A. S. EMERSON.

STREET CLEANING MACHINE.

APPLICATION FILED JULY 10, 1911.

1,145,129.

Patented July 6, 1915.

3 SHEETS—SHEET 1.

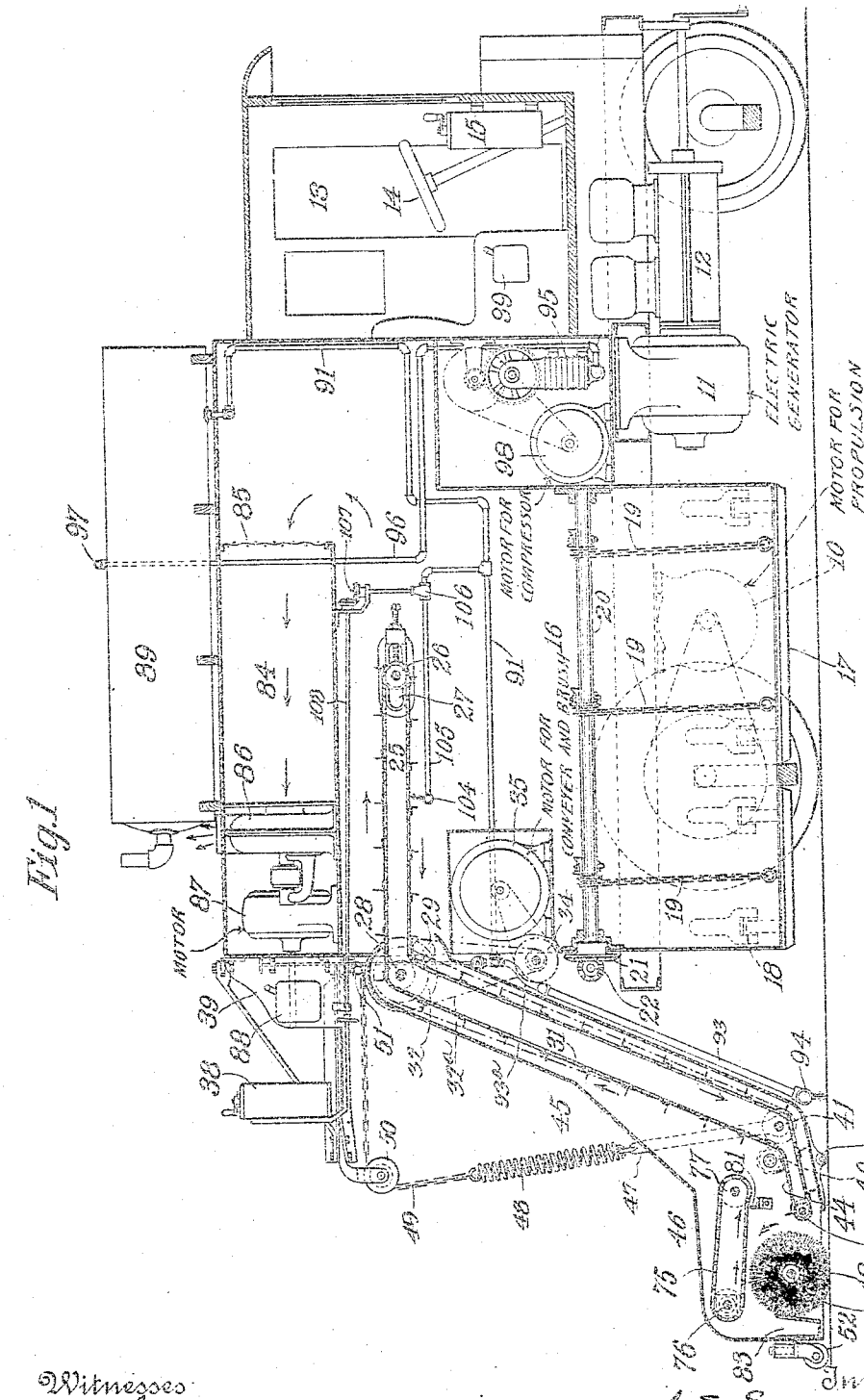


Fig. 1

Witnesses

W. P. Johnson

L. A. Duncan

Inventor

A. S. Emerson

By his Attorneys

Rice, Page, Cooper & Hayward

A. S. EMERSON.

STREET CLEANING MACHINE.

