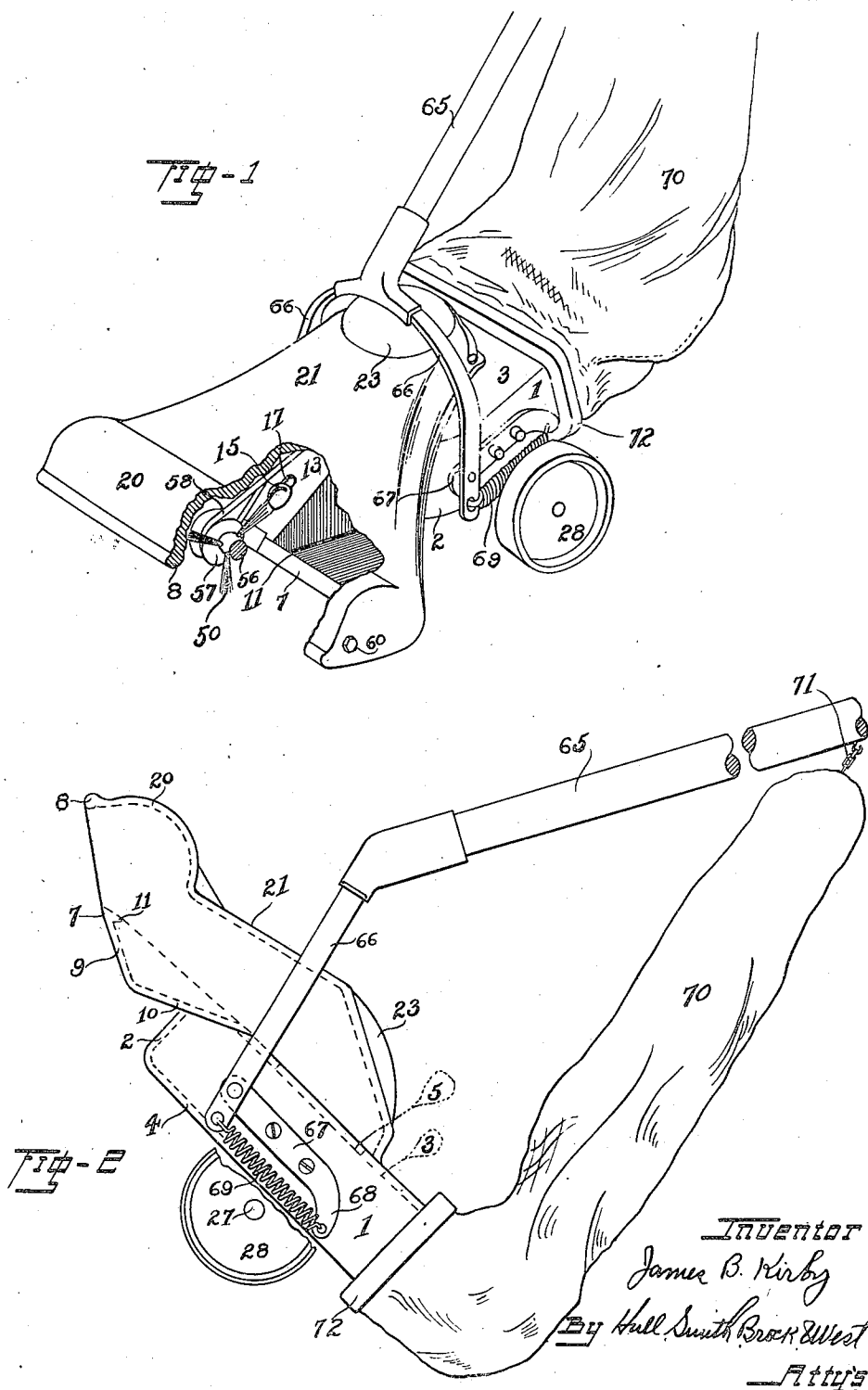


J. B. KIRBY.
 SUCTION SWEEPER.
 APPLICATION FILED OCT. 7, 1918.

1,421,957.

Patented July 4, 1922.

