Aug. 4, 1931. N. H. G. SPRADBROW 1,817,042

STREET SWEEPING MACHINE

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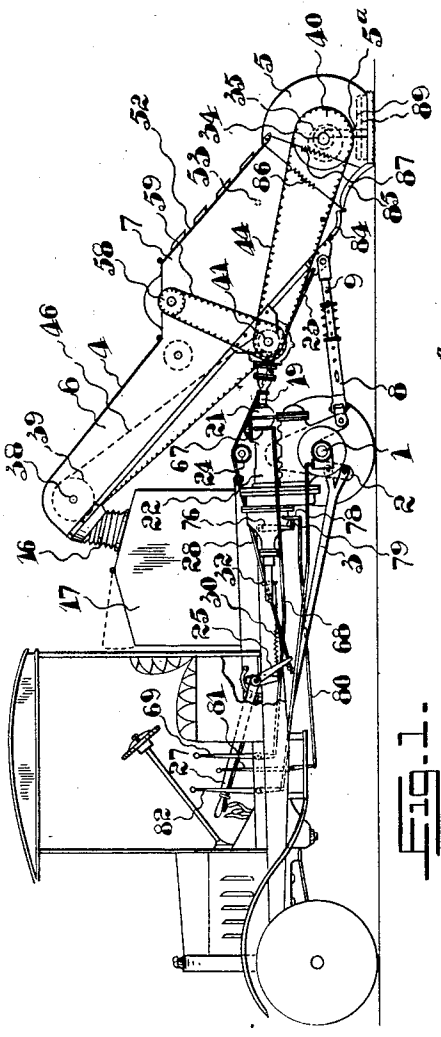

Fig. 1.

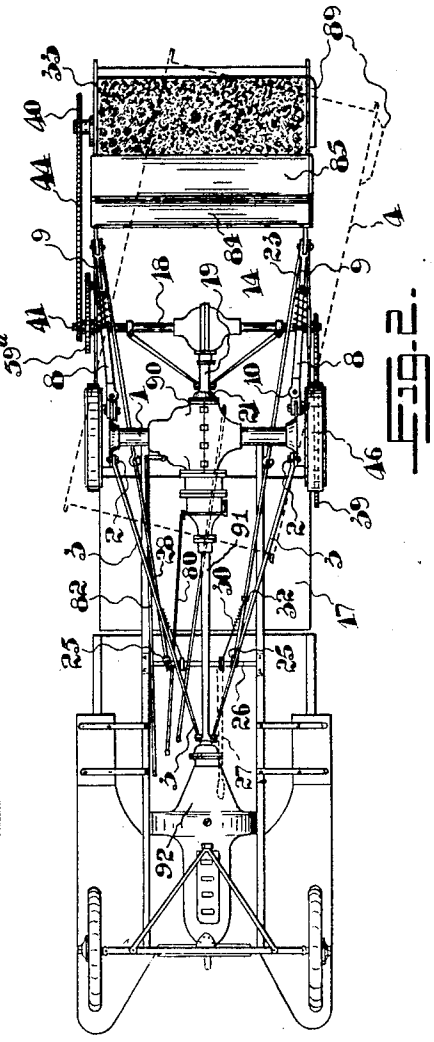

Fig. 2.

