 thence outwardly along the boom around a sheave 13 at the outer extremity of said boom. From the sheave 13 the cable 11 is trained inwardly along the boom adjacent to its under side, said cable passing thence upwardly over a sheave 14 located adjacent to the point of pivotal support of the boom 1. At this point the cable 11 has its end 11^b connected with the drum 9 in the manner previously suggested. The sheaves 12 and 14 are located so that the portions of the cable 11 passing over the same are substantially in vertical alinement with the axis of rotative movement of the boom 1 established by the vertical pivot 15. The pivot 15 connects the boom with the bracket 16 projecting from the frame B of the machine, said bracket forming the main support intermediate the boom and the frame work of the mixer.

To operate the clutches 7 and 8 a rocker lever 17 (see Figs. 3 and 5) is employed, the same being equipped with shifting forks and being mounted upon a vertical shaft 18, seen best in Fig. 3. The shaft 18 has a main hand lever 19 connected with its lower end and this lever is operable to alternately render the clutches 7 and 8 active for effecting reverse movements of the drum 9 and cable 11 or to maintain the clutches 7 and 8 in neutral positions.

The reverse operation of the drum 9 is effective to cause reverse movement of the bucket 2 relative to the boom 1 by interconnections between the cable 11 and the carriage 20, which interconnections are very similar to those set forth in my previous Patent No. 1,141,470. The carriage 20 has the rollers 21 which are adapted to travel in

the channels of the beams which comprise the boom 1, as shown best in Fig. 4. The bucket 2 is supported by the carriage 20 through the provision of hangers 22, and the method of attachment of the cable 11 to the carriage 20 is best shown in Figs. 9 to 11. For the above purpose I provide on the carriage 20, slidable in suitable ways or grooves 23 at opposite sides of the latter, a slide or shuttle 24. The slide or shuttle 24 has end bars with openings 25 through which the cable 11 passes and mounted on the shuttle member 24 is a trip 26 pivoted at 27 and having an upwardly extending arm 28. Centrally of the slide or shuttle 24 there is mounted a slack take-up shaft 29 equipped with ratchet wheels 30 and about which the cable 11 is wound so as to extend from the shaft in opposite directions. It will be evident that by turning the shaft 29 by the application of any suitable tool, any unnecessary slack in the length of the cable 11 may be taken up.

The action of the trip 26 is very similar to the action of certain corresponding trip mechanism of my previous Patent No. 1,141,470, and will be generally set forth hereinafter.

Reverse movement of the cable 11 imparts corresponding movement to the carriage 20, and said carriage supports the bucket 2 for a corresponding movement of the latter. I utilize my previously invented and well known cam 31 to co-operate with an arm 32 on the shaft 33 for the purpose of closing the bottom door 34 of the bucket 2. The bottom door 34 is connected by linkage 35 and spring 36 with the curved link 37 which in turn is attached to the throw over arms 38 projecting from the shaft 33 all substantially as disclosed in my last named Letters Patent.

The design of my bucket 2 and the openable door 34 is especially novel and important. The door 34 is of a length corresponding to the width of the bucket 2, and said door is variably limited in its opening movement by means of an adjustable stop 39 which is attached to one side of the carriage 20 and adjustable lengthwise of said carriage by means of a suitable bolt passing through the said stop. The stop co-acts with the arm 32 to limit the movement of said arm in the direction of the mixer, as the arm is shifted to throw over action of the arms 38 under the influence of the trip 26. That is to say, the door 34 can open just so far as is determined by the movement of the arm 32 in the action of tripping the door 34 to effect said opening. It is the adjustability of the stop 39 which admits of the flowing of the concrete aggregates from the bucket 2 in a ribbon-like stream, the thickness of which depends upon the extent of opening of said door, and due to retarded egress of the aggregates because of the restriction of the door opening. Necessarily the thickness of the stream of materials discharged from the bucket 2 determines the depth of the layer of concrete or aggregates dispensed, so to speak, by the bucket. The bucket opening and door 34 are advantageously arranged transversely of the boom, and of the direction of travel of the bucket 2, for the attainment of the above result of depositing the plastic aggregates in a layer of measured thickness.

