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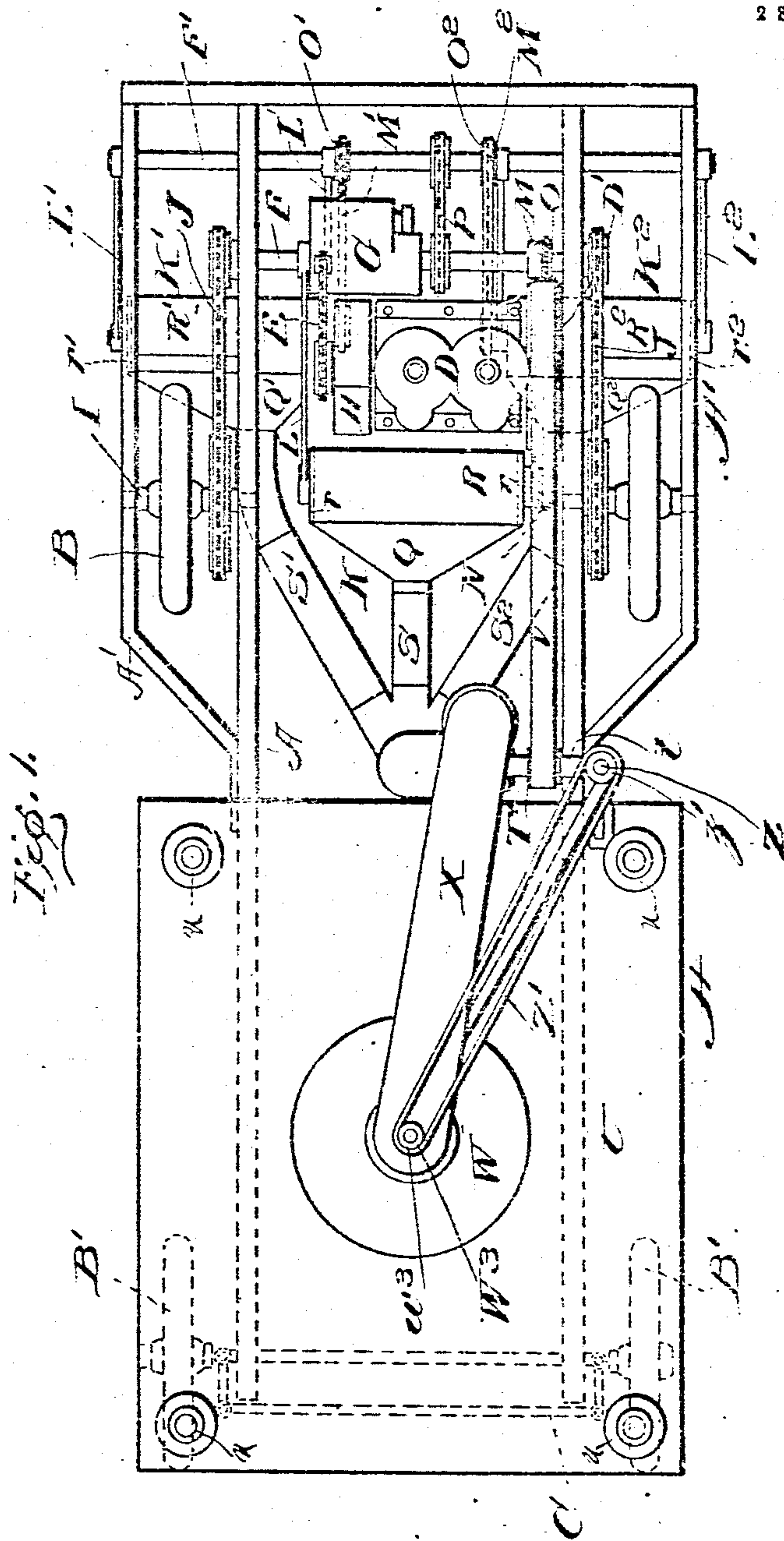
STREET CLEANING MACHINE.