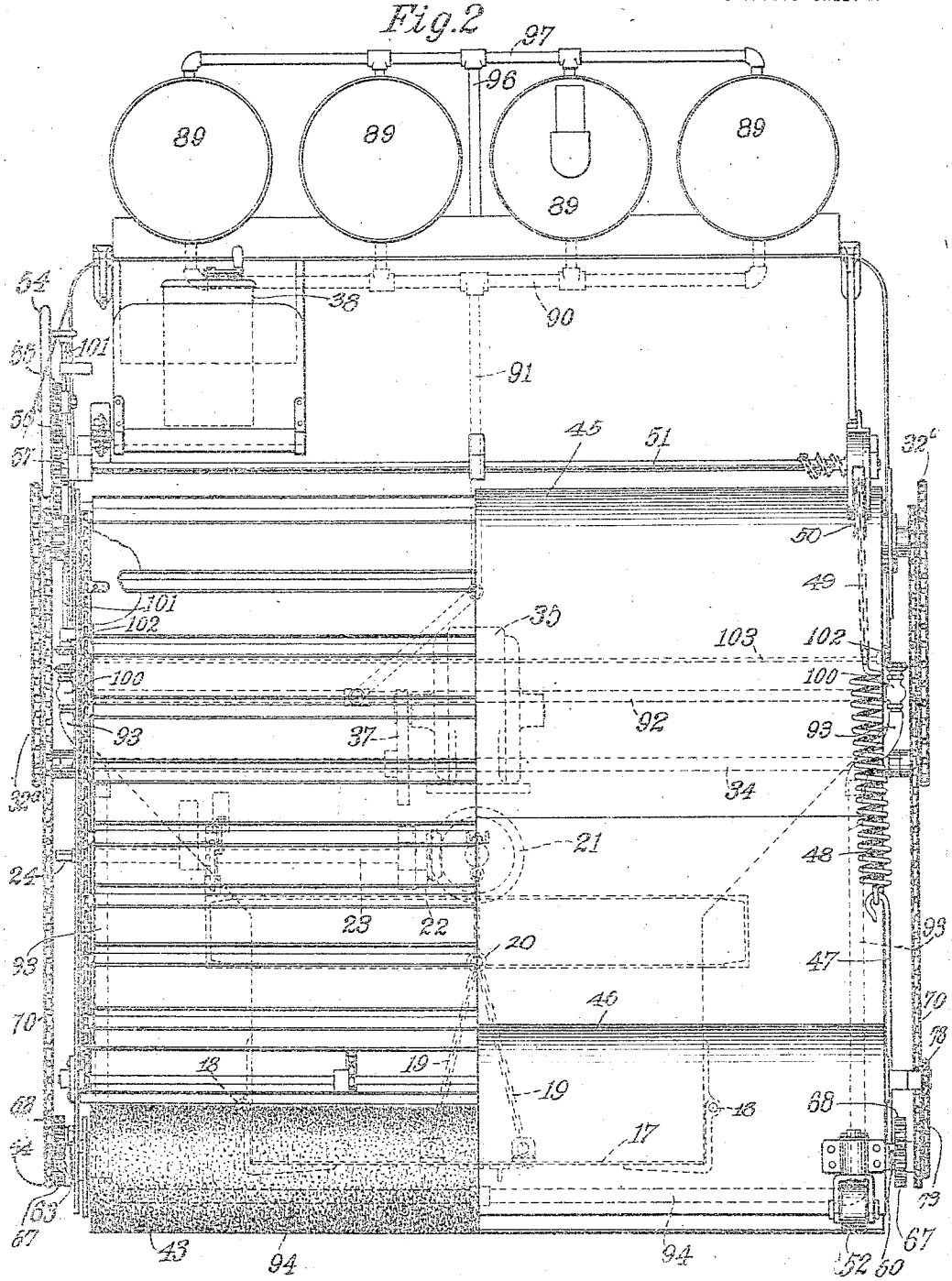
APPLICATION FILED JULY 10, 1911.

1,145,129.

Patented July 6, 1915.

3 SHEETS—SHEET 2.

Fig. 2



Witnesses:

W. P. Johnson

A. L. Dunham

Inventor

A. S. Emerson

By his Attorneys

Keen, Page, Emerson & Hayward

A. S. EMERSON.

STREET CLEANING MACHINE.