The bucket 2 is designedly a low discharge bucket; in other words, the discharge end of the bucket is very near the ground so as to admit of the laying down of the concrete in a relatively thin ribbon-like gravitating stream of a width equal to the width of the bucket and of a depth regulated by adjustment of the stop 39 controlling the operative area of the opening made by release of the door as the latter drops to its effective opening position.

The boom 1 is adapted to be raised and lowered by vertical movement of an axis established by the horizontal pivot 40 connecting the boom with the vertical pivot 15 on the bracket 16. The means utilized for this purpose are like those heretofore proposed including a cable 41 attached to the upper frame work B of the machine (see Fig. 1) passing around a sheave 42 on the boom 1 intermediate the ends of the latter, thence passing up and around another sheave 43 on the frame work sections, down again around a second sheave 42, co-axial with the previous sheave 42, and thereafter passing to a windlass device shown at 44 as mounted on the boom 1 adjacent to the inner end of the boom.

On the boom 1 there is provided certain automatically operating clutch knock-out mechanism for the clutches 7 and 8. This mechanism is seen best in Figs. 2 and 3 of the drawings. In the outward traverse of the carriage 20 with the bucket 2, if the operator does not reverse the movement of the cable 11 by manual control of the clutches through the lever 19, said carriage will strike the knock-out or shifter arm 45 located adjacent to the outer end of the boom and pivoted to a bracket 46 thereon. The arm 45 is equipped with a pull rod 47 extending longitudinally of the boom intermediate the channels thereof. When the knock-out or shifter arm 45 is rocked upward a pull is exerted on the rod 47 and said rod actuates a bell crank lever 48 near the inner end of the boom in such a manner as to pull downwardly upon a bar 49 which is attached to another bell crank lever 50 which is pivoted at 51 on the frame work B. The vertical arm or lever 50 is connected with a horizontal arm 52 and offstanding from the shaft 18 which it will be recalled is

the controlling shaft for the shifting yokes of the clutches 7 and 8. Obviously movement imparted to the bell crank lever 50 in the above manner will shift the arm and therewith the shaft 18 to move the shaft into a position in which the clutches 7 and 8 are neutral or reversed. In this way the drive of the cable 11 is discontinued or reversed automatically through the knock-out device under the initial actuation of the knock-out lever 45. On inward movement of the carriage 20, in order to automatically neutralize or render ineffective the one of the clutches 7 or 8 which is employed to cause return movement of the carriage upon the boom, there is provided a cam 53, seen best in Fig. 2, and this cam is adapted to ride beneath the roller 54 on the bottom of the bar 49, thereby raising said bar and effecting the operation of knock-out of the effective clutch by which the return movement of the carriage and bucket is being caused. This action will be obvious with the previous description of the clutch neutralizing operation from the knock-out member 45 and the principle of operation is quite similar to that found in my Letters Patent No. 1,113,661 previously referred to.