APPLICATION FILED FEB. 14, 1906.

978,216

Patented Dec. 13, 1910.

2 SHEETS-SHEET 1.



Witnesses:
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In witness whereof
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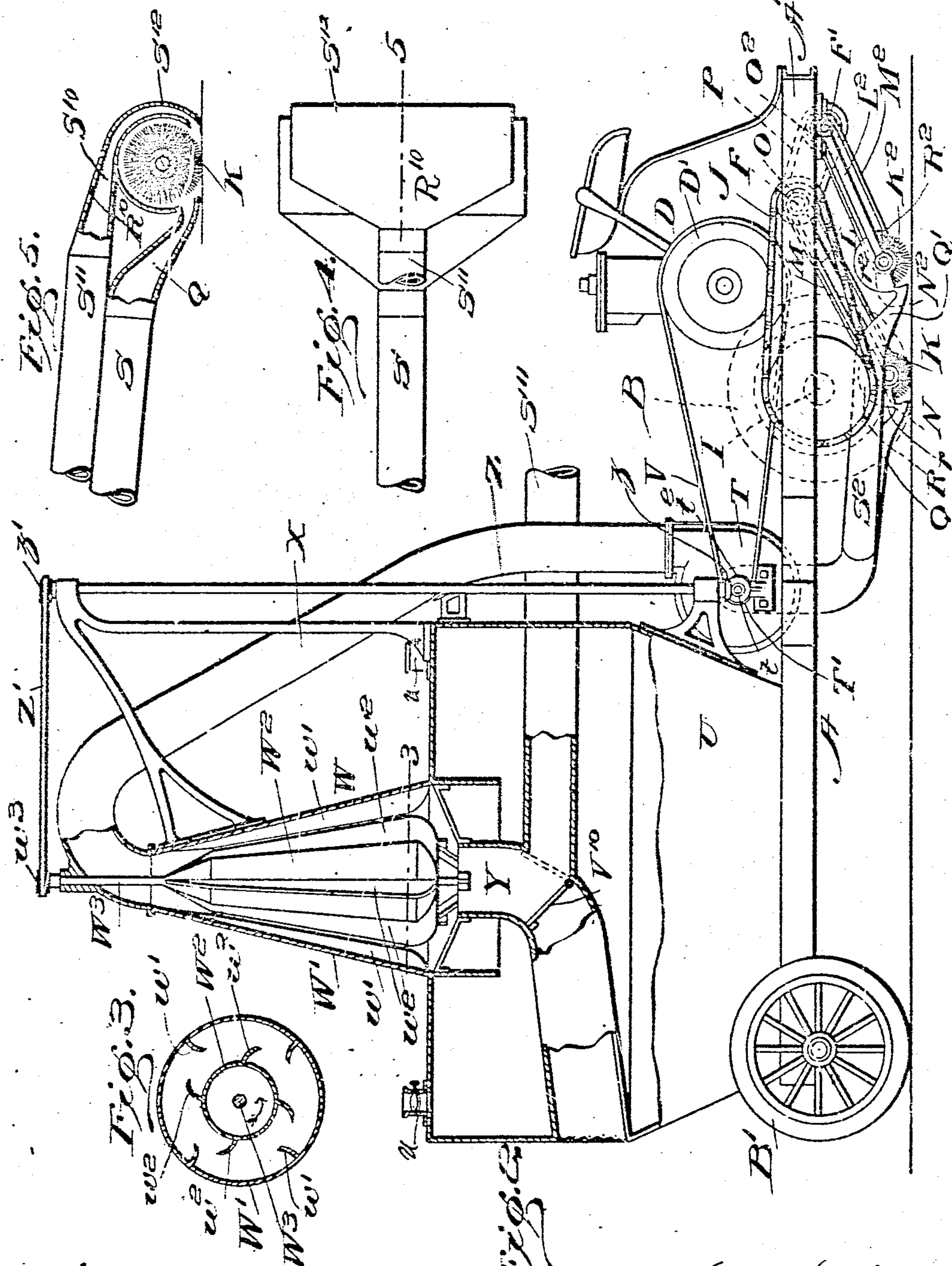
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2 SHEETS-SHEET 2.