APPLICATION FILED JULY 10, 1911.

1,145,129.

Patented July 6, 1915.

3 SHEETS—SHEET 3.

Fig. 3

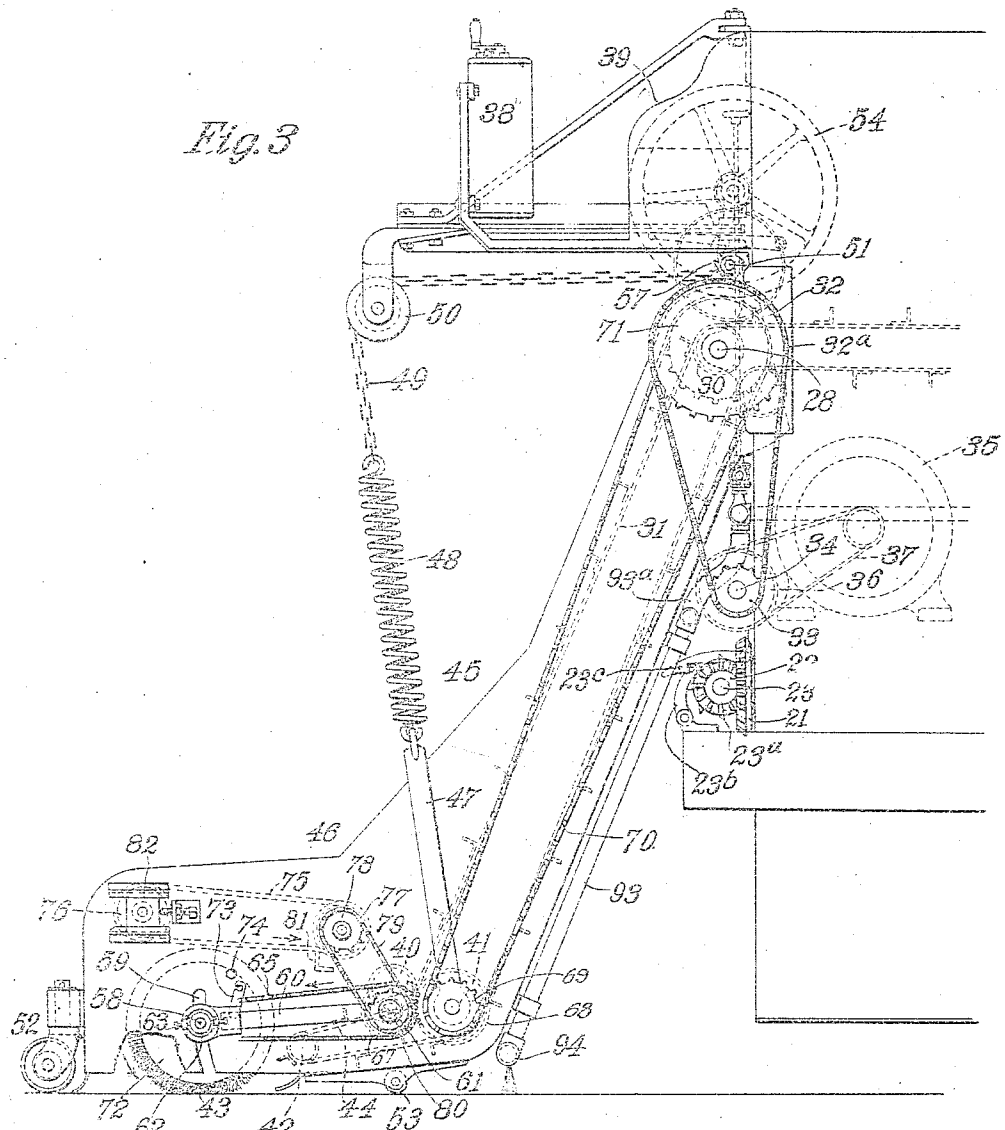
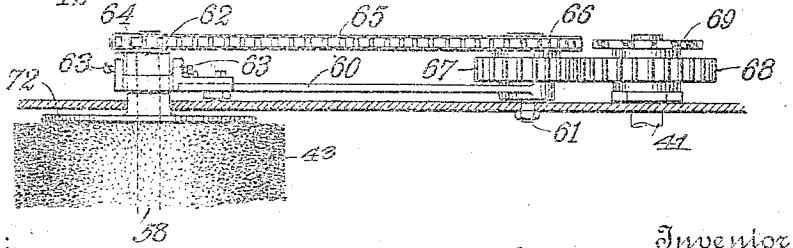


Fig. 4



Witnesses:

Inventor

A. S. Emerson

By his Attorneys

Kerr, Page, Cooper & Hayward

UNITED STATES PATENT OFFICE.