3 SHEETS—SHEET 1.



Inventor

James B. Kirby

By *Hull Smith Brock West*

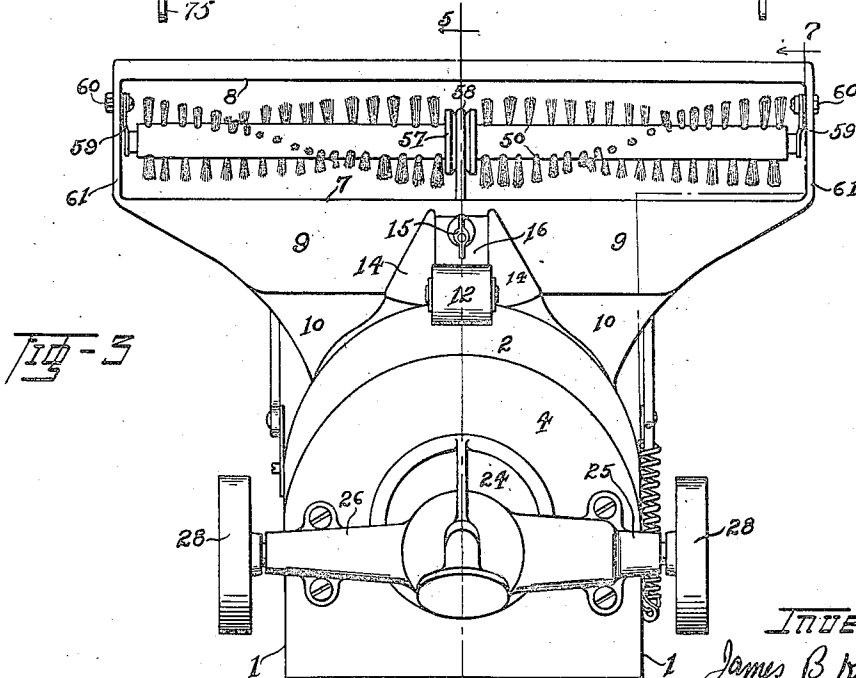
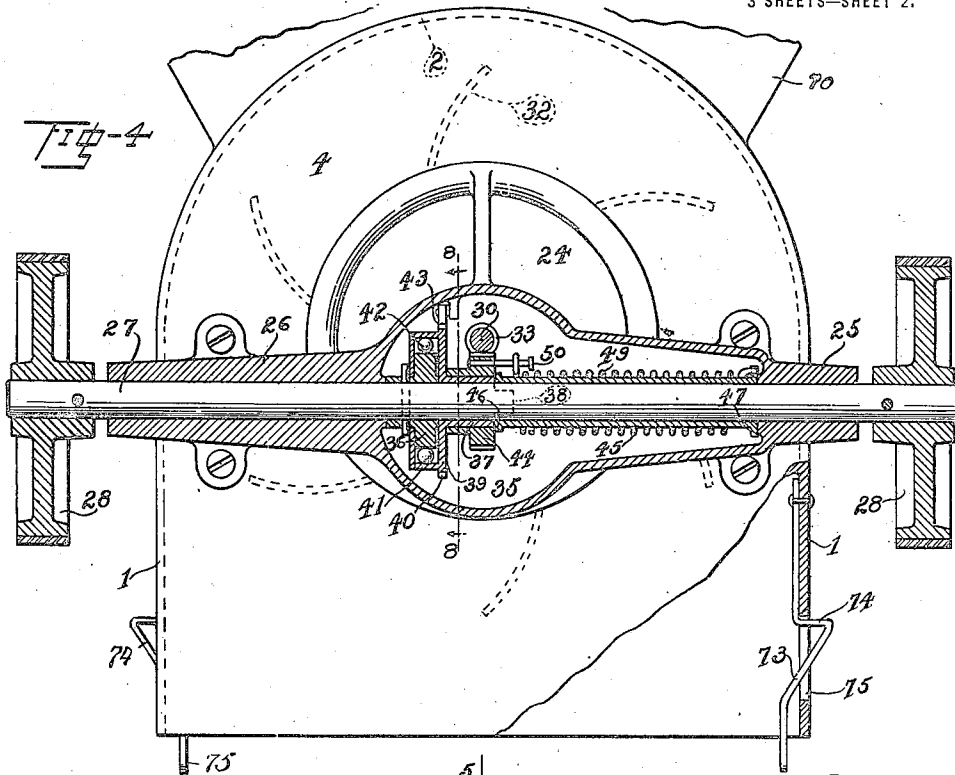
Attys