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UNITED STATES PATENT OFFICE.

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STREET-CLEANING MACHINE.

978,216.

Specification of Letters Patent.

Patented Dec. 13, 1910.

Application filed February 14, 1908. Serial No. 301,032.

To all whom it may concern:

Be it known that we, ROBERT A. RUTHERFURD and MACDONOUGH CRAVEN, residing in the city, county, and State of New York, have jointly invented certain new and useful Improvements in Street-Cleaning Machines, of which the following is a specification.

One of the objects of our invention is to produce a machine for cleaning streets, and especially paved streets, by which dust and dirt are loosened from the pavement by a rotary brush, or other suitable means, then sucked up with air and carried to a centrifugal separator, where the dust or dirt is separated from the air, the air going in one direction, in some cases being returned to the point where the dirt is being sucked up from the pavement, and the dirt in another direction and delivered to a suitable receptacle.

Another object is to produce a machine by which dirt is loosened from the pavement by a number of brushes or other loosening means and taken up through a number of suction nozzles adjacent to said brushes and placed at an acute angle to the pavement.

Another object is to produce a machine in which the steering gear is connected with the rear wheels of the motor vehicle, and the brushes and operating mechanism for loosening the dirt on the pavement, and other operating parts, are placed at the front of the machine.

Another object is to arrange a series of comparatively short brushes preferably out of line with each other and with overlapping ends, the brushes being so connected to the frame of the machine that they will have a free vertical movement independently of each other to permit them to follow the irregularities of a pavement also independently of each other.

Other objects will appear from the hereinafter description.

Our invention consists in the novel construction and combination of parts hereinafter set forth.

The invention is illustrated in the accompanying drawings in which the same parts are indicated by the same reference characters.

Referring to the drawings, Figure 1 is a top plan view of the machine. Fig. 2 is a side elevation with some of the parts in ver-

tical section. Fig. 3 is a cross section on line 3 of Fig. 2. Fig. 4 is a top plan view of the preferred form of nozzle. Fig. 5 is a section on line 5 of Fig. 4.

The part marked A on the drawing represents the frame of a motor vehicle having side extensions A' on which the working parts are mounted.

B represents the front wheels and B' the rear wheels of the machine. In this machine the steering gear C is connected to the rear wheels B' instead of to the front wheels.

Near the front of the machine on the frame A A' is mounted the driving engine D which constitutes a prime mover and is of any convenient construction, a two cylinder gasoline engine being shown.

Journalled in the frame A and driven from the engine by a sprocket chain E is a shaft F. As shown in the drawing, this chain passes through the casing G of the speed gearing.

H represents the casing of the clutch mechanism. As the speed gearing and clutch mechanism form no part of this invention they are not illustrated.

The axles I of the wheels B are connected to the shaft F by the sprocket chains J, through which power is transmitted to drive the machine over the pavement.

While dirt may be scraped or loosened from the pavement by any suitable means placed within range of operation of the suction device, yet we prefer to use rotary brushes, one or more being set out of line with the other and with their ends overlapping. We also pivot the brushes to move vertically independently of each other so that they can enter any depressions in the pavement, which would not be the case if one brush extending entirely across the machine were used. As shown, one of these brushes K is placed near the middle of the machine. This brush is journaled to the rear ends of the arms L, the other ends of these arms being loosely connected to the shaft F. Forward of this center brush and outside thereof, but with their inner ends overlapping the ends of the middle brush, are placed brushes K' K². These two brushes are journaled in the rear ends respectively, of the pairs of arms L' L², the forward ends of said arms being loosely connected to the shaft F' journaled in the frame A and side extensions A' thereof, forward of and parallel to the

shaft F. By this construction the brushes may freely move vertically and independently of each other for the purpose above stated. The brush K is rotated by the sprocket chain M extending from the sprocket wheel N on one end of the axle of the brush to a sprocket wheel O on the shaft F. The brushes K' K² are rotated respectively by the sprocket chains M' M² extending from the sprocket wheels N' N² on one end of each of the brushes K' K² to the sprocket wheels O' O² on the shaft F'. The shaft F' is driven by a sprocket chain P from the shaft F.