There is left to be described the means for turning the boom 1 by movement in a horizontal plane, said means involving generally the previously well known worm gear sector 55 fixed on the pivot 15 by which the boom is supported for said horizontal movement. This worm gear is engaged by a worm 56 on the manually rotatable shaft 57 adapted to be turned by the wheel 58. The worm 56 may be said to be a floating worm to the extent that it is movable endwise on the shaft 57, though of course, splined thereto to turn therewith. The worm operates between boxes 59 in which the shaft 57 is journaled on the bracket 16 and springs 60 are interposed between said boxes 59. On turning the shaft 57 to swing the boom 1 horizontally, the initial action of the worm 56 is to yield by compression of one of the springs 60, the one in the direction opposite that in which the boom will turn. After slight compression of said spring, the boom will begin to swing and the worm will become centralized between the boxes 59 under the action of the springs. On stoppage of the turning movement of the shaft 57, if there is continued movement of the boom under the impetus of its swing produced by manual operation of the wheel 58, said worm 56 will yield longitudinally on the shaft 57 and there will be no tendency for the parts 55 and 56 to become locked by the friction incident to the action of the worm 56 as a stop for limiting the movement or swinging of the boom. There is mounted upon the worm gear 55 a yieldable bumper 61 with which the carriage 20 may abut as it reaches the inward limit of its movement in traversing the boom 1. The bumper includes a plate 61^a, and two springs 61^b interposed between said plate and two pivot lugs 55^a on the gear 55. It will be evident that this bumper 61 affords a resilient means intermediate the bracket 16 and the carriage by which the bracket 2 is supported to absorb the shock incident to abutment between the above parts as the bucket reaches its charging position adjacent to the mixer. As previously described, I utilize linkage 35 and a spring 36 cooperative with the curved link 37 and arms 38 to connect the trip mechanism with the bottom doors 34 of the bucket 2. The specific mode of connection of these parts is novel in that I use a cross plate 37^a through which passes the bolt 37^b that is encircled by the spring 36, previously mentioned. The curved link 37 is so arranged that the bolt 37^b passes through its lower end as seen in Figure 1. The upper link members of the linkage 35 pass through the opposite ends of the plate 37^a and the spring 36 bears upwardly against the intermediate portion of said plate 37^a from beneath. The parts 35 and 36, 37^b and 37 virtually form a resilient connection between the arms 38 and the doors, so that if any foreign matter should lodge between the doors 34 and the body of the bucket 2 no breakage will result in the said connecting means.

It is furthermore notable that the lever 50 controlling the reversing or clutch neutralizing action previously described is adapted to perform an additional function to that of rendering the clutch 8 ineffective. The operation of this lever to turn the shaft 18 is adapted to turn an arm 62 just above the arm 52 of the shaft 18. The arm 62 is connected by links 63 with the toggle lever 64 interposed between a bracket 65 on the frame work, and the free end of a brake band 66 which partially encircles the clutch member 8^a, co-operates with the clutch 8. Thus it is that through the operation of the automatic clutch knock-out mechanism acting on the lever 50 or by the control of the shaft 18 through the hand lever 19 previously described, the parts 62, 63 and 66 may be operated to apply a brake to the clutch 8^a and thus brake the operation of the pinion 6 operating the adjacent drum 9. In this way quick reduction of the movement of the drum and corresponding stoppage of the movement of the bucket outwardly and inwardly is controlled.

The automatic braking means for retarding the movement of the bucket as above described, is particularly useful where the machine is disposed upon a grade which requires that the boom be elevated so as to incline upwardly and outwardly from the mixer, bearing in mind the size and weight

of the bucket, it will be evident that some braking means is very desirable to govern the inward movement of the bucket, both when the boom is adjusted in a horizontal plane, and especially when it is disposed in an inclined position as described.

The general operation of my machine according to the design hereinbefore described is as follows:

The bucket 2 is filled by the customary discharging of a predetermined quantity of concrete or mixed aggregates from the mixer drum A into said bucket. The aggregates are now ready to be distributed or laid upon the sub-grade for which purpose the operator will manually actuate the lever 19 to throw into operation the clutch mechanism whereby to drive the drum 9 in the direction to effect an out-haul movement of the lower bight of the cable. The initial out-haul movement causes the trip member 26 to assume an operative position on the outer side of the upper end of the arms 38 and continued out-haul movement causes the carriage 20 and the bucket 2 to traverse the boom 1 until the operator reverses the movement of the cable 11 by proper control of the clutch mechanism. On reversing the movement of the cable 11 the slide or shuttle member 24 moves in the direction of the inner end of the boom, the trip member 26 actuates the throw-over arms 38, rocks the shaft 33 and releases or opens the door 34 of the bucket. The mixed aggregates in the bucket are in a free flowing state and the reversing of the cable movement is intended not only to effect opening of the door 34, but also immediate return traverse of the bucket 2 relative to the boom 1. The combination of the door opening and the return traverse movement of the bucket 2 are important to my invention because such actions together are effective to stream the aggregates from the bucket 2 in a ribbon-like layer of substantially rectangular cross-section as previously described, the thickness or depth of which layer is controlled by the stop 39. As the bucket 2 returns to its position adjacent to the mixer and at the inner end of the boom 1, the cam 31 engages the cross-arm 32, restores the throw-over arms 38 to their elevated bucket door closing positions, and automatic stopping of the carriage 20 and bucket 2 is effected through the action of the clutch knock-out mechanism hereinbefore described.

