

April 1, 1941.

R. C. EVANS

2,236,813

METHOD OF CLEANING STREETS

Filed May 12, 1938

5 Sheets-Sheet 1

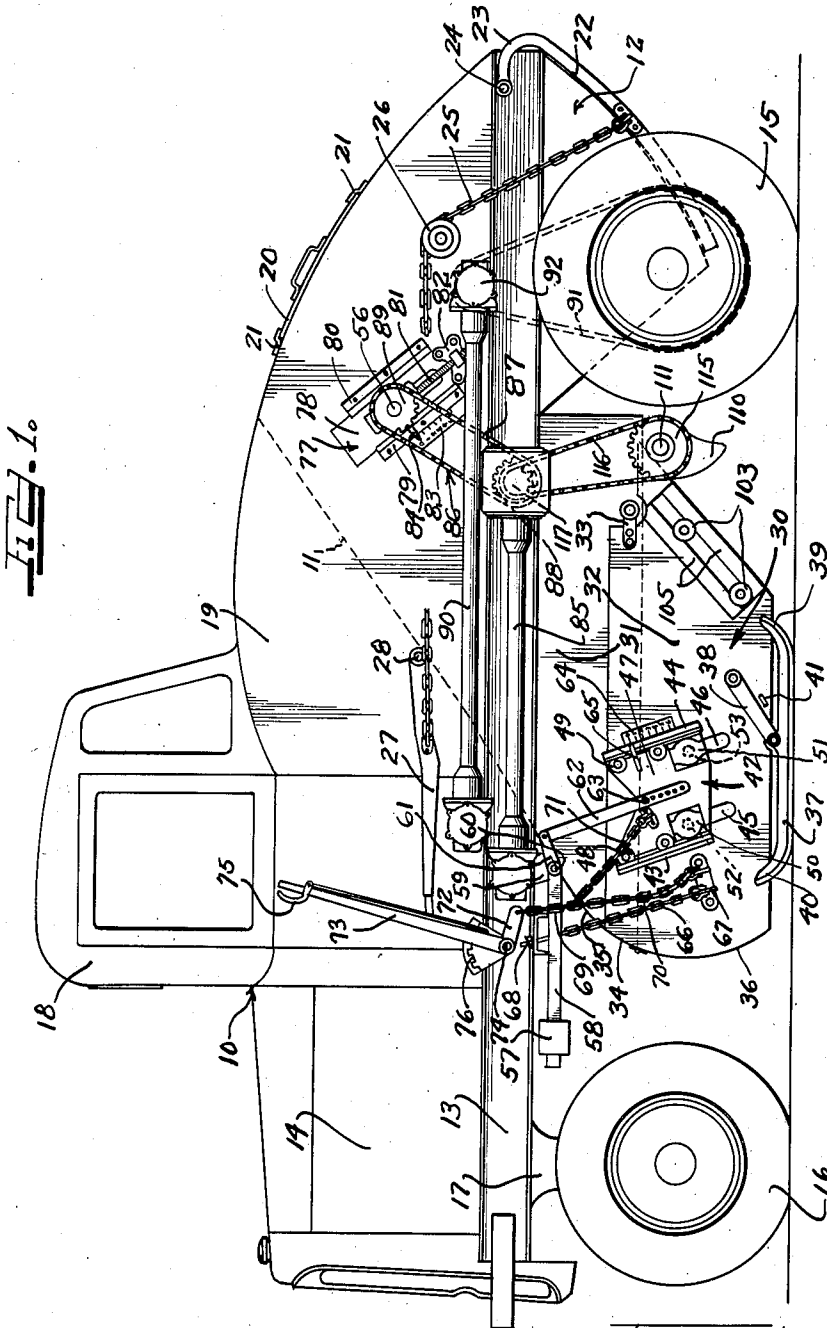


Fig. 1.

EVANS

RONALD CLEMENT EVANS.

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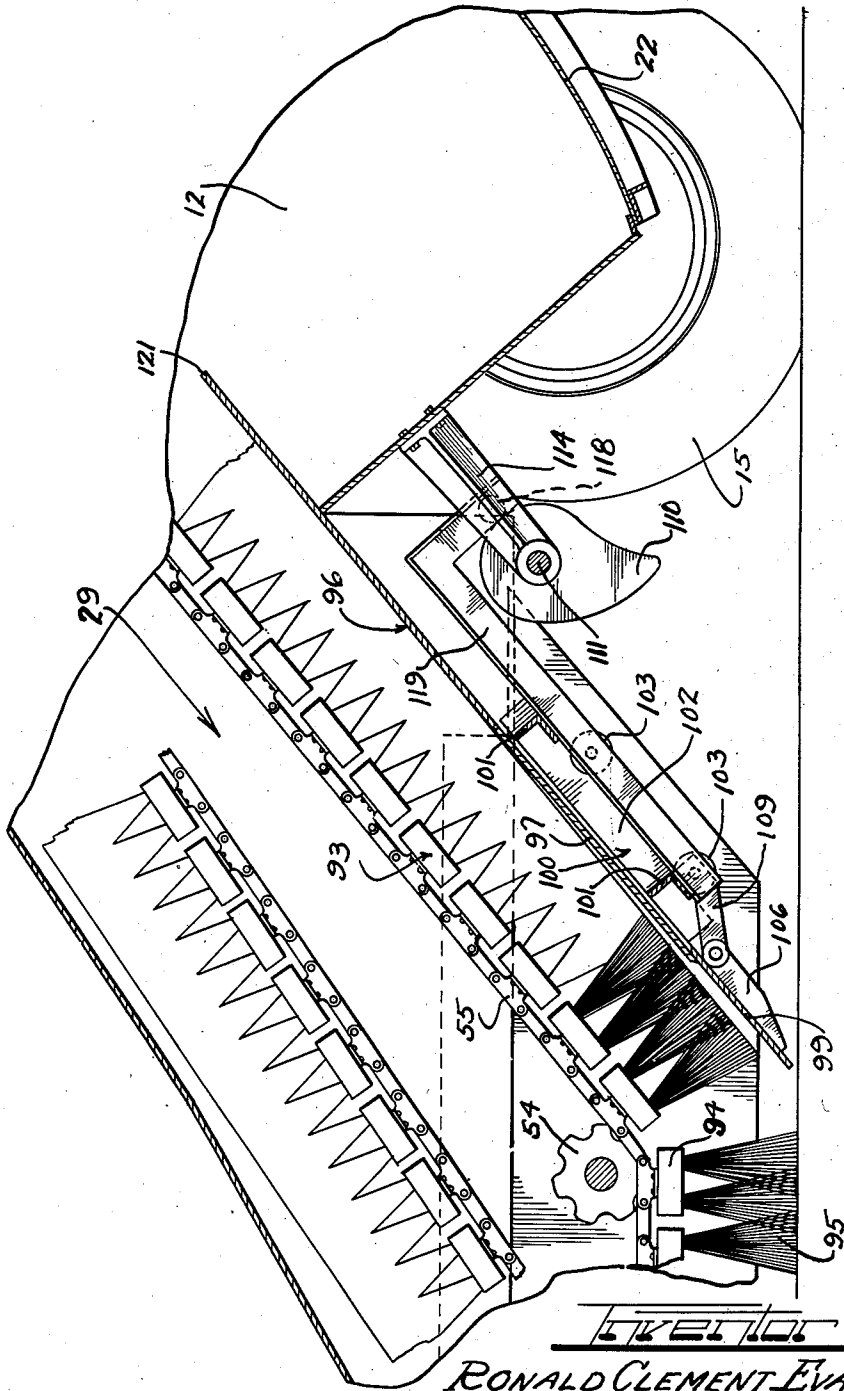
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METHOD OF CLEANING STREETS