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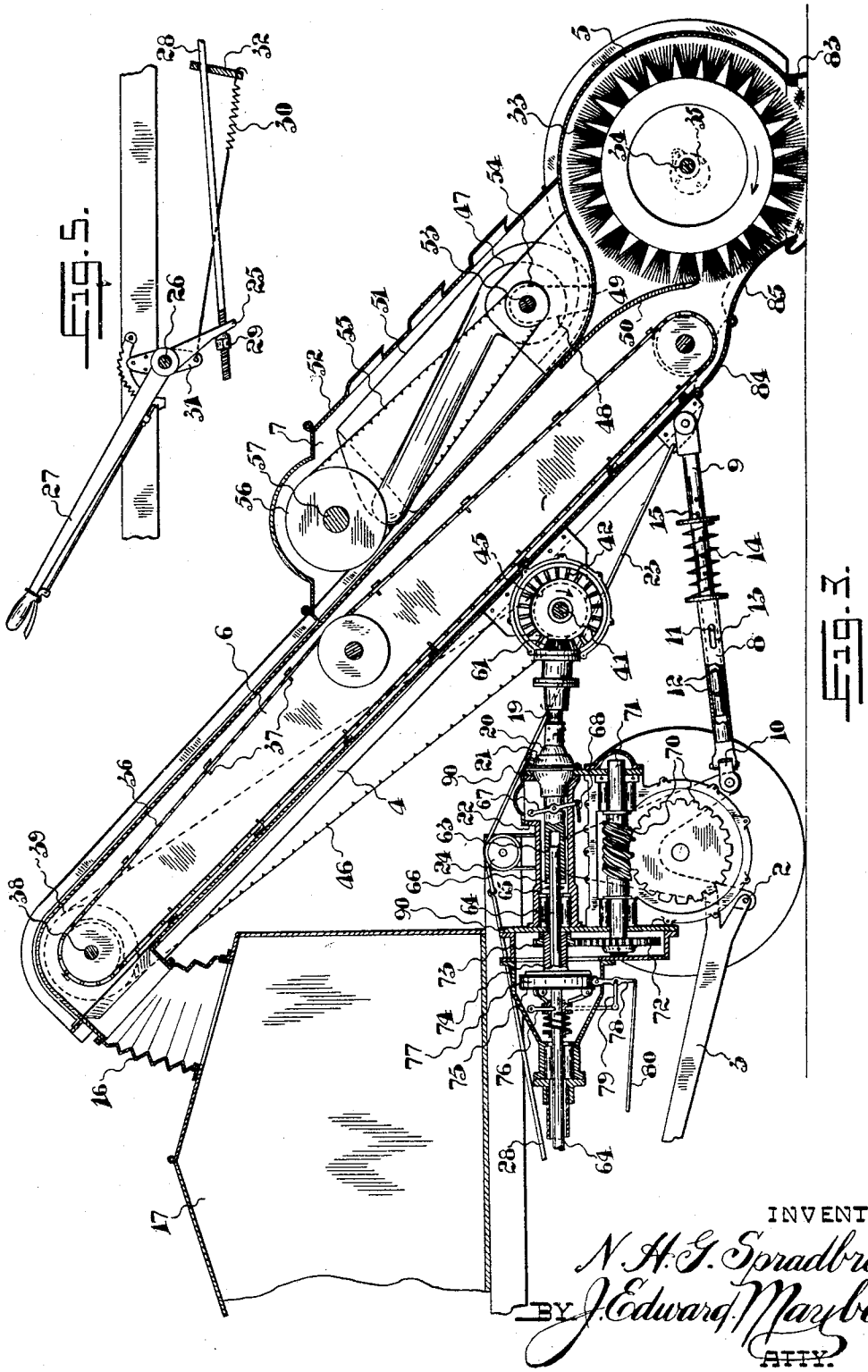
Fig. 5.

Fig. 3.