If the operator fails to cause a reverse movement of the cable 11 by operation of the lever 19 manually the effective action of the bucket discharge will begin to take place as the bucket reaches the outer end of the boom. This will be performed automatically through the carriage 20 abutting with and operating the knock-out or shifter arm 45 of the clutch mechanism controlling the drive means. Furthermore, the operation of the arm 45 will be such as not only to render inactive the clutch controlling the out-haul movement of the cable, but to render active the clutch which embodies the in-haul movement of said cable whereby the movement of the bucket 2 will be actually reversed so as to insure the laying of the concrete by streaming of the same out of the bucket 2 in the manner above set forth.

The method which I practice in the actual operation of my machine is the conveying or conducting of the aggregates mixed in the mixer to the site of deposit, by the distributing element or bucket of course, and then while the aggregates in their plastic condition are in movement they are caused to flow gravitatively from the bucket in a continuous stream of a predetermined depth or thickness substantially equal to that of the slab or portion of pavement of which the particular batch of the aggregates will ultimately form a part. By this method laborious work in spreading the materials is saved. This is a novel method of my invention.

The action of the brake-band 8^c is incident to straightening of the links of the toggle lever 64 and takes place on both the inhaul and outhaul movements of the bucket 2.

Whether the operation of the member 45 effects mere neutralizing of the clutch devices requiring the reverse movement of the bucket to be effected by manual operation, or reversing of the clutch mechanism and inhaul movement of bucket 2 depends on the adjustment of the arm 45, and the latter is controlled by adjustment of turn-buckle 47^a in the length of the rod 47, or in any suitable manner.

Of course the dumping and reverse movement of bucket 2 may be performed at any point in the outward movement of the bucket, as well understood on reference to my previous patents.

It is notable that as the portion 11^a of the cable unwinds from the spiral groove of the drum 9, the portion 11^b winds into the vacated part of the groove, and vice versa.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent, is:

1. A boom and bucket attachment for concrete mixers, the same having in combination, a support, a boom mounted to swing horizontally thereon, a carriage adapted to traverse said boom lengthwise thereof in opposite directions, a concrete distributor bucket mounted on said carriage, the bucket comprising dumping means for emptying it of its contents, trip mechanism on the carriage for controlling the said dumping mechanism, cable apparatus associated with

the boom and trip mechanism and carriage so as to control the movement of the carriage on the boom and the operation of the trip mechanism for dumping the bucket, and automatic brake mechanism mounted on the support carrying the boom and operatively connected with a part of the cable apparatus aforesaid, to retard the movement of the latter and thereby control its action in relation to the carriage.

2. A boom and bucket attachment for concrete mixers, the same having in combination, a support, a boom mounted to swing horizontally thereon, a carriage adapted to traverse said boom lengthwise thereof in opposite directions, a concrete distributor bucket mounted on said carriage, the bucket comprising dumping means for emptying it of its contents, trip mechanism on the carriage for controlling the said dumping mechanism, cable apparatus associated with the boom and trip mechanism and carriage so as to control the movement of the carriage on the boom and the operation of the trip mechanism for dumping the bucket, and a brake mechanism mounted upon the support on which the boom is mounted and operatively connected with a part of the cable apparatus, together with means for automatically applying said brake means on both the outward and inward movements of the bucket along the boom.

3. In a boom and bucket attachment for concrete mixers, the combination of a support, a boom pivotally mounted upon said support to swing horizontally, a bucket adapted to travel inwardly and outwardly upon and suspended from the boom, said bucket comprising dumping means therefor, cable apparatus for controlling the movement of the bucket and the tripping of its dumping mechanism, and an automatically operable brake means cooperative with a part of the cable apparatus to control the operation of the bucket.

