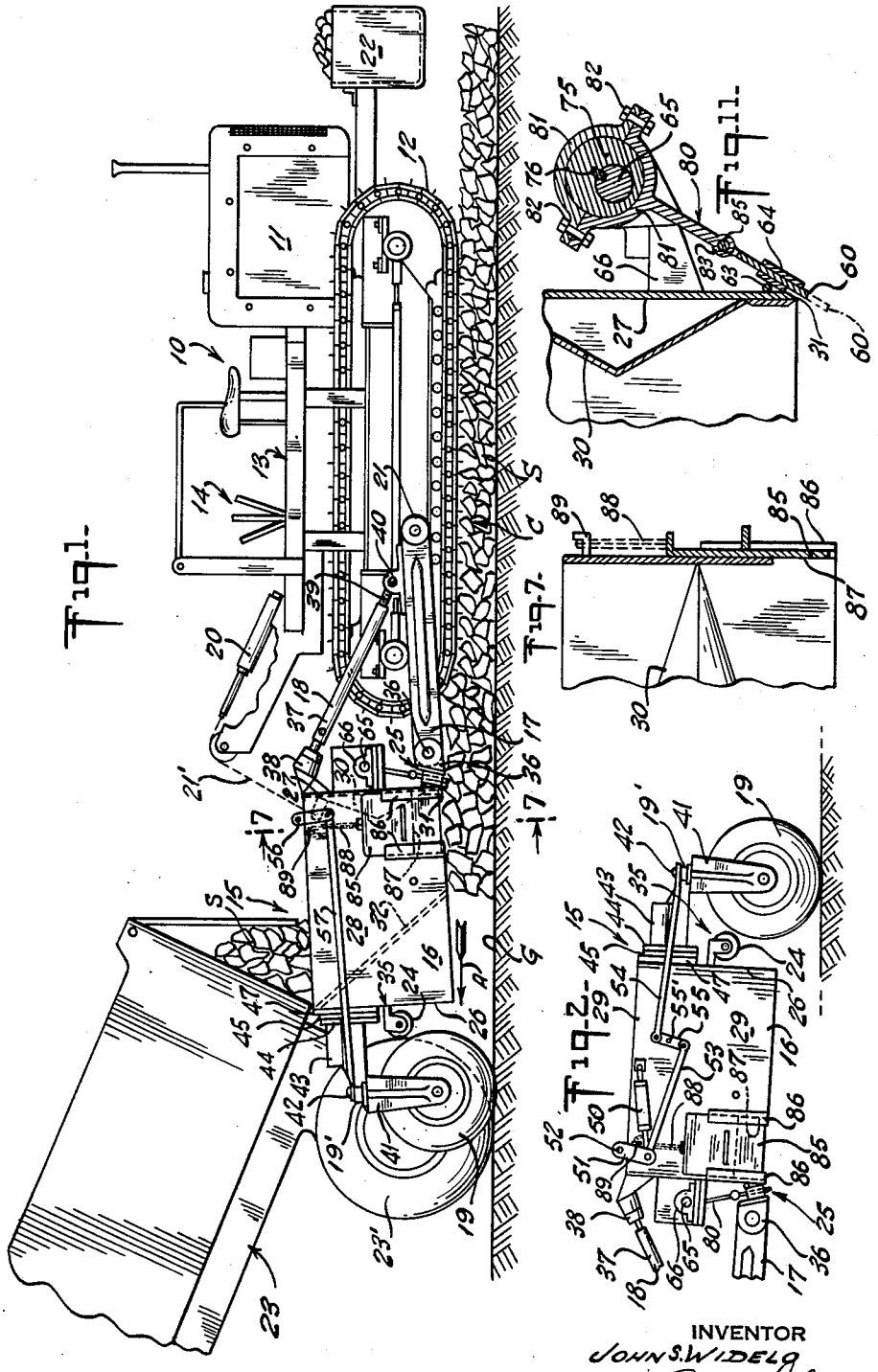
Oct. 16, 1962 J. S. WIDELO 3,058,404

METHOD AND APPARATUS FOR SPREADING STONE AND OTHER AGGREGATES

Filed Oct. 27, 1958 4 Sheets-Sheet 1



INVENTOR
JOHN S. WIDELO
BY
ATTORNEY

Oct. 16, 1962 J. S. WIDELO 3,058,404

METHOD AND APPARATUS FOR SPREADING STONE AND OTHER AGGREGATES

Filed Oct. 27, 1958 4 Sheets-Sheet 2

Fig. 3.