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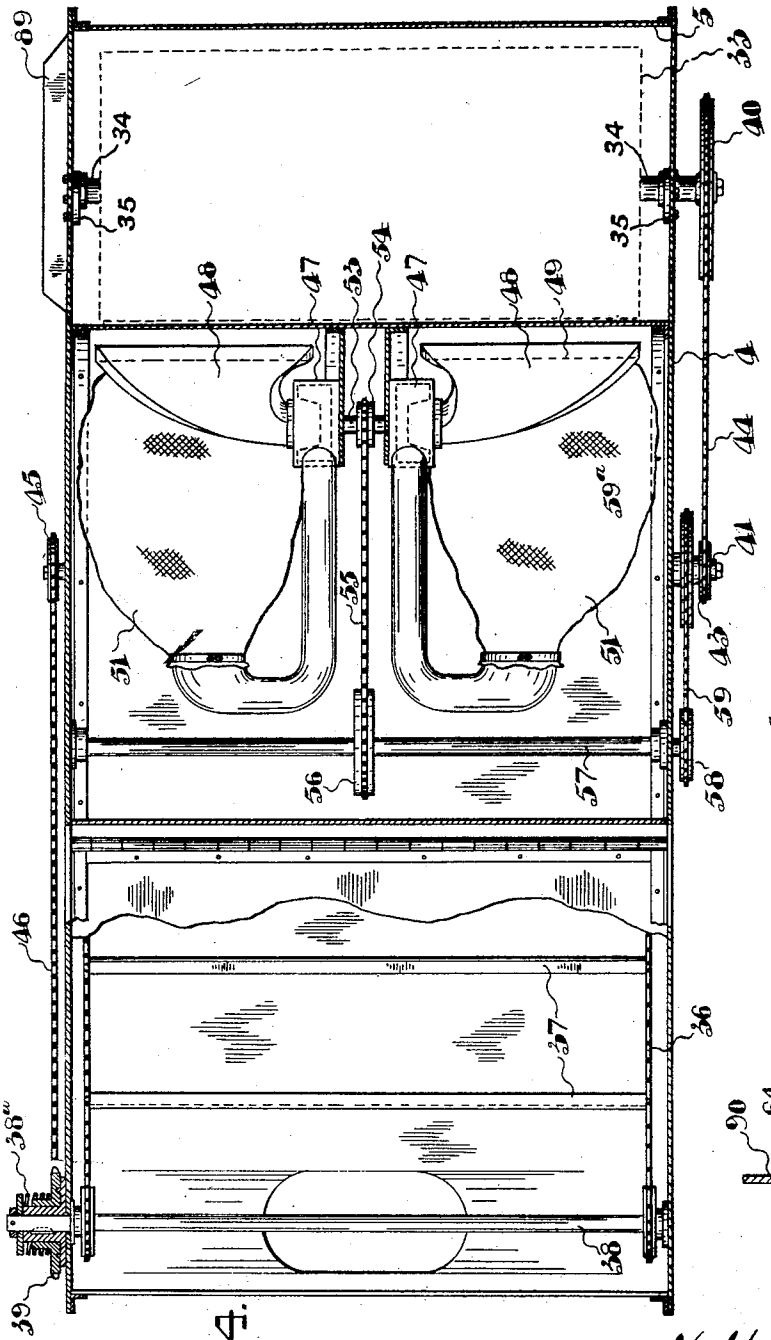

Fig. 4.

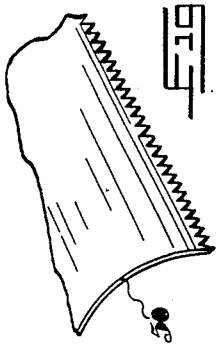

Fig. 7.

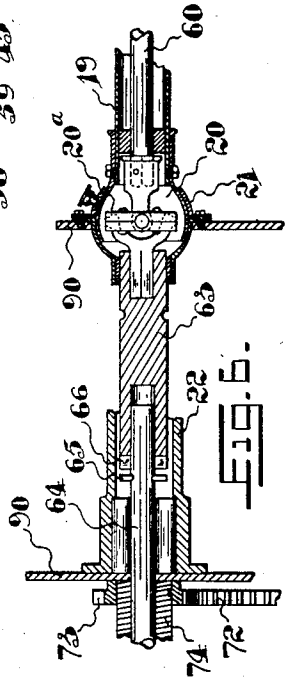

Fig. 6.

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Patented Aug. 4, 1931

1,817,042

UNITED STATES PATENT OFFICE

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STREET SWEEPING MACHINE

Application filed March 31, 1927. Serial No. 179,965.

This invention relates to apparatus for street sweeping of the type in which the dirt is swept up by a rotating brush and elevated to a dirt receptacle while the dust-laden air created is drawn off by suction fans and suitably filtered, and my object is to devise apparatus of this type, which may be drawn by and driven from a known type of truck with readily constructed or easily applied modifications and additions and in which, as largely as possible, standard or readily obtainable parts are employed.