4. In a boom and bucket attachment for concrete mixers, the combination of a support, a boom pivotally mounted upon said support to swing horizontally, a bucket adapted to travel inwardly and outwardly upon and suspended from the boom, said bucket comprising dumping means therefor, cable apparatus for controlling the movement of the bucket and the tripping of its dumping mechanism, and an automatically operable brake means cooperative with a part of the cable apparatus to retard the bucket in its movement in opposite directions relative to the boom.

5. In a concrete distributing machine, the combination of a boom, a bucket for traversing movement thereon, means to drive said bucket to and fro on the boom, and means to discontinue the driving action of the driving means in respect to said bucket, and to simultaneously brake the movement of the bucket relative to the boom.

6. In a concrete distributing machine, the combination of a boom, a bucket for traversing said boom back and forth, clutch mechanism, driving mechanism adapted to be connected by said clutch mechanism for actuating the bucket, means to render said clutch mechanism inoperative, brake means for retarding the movement of the bucket along the boom, and interacting means between said clutch and brake means.

7. In a boom and bucket distributor, the combination of a boom, a bucket to traverse the boom, cable driving means for said bucket, and connecting means intermediate the bucket and cable driving means including a slack take-up device for the cable means.

8. Means as claimed in claim 7, combined with a carriage which supports the bucket on the boom, and which supports the driving connection between the cable means and said bucket, said driving connection comprising a winding member constituting said slack take-up device, and a shuttle member, a trip part connected with the shuttle member, a discharge door for the bucket and discharge door operating means on the carriage adapted to be actuated by said trip part.

9. In a boom and bucket attachment for concrete mixing machines, in combination, a boom, a bucket adapted to travel longitudinally on the boom back and forth, cable apparatus cooperating with the bucket in its back and forth movement, the bucket comprising dumping mechanism, tripping mechanism arranged to coact with said dumping mechanism to operate the latter thru the cooperation of the cable apparatus with said tripping mechanism, and an operative connection between the trip mechanism and a part of the cable apparatus, including a cable take-up means.

10. In a boom and bucket attachment for concrete mixing machines, in combination, a boom, a bucket adapted to travel longitudinally on the boom back and forth, cable apparatus cooperative with the bucket in its back and forth movement, the bucket comprising dumping mechanism, tripping mechanism arranged to co-act with said dumping mechanism to operate the latter thru the cooperation of the cable apparatus with said tripping mechanism, and an operative connection between the tripping mechanism and the portion of the cable apparatus that co-acts therewith to dump the bucket, including a cable tension take-up device.

11. In a boom and bucket attachment for concrete mixers, in combination, a support, a boom mounted to swing horizontally

thereon, a bucket arranged to move back and forth along the boom to carry concrete from a mixer to a point of deposit in the length of the boom, a carriage on the boom supporting said bucket for its said movement, the bucket comprising a dumping means therefor, trip mechanism on the carriage connected with said dumping means for shifting the latter to and from dumping positions, cable apparatus controlling the operation of said tripping mechanism, and means operatively connecting the cable apparatus with the tripping mechanism, including cable tension take-up instrumentalities.

12. In a machine of the class described, in combination, a boom, a carriage arranged to move back and forth on the boom, a bucket supported by said carriage, cable controlling means for the carriage, and a take-up connection intermediate said cable means and the carriage including a winding shaft mounted on the carriage and about which the cable is adapted to be wound in order to take up slack.

13. In a concrete distributor of the boom and bucket type, a boom, a carriage slidable back and forth on the boom, a bucket supported by the carriage, a cable for moving the bucket back and forth and a connection intermediate the cable and the carriage including a shaft mounted on the carriage and adapted to be rotated, and connecting means between the shaft and portions of the cable whereby the cable may be wound about the shaft to take up slack in the cable.

14. In a boom and bucket attachment for concrete mixers, in combination, a support, a boom adapted to swing horizontally thereon, a carriage adapted to move back and forth on the boom, a bucket suspended from the carriage and comprising dumping means, tripping mechanism on the carriage for said dumping means to render it operative and inoperative and including a knockover link shiftable from a position maintaining the dumping mechanism inoperative, to one rendering it operative, and vice versa, cable apparatus cooperative with the tripping mechanism and including a cable part having connection with the latter, the said connection involving cable tension take-up instrumentalities.

