comes at once apparent if a car having smaller wheels than the others is run over the line. When such a car comes to the hard centres it soon stops, and efforts to move it brings only spinning wheels. Upon examination it is found that the motor casings are riding on the crust of snow and raising the wheels from the rails, destroy the traction effort. To remove this hard centre we have the scraper and flanger, which is usually lowered and raised by compressed air. In some cases a device with steel points arranged in the form of a tooth harrow is used successfully to break down the hard centre. In congested terminals and streets where the snow can no longer be pushed aside by the wings of snow plows, etc., it becomes necessary to load it on wagons or cars and haul it to the most convenient place for unloading.

Snow storms vary in intensity and in kind, and it is hardly possible to depend upon a single type of snow plow or sweeper to overcome them all. Certain types of plows are better adapted to control certain storms. To have at command any or all of the above mentioned snow-fighting devices is not alone sufficient; there must be organization for the work. The organization should be carefully planned in advance and the men included therein fully instructed and trained, so as to avoid confusion or misunderstanding when the emergency arises. Men trained to a particular work of this kind should be kept there, if possible, as experience is a valuable asset. The men should be instructed to report for duty immediately upon the first snowfall and be ready to take charge of the work allotted to them. The superintendent or officer in charge should be where reports of progress or difficulty can reach him promptly, so that he can act in accordance therewith with precision. The work must be started with the appearance of the storm, without waiting until reports come in of the cars being stopped.

Having an organization and equipment, it is also important that the equipment be thoroughly overhauled and put in condition for immediate service at the beginning of winter. When the threatened danger has made its appearance, there is no time for repairs or the purchase of shovels and brooms or plows. A contest against the storms of winter is war, so let us follow the adage "In time of peace, prepare for war."

SURFACE OILING AND CONSTRUCTING OIL MACADAM.

The city of Oakland, Cal., has been employing heavy asphaltic road oil on its macadam construction so as to make it suitable for light traffic under modern conditions. A description of the methods employed in this work and the results obtained were given by Mr. Wm. J. Baccus, commissioner of streets, of Oakland, in a paper presented at the 15th annual convention of the League of California Municipalities, held at Berkeley, Cal., September 23 to 28. Mr. Baccus' paper, in abstract, follows:

Surface Oiling Methods.—Our methods of surface oiling may be outlined as follows: The street is first cleaned by scraping and sweeping the dust and mud from the surface, including the gutters, sufficiently at least to show whether any patching must be done to secure a uniform surface. All holes and depressions are filled with suitable rock, watered and rolled. The street should then be allowed to stand long enough to enable the traffic to compact the patches to a density uniform with the rest of the street. When this uniformity is secured, or before, if time presses, the necessary screenings are placed in the gutter and the street again swept to remove the last particles of dust. Oil is then spread upon the street at a rate varying from ½ gal. to the square yard to a full gallon, depending on the compactness of the street surface. Ordinarily on a street that has been in use for two or more years, ½ gal. per square yard gives the best results. This oil is then covered with fine, clean screenings already at hand in the gutters, sufficient to prevent the oil from running into the gutters or adhering to passing vehicles. The street is then rolled with the steam roller and thrown open to traffic. It has been the custom in the past to allow the oil to stand for one or two days before screening, with the thought that the irregularities in the application will disappear, but this has several objections, and it is no longer necessary since we have adopted the use of the pressure oiler. The method described is applicable only to streets in fairly good repair. If so badly worn that half of the street must be covered with rock to produce a uniform surface, it is doubtful if the results will justify the expenditure. In such cases it is now our practice to scarify the street, harrow, reroll and reconstruct as oil-macadam, the oil having a penetration of two or three inches.

Surface Oiling Cost.—Our costs have varied between 5 and 12 cts. per square yard for ordinary surface oiling on different streets. Assuming that the street is in fair condition, and eliminating the cost of patching ruts and holes, which is not properly chargeable to oiling, a cost of 6 cts. per square yard should not often be exceeded. This does not include office expenses or general supervision. This assumes about ½ gal. of oil per square yard. More oil adds to the cost directly by the cost thereof, and indirectly by increasing the amount of screenings that must be used.

Following is a statement in detail of oiling several streets recently in Oakland, aggregating about .7 mile and having an area of 11,738 sq. yds. These streets were hard and smooth and in a hill section of the city:

	Total.	Per sq. yd.
6,000 gals. oil at 4.38 cts. (delivered)..	$263.12	$0.0224
160 yds. screenings at $1.75 (delivered)	280.00	.0238
3 days steam roller at $15.00.....	45.00	.0038
Oiling—		
District deputy 2 days at $5.00.....	10.00	.0009
Sub-foreman 5 days at $3.00.....	15.00	.0012
Labor, 25 days at $2.50.....	62.50	.0053
Cleaning Street—		
Deputy, ⅓ day at $5.00.....	3.33	.0003
Sub-foreman, 2 days at $3.00.....	6.00	.0006
Labor, 10 days at $2.50.....	25.00	.0021
Cart and driver, 2 days at $4.00 per day	8.00	.0007
Total	$717.95	$0.0611

Or about 6 1/10 cts. per sq. yd.

Results From Surface Oiling.—To make clearer the significance of these figures, apply them to a certain group of streets, comprising one sprinkler route in another part of the city. This route is also in a hill section and comprises 4.26 miles, besides a number of blocks not sprinkled because already oiled. The average daily cost for sprinkling is $3.68 for water and $5 for driver, horses and carts, a total of $8.68 per day. Allowing 250 days per year, the annual cost for sprinkling is $2,170. The estimated cost of cleaning the streets twice per year, together with special cleaning of culverts and gutters during and after storms, is $810, of which it is estimated that $426 would be saved if the streets were oiled. The total saving, on these two items alone, of sprinkling and cleaning, would be $2,170, plus $426, or about $2,600, excluding office expense and general supervision. The estimated cost of oiling being about 72,240 sq. yds. at 6.1 cts., is $4,407. Therefore, if the oil surface lasts on the average one year eight months over the district, the expense of oiling this sprinkler route is justified by the saving in these two items. Other routes, on more level ground where sprinkling costs less, would not show results quite so favorable to the oiling; while others would show even more favorably.