In its main features the apparatus comprises a truck, sweeping and elevating mechanism including a frame in the form of a casing, a central universal joint connection between the truck and the frame and draft connections between the truck and the frame at each side of the universal joint connection below the same.

The draft connections are adjustable to incline the elevating and sweeping mechanism either towards the right or left and means are provided for counterbalancing and elevating the elevating and sweeping mechanism from the truck chassis.

The drive for the elevating and sweeping mechanism is carried through the central universal joint connection.

The invention is hereinafter more specifically described and is illustrated in the accompanying drawings in which

Fig. 1 is a side elevation of a street sweeping machine constructed in accordance with my invention;

Fig. 2 a plan view of the underside of the same;

Fig. 3 a vertical section, on an enlarged scale, of the rear portion of the machine;

Fig. 4 a plan view, partly in section, of the sweeping and elevating mechanism;

Fig. 5 a detail and side elevation of the connections of the sweeper elevating cables with the truck frame;

Fig. 6 a sectional detail of the connection between the truck and the drive shaft and drive shaft tube of the elevating and sweeping mechanism; and

Fig. 7 a perspective view of part of the baffle plate.

In the drawings like numerals of reference indicate corresponding parts in the different figures.

The machine comprises two main parts, a motor truck and elevating and sweeping mechanism connected therewith and driven from the power plant of the truck by means of additions to the transmission mechanism of the truck. While any form of truck may be employed, I show the machine as including a Ford model T truck, preferably fitted with a form of drive giving two axle speeds for each gear ratio and such as the Ruckstell two speed axle. The truck, therefore, is of a well-known construction and requires description in detail only as may be necessary to enable the changes and additions made thereto to be properly understood.

The rear axle 1 has a forked plate 2 secured thereto at each end. To the forward part of the lower end of each plate radius rods 3 such as those of a Ford model T truck are secured, instead of as normally above the axle. The radius rods are connected, as usual, to the forward end of the drive shaft tube 91, which connects the transmission housing 92 with the rear axle housing 90 for the driving gearing of the rear wheels at a point above the axis of the same. The rearward part of the lower end of each of the plates 2 serve for the connection of draft members for the elevating and sweeping mechanism.

The elevating and sweeping mechanism includes the frame 4 formed as a casing divided into a brush chamber 5, elevator chamber 6 and dust collector chamber 7. The draft connections with the elevating and sweeping mechanism hereinbefore referred to, are each formed of telescopic members 8 and 9, the member 8 being sleeved over the member 9. Each member 8 is connected, by means of a universal joint 10, with the adjacent plate 2, and each member 9 is pivotally connected with the lower part of the frame 4, by means of a joint which will permit a pivotal movement in at least a vertical plane. A pin 11 is adapted to pass through any one of a plurality of holes 12 in the member 9 and then through a slot 13 in the member 8. When the truck is travelling forward, the pins 11

will lie at the rear ends of the slots 13. Under certain conditions the draft connections may require to be slightly shortened, hence the provision of the slots 13. It is desirable, however, that this movement should be cushioned, and I therefore provide each of the draft connections with a coil spring 14 bearing against the end of the member 8 and against a pin 15 passed through one of the holes 12 in the member 9. The frame of the elevating and sweeping mechanism extends forwardly and upwardly over the rear end of the truck so that the elevator chamber may be connected by means of a flexible tube 16 with a removable dirt box 17 supported on the truck.