ALFRED S. EMERSON, OF NEW YORK, N. Y., ASSIGNOR TO EMERSON CONTRACTING COMPANY, OF NEW YORK, N. Y., A CORPORATION OF DELAWARE.

STREET-CLEANING MACHINE.

1,145,129. Specification of Letters Patent. Patented July 6, 1915.

Application filed July 10, 1911. Serial No. 637,601.

To all whom it may concern:

Be it known that I, ALFRED S. EMERSON, a citizen of the United States, residing at New York, in the county and State of New York, have invented certain new and useful Improvements in Street-Cleaning Machines, of which the following is a full, clear, and exact description.

This invention relates to street-cleaning machines, and its chief object is to provide a machine which will, in effect, scrub the street and take up the scrubbings or sweepings, leaving the pavement clean and free from the finer dirt and dust.

Another object is to provide means by which the vacuum or suction principle may be availed of to aid in conveying the sweepings or scrubbings to the dirt-receptacle, whereby the fine dust will also be carried to the proper receptacle in the machine, so as to avoid the unsanitary scattering of dust.

A further object is to provide means for flushing the pavement as the sweeping or scrubbing proceeds, by discharging water under pressure and in fine jets upon the pavement, to aid in loosening hard or caked material thereon and enable the same to be removed more readily and more certainly by the sweeping apparatus. This water may, if desired, be charged with suitable antiseptic, disinfectant or germicidal material, thereby leaving the pavement sanitarily clean as well as free from dirt and dust.

To these and other ends the invention consists in the novel features of construction and combinations of elements hereinafter described, and more particularly set forth in the appended claims.

An effective embodiment of the invention is illustrated in the accompanying drawings, in which—

Figure 1 shows the machine in vertical longitudinal section. Fig. 2 is a rear view of the machine with the left half of the conveyer trunk removed. Fig. 3 is a side view, on a larger scale than Fig. 1, of the rear portion of the machine. Fig. 4 is a detail plan view of the mechanism for driving the rotary brush or broom.

The machine illustrated is of the automobile type, being driven by an electric motor 10 supplied with current from a generator 11 which is in turn driven by a hydrocarbon internal combustion engine 12. In the driver's cab 13 are the usual steering and engine-controlling devices indicated by the hand-wheel 14, and the usual controller 15 for controlling the driving motor 10. In rear of the cab is the dirt receptacle 16, the bottom of which is divided longitudinally into two parts or doors 17 hinged to the sides of the receptacle at 18 and connected by branched chains 19 to a winding shaft 20. When the chains are wound on the shaft the doors 17 are held closed, as shown. To rotate the shaft, to open and close the doors, the former is provided with a bevel gear 21, meshing with a bevel gear 22 on a transversely extending shaft 23 having a squared end 24 to receive a suitable crank, not shown. To hold the doors in any desired position the shaft 23 is equipped with a ratchet 23^a, Fig. 3, to coöperate with a vertical holding pawl 23^b. To prevent the pawl being disengaged from the ratchet by the jolting of the vehicle or in other accidental manner a pivoted horizontal retaining latch 23^c is provided, having a notch engaging a pin on the pawl, as shown in Fig. 3, in which it will be seen that when the latch is in engagement with the pawl no movement of the latter can take place and hence no rotary movement of the winding shaft. When it is desired to actuate the latter the latch is lifted out of engagement with the pawl.