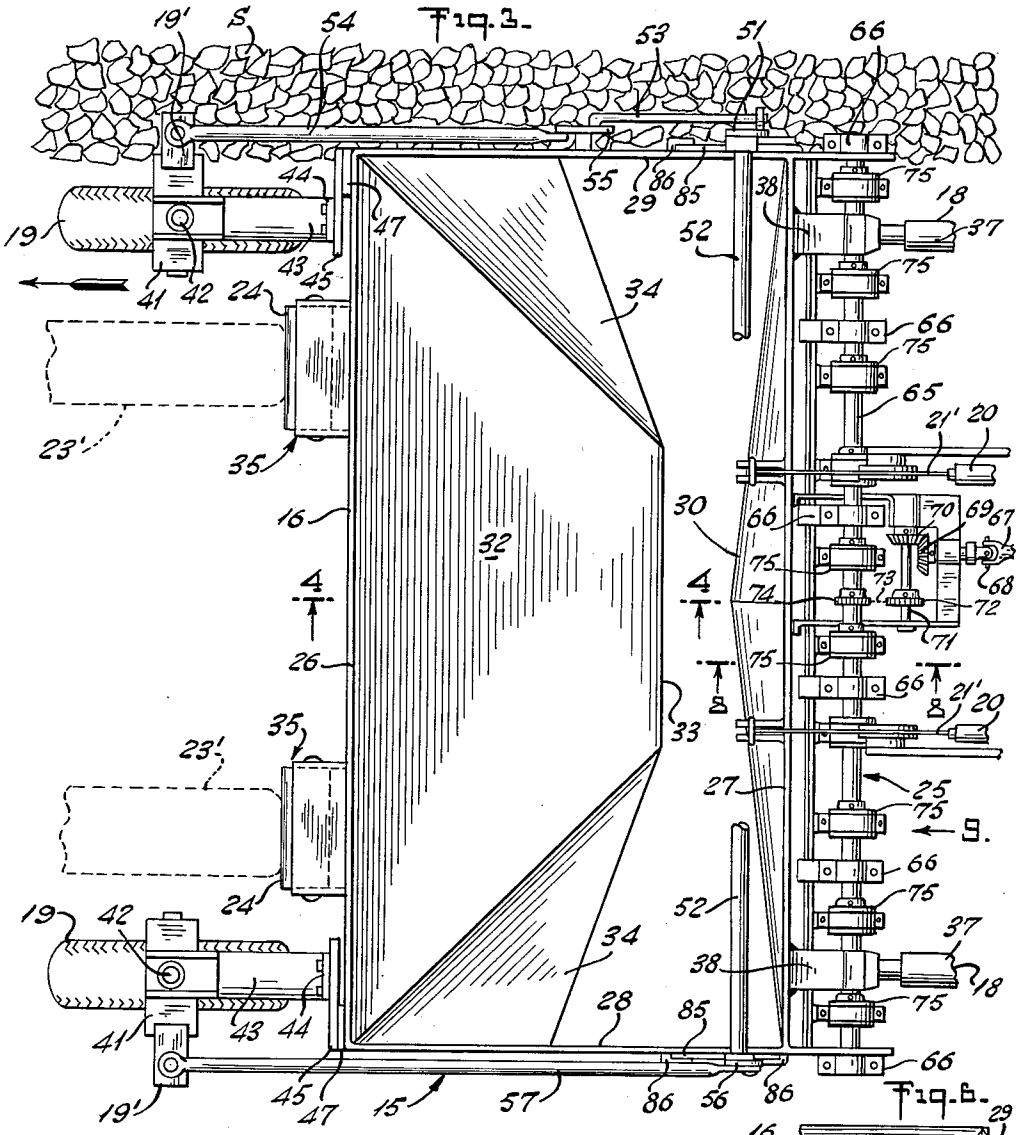


Fig. 6.

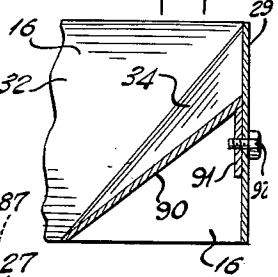


Fig. 4.

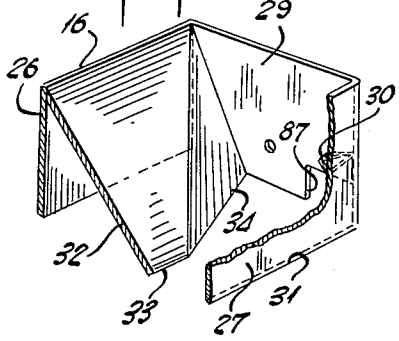
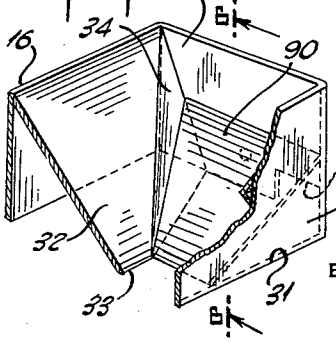


Fig. 5.



INVENTOR
JOHN S. WIDELO
BY Eugene Hoffman Jr.
ATTORNEY

Oct. 16, 1962 J. S. WIDELO 3,058,404

METHOD AND APPARATUS FOR SPREADING STONE AND OTHER AGGREGATES

Filed Oct. 27, 1958 4 Sheets-Sheet 3

Fig. 8.

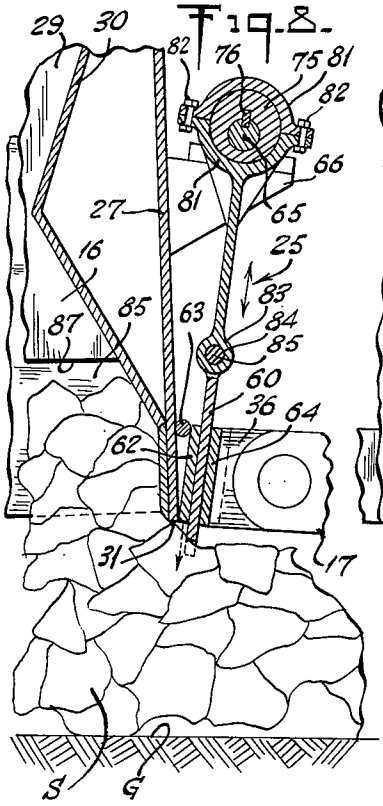


Fig. 9.

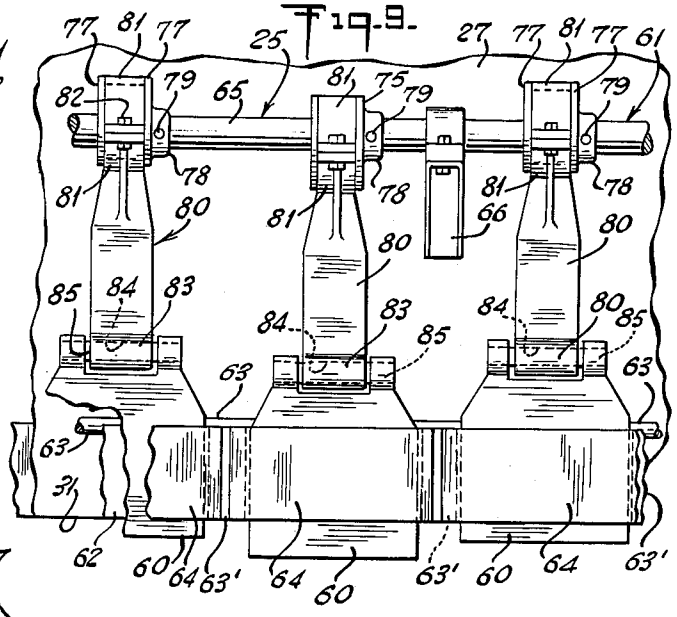


Fig. 10.