As it is desired that the elevating and sweeping mechanism should be capable of being raised from the ground, that it should have a floating movement between certain limits and that it should be capable of being inclined either to the right or to the left in a horizontal plane, a further connection must be provided between the frame 4 and the truck, and means must be provided connected with the truck for largely counterbalancing the weight of the elevating and sweeping mechanism and for raising it when desired. The upper connecting means includes an axle 18 on the ends of which the frame 4 is pivoted. This axle may be an ordinary rear axle of a Model T Ford car with the usual differential gears omitted. Centrally this axle is provided with the drive shaft tube 19 of usual construction except that it is shortened, which tube is provided with a ball 20 engaging in a socket 21 at the rear end of the housing 22, which is carried on upward extensions 90 secured to the differential housing of the truck rear axle. The frame 4 of the elevating and sweeping mechanism may thus rock on the horizontal axle, and the drive shaft tube itself, which is rigid with the axle may swing in any direction on the truck. The drive shaft tube will normally be approximately horizontal with the axle 18 above a plane in which lie the centre of the ball 20 and the points of pivotal connections of the members 9 with the frame 4.

If an upward lift be imparted to the frame 4, the draft connections and the drive shaft tube 19 will all swing upwardly. To impart a counterbalancing force to the frame 4 of the elevating and sweeping mechanism and to lift the same, I employ two cables 23 preferably connected to the frame 4 adjacent the pivots of the members 9 of the draft connections. Above the rear axle 1 of the truck are supported two sheaves 24, over which the cables pass, thence running to rock arms 25 secured to a transverse shaft 26 journalled on the truck chassis. This shaft is provided with a suitable adjusting lever 27. The ends of the cables are formed of rods 28, each of which passes through a hole in one of the rock arms and has a nut 29 screwed on its end whereby slack may be taken up or adjustment made as required. By operating the lever the sweeping and elevating mechanism may be raised. The counterbalancing effect is provided, by means of coil springs 30, one for each cable. Each coil spring is connected with a suitable bracket 31 on the truck chassis, while its other end is connected with one end of a cramp 32 slidable on the rod 28. The holes in these cramps are slightly larger than the diameter of the rods so that they will cramp on the rods in a known manner, while the cramps are readily adjusted on the rods as required. When the springs are acting as counterbalances the rods 28 will project through the rock arms 25 so that the nuts 29 are out of contact therewith.

From the constructions described it follows that, if the truck is passing over absolutely level ground, the elevating and sweeping mechanism will be drawn along with the brush, hereinafter described, contacting with the ground with a pressure determined by the tension of the springs 30. If the rear wheels of the truck pass over an elevation, the draft connections formed by the members 8 and 9 must shorten as their inner ends are lifted and thus brought more nearly to a horizontal position. This movement is permitted by the pin and slot connections, hereinbefore referred to, against the tension of the springs 14. If the rear wheels of the truck drop into a depression, both the draft connections and the drive shaft tube 19 rock on their connections with both the truck and the frame 4 and relative movement in the vertical plane of the rear axle of the truck and the elevating and sweeping mechanism is permitted without strain to the latter or undue pressure on the brush. While the draft connections and the drive shaft tube both take stresses, lateral movement of the elevating and sweeping mechanism relative to the truck is resisted mainly by the drive shaft tube 19 which is rigidly connected with the axle but, as this drive shaft tube is short, no undue stresses are set up. The purpose of providing the members 9 and the draft connections with a plurality of holes 12 is that these connections may be shortened or lengthened as desired to give the elevating and sweeping mechanism an inclination either to the right or to the left as may be desired.

In Fig. 2 of the drawings which shows the apparatus upside down the elevating and sweeping mechanism is shown in full lines as sweeping straight, while in dotted lines the mechanism is indicated as inclined to sweep towards the right by the lengthening of the left hand draft connections and the shortening of the right hand draft connections. This angling either to the right or left is permitted by the universal joints 10 and that formed by the ball and socket joints 20 and 21.

