June 18, 1929. H. ABERNETHY 1,717,904

WINDSHIELD CLEANER

Filed Dec. 9, 1926

Fig. 1.

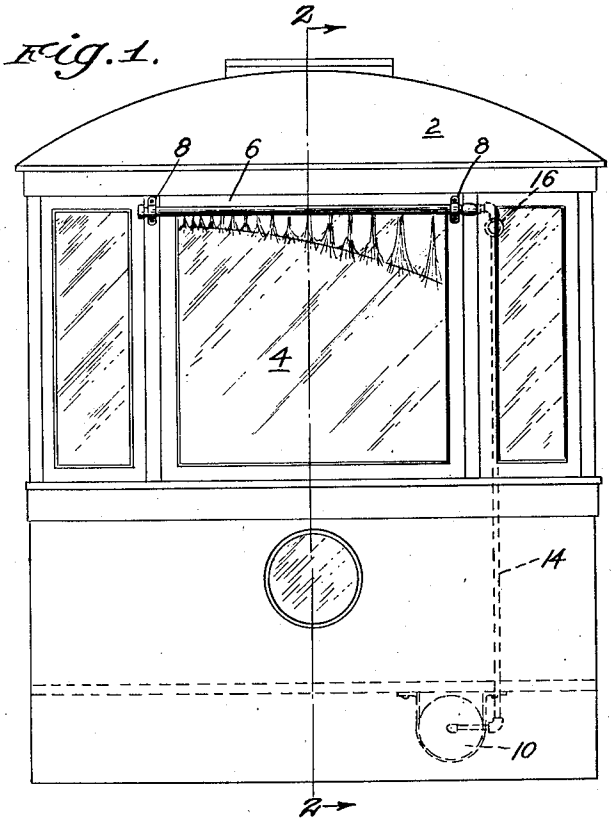


Fig. 2.

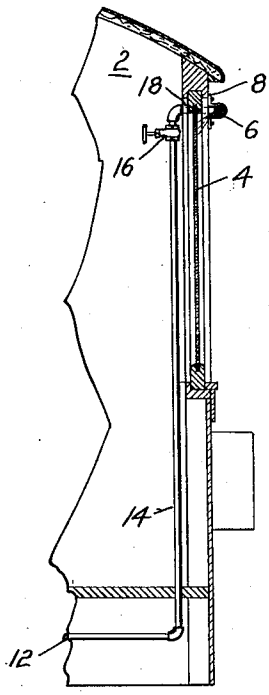


Fig. 3.

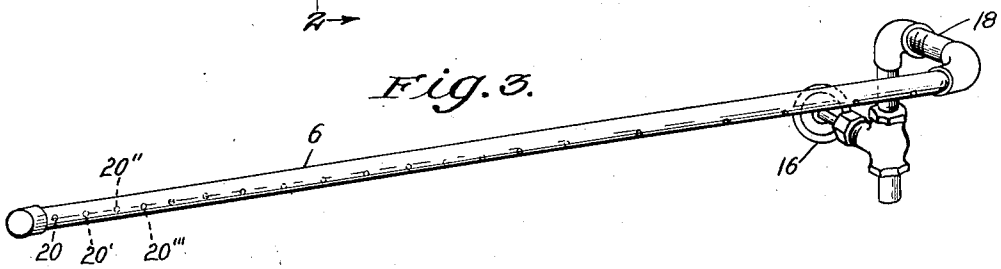


Fig. 4.

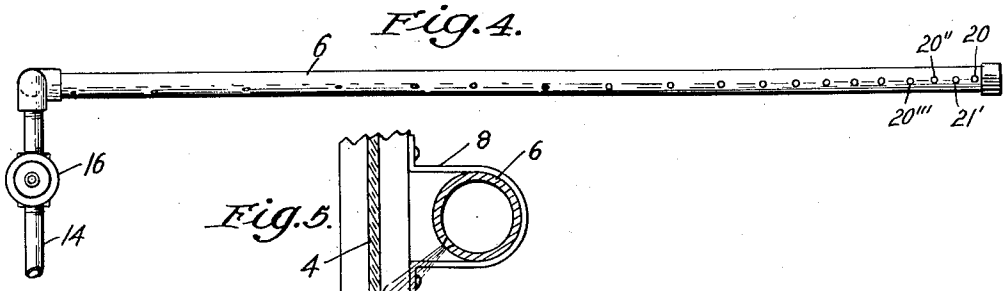
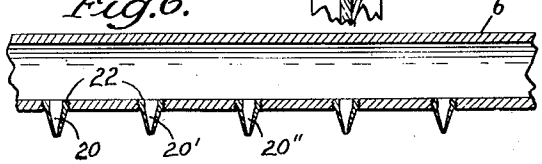


Fig. 5.