Filed May 12, 1938

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Fig. 2.



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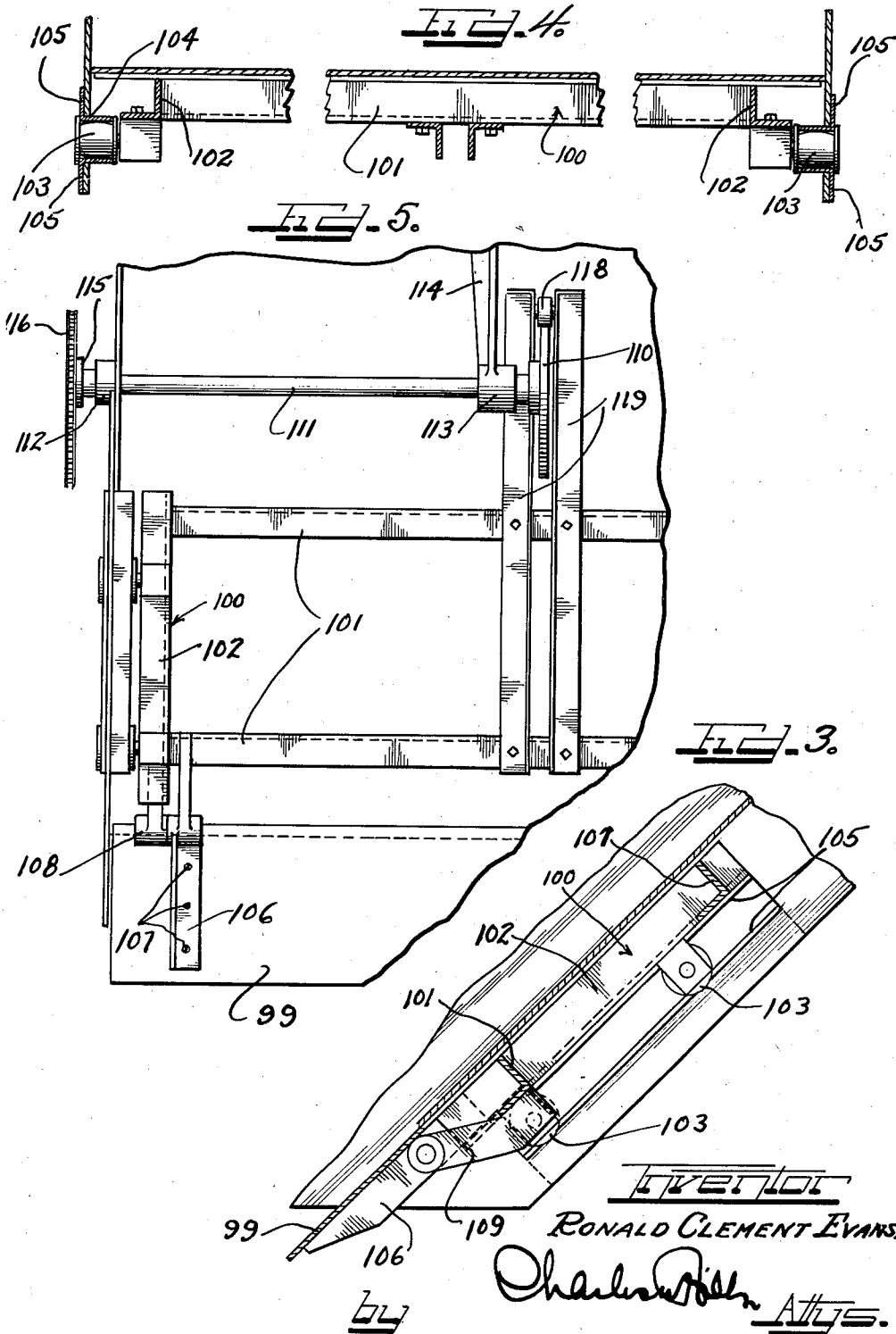
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METHOD OF CLEANING STREETS