The elevating and sweeping mechanism is

constructed as follows. In the brush chamber 5, which is cylindrical in form, is journalled a rotary brush 33 of known type. The axle 34 of this brush is journalled eccentrically in disks 35 rotarily adjustable on the ends of the brush chamber so that the axle of the brush may, by rotating the disks, be adjusted to or from the axle 18 as wear of the driving connections, hereinafter described, takes place. (See Figs. 3 and 4.) One end of the brush axle 34 is provided with a sprocket wheel 40. Slots 5ª are formed in the ends of the brush chamber (see Fig. 1) to enable the brush axle to be positioned after the casing is assembled. In the elevator chamber 6 is located an endless conveyor 36, the flights 37 of which travel over the bottom of the chamber. This conveyor runs over guide pulleys in the usual manner, and the shaft 38 at the upper end of the conveyor is provided at one end with a sprocket wheel 39 whereby the conveyor may be driven. The sprocket wheel is connected with the shaft by a friction clutch 38ª adapted to slip and give an audible indication under a predetermined overload. Any known form of clutch of this type will answer the purpose of my invention. The axle 18 has a shaft 41 mounted therein which may be formed of two Ford Model T rear axle shafts connected together without the usual differential but provided centrally with a crown gear 42. At one end of the shaft 41 is secured a sprocket wheel 43 which, by means of a sprocket chain 44, drives the sprocket wheel 40 on the brush axle. At the other end of the shaft 41 is secured a sprocket wheel 45 which, by means of a sprocket chain 46, drives the sprocket wheel 39 of the conveyor mechanism.

The dust collector chamber 7 contains two suction fans 47, the inlet of each fan being connected by means of a flattened tube 48 with a long, narrow opening 49 leading into the brush chamber at the upper side and above the forward side of the brush. Equality of suction from opposite ends of the brush chamber is thus assured. A baffle plate 50 connected with the upper side of the elevator chamber extends downwardly into contact with the forward side of the brush, thus shutting off the elevator chamber from communication with the brush chamber, except at the lower side of the brush. The suction fans have, therefore, little or no action on the dirt being swept into the elevator chamber but only on the dust which passes the point of contact between the baffle plate and the bristles of the brush. The lower edge of this plate is preferably toothed to give it a better cleaning and separating action on the brush bristles. The discharge pipes of the suction fans 47 are connected with removable dust filtering bags 51 of known type. The chamber 7 is provided with hinged lids 52 provided with louvers or vents for the escape of air.

The suction fans are provided with a common shaft 53 provided with a sprocket wheel 54, which is driven by means of a sprocket chain 55 from a sprocket wheel 56 on the shaft 57 journalled on the frame 4. One end of this shaft is provided with a sprocket wheel 58 driven, by means of a sprocket chain 59, from a sprocket wheel 59ª on one end of the shaft 41.

From the above description it will be seen that, when the shaft 41 is driven, the brush, the conveyor belt and the suction fans are all driven. The shaft 41 is driven from the power plant of the truck in the following manner. Within the drive shaft tube 19 is journalled in the manner known in automotive practice a drive shaft 60 provided with a pinion 61 meshing with the crown gear 42 on the shaft 41. This drive shaft is provided with a known type of universal joint 20ª within the ball 20. The forward end of the universal joint of the drive shaft 60 has a clutch sleeve 63 slidably mounted thereon, by means of which it may be clutched to the propeller shaft 64 of the truck. This latter being provided with a transverse pin 65 adapted to engage in the notches 66 formed in the end of the sleeve 63. The clutch sleeve 63 is actuated by a shifter fork 67 of known type actuated by means of a connecting rod 68, the other end of which is operable by means of a shifter lever 69. The elevating and sweeping mechanism may thus be actuated at will from the drive shaft of the power plant of the truck.

The propulsion of the truck is the standard drive of the vehicle employed and is shown as effected by the worm drive 70 of known type, of which further description is unnecessary. The worm shaft 71 is provided at its forward end with a gear wheel 72 which meshes with a pinion 73 on a sleeve 74 on the drive shaft 64. This sleeve may be given a driving connection with the propeller shaft 64 by means of any suitable friction clutch 75 which is shown as of the ordinary Ford Model T disk type and is actuated by a shifter lever 76. While this lever might be independently operated, I show it operated in conjunction with a friction brake band 77 applied to the periphery of the clutch. This brake band 77 may be of the well-known Ford Model T type and is operated by a lever 78 which is pivotally connected by means of a link 79 with the shifter lever 76. By throwing out the clutch 75 the vehicle may be stopped at any time while sweeping may be continued. The end of the lever 78 is connected by means of the connecting rod 80 with a shifter lever 81. 82 is a shifter lever adapted to actuate the control of the two-speed mechanism of the rear axle. As this control forms no part of the present invention and is of a type well-known in the art, further description is unnecessary.