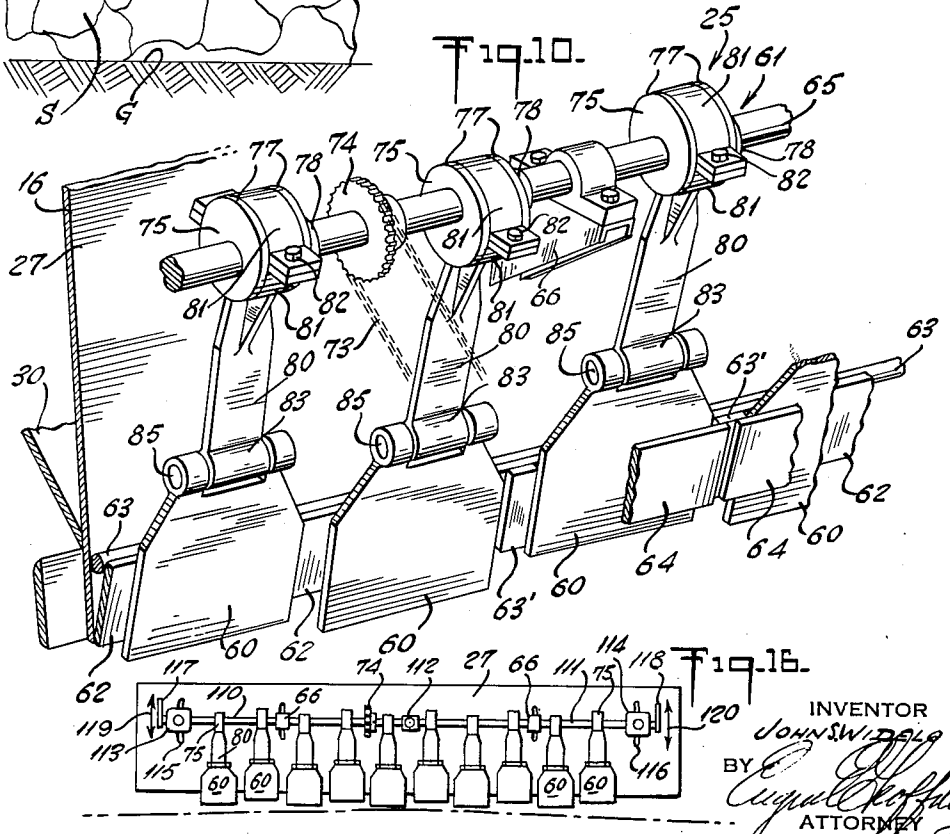


Fig. 16.

INVENTOR
JOHN S. WIDELO
BY
ATTORNEY

Oct. 16, 1962 J. S. WIDELO 3,058,404

METHOD AND APPARATUS FOR SPREADING STONE AND OTHER AGGREGATES

Filed Oct. 27, 1958 4 Sheets-Sheet 4

Fig. 12.

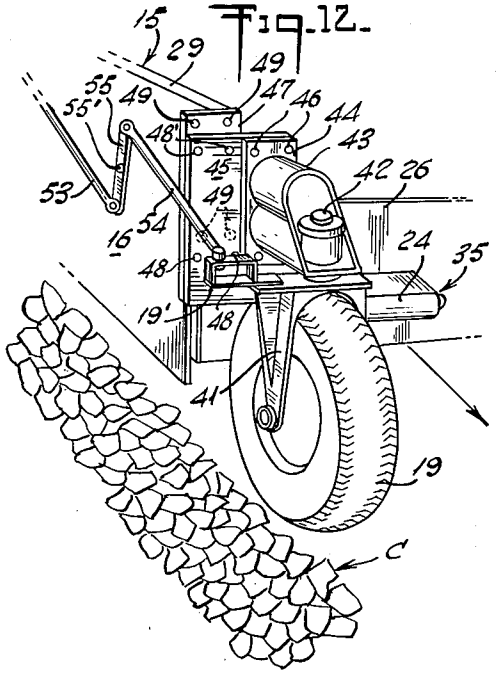


Fig. 14.

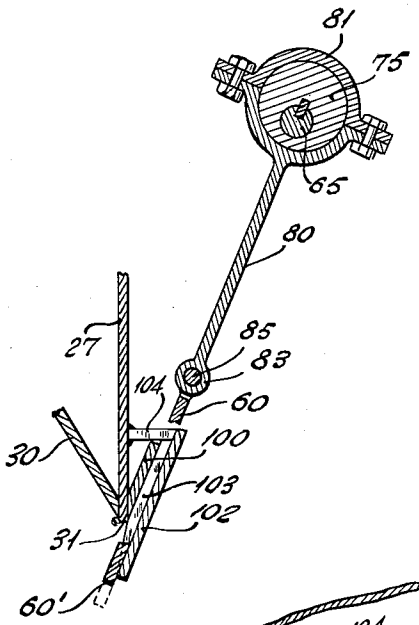
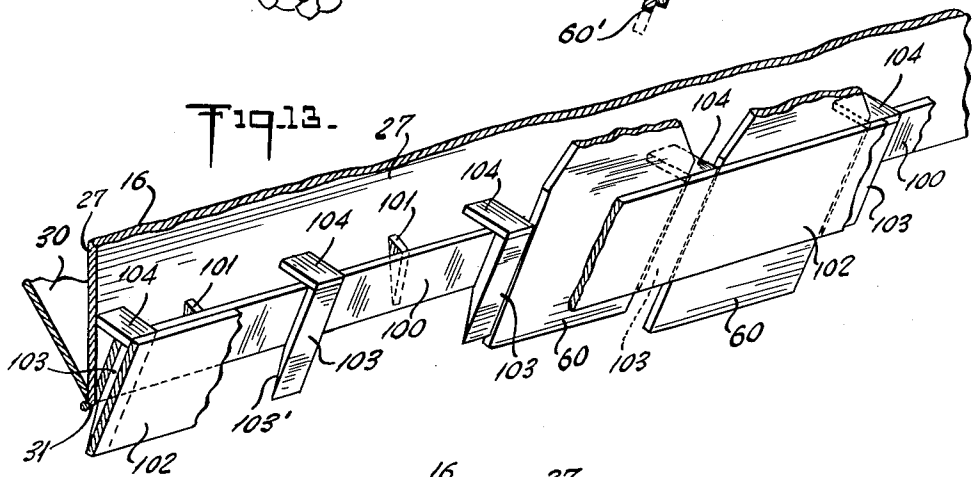


Fig. 13.