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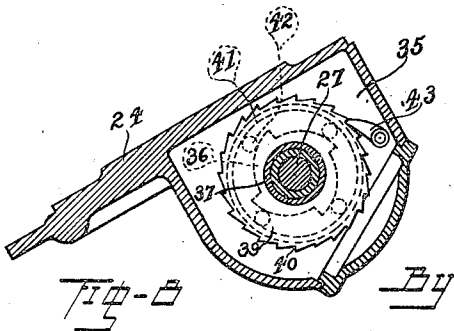
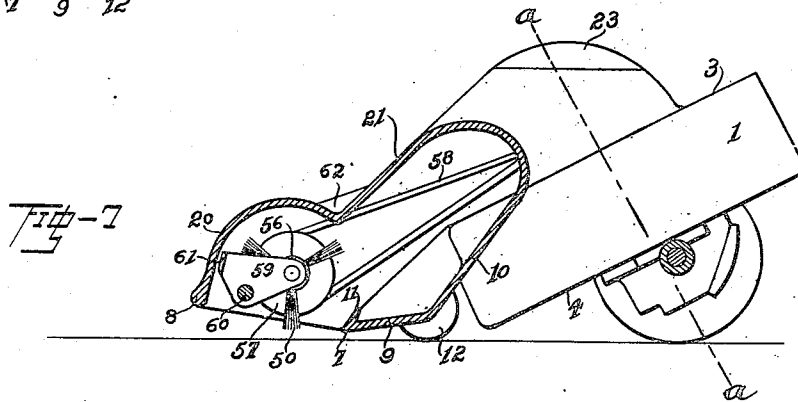
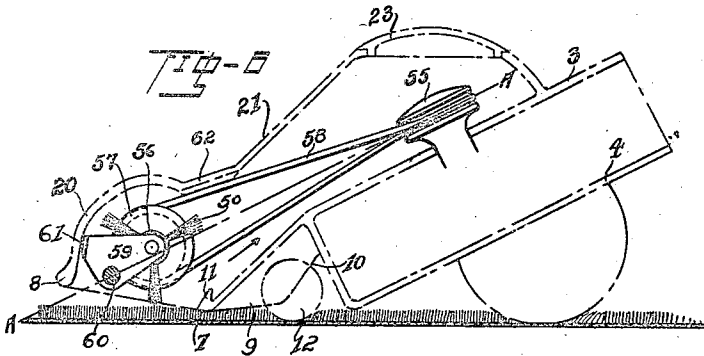
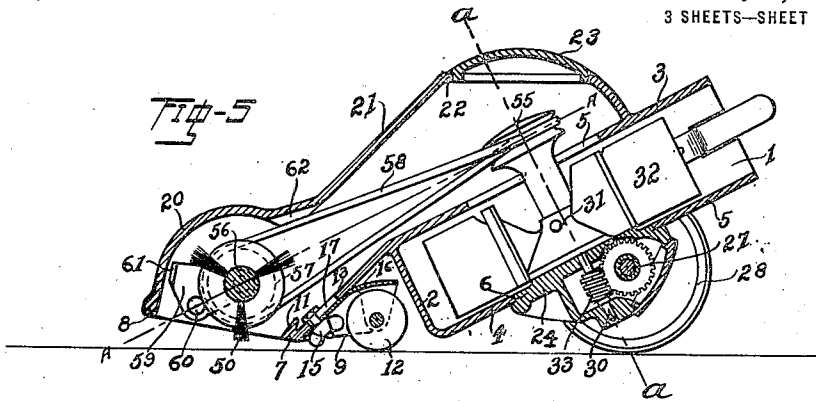
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James B. Kirby

Hull Smith Brock & West Attys

1,421,957.

3 SHEETS--SHEET 3.



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UNITED STATES PATENT OFFICE.

JAMES B. KIRBY, OF CLEVELAND, OHIO.

SUCTION SWEEPER.

1,421,957.

Specification of Letters Patent.

Patented July 4, 1922.

Application filed October 7, 1918. Serial No. 257,108.

To all whom it may concern:

Be it known that I, JAMES B. KIRBY, a citizen of the United States, residing at Cleveland, in the county of Cuyahoga and State of Ohio, have invented a certain new and useful Improvement in Suction Sweepers, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings.