From the above description it will be seen

that the traction and elevating and sweeping mechanism may be actuated either independently or simultaneously and the vehicle itself either forward or backward, thus adapting the apparatus to all conditions of work, while the use of a two-speed rear axle enables the rate of traction to be nicely adapted to the rate of sweeping and elevating. Certain details of the elevating and sweeping mechanism remain to be described.

The opening in the underside of the brush chamber is provided with a flexible petticoat 83. The sweepings from the brush, which rotates in a forward direction, pass up over a jointed apron comprising the parts 84, 85, which are hinged together, the upper member being hinged to the lower end of the underside of the elevator chamber. Coil springs 86 and 87 are each connected with one end of this apron at each side of the machine and to the frame 4. The springs 86 are connected with the apron at the joints between the two members, while the springs 87 are connected adjacent the lower end of the member 85 which is thus drawn up closely to the brush. A constant relationship between the brush and the apron is thus maintained as wear of the brush takes place.

Rubbing strips 89 are preferably provided on the ends of the brush chamber to take the wear if the chamber contacts with the curb.

What I claim is:

1. A street sweeping machine comprising a truck provided with a propeller shaft and carrying a dirt receptacle; sweeping and elevating mechanism including a frame; a rotary brush, an elevator and operating means for the brush and elevator; a central tubular universal joint connection between the truck and said frame; draft connections between the truck and the frame at each side of the universal joint connection; and driving means for the operating means of the elevator and sweeping mechanism including a drive shaft, connected with the propeller shaft, extending through the tubular connection and provided with a universal joint therein.

2. A street sweeping machine comprising a truck provided with a propeller shaft and carrying a dirt receptacle; sweeping and elevating mechanism including a frame; a rotary brush, an elevator and operating means for the brush and elevator; a transverse tubular axle on which the frame is pivoted; a tubular connecting member rigidly connected to the axle and having a universal joint connection with the truck; means for bracing and counterbalancing the frame from the truck; driving means for the operating means of the elevator and sweeping mechanism including a drive shaft, connected with the propeller shaft, extending through the tubular connecting member and provided with a universal joint; and a shaft within the hollow axle connected with the operating means for the elevator brush and geared to the drive shaft.

3. In a street sweeping machine, elevating and sweeping apparatus comprising a casing forming a brush chamber and an elevator chamber terminating above the ground level; an elevator mounted in said elevator chamber; a brush mounted in the brush chamber; an apron extending from the lower end of the lower side of the elevator chamber to the underside of the brush comprising a plurality of plates hinged together, the upper one being hinged to the casing and the lower one having a convexly curved face engaging the brush; and springs drawing said plates towards the brush.

4. A street sweeping machine including a motor truck provided with a propeller shaft and carrying a dirt receptacle; sweeping mechanism, including a frame, a rotary brush, and elevating mechanism adapted to discharge to the dirt receptacle; a connecting member between the truck and the frame pivoted on the latter to swing in a vertical plane and having a universal joint connection with the truck; draft bars loosely pivoted to the truck and the frame at each side of the said connecting member below and approximately parallel thereto; and flexible driving connections between the propeller shaft of the truck and the sweeping and elevating mechanism adapted to permit of their relative movement.

5. A street sweeping machine including a motor truck provided with a propeller shaft and carrying a dirt receptacle; sweeping mechanism, including a rotary brush, elevating mechanism adapted to discharge to the dirt receptacle and a frame on which the brush and elevating mechanism are mounted; a connecting member between the truck and frame pivoted on the latter to swing in a vertical plane and having a universal joint connection with the truck; telescopic draft bars comprising telescoped parts pivotally connected to the truck and the frame at each side of the said connecting member below and approximately parallel thereto; cushion springs engaging the parts of the telescopic draft bars tending to resist the shortening of said draft bars; and flexible driving connections between the propeller shaft of the truck and the sweeping and elevating mechanism adapted to permit of their relative movement.