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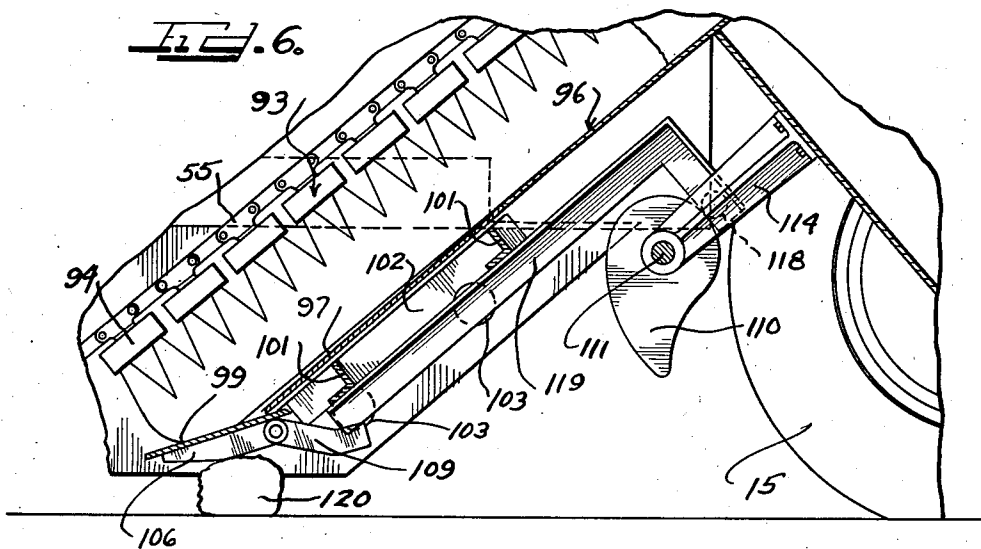
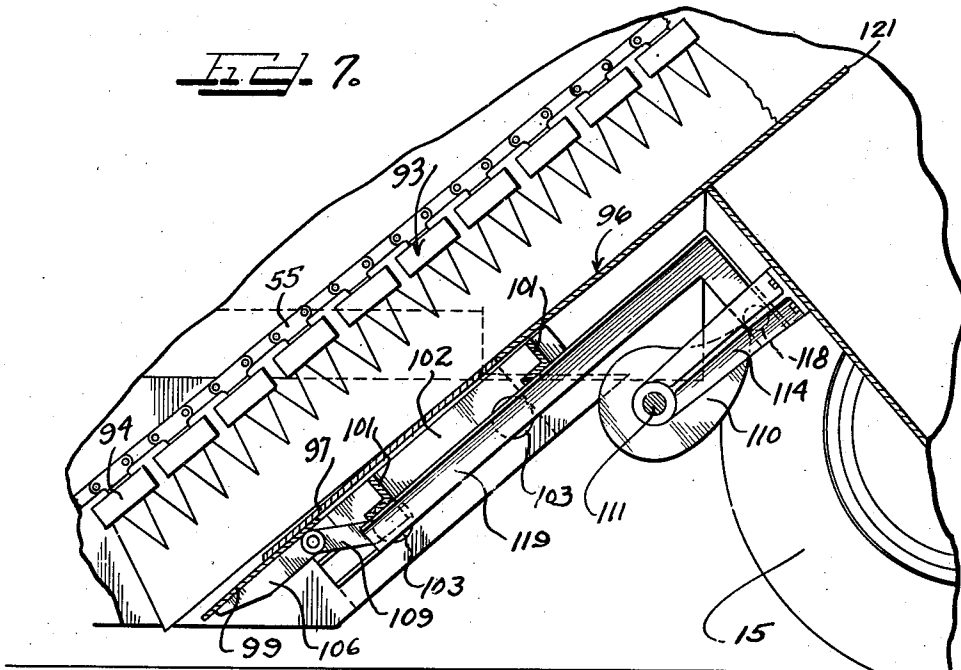
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METHOD OF CLEANING STREETS

Filed May 12, 1938

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Evenor
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METHOD OF CLEANING STREETS

Filed May 12, 1938

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Fig. 8.

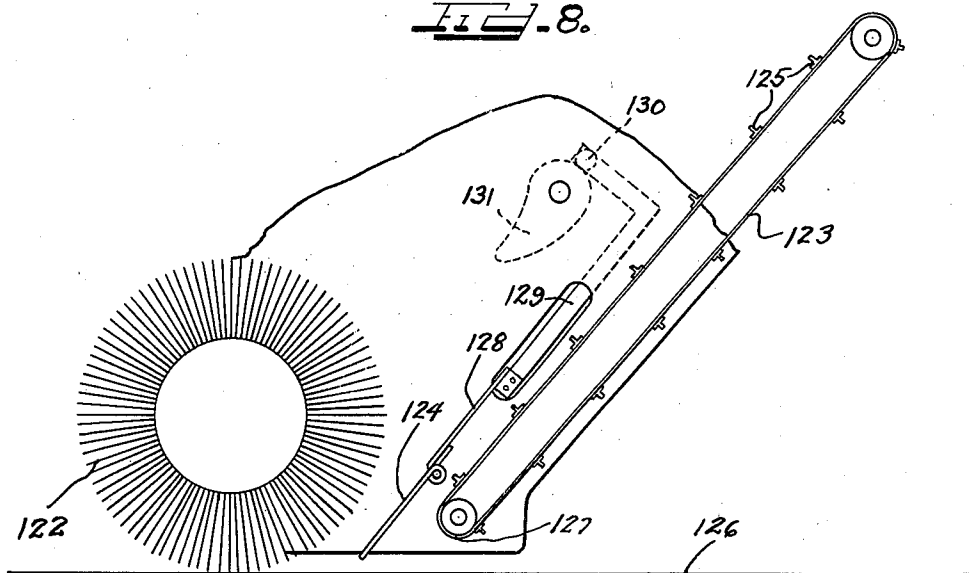
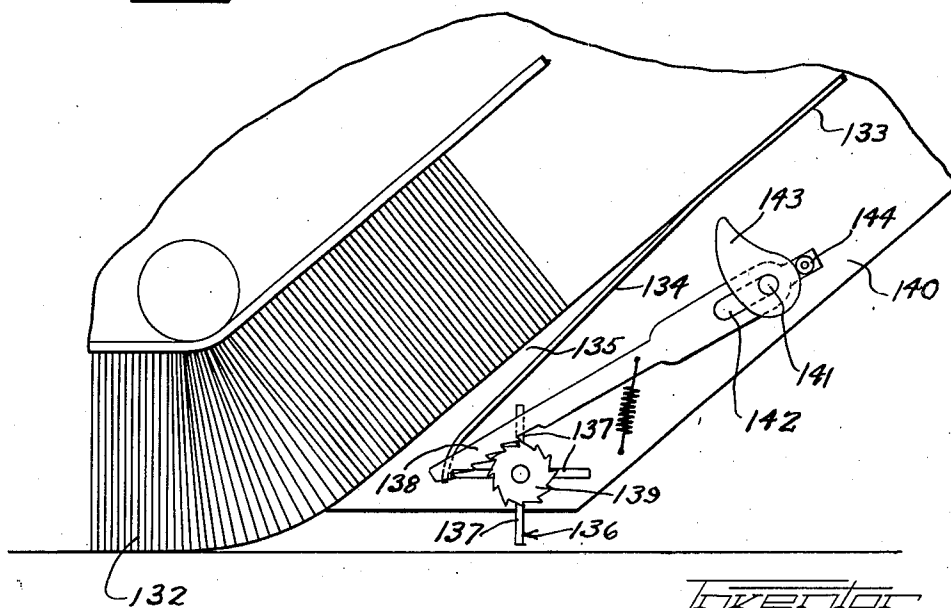


Fig. 9.