This invention relates to floor cleaning devices and has particular reference to a traction-operated carpet-sweeping device, preferably comprising suction devices also, and comprehends improvements both in carpet sweepers and in suction cleaners. Among the objects of the invention are the provision of a device of this character having new and improved expedients for taking up and disposing of litter and refuse; the provision of new and improved means for operating a suction cleaner from the wheels upon which the same is supported; the provision of new and improved expedients for driving, supporting, adjusting, and operating a floor cleaning brush; the provision of new and improved expedients for operating both a fan and a brush from the wheels of a traction cleaner; while other and further objects of the invention will become apparent as the description proceeds.

In the drawings accompanying and forming a part of this application, I have shown one embodiment of my said invention although it will be understood that the same are illustrative only and are not intended to limit me to the particular features of construction and arrangement therein shown. In these drawings Fig. 1 is a perspective view of a complete cleaner embodying my improvements, a portion of the collecting nozzle and brush being broken away; Fig. 2 is a side elevation of the sweeper shown in Fig. 1, illustrating the position assumed by the same when raised from the floor; Fig. 3 is a bottom plan view of the cleaner casing; Fig. 4 represents some of the same parts as shown in Fig. 3 drawn to enlarged scale and showing the fan-operating mechanism in section; Fig. 5 is a vertical central section through the cleaner casing and its mechanism; Fig. 6 is a diagrammatic view illustrating the automatic brush adjustment; Fig. 7 is a sectional view corresponding to the line 7—7 of Fig. 3; and Fig. 8 is a detail view corresponding to the line 8—8 of Fig. 4.

The cleaner as a whole comprises a casing, a handle, and a bag, while the casing in its preferred form comprises essentially a fan chamber and a nozzle. This fan chamber preferably has a U-shaped side wall comprising a pair of straight portions 1—1 connected together by a curved portion 2, the margins of said side wall being connected by flat walls 3 and 4 respectively. This forms a pocket-shaped chamber having its square end open as shown in Figs. 4 and 5, in addition to which the sides 3 and 4 are formed with openings 5 and 6 respectively. This fan chamber is normally supported with its flat walls oblique to the horizon, its aperture 5 uppermost, and its open end disposed at its highest point, while the curved end 2 projects nearly to the floor upon which the device rests.

The collecting nozzle overlaps the top of said fan chamber, being preferably of a flaring or fan shape, its narrowest part surrounding and enclosing the opening 5, and its body broadening with increasing distance from said opening to its forward extremity, where it projects beyond the limits of said fan chamber and is formed with a downwardly facing inlet mouth defined by the parallel horizontal lips 7 and 8. From the lip 7 the bottom wall of the nozzle first extends rearwardly for a short distance as shown at 9 at a comparatively small inclination to the horizontal, and thence extends more abruptly upwardly, as shown at 10 until it reaches the top wall of the fan chamber. The forward extremity of the bottom wall 9 is formed with an upwardly projecting ledge 11 which lies immediately above the lip 7, and in the present embodiment I have shown the wall 9 as interrupted at its central point by a kind of notch formed for the accommodation of the supporting roller 12. This notch is here produced by extending from the lip 7 a flat narrow wall 13 to the lowest portion of the chamber wall 3, and forming on each side of the wall 13 a depending cheek 14 which joins the bottom wall 9 and inclined wall 10. Against the lower surface of the wall 13 I clamp by a suitable set screw 15 a bracket 16 to which the roller 12 is attached, and adjustment of the bracket may if desired be provided for by forming the wall 13 with a slot 17. The portion 9 of the bottom wall constitutes in effect, a dust pan as will be shown later.

From the lip 8 there rises a cylindrical

wall 20 defining a brush-chamber and merging with the top wall 21 of the nozzle which covers and embraces the opening 5. I have shown this top wall as provided above the opening 5 with a circular aperture 22 closed by a removable cap 23 for a purpose which will be shown later.

Secured to the bottom plate 4 is a hollow motor casing having a circular flat portion 24 which closes the aperture 6 and also having aligned horizontal arms 25, 26 which constitute bearings for the carrying shaft 27 which traverses the same from end to end in a direction parallel to the lips 7 and 8. Rigidly secured to the outer ends of this shaft are the carrying wheels 28, 28, which, in conjunction with the roller 12, support the casing in the inclined position heretofore described, these wheels being preferably rubber-tired for traction purposes as well as to prevent the marring of hardwood floors. Journaled in said fitting perpendicularly of the plate 25 is a fan shaft 30 to the upper end of which is secured by suitable means, such as the set screw 31, the rotatable fan 32. This fan and shaft are assembled by inserting the fan into the chamber through the open end of the same and afterwards inserting the shaft into the fan from the bottom. The shaft 30 coincides with the axis of the fan chamber, which axis is indicated by the line $a-a$ in Figs. 5 and 7 and is downwardly and rearwardly inclined. The lower end of the shaft 30 adjacent the shaft 27 is provided with a spiral gear 33, the motor being located below and rearwardly of said fan.