Sweepings are carried to the dirt receptacle by a conveyer having a horizontal portion 25 extending from the rear well into the receptacle and running over suitable sprockets at the ends of a shaft 26 the bearings of which are adjustably mounted in horizontal slots, one slot being shown at 27, so that the shaft may be shifted forwardly or rearwardly as may be necessary to keep the conveyer at a proper tension. At the rear of the dirt receptacle the conveyer runs over a shaft 28 and a roller 29. The former is provided at its ends with sprockets, of which one is indicated at 30, Fig. 3, engaging the side chains 31 of the conveyer to drive the same. The roller shaft also has at its ends driving sprockets 32 connected by chains 32^a to a pair of sprockets 33 on a transverse shaft 34 which is itself driven by an electric motor 35 through the medium of a sprocket 36 and chain 37. This motor is supplied with current from the generator 11, and is controlled by a controller 38 adjacent to an operator's seat 39 at the rear

of the vehicle near the top. From the shaft 28 and roller 29, the conveyer extends downwardly and rearwardly and at a point near the ground runs under a pair of shafts 40, 41, provided with suitable sprockets cooperating with the side-chains of the conveyer. Thence the conveyer extends in a generally horizontal direction to sprockets on a rear shaft 42 adjacent to the rotary brush or broom 43, thus providing a rearwardly extending shelf 44 upon which the sweepings are thrown by the brush revolving in the direction of the arrow, or counterclockwise as viewed in Figs. 1 and 3. The portions of the conveyer which are outside the dirt receptacle or chamber run through a trunk 45, having a rearwardly extending horizontal portion 46 in which the shafts 40, 41, 42 are journaled. The trunk is pivotally mounted at its upper end on the shaft 28, and is suspended by a pair of hangers 47 the lower ends of which are connected to the shaft 41 and the upper ends to a pair of strong coil springs 48 attached to chains 49 running over idler pulleys 50, at the rear edge of the rearwardly extending platform or portion of the vehicle on which the operator's seat 39 and controller 38 are mounted, to a transverse winding shaft 51, so that by winding the chains on said shaft the position of the drum and the parts it contains can be adjusted with respect to the ground, or lifted entirely away from the ground as is desired when the machine is not in operation. When the machine is in use the trunk is let down until the casters 52 and rollers 53 just clear the street or are in only light contact therewith, leaving the weight of the trunk and interior parts supported by the springs 48. Then when an obstruction is encountered in the street the trunk will ride easily over, its upward movement in clearing the obstruction being aided by the springs, as will be readily understood. The shaft 51 is rotated manually by a hand wheel 54 connected to the shaft by gears 55, 56, and is provided with ratchet and pawl mechanism 57 to hold the trunk, and parts supported thereby, in any desired position.

The shaft 58 of the rotary brush 43 is movable vertically in arc-shaped slots 59 in the sides of the trunk and is mounted in the rear ends of a pair of arms 60 which at their forward ends are pivotally mounted on studs 61 on the outside of the trunk. It will thus be seen that the brush, which, when the machine is in operation rests by gravity on the ground, is free to rise and fall in conformity to any inequalities that may exist in the street. To enable the ends of the brush to rise and fall independently of each other, the better to conform to the surface of the roadway, the bearing 62, in which the shaft 58 is journaled, are supported by the arms 60 by means of collars encircling the said bearings and secured to the arms. These collars are provided with adjustable pivot screws 63 engaging the bearings in front and rear. Thus if the right end of the brush, for example, must drop lower than the other to keep in sweeping contact with the pavement, such movement will be permitted by the bearings tilting correspondingly on their supporting pivots, without straining or binding. In practice provision should be made for a slight play of the shaft axially in its bearings as the brush tilts.

The mechanism for driving the brush is the same on both sides of the machine, and in Fig. 4 the parts on the left side (as the machine is viewed from the rear) are shown in plan. As there shown, the shaft 58 is provided with a sprocket 64 driven by a chain 65 running over a sprocket 66 rotatably mounted on a stud 61. The gear 67, rigidly connected to the sprocket 66, is driven by a gear 68 rotatably mounted on the shaft 41 and driven by a sprocket 69 to which the gear is connected. The sprocket last named is itself driven by a chain 70 (see Figs. 2 and 3) running over the sprocket 71. Inasmuch as the mechanism at the right-hand end of the brush is exactly like that at the left it is deemed unnecessary to show the former. It will therefore be seen that the swinging of the brush-supporting arms 60 can exert no stress on the driving mechanism, since the arms swing on the axis of the gears 67, and sprockets 66, thereby making no change in the distance between the sprockets 64 and 66. Furthermore, travel of the brush-driving chains 65, in the direction of the arrow in Fig. 3, exerts an appreciable downward pressure on the brush, resisting the tendency of irregularities in the roadway to raise the brush and thus aiding gravity in keeping the brush always in effective contact with the pavement. The brush, it will be observed, does not partake of the vertical movement of the trunk as the latter passes elevations in the street. On the contrary it hugs the pavement closely, and is thus enabled to sweep up close to an elevation while the trunk rises to pass the same and is also enabled to drop into and speed out a depression even though the trunk does not descend as the depression is passed. In short, the brush follows the contour of the pavement whether the same is even or irregular, smooth or full of depressions and elevations. As the brush exerts considerable pressure on the pavement the "bristles" composing the brush might be subjected to excessive flexure, causing them to be broken or permanently bent, or matted together. To prevent such results each end of the brush is provided with a disk 72, rotatable on the brush shaft