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UNITED STATES PATENT OFFICE

2,236,813

METHOD OF CLEANING STREETS

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tion of Illinois

Application May 12, 1938, Serial No. 207,443

1 Claim. (Cl. 15—269)

This invention relates to street sweeping apparatus, and more particularly to a novel method and means for cleaning streets.

The subject matter hereof is related to that of my copending applications Serial Nos. 207,445, 207,446, and 216,740, the first two of which were filed on May 12, 1938, and the latter of which was filed on June 30, 1938.

Many forms of street sweeping apparatus have been employed in the past for cleaning streets and other surfaces to be swept. The different forms of sweeping apparatus may be roughly classified as caterpillar brush sweepers, rotary brush sweepers, and combined rotary brush and conveyor sweepers. The greatest difficulty in the design of any of these sweepers lies in the fact that a sweeping apparatus which is particularly well suited for sweeping dirt and other finely divided debris has not in the past been particularly efficient in sweeping leaves, twigs, stones, refuse, and other similar forms of debris; while sweeping apparatus which has been designed to sweep leaves and other similar debris efficiently has not been particularly well suited for sweeping dirt and finely divided debris. It is believed that the reason for this lies in the fact that an efficient dirt sweeper requires a pick-up plate or drag plate disposed in front of the brush with its bottom edge very close to the surface being swept, while an efficient sweeping apparatus for picking up leaves and the like requires some means which will permit the leaves to pass to the brush. In the first instance referred to above, the leaves are pushed ahead of the sweeping apparatus and for that reason do not come into contact with the sweeping brush. Where the pick-up plate or drag plate is high enough to permit leaves to pass thereunder, the sweeping apparatus throws the dirt underneath the pick-up or drag plate and for that reason it is not swept up.

It is an object of the present invention to provide a novel method and means for sweeping streets and the like which is efficient in picking up both types of debris referred to above.

It is a further object of this invention to provide a novel method for cleaning streets which includes permitting dirt and other finely divided debris to pass to the sweeping brush at all times, while leaves and other similar debris are intermittently passed to the sweeping brush of the sweeping apparatus.

Another and further object of this invention is to provide a novel method of accumulating and picking up debris.

Another and still further object of this invention is to provide a novel method of segregating debris into two classes and for continually sweeping one of said segregated classes of debris, but only intermittently sweeping said other segregated class of debris, said second class of debris being pushed ahead of the sweeping apparatus during the interval when it is not being swept.

The novel features which I believe to be characteristic of my invention are set forth with particularity in the appended claim. My invention itself, however, both as to its organization and method of operation, together with further objects and advantages thereof may best be understood by reference to the following description taken in connection with the accompanying drawings in which:

Figure 1 is a side elevational view of a street sweeping apparatus employing a caterpillar brush and a periodically oscillated drag plate;

Figure 2 is an enlarged fragmentary elevational view illustrating the lower end of the caterpillar brush assembly and the drag plate which co-operates therewith;

Figure 3 is a greatly enlarged cross-sectional view of the drag plate and drag plate mounting of the sweeping apparatus;

Figure 4 is an enlarged cross-sectional end view of the drag plate and drag plate mounting of the sweeping apparatus;

Figure 5 is a fragmentary bottom view of one side of the drag plate and drag plate mounting;

Figure 6 is an enlarged fragmentary elevational view showing the drag plate carriage in its lower position and the drag plate being rocked upwardly as it passes over a large boulder;

Figure 7 is a view similar to Figure 6 but shows the drag plate carriage in its upper position;

Figure 8 illustrates a different form of sweeping apparatus which is capable of carrying out the novel method of the present invention; and

Figure 9 is a still further apparatus capable of carrying out the novel method of the present invention.

The sweeping apparatus illustrated in Figure 1 of the drawings is a street sweeper of the caterpillar brush type. The sweeping elements of this apparatus together with their associated elements are mounted on a motor driven vehicle 10, the principal component parts of the complete apparatus being a caterpillar brush assembly 11, a dirt and debris storage hopper 12, and a chassis 13 having a rear mounted motor 14 thereon (the motor being diagrammatically indicated by show-

ing the customary hood enclosing the same). The chassis 13 includes a pair of front wheels 15 mounted on a fixed axle (not shown) and a pair of rear wheels 16 which are preferably mounted closely together on a pivotally mounted steering assembly 17. Steering assembly 17 is connected through any suitable connecting mechanism to a steering wheel disposed in the driver's compartment or cab 18.

To enhance the general appearance of the vehicle 10 and to protect the sweeping apparatus from the elements, a body 19 is provided which forms a continuation of cab 18 and which may be given any shape which will further enhance the general appearance of the vehicle. In the upper forward wall of the body 19, a relatively large transverse opening is provided to permit access to the upper portion of the caterpillar brush assembly 11. This transverse opening in the upper forward wall of body 19 is closed by a sliding cover 20 which is held in desired position by a pair of flange members 21 welded or otherwise suitably secured to the top of body 19, the flanges 21 being so arranged as to permit transverse sliding movement of the cover 20.

The dirt and debris collecting hopper 12 is situated at the extreme forward end of the vehicle 10 and communicates directly with the upper portion of the brush assembly 11. Hopper 12 is designed to receive dirt and debris carried upwardly thereto by the sweeping apparatus and to store the same until it is desired to empty the hopper 12. The lower end wall 22 of the dirt and debris collecting hopper 12 is pivotally mounted to the end of chassis 13 by a pair of hook shaped arms 23 which are pivotally secured to the horizontal frame members of the chassis 13 as at 24.

In order to hold the end wall 22 of hopper 12 in its closed position so as to prevent escape of dirt and debris from the hopper, a flexible cable or chain 25 is employed to hold end wall 22 in place. Chain 25 is connected at one end to end wall 22, is then passed over a sheave 26 secured to the side wall of the body 19, and is connected finally at its opposite end to a dump lever 27. The dump lever 27 is pivotally mounted on the body 19 as at 28, its downward angular movement being limited by a suitable stop means (not shown) to the position shown in Figure 1. In this position the lever is in an overcenter position which automatically locks the end wall in its closed position. When dump lever 27 is moved upwardly and forwardly, the forward movement of the flexible cable or chain 25 permits the end wall 22 to open by virtue of its own weight.