While I do not restrict myself to this type of construction of motor, the driving means here illustrated is constructed and operated as follows: between the arms 25 and 26 the fitting is hollowed out to form the chamber 35, and adjacent to one end of the chamber there is rigidly secured to the shaft the inner member 36 of a ball clutch. Journaled upon said shaft at one side of the member 36 is a cylindrical sleeve 37 having at one end the forwardly projecting teeth 38 and having at the other end the circular plate 39 whose periphery is formed with the ratchet teeth 40. Adjacent to its periphery this plate is formed with a laterally projecting flange 41 which overhangs the clutch member 36 and cooperates therewith through the medium of the clutch balls 42. Located inside the cavity 35 is a pawl 43 which cooperates with the ratchet teeth 40; and journaled upon the exterior of the sleeve 37 is a helical gear 44 which meshes with the gear 33 carried by the shaft 30. Surrounding the shaft 27 beyond the sleeve 37 is a second sleeve 45 having its opposite ends provided with flanges 46 and 47 as shown, the end having the flange 46 also being notched for the reception of the driving

tooth 38. The length of the sleeve 45 is such as exactly to fit between the inner end of the bearing 25 and the adjacent end of the sleeve 37 and gear 44, thus holding all the parts in place. Secured to the flange 47 is one end of a helical spring 49 whose opposite end is connected to a pin 50 carried by the gear 44. The direction of the clutch 36 is such that when the machine is run forward the clutch will engage; the direction of the ratchet teeth 40 is such that when the machine is run forwardly the ratchet will turn; and the direction of twist of spring 49 is such that when the machine is run forwardly the spring will be wound up. However after this spring has once been wound it can release its energy only by driving the fan 32, since the pawl 43 prevents unwinding of the same; while over-strain of the spring due to too tight winding is prevented since after a given number of turns this spring will be gripped tightly around the exterior of the sleeve 45 after which the device will operate as though the gear 44 were secured directly to shaft 27. The parts numbered 36 to 49 constitute a form of spring motor adapted to be wound up by the forward movements of the casing.

Rigidly secured to the fan and rotatable therewith is a pulley 55 which projects through the aperture 5 into the nozzle; and journaled inside the suction mouth, beneath the wall 20, is a brush 56 provided midway of its length with a pulley 57 connected to the pulley 55 by the belt 58 which is preferably of some elastic material like rubber. This brush is supported by having its ends pivoted to links 59—59 which are themselves loosely pivoted at 60—60 to the end walls 61 of the inlet mouth. These pivots 60—60 are located upon the opposite side of the brush from the pulley 55, the result being that when the fan and brush are at rest the tension upon the two sides of the belt is equal, so that the center of the brush then lies upon the straight line connecting the pivots 60 with the groove of the pulley 55 as shown at $a-a$ in Fig. 5; which also is the condition when the brush is rotated with little or no obstruction as is the case when the cleaner is employed upon a naked floor or upon a short-nap rug. However this belt is applied to the pulleys 55 and 57 in such wise that its power run is lowermost wherefore upon any obstruction to the rotation of the brush as would be produced by a heavy-nap carpet, the tension of the lower part of the belt immediately becomes greater than that of the upper part with the result that the links 59—59 are elevated above the line $a-a$ as shown in Fig. 6, and the opposition to the brush rotation is decreased while still maintaining the required sweeping action.

This automatic regulation of the brush height is important, not only because of the

fact that it prevents the brush from digging into the carpet, but is particularly useful in a hand-operated or traction cleaner since the power available for brush-operation is much smaller than in other types. The removable cover 23 is provided for the purpose of enabling this belt to be applied to and detached from the pulley 55; and it is essential that the belt be applied in the direction stated both for the sake of the automatic brush-adjustment thereby secured and also to insure that heavy articles displaced by the brush will be thrown upon the inclined ledge or dust pan 9. The lip 8 is also preferably elevated a material distance above the lip 7 for the double purpose of providing a rush of air across the top of the carpet which shall assist in the elevation of the refuse onto this dust pan and also to prevent any sealing contact which would cut down the volume of air flow and thus decrease the efficiency of the cleaner.