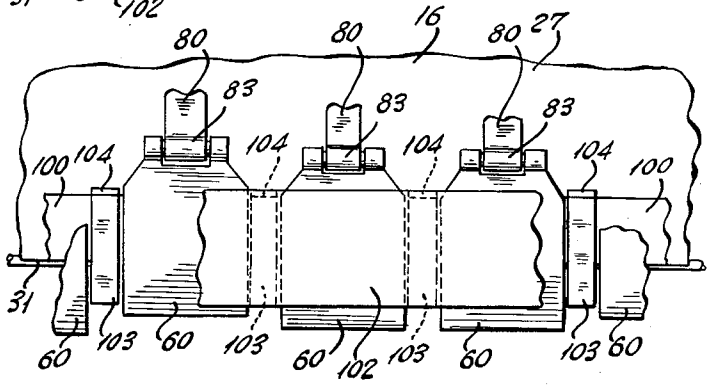


Fig. 15.

INVENTOR
JOHN S. WIDELO
BY
ATTORNEY

United States Patent Office 3,058,404 Patented Oct. 16, 1962

3,058,404

METHOD AND APPARATUS FOR SPREADING STONE AND OTHER AGGREGATES

John S. Widelo, North Hatfield, Mass., assignor to The Lane Construction Corporation, Meriden, Conn., a corporation of Connecticut

Filed Oct. 27, 1958, Ser. No. 769,924
6 Claims. (Cl. 94—46)

This invention relates to the spreading of aggregates and more particularly concerns an improved method and apparatus for laying and spreading aggregates, such as crushed stone and the like, to form base courses for the support of roadways and for the other purposes.

Spreading of aggregates to form layers of relatively uniform thickness and density has presented a serious problem particularly in the construction of modern highways which require base courses of stone or other material to furnish the necessary support for the final surfacing material. Base courses may be of any desired thickness and must be solidly packed to prevent settling when subjected to the stresses of heavy vehicular traffic. Inasmuch as the aggregates must be laid mechanically in order to maintain costs at a minimum, and since it has not been possible to lay the larger aggregates by mechanical devices and produce base courses affording the necessary support, highway specifications generally require that aggregate sizes shall not exceed 4 in. maximum and place rigid limitations on gradation. Present maximum size and gradation limitations for aggregates materially increases the cost of highway construction, though the overall cost of spreading small aggregates by mechanical means is substantially less than the cost of laying large aggregates by hand.

Another difficulty that has been encountered in spreading aggregates with prior known equipment, is the drag effect encountered when elongated aggregates become caught beneath the striker plate or leveling means on the spreader. This occurs by reason of the screening procedure which will pass a piece of aggregate if it falls on the screen with its long axis perpendicular to the screen. Thus, 4 in. aggregates could have any length in excess of 4 in. and in cases where they are unusually long, the aggregate will catch or drag on the striker plate and produce deep ruts and grooves in the surface of the resultant layer which must be filled by hand.

The foregoing difficulties have been overcome with this invention which provides a novel and improved method and apparatus for laying all sizes of aggregates including aggregate sizes up to and exceeding 6 in. and without encountering objectionable drag effect. Furthermore, gradation limitations and aggregate sizes can be materially relaxed without affecting the quality of the resultant roadway. As a result, the cost of highway construction is materially reduced and actual tests have indicated that crushed stone courses using 6 in. material and laid in accordance with the invention provides a stable and durable base offering as much, if not more, support than small aggregates laid by prior known devices. Because of the inherent characteristics of the equipment in accordance with the invention, skilled, or highly experienced personnel are not required, for its operation.

Another object of the invention resides in a novel and improved method and apparatus for spreading aggregates that will produce dense and highly uniform courses and enable the laying of successive courses side by side without leaving gaps or gulleys between adjacent courses that heretofore have had to be filled or leveled by a subsequent hand or mechanical operations.

Another object of the invention resides in the provision of a novel and improved stone spreader that is

readily adaptable for spreading aggregates up to and exceeding 6 in. to 8 in. and that is characterized by its simplicity, dependability and ease of operation. Through a novel and improved arrangement and organization of elements, this improved spreader can be adjusted to lay courses of any desired width, thickness and shape.

A further object of the invention resides in the provision of a novel and improved method for laying stone that will prevent dragging of stone and thus produce a resultant course having a uniform thickness and relatively smooth surface free of ruts and other discontinuities produced by wedging of the stone beneath the striker plate or leveling means.

A still further object of the invention resides in a novel and improved spreader for aggregates embodying means for automatically laying the stone in a solid compact layer and that will effect this end rapidly and dependably without need for highly skilled or specially trained operators.

A still further object of the invention resides in a novel and improved method for spreading aggregates such as crushed stone and the like.

A still further object of the invention resides in the provision of a novel and improved spreading apparatus for aggregates such as crushed stone and the like.

The above and other objects of the invention will become more apparent from the accompanying drawings forming part of this application.

In the drawings:

FIGURE 1 is a side elevational view of one embodiment of the apparatus in accordance with the invention.

FIGURE 2 is a rear fragmentary view of the spreader box of FIGURE 1.

FIGURE 3 is a plan view of the spreader box or hopper shown in FIGURE 1.

FIGURE 4 is a perspective view of the spreader box taken in the direction of the arrows 4—4 of FIGURE 3.

FIGURE 5 is a perspective view similar to FIGURE 4 with a filler plate for reducing the width of the course to be laid.

FIGURE 6 is a cross sectional view of FIGURE 5 taken along the line 6—6 thereof.

FIGURE 7 is a cross sectional view of FIGURE 1 taken along the line 7—7 thereof.

FIGURE 8 is a cross sectional view of FIGURE 3 taken along the line 8—8 thereof.

FIGURE 9 is an elevational view of FIGURE 3 taken generally in the direction of the arrow 9 with parts omitted for clarity.

FIGURE 10 is a fragmentary perspective view in partial section of the striker plate and tampers in accordance with the invention.

FIGURE 11 is a cross sectional view of a modified embodiment of the invention.

FIGURE 12 is a perspective view of a portion of FIGURE 1 showing the wheel mount.