58 inside the trunk or hood 46 and of somewhat less diameter than the brush when the bristles of the latter are fully extended. The downward movement of the brush is therefore limited by the disks engaging the pavement, and matting and excessive flexing of the bristles is therefore impossible. Being rotatable on the brush shaft the disks roll on the pavement independently of the brush, which revolves at a high speed compared to the rate at which the machine travels forward. When the machine is not in operation the brush may be hung up, out of contact with the ground, by means of suitable hooks on the arms 60. One of the hooks is shown at 73 and the pin which it engages is shown at 74. The rapidly revolving brush throws the sweepings upwardly and forwardly, upon the lower horizontal portion of conveyer 44, by which they are carried to the receptacle 16. Some of the sweepings may, however, be thrown against the top of the hood or trunk 46 and, dropping at once or later, be carried backward by the brush and deposited on the street in the rear. To avoid such occurrence a traveling spatter apron 75 is provided, above the brush and extending well forward over the rear portion of the conveyer, to receive the spattered material. The apron moves in the direction of the arrow over a pair of rollers 76, 77, journaled in the trunk 46, the latter roller being driven by a sprocket 78 over which runs a chain 79 from a sprocket 80 alongside of and fixed to one of the sprockets 67. In rear of the roller 76 is a transverse scraper 81 engaging the lower reach of the apron, to scrape off material lodged thereon and cause it to drop upon the conveyer. The rear roller 76, is journaled in adjustable bearings, as 82, by which the tension of the apron may be regulated as desired. Behind the brush is a transverse trough 83 to receive material which may be thrown upon the rear wall of the hood by the brush. If desired the forward edge of the trough may bear against the brush, to serve as a scraper to relieve the brush of any material that may be clinging to it when such edge is reached.

As previously stated, the brush revolves rapidly in comparison with the rate at which the vehicle travels. As both the conveyer and the brush are driven by the same motor, 35, the sprockets 32, 71, 69, 66, 64 and gears 68, 67, by which the parts are driven are so proportioned that the brush will have a high speed and the conveyer a relatively low speed. In practice the speed of the brush, regulated by the controller 38, will depend somewhat upon the character of the street, whether much or little dirt has to be removed to leave the pavement clean, but in general it is found that under ordinary conditions the work will be satisfactory if the brush makes about three revolutions in moving forward a distance equal to its circumference. Thus a brush fifteen inches in diameter has a circumference of about forty-seven inches, and should make three revolutions in traveling that distance.

To prevent dust being scattered from under the hood 46, as may happen when sweeping a very dusty pavement, means are provided for creating a strong suction up through the conveyer trunk and into a dust separator, so that particles light enough to be blown about by the wind will be sucked up through the trunk. For this purpose a suitable dust separator is employed, preferably of the type shown in my prior Patent No. 905,999, dated December 8, 1908. In the present instance, however, compartment 84 at the top of the dirt receptacle 16, and a simple screen 85 over the forward end of the compartment, are shown to indicate any convenient and effective separator. At the rear end of the separator is a suction fan 86, driven by a motor 87 receiving current from the generator 11 and controlled by a starting box 88 adjacent to the operator's seat 39. When the fan is running a strong suction is produced up through the trunk 45, through the upper part of the dirt receptacle, and thence through the separator, in which latter the dust-laden air is purified by removal of the dust before being discharged into the atsmosphere by the fan.

For the purpose of scrubbing or flushing the pavement a reservoir for carrying the necessary liquid, usually water, is provided on the top of the machine. In the present instance the reservoir is composed of a plurality of cylindrical tanks 89 connected at the bottom to a bus pipe 90 from which the liquid is conveyed by a supply pipe 91 to a cross pipe 92. From the latter the water passes through a pair of side pipes 93 to a jet pipe 94 extending across the path of the machine immediately in front of the trunk 45 and close to the ground. The underside of the jet pipe is provided with small discharge apertures, so that the water will be discharged upon the pavement in fine jets.