I have shown the links 59 as provided with extensions 61 arranged to contact the inner surface of the nozzle at a given point and thus prevent the displacement of the brush to such a point as to bring its bristles into contact with the cleaner wall; and I have also shown the casing as formed with a notch 62 for the belt 58, which notch may be so located as to receive the belt freely only when the same is applied to the brush in the proper direction, thus insuring that the same will not inadvertently be applied in the wrong position.

The device is operated by means of a handle 65 provided with a fork 66 whose arms depend one on each side of the cleaner and are pivoted to suitable brackets 67, one of which at least is provided with a down-turned arm 68 receiving a tension spring 69 the opposite end of which is attached to a projection of the yoke 56. Tightly secured to the open end of the fan chamber is the mouth of a porous bag 70 whose opposite end is attached to the handle by a suitable hook 71, and said bag is preferably made considerably loose as shown in Figs. 1 and 2. The mouth of this bag is shown as provided with a stiffening frame 72 adapted to surround rather closely the part of the casing to which it is applied and the casing wall is provided with spring catches 73 having engaging parts 74 protruding through slots or apertures 75 so as to engage this frame and hold it securely while being easily disengaged by pressing the catches inwardly.

The operation and advantages of the device are as follows: Upon starting the cleaner from rest the inertia of the fan 32 (which intentionally is made rather heavy so as to present considerable fly-wheel action) causes the same to lag considerably behind the wheels 28, yet the spring 49

permits the cleaner to be started with a steady, uniform resistance and without imposing upon the operator that feeling of hard work which would be present in case it were necessary to start the whole machine instantly. The device is moved backward and forward over the floor exactly like an ordinary carpet sweeper, except that the brush always rotates in the same direction, always throwing the heavier refuse upon the ledge 9 while the rotating fan gathers up the dust and lighter particles forcing them into the porous bag and preventing the occurrence of the dusty smell so observable when an ordinary carpet sweeper is used. Arrived at the forward end of each stroke the ratchet 43 holds the spring against unwinding, and thus provides a continuous turning movement during the retraction of the casing, as well as serving to operate the fan and brush for a very noticeable time in case it be desired to pick up dust or lint in some corner or under some piece of furniture where movement of the cleaner is impossible. From time to time the cleaner is raised from the floor by lifting the handle 65 whereupon the spring 69 operates to tilt the casing to the position shown in Fig. 2, and the refuse gathered on the ledges 9-9 will gravitate through the aperture 5 and into the dust bag. As a result of this action the machine will pick up matches, coins, bullets, nails, cigar stubs, cigarettes, and other articles which few cleaners or carpet sweepers will accommodate, as well as removing such things as lint, dust, bran, ashes, flour and light refuse either from floors or from rugs.

While my improved brush regulating mechanism can be used upon any kind of cleaner whatever, it is particularly valuable in connection with a traction-cleaner wherein the amount of power available for driving the brush is comparatively small, and especially in a cleaner wherein the brush and fan are connected together since overloading of the brush is in that event particularly disadvantageous to the fan action. Also while my improved power-storing appliances are applicable to any type of suction sweeper the same are particularly desirable in a cleaner wherein a fan and brush are operatively connected together in view of the greater continuity of the power available for driving the fan against the opposition of the brush. And while the tilting casing arrangement has particular utility in connection with a driven brush and a suction fan, there are features of utility possessed by the same regardless of the presence of either or both the brush or fan. Therefore, while I have described my invention in detail and pointed out at length the construction which now commends itself to me as the best and most satisfactory, it will be apparent that great changes can be made in the various

details of my apparatus, wherefore I do not limit myself to the construction or arrangements herein shown except as the same are specifically recited in the claims hereto
 5 annexed or rendered necessary by the prior state of the art.

Having thus described my invention, what I claim is:—

1. The combination with a dustpan and
 10 a rotatable brush located in operative relation thereto, of carrying wheels, and means operatively connecting said wheels and brush, whereby the latter is rotated toward the pan as said pan is advanced, said means
 15 including energy storing devices whereby said brush will be operated for a time after the advancing movement of said dustpan has ceased.