The caterpillar brush assembly 11 includes in general a caterpillar brush 29, and a caterpillar brush housing 30 composed of an upper stationary housing portion 31 and a lower movable housing portion 32 arranged for limited angular movement about a transverse axis. More specifically, lower housing portion 32 is hinged to and supported by upper housing portion 31 as at 33. The rear wall 34 of housing portion 32 is preferably given a segmental cylindrical curvature, and the lower end 35 of the top wall of the upper housing portion 31 is similarly curved but arranged to permit the lower housing member 32 to be telescoped thereover. The side walls of lower housing member 32 overlap the side walls of upper housing member 31 even when the former are in their lowermost position. This substantially complete telescopic engagement of the lower housing member 32 with the upper housing member 31 permits the former to be raised and

lowered without any substantial interference from the latter.

In order to permit ready accessibility to the caterpillar brush 29 to repair or replace a portion thereof, the rear wall 34 includes a pivotally mounted panel 36 which preferably extends over a major portion of the rear wall 34.

The caterpillar brush assembly 11 also includes a pair of dirt shoes 37 carried on the lower housing portion 32 by arms 38, the latter being pivotally connected to shoes 37 as well as to the housing portion 32. Dirt shoes 37 are in the form of runners which ride along the street surface, the forward and rear ends 39 and 40 being turned up for that purpose. These shoes prevent dirt and other debris from being thrown out the sides of the sweeping apparatus. A stop block 41 on each side of housing portion 32 engages the arms 38 when the housing portion 32 is raised and this carries the shoes 37 up with it. The general and specific nature of dirt shoes 37 is described in claims in my copending application Serial No. 207,446, filed May 12, 1938, and assigned to the same assignee as the present invention.

In order to provide continuous and efficient sweeping irrespective of ripples and the like in the street surface, a floating mount 42 is provided for caterpillar brush 29. This floating mount has the effect of permitting the lower end of the caterpillar brush 29 to float on the surface being swept. The novel features of this floating mount are described and claimed in my aforesaid copending application.

More specifically the caterpillar brush floating mount 42 comprises a pair of tracks 43 and 44 which are mounted in parallel spaced relationship on both sides of the lower housing portion 32. The tracks 43 and 44 may be provided by employing offset flange members which are welded or otherwise suitably secured to the sides of housing portion 32. Portions of the housing wall between the complementary track members 43 and 44 are cut away as at 45 and 46 to permit free movement of the caterpillar brush supporting means which extends therethrough. A caterpillar brush supporting plate 47 having small wheels or rollers 48 and 49 is disposed between each pair of complementary tracks 43 and 44, the wheels or rollers 48 and 49 being arranged to ride in tracks 43 and 44 respectively. It will thus be understood that caterpillar brush supporting plate 47 is mounted for limited movement along a line parallel to the tracks 43 and 44.

Secured to the lower portion of supporting plate 38 are two bearings 50 and 51 which are adapted to receive and have journaled therein sprocket axles 52 and 53. Sprocket axles 52 and 53 each carry a pair of sprocket wheels 54 (see Figure 2), over which two endless articulated caterpillar brush chains 55 ride. At the upper end of the assembly the two endless chains 55 ride on sprocket wheels (not shown) which are similar to sprocket wheels 54 and which are carried on a sprocket axle 56.

Since the position of the lower end of the caterpillar brush 29 is defined by the position of the axles 52 and 53, it will readily be perceived that the position of the lower end of caterpillar brush 29 depends upon the relative position of the brush supporting plate 47 in the complementary tracks 45 and 46.

Due to the relatively heavy weight of caterpillar brush 29, some means must be provided to partially relieve the weight of the brush, brush mech-

anism and brush fibres to lighten the pressure of the brush construction on the surface to be swept. Such a means may be conveniently provided by counterbalancing the brush supporting plates 47. One means for providing such a counterbalance is shown in Figure 1, wherein counterweights 57 are provided on opposite sides of the vehicle 10 and are pivotally supported from the chassis 13 by means of counterweight arms 58, the counterweight arms being pivotally mounted on the support brackets 59 at an intermediate point in their length as at 60. The counterweight arms 51 each have an overhanging portion 61 which pivotally carries the supporting link arm 62. The lower end of the link arm 62 is bolted or otherwise suitably secured to the supporting plate 47 as at 63. As is clearly shown in Figure 1 of the drawings, the lower end of each link arm 62 is preferably provided with a series of holes so that the relative length of each link arm may be adjusted at the will of the operator of the machine. A position index may be provided by employing an index scale 64 on the lower housing portion 32 and a pointer 65 on the plate 47.

From the above description it will be apparent that the greater part of the weight of the caterpillar brush 29 is released from the brush fibres. The counterweights 57 are preferably adjusted on their arms 58 until the force tending to lift the caterpillar brush 29 off of the street approaches but does not quite equal the weight which the brush fibres of the brush 29 must support.

Previous mentioned has been made of the fact that lower housing portion 32 is pivotally mounted for limited angular movement on upper housing portion 31. Some means must of course be provided for limiting downward movement of the housing 32 and for raising and lowering the same at the will of the operator. The means for raising housing 32 must include means for raising caterpillar brush 29 at the same time. Accordingly a flexible cable or chain 66 is provided for defining the lowermost position of housing 32 which is connected at one end to the housing 32 as at 67 and at the other end to the chassis 13 as at 68.

Additional means is provided for raising and lowering the entire caterpillar brush assembly 11. More particularly, the caterpillar brush 29 and the caterpillar brush lower housing 32 may be raised or lowered by means of a flexible cable or chain 69 which branches off into two lower chain portions 70 and 71 which are connected to the caterpillar brush housing 32 and the caterpillar brush supporting plate 47 respectively. The upper end of chain 69 is connected to a crank arm 72 of a control lever 73 which is pivotally mounted on the chassis 13 as at 74. Control lever 73 is preferably equipped with the usual spring biased latch (not shown) under the control of the control lever latch release 75, the latch being arranged to engage a cooperating notched latch plate 76 mounted on the side of the vehicle. As shown in Figure 1 of the drawings, when control lever 73 is in its forward position, the caterpillar brush assembly 11 is in its lowermost position, while when control lever 73 is in its rearwardmost position, the caterpillar brush 29 and the caterpillar brush housing 32 have been lifted by the chain 69 to a raised position.