Fig. 6.



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Patented June 18, 1929. 1,717,904

UNITED STATES PATENT OFFICE.

HENRY ABERNETHY, OF BERKELEY, CALIFORNIA.

WINDSHIELD CLEANER.

Application filed December 9, 1926. Serial No. 153,499.

My invention relates to pneumatic blast means for keeping the glass of windshields, street car and locomotive cab windows, and the like, free from vision-obscuring deposits such as dirt, rain, snow and sleet. It will be most easily understood with reference to Patent No. 1,346,348 of July 13, 1920; over which it constitutes a new improvement.

In common with other cleaners of the pneumatic blast type, it is an object of my invention to provide a scouring action by means of a transparent medium such as air, and to provide a cleaner in which there are no moving parts to scratch the glass, or liable to mechanical breakdown.

I desire not only to use a transparent medium, but it is a further object of my invention to so improve the effectiveness of air-blast cleaners that it becomes unnecessary to heat the air. Aside from the expense entailed in heating, it is found that objectionable diffraction or other vision-obscuring effects are produced directly or indirectly due to the use of heated air.

It is an object of my invention to provide a cleaner of the air-blast type with certain modifications to improve the stripping action of the air blast; and it is a further object of my invention to add a sweeping action to facilitate cleaning.

I aim to improve the stripping action by providing a thinner blast of air having a sharper cutting action than it has hitherto been possible to attain. Corollary to this purpose, I have attained a most important object of this invention; viz, to provide a device which operates on a far lower air consumption than previously has been considered possible, so that it becomes feasible to keep the cleaner continuously in operation during wet weather to prevent accumulation of vision-obscuring deposits.

Other objects of my invention will be suggested in the following description and in the use of my device. Certain of its objects may be realized with modifications within its purview and with less than all its advantageous features, I desire therefore, not to be circumscribed beyond the limits of the claims finally determining my invention.

Referring to the drawings:

Figure 1 is a front elevation of a street-car windshield having my improved cleaner attached thereto. Fig. 2 is a median vertical section at right angles to the elevation of Fig. 1 and as indicated by the line 2—2 in Fig. 1. Fig. 3 is a detached front elevation of the windshield cleaner as shown to small scale in Fig. 1. Fig. 4 is a detached rear elevation of the same. Fig. 5 is a cross-section of the nozzle pipe through one orifice, and is a fragmentary enlargement of this feature of Fig. 2. Fig. 6 is a developed axial section of a fragment of the nozzle pipe through several of the orifices. The sectioning surface is a slightly twisted one, to cut the helically aligned orifices centrally. In all the figures the size of nozzle openings and the degree of curvature of the helix of the nozzle center-line are necessarily exaggerated for purposes of illustration.

My device is applied to a street car 2, having a motorman's window or windshield 4 that is desired to be kept clean. A nozzle pipe 6 is supported horizontally and parallel to the window by a pair of wall-saddles 8, above the window front. Piping is provided to connect the nozzle pipe to a compressed air tank 10, which may conveniently be the air-brake storage vessel of the street car. A horizontal pipe 12 from the air tank leads to a vertical pipe 14 just inside the windshield 2, and has an air-control valve 16 located convenient to the operator at the top of pipe 14. A short horizontally-positioned nipple 18 leads through the car front to the nozzle pipe 6 outside the car.

The nozzle pipe 6 has a plurality of separate radial nozzle orifices 20, 20′, 20″, 20‴ etc. leading therefrom toward the windshield 4, and spaced longitudinally of the pipe. The nozzle orifices are formed as tapering circular openings each in a separate threaded nipple 22 screwed into the cylindrical wall of the pipe, with the orifice tapering to smallest size at the extremity of the nipple outside the pipe. The orifices might of course, be drilled directly in the original pipe wall, but I prefer the use of nipples for two reasons. First, the nipples permit of tapering the orifice to produce a pronounced high-velocity-nozzle effect. Second, the use of separate nipples makes it possible to form orifices of microscopic dimension such as I employ.