FIGURE 13 is a fragmentary perspective view of a further embodiment of the invention.

FIGURE 14 is a cross sectional view of the embodiment shown in FIGURE 13.

FIGURE 15 is an elevational view of the embodiment of the invention shown in FIGURES 13 and 14.

FIGURE 16 is a diagrammatic view of another embodiment of the invention.

As pointed out above, the laying of stone or other aggregates for base courses for roadways and other purposes has presented a serious problem and at the present time mechanical spreading is restricted to aggregates of 4 in. and smaller in order to produce courses offering the support necessary for the roadways or other structures to be built thereon. This invention enables the laying of stone considerably larger than 4 in. by me-

chanical means and at the same time provides increased compaction and resulting increased support for the overlying structure. This end is attained through a novel and improved arrangement of tamping devices operable to engage the stones being laid and cause them to form a uniformly dense layer. In addition, the invention affords among other things, means for laying successive courses side by side to produce a resultant smooth and uninterrupted surface. Furthermore, the courses being laid can be provided with inclined and crowned surfaces to produce the desired roadway surface configuration.

While the invention may take a variety of forms, one embodiment is illustrated in FIGURE 1. In this figure the numeral **10** denotes the driving vehicle which in the instant case comprises a tractor having a suitable motor **11**, a pair of tracks **12**, an operator's platform **13** and controls **14** for the operation of the vehicle. An aggregate spreader, in accordance withe the invention, is generally denoted by the numeral **15** and includes a spreader box or hopper **16** secured to the tractor **10** and tamping means **25**. More specifically, the spreader box is secured to the tractor or propelling vehicle **10** by means of a pair of adjustable A-frames each including a tie bar or link **17** and an adjustable jack **18** while the forward end of the spreader box is supported by a pair of pivotally mounted wheels **19** to facilitate maneuverability of the equipment. The tractor **10** is further provided with a pair of hydraulic cylinders **20** and cables **21'**, the latter being attached to the spreader box for lifting the entire spreader box assembly **15** about the pivotal attachment **21** to the tractor **10**. With the spreader box assembly in a raised position the tractor can then be maneuvered in the normal manner. A counterweight **22** is secured to the tractor **10** in order to counterbalance the weight of the spreader box assembly **15** when the latter is in a raised position.

In operation of the equipment shown in FIGURE 1, a truck **23** loaded with stone or other aggregate is backed against the spreader box **15** until the wheels of the truck contact cooperating rollers **24** carried on the forward wall of the spreader box **16**. The body of the truck is raised to discharge stone into the spreader box whereupon the tractor **10** is operated to move the spreader box and the truck **23** in the direction of the arrow A until the truck has deposited its entire load in the hopper **16**. During this forward motion the stone is deposited on the ground surface as indicated at G to form the course C.

In laying aggregates as small as 4 in. and even 3 in., it is difficult, if not impossible, to secure a uniform layer of stone because elongated pieces of stone often become caught beneath the striker or leveling plate and leave deep grooves in the surface of the stone layer. It has been found that with the apparatus as shown in FIGURE 1 which includes a plurality of tamping devices **25** to be described, large size aggregates of the order of 6 in. and even larger, can be laid quickly and easily without the evidence of drag marks and at the same time providing a more compact, uniform layer of stone that will furnish a high degree of support for any overlying structure.

More specifically, the novel and improved aggregate spreading apparatus **15** in accordance with the invention includes a spreader box having a front wall **26**, a rear wall **27** and side walls **28** and **29**. The rear wall **27** must be heavy enough to support the tamping assembly generally denoted by the numeral **25** and withstand the pressure produced by the deposition of stone within the spreader box. In the illustrated embodiment of the invention a reinforcing structure **30** is employed, though it is evident that the wall **27** may be made of a sufficiently heavy gage material for the attainment of the desired ends. The bottom edge **31** of the rear wall **27** generally served in prior apparatus as leveling means, and its height from the ground surface G determined the thickness of the course. In the instant embodiment of the invention, the tamping devices **25** effect the leveling

operation and in actual practice the tampers **25** actually move into and out of positions slightly below the edge **31**.

Aggregate distributing means are included within the spreader box in order to obtain a uniform distribution of the stone within the box when it is discharged from a conventional vehicle such as the truck **23**, as shown in FIGURE 1. For this purpose a central inclined baffle **32** extends generally from the top edge of the front wall **26** and slopes downwardly and rearwardly to leave a narrowed section between the bottom edge **33** of the central baffle and the rear wall **27**. The sides of the central baffle **32** are sloped inwardly and inclined baffles **34** extend from the edges of the baffle **32** to the side walls **28** and **29**. The opening of the spreader box adjoining the side walls **28** and **29** is considerably greater than the central opening so that the stone or other aggregate will be fed downwardly at a substantially uniform rate throughout the entire width of the spreader. The forward wall **26** further includes a pair of roller assemblies **35** for engaging the wheels **23'** of a truck **23** to displace the truck forwardly as its load is deposited into the spreader box during the forward motion imparted by the tractor or other propelling vehicle **10**.

As pointed out above, the spreader box **15**, including the tamper assembly **25** is secured to the vehicle by a pair of A-frames including elements **17** and **18**. More specifically, the element **17** of each frame is in the form of a link pivoted at one end to a pin **21** on the tractor and pivoted at the other end to a bracket **36** fixedly secured to the trailing side of the tamper assembly **25**, to be described. Each element **18** is adjustable in length and includes a tubular member **37** rotatably supported by a knuckle **38** fixedly attached to the top of the rear wall **27** of the spreader box. An elongated, threaded member **39** engages cooperating threads on the inside of the rotatable member **37** and the outer end of the member **39** is pivotally secured to a bracket **40** carried by the link **17** at a point between its ends. With this arrangement, adjustment of each element **18** to extend the length between the bracket **40** and the knuckle **38** will tend to raise the lower edge **31** of the rear wall **27**. Shortening of each element **18** will lower the edge **31** of the striker plate. The use of the individual elements **18** also provides means for adjusting the level of spreader box for purposes to be described.