A caterpillar brush tensioning device 77 is provided to take up slack in the endless articulated chains 55 of the caterpillar brush assembly 11 and to provide the desired amount of tension therein. As will readily be appreciated from a cursory examination of Figure 1, the degree of tension in

the endless chains 55 can be governed by varying the relative spacing of the upper sprocket axle 56 from the two lower sprocket axles 52 and 53. Thus, if some means is provided for varying the distance between the upper sprocket axle 56 and the two sprocket axles 52 and 53, it is apparent that an adjustable tensioning arrangement will be provided. The specific means for accomplishing this end has been described in detail and claimed in my aforementioned copending application Serial No. 207,446, filed May 12, 1938, and assigned to the same assignee as the present invention.

The tensioning device 77 is provided by journailing the upper sprocket axle 59 in suitable bearings (not shown) carried on support plates 78 which are arranged to slide within complementary flange or track members 79 and 80. These complementary track members 79 and 80 are secured to the side walls of upper housing 31 in parallel spaced relationship to each other, but special note should be taken of the fact that the longitudinal axis of the track members 79 and 80 are not in parallelism with the longitudinal axis of the track members 43 and 44. While the angle of divergence of the longitudinal axis of the two sets of track may vary within wide limits without departing from the spirit and scope of the present invention, the angle is illustrated in Figure 1 of the drawings as being approximately 20°, the lower ends of the track members being further apart from each other than their upper ends. Due to the fact that the longitudinal axis of the track members 79 and 80 is disposed at an angle with respect to the longitudinal axis of track members 43 and 44, it will readily be appreciated that by raising and lowering the support plates 78, the tension in the endless chains 55 may be adjusted. This is by virtue of the fact that as the plate members 78 are lowered in track members 79 and 80, the distance between the upper sprocket axle 56 and the two lower sprocket axles 52 and 53 is increased. The position of the support plates 78 in the tracks 79 and 80 is determined by clamping bolts 81 which are mounted in collars 82 to upper housing 31. A position index is preferably employed by providing an index scale 83 on the sides of the housing opposite each lower track 79 and by providing a pointer 84 on the movable plate 78 of each tensioning device 77.

Power for driving the caterpillar brush 29 is obtained from the motor 14 and is transferred through a pair of drive shafts 85 (the drive shafts being illustrated in the drawings merely by showing the housing thereof) and then through a chain drive 86 to the upper sprocket axle 55, the necessary drive chains 87 and sprocket wheels 88 and 89 being provided for this purpose.

Power for driving the vehicle itself is obtained from the motor 14 through a second pair of drive shafts 90, one on each side of the vehicle, and a pair of drive chains 91, the usual bevel gear boxes being provided at 92.

As may be seen best in Figure 2 of the drawings, the caterpillar brush 29 is preferably made up of a plurality of individual brush units 93 which are detachably and individually secured to the articulated chains 55. Each brush unit 93 includes in general a brush head 94 and a brush proper or fibre portion 95, which is made up of a multitude of individual fibres composed of any suitable material, such for example as bamboo fibres. The novel features and specific characteristics of this caterpillar brush and mounting

are described in detail and claimed in my copending application, Serial No. 216,740, filed June 30, 1938, and assigned to the same assignee as the present invention.

During the sweeping operation the caterpillar brush 29 is driven in a counterclockwise direction from the upper sprocket axle 56. The individual brush units 93 as they pass over the surface being swept cause the dirt and debris to be thrown forwardly and upwardly. In order to convey the dirt and debris upwardly to a point where it may be deposited in the hopper 12, an inclined plane 96 must be provided immediately below the ends of the brush fibres 95. This inclined plane 96 forms the bottom wall of the brush housing portions 31 and 32, although it is spaced from the lower edges of the side walls of housing portions 31 and 32.

In order to get the dirt and debris onto this inclined plane 96, it is necessary to cause the lower end 97 of the inclined plane 96 to diverge slightly away from the brush fibres 95 to provide a throat into which the dirt and debris may be thrown by the brushes. The upper portion 98 of the inclined plane however is preferably in direct contact with the lower end of the brush fibres 95. This novel caterpillar brush and brush assembly is described in detail in my aforementioned copending application.

Extending downwardly from the lower edge of the inclined plane 96 and forming substantially a continuation thereof is a drag plate 99. For a reason which will presently appear, drag plate 99 is mounted for limited longitudinal movement in a plane parallel to the lower end portion 97 of the inclined plane 96.

The particular mounting for the drag plate 99 may be seen best in Figures 3, 4, and 5, and includes a carriage 100 having a pair of cross bars 101 and a pair of end bars 102. Rotatably mounted on each end bar 102 is a pair of flanged wheels 103. Housing 32 is suitably slotted at 104 for the reception of wheels 103, the major axis of the slots 104 being parallel to portion 97 of inclined plane 96. Welded or otherwise suitably secured to the side walls of the housing 32 within slots 104 are a set of tracks 105 in which the wheels 103 are arranged to ride. Two drag plate mounting arms 106 are secured to the underside of the drag plate 99 by rivets 107 or in any other suitable manner and these mounting arms 106 are pivotally mounted to the carriage 100 as at 108. A stop arm 109, which is arranged to engage lower cross bar 101, is provided to prevent angular movement of the drag plate 99 below the plane of the portion 97 of the inclined plane 96. That is to say, when the carriage 100 is in its lowermost position, the drag plate 99 may move angularly upwardly, but cannot move angularly downwardly (see Figures 3 and 6 of the drawings).

Now it has been found that in sweeping with a caterpillar brush, two separate and distinct problems must be overcome in order to have a satisfactory and efficient sweeping apparatus. More particularly, it has been found that in order to sweep dirt and other finely divided debris the drag plate 99 must be disposed relatively close to the surface being swept. When this is not done, there is hardly any effective pickup by the caterpillar brush of the sweeping apparatus, for the reason that the dirt is swept forwardly underneath the drag plate. By way of example it was found that when the drag plate was disposed with its lower edge approximately two inches above the

surface being swept, there was little or no pickup ability left in the sweeping apparatus; but when the drag plate was disposed with its lower edge approximately three-quarters of an inch above the surface being swept, the apparatus was very efficient in sweeping dirt.