There is, unavoidably a certain amount of dispersion of an air blast after leaving any nozzle orifice. Dispersion parallel to the windshield 4; i. e. longitudinally of the pipe, is readily compensated for by the spacing between orifices 20, 20′, 20″, etc. but the dispersion at right angles to this direction merely thickens the layer of flowing air and would

be of no advantage so far as cleaning is concerned. I desire to produce an extremely thin sheet of high-velocity air across the window to cause a cutting stripping action, as well as to conserve air. With this end in view, I have spaced the nozzles 20, 20′, 20″, etc., far enough apart so that each air blast when it strikes the windshield surface, will flatten out into a thin sheet unhampered by piling up of air currents from adjacent nozzles, and so that the blasts do not meet until after impingement upon the windshield surface. Thus a single very thin sheet of high velocity air is produced covering the entire windshield breadth and advancing with a sharp cutting edge down across the surface of the windshield. This shearing sheet of air strips all dirt, water, and the like, off the windshield in a most efficient manner, and I ascribe much of its effectiveness to the sharp edge of the thin sheet of cleansing air; which sharp edge is made possible by flattening out the dispersed streams from each nozzle. It would not be possible to produce so thin a sheet of air with any type of nozzle I am aware of, because of the dispersion which inevitably takes place beyond the restraining walls of any nozzle.

The nozzles, instead of being aligned truly parallel to the axis of the pipe, are disposed along the pipe on a slightly helical line so that each nozzle is directed at a slightly different angle upon the windshield. The drawings exaggerate this twisting necessarily in order to illustrate it at all. It will be understood however, that the entire helix is contained within a relatively few degrees of arc, considerably less than the right angle from horizontal to vertical. The air blasts from the orifices at the lowest part of the helix; i. e. at the right-hand end of the pipe in Figs. 1 and 3, impinge upon the windshield from the smallest angle and farthest from top. This produces a sweeping action in which the dirt is progressively collected from one side of the windshield to the other as well as from the top to the bottom. The nozzles are spaced farther apart at this right-hand end of the pipe (Figs. 1 and 3), and the air conduit is connected to this same end to provide the highest air pressure for these lowermost orifices.

I claim:

1. A windshield cleaner comprising a compressed air nozzle pipe for directing an air blast on said windshield, and having its orifice center-line extending longitudinally of the pipe in a slightly helical direction thereabout so that the air blast strikes each portion of the windshield progressively at a slightly different angle and in an unbroken impact line oblique to the pipe axis.

2. A windshield cleaner comprising a compressed air nozzle pipe providing a plurality of jet orifices for cooperatively directing an air blast obliquely against said windshield, and having its orifice center-line extending longitudinally of the pipe in a slightly helical direction so that the air blast strikes each portion of the windshield at a slightly different angle, and a source of compressed air connected near the end of said pipe at which said orifice center-line is farthest from the horizontal radial plane through said pipe, whereby the highest pressure is effective upon the portion of the air blast making the least angle with the plane of the windshield, the other end of said pipe being closed.

3. A windshield cleaner comprising a nozzle pipe providing a plurality of separate minute nozzles for simultaneously directing jets of fluid obliquely against a face of said windshield at progressively different angles to the plane thereof to induce a cooperative action of the jets against said face along an unbroken impact line obliquely related to the jet axes and extending across the windshield.

4. A windshield cleaner comprising a nozzle pipe providing a plurality of separate minute nozzles for simultaneously directing jets of fluid obliquely against a face of said windshield at progressively different angles to the plane thereof to induce a cooperative action of the jets against said face along an unbroken impact line obliquely related to the jet axes and extending across the windshield, the nozzles being of like bore and those nozzles making the smaller angles with said windshield face being spaced progressively further apart.

5. A windshield cleaner comprising a nozzle pipe connected at one end with a source of fluid under pressure and having the other end closed, said pipe providing therealong a line of nozzles for simultaneously directing jets of fluid against a face of said windshield at progressively different angles to the plane thereof to induce a cooperative action of the jets against said face along a continuous line of impact obliquely related to the jet axes, the nozzles making the larger angles with said windshield face being spaced progressively closer together and being nearest the closed end of the pipe whereby the fluid is evenly distributed along said line of impact.

6. A windshield cleaner comprising a straight nozzle pipe disposed in parallel relation to the face of a windshield and providing a line of nozzles for directing jets of a cleaning fluid radially and at like angles from the nozzle pipe axis toward said windshield face, successive nozzles being directed at different angles to the plane of the windshield to cooperatively induce a sweeping action of air issuing from said nozzles along an impact line oblique to said axis, said impact line being defined by at least three adjacent jets.

In testimony whereof, I affix my signature.

HENRY ABERNETHY.