2. The combination with a dustpan and a
 20 rotatable brush located in operative relation thereto, of energy storing means of the fly-wheel type operatively connected to said brush, carrying wheels journaled to said dustpan, and operative connections between
 25 said carrying wheels and energy storing means whereby upon the forward movement of said dustpan said brush will be rotated in a direction to throw litter thereon, and upon a cessation of such forward movement
 30 said connections will be broken.

3. The combination with a dustpan and a rotatable brush located in operative relation thereto, of energy storing means of the fly-wheel type operatively connected to said
 35 brush, carrying wheels journaled to said dustpan, a driving member geared to said energy storing means, and a spring connected to said member and said wheels, said spring being adapted and arranged to be
 40 wound up with the forward movement of said dustpan and also to operate said driving member in a direction to turn said energy storing means in a direction to rotate said brush in a direction to throw litter upon
 45 said dustpan.

4. The combination with a dustpan and a rotatable brush located in operative relation thereto, of energy storing means of the fly-wheel type operatively connected to said
 50 brush, carrying wheels journaled to said dust pan, a spring motor connected to said energy storing means and adapted to drive the same, and means connecting said wheels to said spring motor in a direction to wind
 55 the same upon the forward movement of said dustpan.

5. The combination with a floor-cleaning tool and a rotatable brush carried thereby, of carrying wheels therefor, and a spring
 60 motor carried by said tool and operatively connected to said brush and adapted to be wound up by the intermittent forward movements of said tool.

6. In a floor cleaning tool, a suction cham-
 65 ber having bearings at its ends, a rotary

brush pivoted to said bearings and having a pulley intermediate of its ends, a driving pulley located above and to one side of said brush and having its axis perpendicular to the plane of that of said brush, and a twisted
 70 elastic belt connecting said pulleys.

7. In a device of the character described, in combination, a collecting nozzle, a horizontal rotatable brush journaled therein, a
 75 pulley carried by said brush, a driving pulley located above and at one side of said brush with its axis perpendicular to the plane of that of the brush, and an endless belt connecting said pulleys and arranged so that in the vicinity of said brush its power
 80 run will be lowermost.

8. In a device of the character described, the combination with a casing having a fan chamber and a collecting nozzle, a suction
 85 fan in said chamber, a rotatable brush in said nozzle, means operatively connecting said fan and brush, carrying wheels journaled to said casing, and gearing connecting said wheels and fan adapted to drive said fan upon the forward movement of said casing
 90 and to become disconnected from said fan upon the cessation of such forward movement but leaving said fan operatively connected to said brush.

9. In a device of the character described, 95 the combination with a casing having a fan chamber and a collecting nozzle, a suction fan in said chamber, a rotatable brush in said nozzle, means operatively connecting said fan and brush, a spring motor operatively
 100 connected to said fan in driving relation, carrying wheels journaled to said casing, and means connected to said wheels adapted to wind said spring motor upon the forward movement of said casing.
 105

10. In a device of the character described, the combination with a casing having a fan chamber and a collecting nozzle, a suction fan in said chamber, a rotatable brush in
 110 said nozzle, means operatively connecting said fan and brush, a horizontal transverse shaft carried by the casing, driving and carrying wheels on said shaft, the former being operatively connected to said fan and the latter adapted to rest on the floor and certain
 115 of said wheels being loose on the shaft, and a power spring connecting the shaft and loose wheel and adapted to be wound up by the forward movement of said carrying wheels.
 120

11. In a suction cleaner, a fan chamber having an inlet opening in its upper wall and a fan shaft projecting through its lower wall, a collecting nozzle overlapping said
 125 upper wall and enclosing said opening, said nozzle having a mouth whose plane lies below the lower wall of said fan chamber, a rotatable brush in said nozzle, a driving pulley carried by said fan and projecting through said inlet opening and operatively
 130

connected to said brush, and operating mechanism disposed beneath said lower wall and connected to said shaft.

12. In a suction cleaner, a fan chamber 5 having an inlet opening in its upper wall, a collecting nozzle overlapping said upper wall and enclosing said opening, said nozzle having a mouth whose plane lies below the lower wall of said fan chamber, a rotatable

brush in said nozzle, a shaft projecting 10 through said opening and connected to said fan, a pulley carried by said shaft inside said nozzle and operatively connected to said brush, and means for rotating said fan and pulley.

In testimony whereof, I hereunto affix my 15 signature.

JAMES B. KIRBY.