If a drag plate is fixed in this position, however, it has been found that the sweeping apparatus would not operate effectively to sweep up leaves and other debris of that character for the reason that the leaves would not pass under the lower edge of the drag plate, but would cause them to be pushed forwardly in front of it. Some means was necessary, therefore, to permit the leaves to pass to the caterpillar brush. One of the important features of the present invention is the manner in which this is accomplished. More particularly, and in accordance with the teachings of the present invention, the drag plate 99 is periodically oscillated (that is, raised) to permit the leaves and other similar debris to pass thereunder to the caterpillar brush 29. In order to maintain effective and efficient sweeping of dirt and other finely divided debris, it has been found preferable to provide a mechanism which will maintain the drag plate 99 in its lowermost position for a predetermined distance and to then effect a quick lifting and lowering of the drag plate 99.

The novel means for periodically raising and lowering the drag plate 99 includes a cam 110 of the wiper or involute type (see Figures 2, 6 and 7) which is centrally secured to a cam axle 111 that is journaled in bearings 112 and 113 secured to one side wall of the housing 32 and to a centrally disposed mounting bracket 114 respectively. Secured to the outer end of the cam axle 111 is a sprocket wheel 115 which is driven by an articulated chain 116 from the drive shaft 85, a suitable gear reduction being provided in the gear box 117 so that the rate of rotation of the cam 110 is relatively slow. The speed of rotation of cam 110 may, of course, vary within wide limits without departing from the spirit and scope of the present invention, it being simply necessary to adjust the cam speed so that the accumulation of leaves and other similar debris will not be unduly great.

The cam 110 is positioned to engage a roller bar or cam follower 118 which is carried at the lower end of an L-shaped roller bar support arm 119. Roller bar support arm 119 is centrally secured to the carrier 100, as may be seen best in Figures 2 and 4 of the drawings. From a careful inspection of the drawings it will at once be understood that the cam 110 will cause an upward movement of the carrier 100 along its tracks 105 during a small fraction of each revolution of the cam axle 111. This upward movement of the carrier 100 causes the drag plate 99 to be periodically raised in a plane parallel to the lower portion 97 of the inclined plane 96.

The drag plate 99 is pivotally mounted on the carrier 100 in order that it may pass over large stones 120 and other heavy objects without damage to the apparatus as is clearly shown in Figure 6.

To operate the sweeping apparatus of the present invention, power is supplied to the upper sprocket axle 56 which causes counterclockwise movement of the endless chains 55 which carry the brush units 93. Due to the fact that the lower end of the caterpillar brush assembly 29 is freely floating on the surface which is being swept, the lower ends of the brush fibers 95 are constantly

in engagement with this surface. By properly adjusting the counterbalance weight 57, substantially all of the weight of the caterpillar brush assembly 29 is removed from the fibers 95 themselves. The individual brush units 93 sweep the dirt and other finely divided debris upwardly and forwardly against the drag plate 99 where it is carried by the brush 29 upwardly along the inclined plane 96 until it passes over the open mouth 121 of the hopper 12.

Leaves and other debris of this character is pushed forwardly in front of the drag plate 99 by the drag plate itself until the drag plate is raised by the cam 110 in the manner shown in Figure 7 of the drawings. At this time leaves and other debris of this character pass under the lower edge of the drag plate 99 where they are thereafter swept forwardly and upwardly by the brush units 93 onto the inclined plane 96.

As the rotation of the cam 110 is continued, the drag plate 99 is returned by gravity or by suitable spring means (not shown) to its lowermost position as shown in Figure 2 where it is again effective to catch and collect the dirt swept forwardly and upwardly by the individual brush units 93. During the interval that the drag plate is being moved upwardly and returned, the dirt and finely divided debris on the surface being swept is merely thrown forwardly ahead of the brushes until such a time as the drag plate is in its lowermost position, where the dirt and other finely divided debris is again caught and collected by the drag plate and caused to pass upwardly along the inclined plane 96 into the hopper 12.

The dirt shoes 37 slide along the surface which is being swept and prevent dirt and other debris from slipping out either side of the sweeping apparatus. These dirt shoes 31 thus prevent any impairment of efficient sweeping action by the apparatus.

After the storage hopper 12 has become filled, the dirt and debris collected therein may be dumped by throwing the dump lever 27 upwardly and forwardly thus causing the lower end wall 22 of the hopper 12 to open about its pivot 24. After the hopper 12 has been dumped, the end wall 22 is returned to its closed position by pulling the dump lever backwardly and downwardly until it has passed its overcenter position.

In traveling to and from the area to be swept, the caterpillar brush assembly 29 and the lower brush housing 32 are elevated by pulling the control lever 73 to its rearward position (that is, to its left hand position as viewed in Figure 1 of the drawings).

From the above description it will be apparent that I have illustrated novel means for carrying out a novel method of cleaning streets. As will readily be apparent to those skilled in the art, dirt and finely divided debris is segregated from other debris such as leaves and the like. The dirt and finely divided debris is continually permitted to pass to the brush of the sweeping apparatus while the other debris, such as leaves, is pushed forwardly, except for intermittent intervals, when it is permitted to pass to the sweeping brush along with the dirt and finely divided debris. This novel method may obviously be carried out by many different types of apparatus and for that reason is independent of any specific apparatus.

The novel apparatus which has been illustrated as being one form of apparatus capable of carrying the novel method described herein is described and claimed in another copending appli-

cation Serial No. 207,445, filed May 12, 1938, and assigned to the same assignee as the present invention.

My novel method may, of course, be carried out by many other forms of apparatus, two forms of which will now be described.

Figure 8 illustrates a sweeping apparatus of the rotary brush belt conveyor type. For purposes of simplicity, only the essential elements of the sweeping apparatus which relate to the novel method of the present invention have been illustrated, but it is to be understood that this apparatus is, of course, mounted on a suitable sweeping apparatus vehicle, such as the one illustrated in Figure 1, which includes a storage hopper having an open mouth disposed beneath the top of the belt conveyor, the brush and belt conveyor and other associated mechanisms being driven from a suitable power supply source.

Referring now to Figure 8, there is illustrated therein a rotary brush 122, a belt conveyor 123, and a drag plate 124. The belt conveyor 123 is provided with a plurality of transversely disposed raised portions or T-bars which are designed to retain dirt and other debris which is thrown onto the belt conveyor 123 by counterclockwise rotation of the rotary brush 122. The belt conveyor 123 extends forwardly and upwardly from a point in front of the rotary brush 122 and slightly above the surface 126 which is being swept. It is to be understood that the lowermost point 127 of the belt conveyor 123 is spaced at a sufficient distance above the surface 126 to permit all forms of debris which are adapted to be swept up by the sweeping apparatus to pass thereunder.