Q, Q', Q² are suction nozzles which are flattened or broadened at their ends to the full length of the brushes K, K', K².

R, R', R² are shields or hoods semi-cylindrical in cross section, placed over the top of the brushes. These hoods are preferably formed integral with the nozzles and are provided with end pieces r, r', r² through which the shafts of the brushes extend, and by which the hoods are carried. The hoods being connected to the nozzles and being mounted on the shafts of the brushes, the hoods and nozzles will take of the vertical movement of the brushes when moving over any uneven parts of the pavement.

S, S', S² are pipes connected to the nozzles Q, Q', Q² to the blower T, which is secured to a dirt tank or receptacle U mounted on the rear part of the frame A. These pipes, or some portions thereof, are flexible to permit the nozzles to move vertically, as just described.

Between the blower T and the receptacle U is a power driven separator W to which the dust-laden air is delivered by the blower and within which the dust or dirt is separated from the air by centrifugal action. An important part of our present invention consists in so relating the blower and the separator that there will be a correspondence of action between the two; any increase in the power of the fan, for example, resulting in a corresponding increase in the action of the separator, and any decrease of the power of the fan similarly resulting in a corresponding decrease in the action of the separator, whereby an effective separation of the dust and dirt from the air is accomplished at all times, and liability of clogging of the separator is overcome. In the apparatus herein shown the fan and the rotary element of the centrifugal separator are geared together and one derives motion from the other. It is preferred to drive the separator from the blower, and the shaft t of the latter, therefore, is provided with a pulley T' which is connected by a belt V with the fly wheel D' of the engine: and said shaft t is, further, provided with a bevel gear t², which meshes with another bevel gear z mounted on the lower end of a vertical shaft Z; the

upper end of which has a pulley z' connected by a belt Z' with a pulley w² on the shaft W³ of the drum W² (the rotative element) of the separator. While this is an efficient means for transmitting movement from the prime mover and between the blower and separator, it will be understood that the invention is not restricted thereto. The separator herein shown is a cone-shaped one, and has communication with the blower by means of a pipe X which leads from the casing of the blower to the apex of the separator.

The separator consists of an outer casing W' provided on its inner surface with inwardly projecting plates or wings w' and an inner cone-shaped rotary drum W² provided on its outer surface with curved plates or wings w² adapted to impart centrifugal motion to the dirt and dust laden air. The wings w' are set or curved in a direction opposite to the rotation of the inner cone so that they will more readily catch the dirt and dust thrown outwardly by the centrifugal action of the inner cone. The outer casing of the separator is open at the bottom to permit the dust and dirt thrown against the side thereof and collected by the plates w' to drop down into the dust box or receptacle U. This receptacle, it may be stated, is furnished with relief valves u to regulate the air pressure in the dust box and to prevent back pressure. Connected to this outer shell of the separator and directly under the inner drum is a pipe Y of considerably less diameter than the bottom of the separator, through which the air separated from the dirt and dust is conveyed out into the atmosphere.

Particular attention is called to the fact that the separator is of such construction that it creates a suctional force within the delivery pipe X adapted to assist the blast from the fan in delivering to it the dust-and-dirt laden air, thus materially increasing the efficiency of the apparatus. Again, such separator will tend to force the air through the pipe Y and make it more effective as a means for loosening the dirt contiguous to the suction mouth of the nozzle, hereinafter described.