Although the machine does satisfactory work with the water discharged from the jet pipe by gravity, the best results are obtained by discharging the water with great force, so as to exert a powerful penetrating and loosening action on material caked or dried on the pavement. For this purpose the water in the tank or reservoir is put under the pressure of compressed air supplied by a compressor 95 through pipes 96, 97, the motor 98 which drives the compressor being supplied with current from the generator 11 through a starting box 99 in the cab 13. By this means the water in the reservoir is put under high pressure and is discharged with great force from the jet pipes.

Being discharged in fine jets, however, the water is not delivered in excessive amount, but only sufficient quantity to wet the material and render it easily removable from the street by the rapidly revolving brush. In fact a damp appearance of the pavement in the rear of the machine is practically the only evidence of the use of water, all the scrubbings being taken up. This is true even when the pavement is full of hollows or depressions, since, as before explained, the brush works down in such hollows and cleans them as thoroughly as the level portions. To permit raising and lowering of the trunk 45, to which the side pipes 93 are attached, the side pipes are provided with flexible portions 93ª at their points or juncture with the cross pipe 92. At these points valves 100 are provided, operated by a rod 101 connected to the valves by means of bevel gears 102 and a transverse shaft 103. The rod 101 is provided with a hand wheel, as shown, and is arranged within easy reach from the operator's seat 39. The operator is thus at all times able to control the water supply to suit the condition of the street on which the machine is working.

Extending across the underside of the conveyer in the dirt receptacle is a jet pipe 104, directing jets of water against the conveyer for the purpose of washing from the same any material that may not have fallen off as the belt rounds the roller 26. The jet pipe 104 is supplied with water by a pipe 105 connected to the pipe 91 and is controlled by a valve 106 operated by bevel gears 107 and a rod 108 reaching to the operator's seat 39.

The operation of the various parts has been explained, but the machine as a whole is managed as follows: The driver, in the cab 13, controls only the travel of the vehicle and the running of the compressor 95, the street-cleaning devices being controlled by the operator in the rear, occupying the seat 39. As the machine advances the operator regulates the speed of the brush by means of the controller 38, through which the speed of the driving motor 35 is varied, to suit the condition of the street, a very dirty pavement requiring a higher speed of the brush than one which is less dirty. As the machine travels a section of pavement may be reached which may make the use of the suction apparatus necessary to prevent dust escaping from under the hood 46, in which case the fan 86 is started, causing a strong suction up through the trunk 45 and through the dust separator 84. Instead of using suction, the operator may, particularly if the material to be removed from the street adheres at all tenaciously, open the jet pipe 94, so that the pavement will be flushed and scrubbed as described above. In some cases, as for example when the street is so dirty that the amount of water discharged by the jet pipe is insufficient to accomplish the desired result, or when the discharge of water in sufficient quantity would deplete the supply in the reservoir 89 too rapidly, the use of suction through the trunk 45 may be resorted to at the same time, to take care of any material that may not be wet enough to cause it to follow the conveyer readily. Of course in cleaning a wet or muddy pavement neither water nor suction is used. As the machine advances the rising and falling brush follows all the irregularities of the pavement and conforms to the "crown" of the street. The steel wire bristles being flexed by the weight of the brush and the downward pressure exerted by the driving chain 65, they straighten out with a smart flip as they escape from contact with the pavement, thus snapping the dirt forward upon the horizontal portion 44 of the conveyer. This flexure of the bristles is also advantageous in that it enables the brush to sweep out depressions that otherwise it might not be able to reach. Thus if a hollow is passed which lies wholly between the ends of the brush the latter, resting on the higher parts of the pavement, might sink only part way or not at all into the depression, thus leaving the same full of dirt or only partly cleaned. But instead of this result happening, the flexed bristles straighten out, reaching down to the bottom of the hollow and sweeping it out as clean as the higher portions of the pavement. When an abrupt elevation is reached the spring-supported trunk rides easily over, while the brush rises on the arms 60. If the street is excessively dirty or muddy the driver may reduce the speed of the machine's travel or the operator speed up the brush, or both. As the dirt accumulates in the receptacle 16 it may pile up until it reaches the conveyer, in which case the rearwardly moving bars on the under reach of the conveyer constantly scrape off the top of the pile toward the rear, thus serving not only to carry the dirt to the receptacle but also to trim the load and insuring that all the space in the receptacle is utilized.