The mounting for wheels **19** and the associated steering mechanism may take any desired configuration. In the illustrated embodiment of the invention each wheel **19** is carried by a fork **41** pivotally secured at **42** to a bracket member **43** which includes a substantially vertical disposed end plate **44**, as will be observed more clearly in FIGURE 12. In this figure it will be observed that the plate **44** carrying the wheel assembly is secured to the leading edge of hopper wall **26** by means of an intermediate plate **45** and four bolts **46** extending through cooperating openings in the plates **44** and **45**. The intermediate plate **45** is attached to a mounting plate **47** fixed to the hopper **16**, the attachment being accomplished by bolts **48** or other suitable fastening means engaging cooperating opening in plates **45** and **47**. The sets of openings securing bolts **46** and **48** are on equal centers so that the wheel supporting plate **44** can be secured directly to the hopper plate **47**. The plate **47** includes at least one additional set of holes **49** for attachment of the plates **44** or **45** as the case may be to adjust the height of the hopper **16**.

With the wheel mounting as described above, either or both wheels may be mounted in positions as shown in FIGURE 12 so that the adjoining side wall of the hopper **16** can be guided close to a prior course C during the laying of an adjoining parallel course. This procedure minimizes the gap or space between adjoining courses which is filled by adjustment of a side gate **85** which permits the discharge of sufficient stone to fill the gap and form a continuous uninterrupted surface throughout the area of the two or more parallel courses.

Steering of the wheels 19 is effected by a hydraulic cylinder 50 pivoted at one end to the side wall 29 of the hopper and at the other end to a link 51. The link 51 is carried by a transverse shaft 52 spanning the hopper and journalled to the side walls 28 and 29. The lower end of lever 51 (see FIGURES 2 and 12) is connected to a crank arm 55 by a shaft 53, the arm 55 being pivoted to the wall 29 at 55'. The upper end of the arm 55 is connected to a bracket 19', secured to the wheel fork 41, by a rod 54. Thus actuation of cylinder 50 will shift the angular position of the wheel 19 shown in FIGURE 12. Operation of the other wheel 19, as viewed in FIGURE 1 is accomplished by a link 56 carried by rod 52 and connected to the wheel fork by a rod 57.

As discussed above it has been found that relatively large aggregate of the order of 6 in. and even larger can be laid mechanically to form courses for supporting overlying structures by utilization of the novel and improved tamping means in accordance with this invention and denoted generally in FIGURE 1 by the numeral 25. This tamping means is shown more clearly in FIGURES 3 and 8 through 10.

Referring now to these figures, a plurality of tampers 60 are spaced along the back side of the rear wall 27 and are inclined relative thereto. Vertical reciprocation of the tampers is effected by a cam shaft generally denoted by the numeral 61. In the embodiment of the invention illustrated in FIGURES 8 through 10, the tamper mounting means includes an elongated strip 63 fixedly secured along the bottom edge of the rear wall 27 and inclined relative thereto. The bottom edge of the strip 63 is preferably welded to the striker plate and the upper edge of the strip 62 is spaced from the striker plate by a spacer bar 63 welded to the striker plate and to the top edge of the strip 62. A plurality of spacer plates 63' are secured at intervals to the strip 62 and are spaced apart a distance slightly greater than the width of the tampers 60. These spacer plates are welded to the strip 62 though it is evident that they may be secured in any desired manner. A series of bridging plates 64 span the spacer plates 63 and are welded thereto. With this arrangement the strip 62, the spacer plates 63 and the spanning plates 64 define a plurality of inclined slots slidably receiving the tampers 60.

The cam shaft assembly includes a transverse rod 65 rotatably carried by a plurality of journals 66 secured to the rear wall 27 of the hopper 16. Power is supplied to the shaft 65 by means of a drive shaft 67 connected through a universal joint 68 to a pinion gear 69. The gear 69 meshes with a second cooperating gear 70 carried by a countershaft 71. A sprocket 72 on the countershaft 71 is coupled by a chain 73 to a second sprocket 74 secured to the shaft 65. The shaft 65 is provided with a plurality of eccentric cams 75 that are locked in position by a key 76 and each cam includes a pair of side plates 77 with one of the plates having a hub 78 pinned to the shaft 65 by a pin 79.

In this embodiment of the invention each cam 75 functions to reciprocate one of the tamper plates 60 and this is accomplished by a connecting rod 80 which includes a split bearing assembly 81 surrounding the cam 75 and slidably engaged therewith. The two halves of the bearing 81 are held together by an appropriate fastening means such as bolts 82. The lower end of the connecting rod 80 is provided with an enlarged portion 83 having an opening 84 extending therethrough for the receipt of a wrist pin 85 carried by the upper end of the tamper 60. With this arrangement, as the shaft 65 is rotated, the connecting rod 80 is reciprocated by the cam 75 and functions through the wrist pin 85 to reciprocate the associated tamper 60.

In accordance with the invention, the tampers 60 are positioned to engage the aggregate in the course of laying to compact it and prevent individual pieces from being carried along by the hopper. In the instant case, the

tampers 60 are inclined relative to the striker plate 67 at about 10 to 15 degrees and the throw of the tampers is approximately one inch with the uppermost position of each tamper being slightly below the lower edge 32 of the rear wall 27. With this arrangement, the lower edges of the series of tampers 60 form the striking edge which effects the actual leveling operation. It will also be observed in the embodiment of the invention shown in FIGURES 8 through 10, for instance, that adjoining tampers 60 are phased at 180 degrees so that when one alternate set of tampers is in the uppermost position as shown in FIGURE 9, the intervening set of tampers 60 is in the lowermost position.

In actual operation oscillation of the tampers is carried out at a rate of approximately 400 reciprocations per minute, which has been found particularly advantageous for laying large aggregate as, for instance, stone of the order of 6 in. and even larger.

The action of the tampers 60 may be observed more clearly in FIGURE 8. The stone S within the hopper 16 falls downwardly through the opening in the hopper as previously described and onto the ground surface G. In so doing, the uppermost stones slide downwardly past the tampers and the lower edge of the tampers engage and push the stone downwardly so that they cannot engage and be carried by the edge 31 of the rear wall 27. In addition, the vibration imparted to the stone as it is being laid on the ground surface by reason of the action of the tampers 60 causes the stone to nest snugly to form a dense, uniform layer. Actual tests with apparatus in accordance with the invention have clearly demonstrated the substantial utility of this invention and have shown conclusively that large aggregates can be successfully laid to produce a resultant smooth, dense layer of stone that affords a more stable base for roadways and other purposes than has been obtainable with prior mechanical devices. In actual demonstrations laying stone of the order of 6 in. to produce a base course about 13 in. in thickness, interruptions of tamper operation produced gouges and depressions in the resultant surface of as much as 8 to 10 in. and the resultant surface was so uneven that it would be unsatisfactory for any purpose. Upon subsequent operation of the tampers a uniform, dense base course was produced having a smooth, uninterrupted surface.