The operation of the apparatus is as follows: The engine D is put in motion and the machine is driven forward thereby through the gearing heretofore described. At the same time the brushes are caused to rotate by their gearing and the blower is operated from the fly wheel of the engine, and the inner drum of the separator is also put in operation through the connections from the blower heretofore described. The dirt and dust is scraped from the pavement and agitated by the brushes as the machine moves along, the shields or hoods preventing the dirt and dust from being thrown upward

or scattered. This loosened dirt and dust is sucked up through the nozzles and pipes to the blower. The dirt and dust laden air is then forced by the blower into the separator through the pipe that extends from the blower to the top of the separator. As this dirt and dust laden air enters the separator, the heavier particles are thrown against the outer walls of the separator and against the inner wings thereof, and fall down into the dirt or dust receptacle. The air with the dirt and dust removed therefrom is forced out through the pipe located at the lower end of the separator. If the machine should strike any inequalities or depressions in the pavement the brushes will rise and fall as they pass over the same, carrying the hoods and nozzles with them as heretofore stated.

As one of the objects of our invention is to loosen the dust from the pavement and carry the dust and dirt laden air to a separator where the air and dirt are separated, it is evident that any convenient means for loosening the dirt from the pavement and sucking it up therefrom by an air exhaust would be within the scope of our invention.

Instead of mounting the brushes as herein shown, they may be connected to the frame of the machine in any other suitable manner, and other forms of gearing may be used to operate the brushes, the blower or the separator.

Sometimes it may be desirable to return the air separated from the dust and dirt from the separator to the point where the dirt is being loosened from the pavement, for the purpose of assisting in the agitation and removal of dirt from the pavement, instead of permitting it to escape into the atmosphere, as heretofore described; and our invention, therefore, contemplates as one of its important features the provision of means whereby the dirt-and-dust freed air may be either returned, as a blast, to the pavement, contiguous to the brushes, or diverted as aforesaid and discharged directly into the air without performing any function of loosening and agitating the dirt at or near the area of suction. In Figs. 2, 4 and 5 we have shown a construction by which this may be done. To the top of each hood is secured a curved plate leaving a space between the hood and said plate. This space is contracted and is connected by a pipe with the air exit pipe of the separator. On the drawing the part marked R¹⁰ represents the plate referred to, which is connected to the hood. S¹⁰ is the space between the hood and the said plate. S¹¹ is the pipe which connects this space with the air exit pipe of the separator. It will be noticed that the plate over the hood is of less width than the hood. This is for the purpose of preventing the air from escaping at the sides. The forward ends of the hoods and

the plate form a flattened nozzle S¹², as shown. We have provided the air exit pipe from the separator with a valve to be moved to permit the air from the separator to escape into the atmosphere or to be driven back through the pipe S¹¹, depending upon which way the valve is turned, to the place where the dirt is being scraped from the pavement by the brushes or other means. In operation, suppose the valve V¹⁰ is turned so as to prevent the air escaping through the pipe to the atmosphere, but to permit it to flow through the pipe S¹¹, it will be seen that the air as it comes from the separator is forced through said pipe S¹¹ through the contracted nozzle S¹² and impinging upon the pavement will act as a blast to loosen the dirt and dust on the pavement, which together with the dirt and dust loosened by the brushes or scraping device, will be taken up by the exhaust nozzles.

As many changes could be made in the above construction and many apparently widely different embodiments of our invention could be made without departing from the scope thereof, we intend that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

Having now described our invention, what we claim as new and desire to secure by Letters Patent is:—

1. In a street cleaning machine, the combination of means for removing the dust and dirt from the surface to be cleaned, comprising suction and blast chambers with mouths open to such surface, means for separating the dust and dirt from the air, having an air exit, means through which said exit has separate connection with the atmosphere and with the blast chamber, a valve adapted to divert the air into either of said connecting means, and means for drawing the dust-and-dirt laden air into the suction chamber and delivering the same to the separator.

2. In a street cleaning machine, a nozzle having suction and blast chambers, means arranged in the nozzle between said chambers and adapted to loosen the dirt, suction means communicating with the suction chamber, a separator into which the dirt-and-dust laden air is delivered, and means for conveying the separated air to the blast chamber.