The apparatus herein specifically illustrated and described is merely the preferred embodiment of the invention, which may be embodied in other forms without departure from its proper spirit and scope as defined by the following claims.

What I claim is:

1. In a street cleaning machine, the combination with a vehicle having a dirt receptacle, a conveyer for carrying dirt thereto, and a rotary brush adjacent to the conveyer to operate on the pavement, the conveyer being arranged to receive dirt thrown forwardly by the brush, of a traveling apron

above the brush and the adjacent portion of the conveyer to receive dirt thrown upwardly by the brush, and means adjacent to the apron above said portion of the conveyer to dislodge from the apron material adhering thereto.

2. In a street cleaning machine, the combination with a vehicle having a dirt receptacle, a conveyer for carrying dirt thereto, and a rotary brush adjacent to the conveyer to operate on the pavement, the conveyer being arranged to receive dirt thrown forwardly by the brush, of a trunk inclosing the conveyer and the brush, a traveling apron inside the trunk and above the brush and the adjacent portion of the conveyer, and means adjacent to the apron above the said portion of the conveyer to dislodge from the apron material adhering thereto.

3. In a street cleaning machine, the combination with a vehicle having a dirt receptacle and a rearwardly extending portion, of a trunk extending downward from said receptacle toward the ground and having its upper end pivotally mounted, a conveyer traveling through and supported by the trunk to carry dirt to said receptacle, a rotary brush mounted in the lower portion of the trunk, and yielding means suspending the lower end of the trunk and conveyer from said rearwardly extending portion of the vehicle, comprising vertical hangers pivotally connected to the lower portion of the trunk, springs connected with the hangers, and flexible devices connecting the springs with the said rearwardly extending portion.

4. In a street cleaning machine, the combination with a rotary brush, of a traveling apron above the brush to receive dirt thrown upwardly therefrom, means coöperating with the apron to dislodge dirt therefrom, and means to receive the dislodged material.

5. In a street cleaning machine, the combination with a rotary brush, and a conveyer adjacent to the brush, of a traveling apron above the brush and the conveyer to receive dirt thrown upwardly by the brush, and means coöperating with the apron above the conveyer to dislodge material from the apron and cause the same to fall upon the conveyer.

6. In a street cleaning machine, the combination of a rotary brush, and a downwardly open hood over the brush, of a traveling apron within the hood and above the brush to receive dirt thrown upwardly by the brush, means for dislodging from the apron material adhering thereto, and means in rear of the brush inside the hood to receive material thrown backwardly by the brush.

7. In a street cleaning machine, the combination of a rotary brush, and a conveyer having a portion extending approximately horizontally into juxtaposition to the brush, of a traveling apron above the brush and the said horizontal portion of the conveyer, and a scraper engaging the apron at a point over the said horizontal portion of the conveyer.

8. In a street cleaning machine, the combination of a supporting structure, a pair of rearwardly extending arms pivoted at one end to said structure to swing vertically, a rotary brush extending transversely between the free ends of the arms and having a shaft, bearings for the ends of the shaft, supporting members for the bearings, said members connected to the arms and encircling the bearings, and pivots mounted in the members in front and rear of the bearings and engaging the said bearings in front and rear, to permit either end of the brush to rise and fall independently of the other.

9. In a street cleaning machine, the combination of a supporting structure, a pair of rearwardly extending arms pivoted at one end to the supporting structure, a rotary brush extending transversely between the free ends of the brush and having a shaft, bearings for the shaft, supporting members carried by the free ends of the arms and extending in front and rear of said bearings, and pivots mounted in the said members and engaging said bearings in front and rear, whereby either end of the brush may rise and fall independently of the other.

10. In a street cleaning machine, in combination, a rotary brush having resilient bristles, supporting devices for the brush permitting the brush to move up and down and bear on the pavement, and disks at the ends of the brush, co-axial therewith and rotatable independently thereof.

In testimony whereof I affix my signature in the presence of two subscribing witnesses.

ALFRED S. EMERSON.

Witnesses:
WM. M. KIRCHHOFF,
CHARLES ANDERSON.