In the provision of base courses for roadways, and particularly for modern highways, it is necessary to lay two or more parallel courses in order to cover the complete roadway width. For this purpose, the invention further includes a pair of side gates 85 slidably carried by channels 86 to open and close openings 87 in the sides of the hopper 16. The gate 85, as shown in FIGURE 1 is in the closed position and may be raised by any suitable means, as for instance, a chain 88 which engages a cooperating hook 89 on the upper edge of the hopper 16. With this arrangement and with at least one wheel 19 of the hopper displaced inwardly as shown in FIGURE 3, the associated side gate 85 will discharge sufficient stone to completely fill the gap between successive stone courses. This avoids the necessity of a separate operation for filling spaces between the courses prior to further treatment of the courses in the usual maner to insure complete compaction of the stone and fill the interstices with filler material such as sand, clay and the like.

In certain instances it may be desirable to reduce the width of the base course to be laid by the spreading apparatus 15 in accordance with the invention. In such instances, a filler plate generally denoted by the numeral 90 and illustrated in FIGURE 6 may be inserted in one or both ends of the hopper 16. The filler plate is generally rectangular and has one inclined side for cooperation with the sloping baffle 34. With the baffle arranged in the manner illustrated in FIGURES 5 and 6, the width of the hopper is reduced to substantially ⅔ of the original width. It is apparent that different sizes of baffles 90

may be employed and fastened in position in any suitable manner as, for instance, by the provision of a flange **91** having a threaded opening therein for attachment to the side wall **29** by a screw **92** or other suitable means.

A modified embodiment of the invention is illustrated in FIGURE 11 of the drawings. This embodiment is along the lines of the embodiment previously described, with the exception that the tampers **60** are inclined relative to the rear wall **27** at an angle substantially greater than the angle shown, for instance, in FIGURE 8. The connecting rod **80** and cooperating cam **75** in this figure are substantially identical to the corresponding elements of FIGURE 8 except for the fact that the cam **75** is arranged to produce somewhat increased displacement of the tamper **60**. It will be observed that in FIGURE 11 the tamper **60** in its raised position has its lower end substantially in line with the rear wall **27** and when in the extended position as shown in dotted outline, the end of the tamper **65** is disposed forwardly of the rear wall 27. In this way the operable edge of the spreading means **15** is formed by the lower edges of the tampers **60**.

In both of the embodiments of the invention previously described, the cams **75** were positioned on the shaft **65** so that the two alternate tampers were phased 180 degrees apart. It is evident that any desired sequence of cam operation may be employed, for instance, the cams may be phased at 15 degree, 30 degree, 60 degree, or even 120 degree angles depending on the number and arrangment of cams. In actual tests, with the apparatus as shown, for instance, in FIGURE 1 through 10, approximately ten individual tampers were employed with each tamper being roughly 12 in. long and spaced from adjoining tampers a distance of about 2 in.

While the utilization of a large number of tampers is ordinarily desirable, the advantages of the invention can be obtained by the utilization of fewer tampers of increased width, it being essential, however, that the tampers be placed in a position to engage the stone being laid and displace it in a manner that will prevent it from being dragged by the spreader box and, at the same time, drive it downwardly with a force that will cause the resultant stone layer to be relatively tightly packed.

A still further embodiment of the invention is illustrated in FIGURES 13 through 15. In these figures the elements corresponding to elements of the previous embodiments of the invention have been denoted by like numerals.

Referring first to FIGURE 14, it will be observed that the tamper **60** has its lower edge **60'** disposed at all times forwardly of the hopper box wall **27**. In this way, the tampers **60** effect the complete operation of levelling and tamping the aggregates being laid. The tamper supporting means comprises an elongated strip **100** of steel or other material welded to the backside of the plate **27** at an angle of roughly 25 degrees. The strip **100** is supported throughout its length by a series of wedge-shaped braces **101** welded to the strip **100** and to the plate **27**. The lower edge of the plate is beveled as indicated to minimize the spacing between the forward surface of the tampers **60** and the lower edge **31** of the plate **27**.

A second elongated strip **102** also of steel or other similar material is supported in spaced relationship to the plate **100**. The strip **102** is somewhat wider than the strip **100** and extends downwardly to a point generally in line with the lower edge **31** of the plate **27**. The strip **102** is held in position by a series of spacer bars **103** that are secured to the strip **100** at intervals slightly greater than the width of the tampers **60**. The thickness of these bars is also slightly greater than the thickness of the tampers. The lower ends of the bars **103** are tapered as indicated at **103'** and extend substantially to the lower edge of the strip **102** to afford maximum support for the strip. A plurality of bracing plates **104** are welded to the tops of the spacer plates **103** and the top edge of the strip **100** and extend inwardly to the plate **27** for attachment thereto by welding or other suitable means. The plate **102** is firmly welded to the spacers **103** and thus forms a series of tamper receiving slots in which the tampers are reciprocated during operation of the apparatus. While the plate **102** is illustrated as being in the form of a single elongated strip, it can be formed in sections bridging the spacer plates **103** in the same manner as illustrated in FIGURE 9. The tampers are operated in the manner described in connection with the previous embodiments of the invention by means of a shaft **65** carrying a plurality of eccentric cams **75**. Each cam carries a connecting rod **80** having a bearing **81** slidably engaging the cam and a tubular bearing portion **83** for engaging a wrist pin **85** carried by the tampers **60**.

In this embodiment of the invention the cams **75** are phased at 120 degree intervals and the operation of three successive tampers with this cam arrangement is shown in FIGURE 15. The tampers **60** to the left as viewed in FIGURE 15 is shown in the upper, dead center position. The center tamper **60** is moving downwardly as indicated by the arrow and the right hand tamper **60** has just passed the dead center bottom position and is proceeding in an upward direction as indicated by the arrow.