15. In a boom and bucket concrete distributor the combination with a boom, of a carriage adapted to travel along said boom, a bucket supported by the carriage and comprising dumping means including a door at its bottom portion, means for opening the door of the bucket comprising a member pivotally supported on the carriage, a cross plate, linkage between opposite ends of the cross plate and said dumping means, and a resilient connection intermediate said cross plate and said trip member pivotally connected to the carriage, said dumping means being inactive when the pivoted trip member is in its normal uppermost position and rendered operative by pivotal movement of said trip member downwardly to lower said linkage.

16. In a boom and bucket concrete distributor, the combination with a boom adapted to swing horizontally, a carriage adapted to travel back and forth on the boom, a bucket supported by said carriage and having dumping means at its bottom portion, trip mechanism on the carriage including a shaft, a curved link operatively connected with said shaft to be raised and lowered thereby, a cross plate adjacent to the lower end of said link, a bolt passing through the lower portion of said link and through said cross plate, a spring beneath the cross plate and surrounding said bolt and bearing at one end against the cross plate and having a bearing at its opposite end against the lower end of the bolt, linkage between the opposite ends of the cross plate at opposite sides of said bolt and having connection with the dumping means of the bucket, and means for tripping the trip mechanism to lower said curved link and raise it, the dumping means becoming operative when the link is lowered and inoperative when the link is raised.

17. In a concrete distributor in combination with a boom, a distributing bucket, a carriage movable back and forth on the boom to carry said bucket, trip mechanism on the carriage including a curved knockover link, the bucket having dumping means at its bottom, a cross plate, linkage connecting the ends of said cross plate with the dumping means of the bucket, and a resilient connection intermediate said knockover member and said cross plate as and for the purpose described, the knock-over member being adapted to be raised and lowered by the trip mechanism to maintain the dumping means of the bucket closed and open respectively.

18. In a boom and bucket concrete distributor, the combination with a boom, a carriage to traverse the same, a bucket supported by the carriage, a supporting frame-work, a bracket device mounted on said frame-work to support the boom and to which the boom is pivotally connected, another bracket device including a worm gear appliance for swinging the boom, and resilient buffer means intermediate the carriage and one of said bracket devices.

19. In a boom and bucket concrete distributor, the combination with a boom, a carriage to traverse the same, a bucket supported by the carriage, a supporting frame-work, a bracket device mounted on said frame-work to support the boom and to which the boom is pivotally connected, an-

other bracket device including a worm gear appliance for swinging the boom, resilient buffer means intermediate the carriage and one of said bracket devices and comprising springs adapted to absorb the shock between the carriage and said bracket device as the carriage reaches the end of the boom supported by the bracket device.

20. In a boom and bucket concrete distributor, the combination with a boom, a carriage to traverse the same, a bucket supported by the carriage, a supporting frame-work, a bracket device mounted on said frame-work to support the boom and to which the boom is pivotally connected, another bracket device including a worm gear appliance for swinging the boom, resilient buffer means intermediate the carriage and one of said bracket devices and comprising springs carried by parts of the bracket device above mentioned, and adapted to be compressed by cooperation with the carriage as the latter reaches the end of the boom adjacent the bracket device and comes to a stop at such point.

21. In a boom and bucket concrete distributor, in combination, a boom, a carriage to traverse the boom, a bucket supported by the carriage, cable means for moving the carriage on the boom, and a brake means directly cooperating with said cable means for braking the movement of the carriage as it operates on the boom.

22. In a boom and bucket concrete distributor, in combination, a boom, a carriage to traverse the boom, a bucket supported by the carriage, cable means for moving the carriage on the boom, brake means directly cooperating with said cable means for braking the movement of the carriage as it operates on the boom and manual and automatic devices to control the action of said brake means.

In testimony whereof I affix my signature.

ERICH H. LICHTENBERG.