3. In a street cleaning machine, a rotary brush, suction and blast chambers on opposite sides thereof, a wall arranged between said chambers and serving as a hood to the brush, suction means communicating with the suction chamber, and means for delivering air to the blast chamber.

4. In a street cleaning machine, a rotary brush, a nozzle adapted to cover said brush and provided with suction and blast cham-

bers on opposite sides of the latter, suction means communicating with the suction chamber, a separator into which the dust-and-dirt laden air is delivered, said separator having an air exit, and means for conveying the air from said exit to the blast chamber.

5. In a street cleaning machine, a rotary brush and its shaft, mounted to freely follow the inequalities of the surface to be cleaned, a nozzle having a suction chamber and a chamber constituting a hood for the brush, said nozzle mounted upon the brush shaft and partaking of the rising and falling movements thereof, and means for lifting the dirt and dust through said nozzle.

6. In a street cleaning machine, rotary brushes located at the forward end thereof out of line with each other but with their adjacent ends overlapping, means for connecting the brushes to the machine so as to it them to have free rising and falling movement, means for driving said brushes, nozzles extending over the tops of the brushes, and connected therewith to partake of the rising and falling movements thereof, a pipe connected to each of the nozzles and communicating with the inlet of a rotary blower, said blower, a delivery pipe extending from the blower, a dust receptacle and a separator between the receptacle and outlet of the delivery pipe.

7. In a street-cleaning machine, a rotary brush, a nozzle adapted to cover said brush and provided with suction and blast chambers on opposite sides of the latter, suction creating means communicating with the suction chamber, a separator into which the dust-and-dirt laden air is delivered, an air conduit leading from said separator to the open air, an air conduit leading from the separator to the blast-chamber, and a valve adapted to close one of said conduits.

8. In a street cleaning machine, rotary brushes located at the forward end thereof adapted to loosen dirt and dust on a pavement, said brushes being out of line with each other but with their adjacent ends overlapping, means for connecting the brushes to the machine so as to give them a free vertical movement, means on the forward part of the machine for driving said brushes, nozzles extending over the top of the brushes and connected therewith to partake of the rising and falling movements thereof, a pipe connected to each of said nozzles, and communicating with the inlet of a rotary blower, said blower, a delivery pipe extending from the blower, a separator mounted on the ma-

chine, and a dust receptacle connected to and communicating with said separator, and means whereby the speed of the brushes and blower are so controlled that the speed of the blower will be increased with an increase of the speed of the brushes.

9. In a street cleaning machine, rotary brushes located at the forward end thereof adapted to loosen dirt and dust on a pavement, said brushes being out of line with each other but with their adjacent ends overlapping, means for connecting the brushes to the machine so as to give them a free vertical movement, means on the forward part of the machine for driving said brushes, nozzles extending over the top of the brushes and connected therewith to partake of the rising and falling movements thereof, a pipe connected to each of said nozzles and communicating with the inlet of a rotary blower, said rotary blower, a separator mounted at the rear of the machine, a delivery pipe extending from said blower to the separator, a dust receptacle connected to and communicating with said separator, a pipe communicating with said separator and having its exit end adjacent to the said brushes and nozzles, the said brushes and blower being driven from the same source of power, and means whereby the speed of the brushes and blower are so controlled that the speed of the blower will be increased with an increase of the speed of the brushes.

10. In a street-sweeper, a plurality of separately-mounted rotative sweeper-elements, means for allowing vertical movement thereof to follow inequalities in the surface to be cleaned, a hood covering each of said sweeper-elements, means for allowing the hoods to follow the up and down movements of the sweeper-elements, conduits leading from the hoods, a suction-fan having its casing suitably connected to the conduits, a dust-collector, a casing therefor suitably joined to the fan-casing, means for rotating the sweeper-elements and the suction fan, and means geared to said fan for operating the dust-collector.

In witness whereof we have hereunto set our hands at the city, county and State of New York, this thirteenth day of February, 1906.

ROBERT A. RUTHERFURD.
MACDONOUGH CRAVEN.

In presence of—

T. R. RICHARDS,
JOHN J. RANAGAN.