The drag plate 124 is mounted on a carriage 128 which is suspended from the vehicle in such a manner as to permit limited movement of the drag plate 124 in a plane parallel to the upper surface of the belt conveyor 123. While the particular manner in which the carriage 128 is mounted on the vehicle has not been shown for purposes of simplicity of illustration, it is to be understood that this may be mounted in any convenient manner, such, for example, as that shown in connection with Figures 1 to 7 of the drawings. Connected to the upper end of the carriage 128 is an L-shaped member 129 which is provided with a roller bar 130 at its outer extremity. Roller bar 130 is adapted to be engaged by an involute type cam 131 in a manner similar to that described in connection with Figures 1 to 7, it being understood that the cam 131 is rotated in a counterclockwise direction by forward movement of the vehicle, thereby causing intermittent raising and lowering of the drag plate 124 at a predetermined distance of travel of the sweeping apparatus.

The lower end of the drag plate 124 in its lowermost position is spaced at such a height above the surface 126 that dirt and other finely divided debris may continually pass thereunder, but leaves and other similar types of debris are pushed forwardly thereby. During the interval in which the drag plate 124 is raised and lowered by the cam 131, the leaves and other debris of this character pass thereunder and into contact with the rotary brush 122. As the drag plate 124 is again lowered, all forms of debris which are adapted to be swept up by the apparatus are thrown forwardly and upwardly by centrifugal force and onto the belt conveyor 123, where it is carried upwardly into the storage hopper (not shown). If the drag plate 124 is not provided, it has been found that leaves and other

similar debris will be swept up by the sweeping apparatus, but dirt and other finely divided debris is not swept efficiently, by reason of the fact that a great part of it is thrown forwardly under the lower edge of the belt conveyor 123. Drag plate 124 or some other similar form of pickup plate is therefore necessary to provide efficient sweeping of dirt and other finely divided debris. If the drag plate is not periodically raised and lowered, as was previously pointed out, the leaves and other debris of this character would never reach the brush. The drag plate 124 therefore acts as a means for segregating dirt and other finely divided debris from leaves and other similar debris, and further provides a means for continually passing finely divided debris to the brush but permitting a passage of leaves and other similar debris at periodic intervals only.

A third form of apparatus capable of carrying out the novel method of the present invention is illustrated in Figure 9 of the drawings. In order to simplify the illustration as much as possible, only that portion of the sweeping apparatus which directly bears upon the novel method has been illustrated. As shown, the sweeping apparatus includes a caterpillar brush 132, an inclined plane 133, the lower portion 134 of which diverges slightly outwardly away from the bottom of the caterpillar brush 132 to provide a debris receiving throat 135, and a debris segregating and collecting means 136, the debris segregating and collecting means 136 is provided with four transversely disposed plates 137, which are placed substantially at right angles to each other. The segregating and collecting means 136 is arranged to be periodically rotated in a clockwise direction through an angle of substantially 90°. In other words, one of the transversely disposed plates 137 is adapted to be moved into the position previously occupied by the next succeeding plate 137 at intermittent intervals, one of the plates 137 during the intervals between rotation always being in a downwardly extending position. The lower edge of the segregating and collecting means 136 is so spaced above the surface which is being swept, that the dirt and other finely divided debris is permitted to pass thereunder, but leaves and other similar debris are pushed forwardly thereby. By rotating the means 136 through 90° in a clockwise direction, it will at once be apparent to those skilled in the art that the leaves and other debris which have been collected in front of the means is permitted to pass to the caterpillar brush 132; as the next succeeding plate 137 moves into a downwardly extending position, further passage of leaves and other similar debris is prevented and the means thereafter acts as a segregating and collecting device, the leaves being pushed forwardly thereby.

The segregating and collecting means 136 may be periodically rotated in any suitable manner, the particular means shown in Figure 9 being a rack 138 and a ratchet wheel 139. The ratchet wheel 139 is secured to the segregating and collecting device 136, while the rack 138 is slidably mounted on the side wall 140 of the sweeping apparatus by a pin and slot connection 141 and 142 respectively. The pin 141 has mounted thereon an involute type cam 143 which is arranged to be rotated by the forward movement

of the sweeping apparatus. Mounted on the end of the rack 138 is a roller bar 144 which engages the cam 143.

From the above description it will be seen that I have provided an extremely simple and yet efficient method of sweeping and cleaning streets and other surfaces, and which permits the use of apparatus which is economical to manufacture and which is rugged and reliable in use.

While I have illustrated a street sweeping apparatus with a rear mounted motor and a front mounted dirt and debris collecting hopper, it will, of course, be understood that the same vehicle can be run in the opposite direction with all of the equipment disposed in exactly the same position as that illustrated in the drawings, it being simply necessary to increase the speed of the caterpillar brush to a speed at which the ground speed of the brush fibres is substantially greater than the ground speed of the vehicle (such, for example, as twice the ground speed). This increase in the speed of operation of the caterpillar brush is necessary when the vehicle is being moved in the opposite direction in order to obtain an effective relative rearward speed of the caterpillar brush with respect to the surface being swept which is necessary to cause the dirt and debris to be thrown rearwardly onto the inclined plane which is now located behind the brush rather than in front of the brush as is the case when the machine is being moved in the direction indicated in the preferred embodiment of the invention.

While I have designated my sweeper as a street sweeper, it is, of course, to be understood that I do not intend in the accompanying claim to limit the use of my sweeper solely for cleaning streets. It may be used with equal advantage in sweeping paved yards, warehouse floors, stadium floors, and numerous other similar surfaces where extensive sweeping operations are required.

While I have shown particular embodiments of my invention, it will, of course, be understood that I do not wish to be limited thereto, since many modifications may be made, and I therefore contemplate by the appended claim to cover all such modifications as fall within the true spirit and scope of my invention.

I claim as my invention:

The method of sweeping and brushing a surface such for example as that of a street which comprises continuously brushing the dirt and dust off the surface in a predetermined confined sweeping zone both as the surface is being forwardly traversed and also when the sweeping is confined only to a given portion of the surface without any forward movement thereover, contemporaneously with forward movement over the surface scraping together debris other than dust and dirt such as leaves, twigs and refuse and the like so as to collect such debris in advance of the sweeping zone, periodically releasing the debris scraped together so as to allow the same to enter the confined sweeping zone as the surface being swept is forwardly traversed and thereafter sweeping up in said confined zone such segregated and collected debris off said surface.

RONALD CLEMENT EVANS.