The utilization of a plurality of tampers as illustrated in the drawings permits the application of greater forces to the aggregate being laid to secure a highly uniform and dense layer on the road bed. The optimum number of tampers for use in a given application will depend in part on the width of the equipment and in part on the force desired for laying and compacting the aggregate. In any case it is generally desirable to use three or more individual tampers reciprocated in the manner described above for effective and efficient operation.

In certain applications it may be desirable to provide a layer of aggregate of non-uniform thickness throughout the width of the layer and this end may be accomplished by the structure shown diagrammatically in FIGURE 16. In this embodiment the tampers are slidably carried by the back or rear wall or plate **27** as in the case of the previous embodiments of the invention. The drive or cam shaft **65** of the previous embodiments has been replaced by two separate shafts denoted herein by the numerals **110** and **111**. The shafts are in end to end relationship with the inner or adjoining ends carried by a pivotally mounted bearing assembly generally denoted by the numeral **112** and fixed to the plate **27**. The outer ends of the shafts are carried by journals **113** and **114** adjustably carried by slots **115** and **116** in the plate **27** or other similar supporting member. The vertical positions of the journals **115** and **116** are selected by operation of suitable adjusting means **117** and **118** that will move the journals and associated shaft sections upwardly and downwardly as indicated by the arrows **119** and **120** and also serve to lock the journals in the selected position. Movement of the shaft sections will also displace the tampers **60** a proportional amount and thereby enable a variety of surface configurations of the deposited layer to be obtained. This is desirable particularly in the laying of base courses of roadways in order to produce for instance the desired slope for curved sections and crowns for straight sections.

While only certain embodiments of the invention have been illustrated and described, it is evident that modifications, changes and alterations may be made without departing from the true scope and spirit thereof as defined by the appended claims.

What is claimed is:

1. Apparatus for spreading aggregates comprising a hopper for receiving and spreading aggregate, said hopper including a rear wall and a bottom outlet forwardly of said rear wall, a plurality of guides carried in spaced relationship along the lower edge of said rear wall, a tamper plate carried in each guide with the tamper plate being closely embraced by its associated guide to restrict movement of the tamper plate to a substantially linear

path with the lower edge of each tamper plate being movable to and from a position below said rear wall whereby said tamper plates constitute a striker edge for spreading and compacting said aggregate, and means mechanically coupled to said tamper plates for reciprocating said plates in their respective paths and with each of said tamper plates being reciprocated in out-of-phase relationship with the adjoining tamper plates.

2. Apparatus for spreading aggregates comprising a hopper for receiving and spreading aggregate, said hopper including a rear wall and a bottom outlet forwardly of said rear wall, a plurality of guides carried in closely spaced relationship along the rear lower edge of said rear wall, a tamper plate carried in each guide with the tamper plate being closely embraced by its associated guide to restrict movement of the tamper plate to a substantially linear path with the lower edge of each tamper plate being movable to and from a position below and in close proximity to said rear wall whereby said tamper plates constitute a striker edge for spreading and compacting said aggregate, and means mechanically coupled to said tamper plates for reciprocating said plates in their respective paths and with each of said tamper plates being reciprocated in out-of-phase relationship with the adjoining tamper plates.

3. Apparatus for spreading aggregates comprising a hopper for receiving and spreading aggregate on a surface, said hopper including a rear wall and a bottom outlet forwardly of said rear wall, a plurality of vertically disposed guides carried in spaced relationship along the lower edge of said rear wall, said guides being inclined relative to said surface with the lower portion of said guide being disposed forwardly of the upper portion of the guide, a tamper plate carried in each guide with the tamper plate being closely embraced by its associated guide to restrict movement of the tamper plate to an inclined and substantially linear path with the lower edge of each tamper plate being movable to and from a position below said rear wall whereby said tamper plates constitute a striker edge for spreading and compacting said aggregate, and means mechanically coupled to said tamper plates for reciprocating said plates in their respective paths and with each of said tamper plates being reciprocated in out-of-phase relationship with the adjoining tamper plates.

4. Apparatus according to claim 3 wherein the lower edges of said tamper move to and from positions below and forwardly of the lower edge of said rear wall.

5. Apparatus for spreading aggregates comprising a hopper for receiving and spreading aggregate, said hopper including a rear wall and a bottom outlet forwardly of said rear wall, a plurality of guides carried in spaced relationship along the lower edge of said rear wall, a tamper plate carried in each guide with the tamper plate being closely embraced by its associated guide to restrict movement of the tamper plate to a substantially linear path with the lower edge of each tamper plate being movable to and from a position below said rear wall whereby said tamper plates constitute a striker edge for spreading and compacting said aggregate, a transverse driven shaft carried in spaced relationship to the upper ends of said tamper plates, eccentric cams carried by said shaft with each cam in alignment with an associated tamper plate, a link having a cam receiving bearing therein embracing each cam, and means pivotally connecting each link to one of said tampers, each of said cams being in out-of-phase relationship with its adjoining cams whereby rotation of said shaft causes out-of-phase reciprocation of said tampers.

6. Apparatus according to claim 5 wherein said shaft is formed of two end-to-end sections and said apparatus further includes means for angularly adjusting the axes of the shafts one relative to the other to modify the contour of the striker edge.

References Cited in the file of this patent

UNITED STATES PATENTS

992,649	Gale	May 16, 1911
1,887,341	Venable	Nov. 8, 1932
1,974,013	Clausen	Sept. 18, 1934
2,012,784	Barber	Aug. 27, 1935
2,035,627	West	Mar. 31, 1936
2,109,020	Abernathy	Feb. 22, 1938
2,215,455	Abernathy et al.	Sept. 24, 1940
2,245,426	Baker	June 10, 1941
2,249,264	Baily	July 15, 1941
2,267,022	Gledhill	Dec. 23, 1941
2,333,041	Poulter	Oct. 26, 1943
2,351,592	Barber	June 20, 1944
2,511,589	Jaeger	June 13, 1950
2,762,276	Mauch	Sept. 11, 1956
2,842,036	Overman	July 8, 1958

FOREIGN PATENTS

464,548	Italy	July 2, 1951
514,341	Italy	Feb. 9, 1955
751,288	Great Britain	June 27, 1956
775,284	Great Britain	May 22, 1957