6. A street sweeping machine, including a motor truck provided with a propeller shaft and carrying a dirt receptacle; sweeping mechanism, including a rotary brush, elevating mechanism adapted to discharge to the dirt receptacle and a frame on which said brush and elevating mechanism are mounted; a transverse axle on which the frame is pivoted; a connecting member rigidly connected to the middle part of the axle and having

a universal joint connection with the truck; yielding draft bars loosely pivoted to the truck and the frame at each side of the said connecting member below and approximately parallel thereto; and flexible driving connections between the propeller shaft of the truck and the sweeping and elevating mechanism adapted to permit of the movement of the sweeping and elevating mechanism relative to the truck.

7. A street sweeping machine comprising a truck provided with a propeller shaft and carrying a dirt receptacle; sweeping mechanism including a rotary brush, elevating mechanism adapted to discharge to the dirt receptacle and a frame on which said brush and elevating mechanism are mounted; a central tubular connecting member between the truck and said frame pivoted on the latter to swing in a vertical plane and having a universal joint connection with the frame; yielding draft connections between the truck and the frame at each side of the tubular connecting member; and driving means for the elevating and sweeping mechanism including a drive shaft extending through the tubular connection and provided with a universal joint concentric with the first mentioned tubular joint and connected with the propeller shaft of the truck.

8. A street sweeping machine comprising a truck; sweeping and elevating mechanism including a frame on which said mechanism is mounted; means for driving the sweeping and elevating mechanism; a transverse axle on which the frame is pivoted; a connecting member rigidly connected to the middle portion of the axle and having a universal joint connection with the truck; and draft connections between the truck and said frame at each side of the universal joint connection and below the same, each connection comprising two rigid members slidable on one another, a spring tending to extend said members, and means limiting the extension of the one member relatively to the other.

9. A street sweeping machine comprising a truck; sweeping and elevating mechanism including a frame on which said mechanism is mounted; substantially stiff draft connections pivotally connected to the truck and frame adjacent the ground level to swing vertically; a substantially stiff draft connection pivotally connected to the truck and frame to swing vertically and located adjacent the median plane of the truck and at points higher than the aforesaid draft connections and forming therewith means for maintaining the angle of the elevating mechanism to the ground level approximately constant when said mechanism is raised and lowered; and counterbalancing mechanism connected with the truck and frame tending to raise the frame.

10. A street sweeping machine comprising a truck; sweeping and elevating mechanism including a frame on which said mechanism is mounted; two substantially stiff draft connections loosely pivoted to the truck and frame adjacent the ground level and at opposite sides of the frame; means for shortening either connection to vary the angle of the sweeping mechanism to its direction of travel; a substantially stiff draft connection pivotally connected to the truck and frame to swing either horizontally or vertically and located at points higher than the aforesaid draft connections and forming therewith means for maintaining the angle of the elevating mechanism to the ground level approximately constant when said mechanism is raised and lowered.

11. A street sweeping machine comprising a truck; sweeping and elevating mechanism including a frame on which said mechanism is mounted; a transverse axle on which the frame is pivoted; a connecting member rigidly connected to the middle portion of the axle and having a universal joint connection with the truck; draft connections between the truck and said frame at each side loosely pivoted to said truck and frame below the level of the said universal joint connection, each comprising rigid telescoped members and a spring yieldingly resisting relative movement of said members under stresses to shorten the overall length of the connection; and depending means at opposite sides of the universal joint connected to the truck and the frame tending to counterbalance the weight of the latter, said counterbalancing mechanism being adapted to permit relative lateral movements of the truck and frame.

Signed at Toronto, Canada, this 29th day of March, 1927.

NORMAN H. G. SPRADBROW.