sieve. When the material is less fine, more must be used to secure a given result; and, as the inorganic dust is usually introduced cold at the mixer into the hot sand of the bulk of the mineral aggregate, the result of using too much of this cold material is obvious. Such mixtures, in that they approach the aggregate of rock asphalt pavements, are also harder to lay in the manner usually employed in the construction of the artificial or American pavement.

Stone dust and Portland cement are the most widely used filler materials, the former being the more common because the lower in cost, but the latter being preferred by some on the ground that it is thought to make a superior mixture. When Portland cement is employed, the difference in specific gravity between that material and the remainder of the mineral aggregate should be taken into consideration, as the mixtures are usually figured by weight instead of by volume, though the latter would seem a more logical method if it could be used with reasonable convenience.

Filler Materials

Other filler materials are pulverized clay, marl, shale, silica, etc. Many materials have been tried and found satisfactory, but a few have produced disastrous results. "Safety first" demands that a new material be thoroughly investigated before it is used extensively as an asphalt pavement filler. These investigations can only be conducted in a properly equipped laboratory, and by those with comparative experience to draw upon.

The 200-mesh sieve is not a sufficient test for an inorganic dust filler, except for routine work on a known material. The particles of dust that are of the most value are those that would pass a 500-mesh sieve, were one of such fineness of practical value for laboratory testing.

Two-hundred-mesh fine sand was offered to the city of Montreal as a filler material last season. A deposit of this material, practically all of which would pass the 200-mesh sieve, had been uncovered in a local sand pit, and it was offered to the municipal purchasing department at a fancy sand price as a substitute for the more expensive stone dust. It had to be rejected on the ground that, though it passed the specifications under which bids had been received, it was not a proper filler material at all, there being practically none of the finer material for the separation of which no laboratory sieve is practical, and which is the really important factor in a dust filler.

Photomicrographs of Sand

Photomicrographs saved the day in this instance. It was a rather difficult matter to advise a city purchasing department that the material which passed their specifications better and was about 50 per cent. cheaper than stone dust, should not be bought and used; but when we submitted comparative photomicrographs of the part of each material that had passed the 200-mesh sieve, and it was seen that the sand grains looked like rocks under the same magnification that still left the stone dust grains the appearance of fine powder, even the low bidder who was offering the fine sand was satisfied that his material would not serve the purpose.

The air separation dust test is by far the most satisfactory that we have yet found for making comparisons of materials. Water separation gave some good results, but the air method seems more practical. Neither is sufficiently simple to be used on routine work, so the 200-mesh sieve must still be relied upon for much of the checking of deliveries with samples submitted. As we do not know of any other air or water separators of the type we are using in Canada, they being especially constructed by us, it is hardly worth while at this time to use these tests in specifications.

The specially graded sand that forms about 75 per cent of the weight of a standard sheet asphalt pavement surface is a very simple matter if one fully understands and appreciates what is necessary. To fully comprehend the very great difference in an asphalt pavement mixture that the grading of the sand will make, one has but to follow daily on the street the work turned out by a mixing plant where the man in charge is careless of detail, or thinks that any old sand grading at all is good enough.

Sand Must Be Watched

We have seen a mixture produced by an asphalt paving plant at one o'clock that was all that could be desired, and at four o'clock of the same afternoon that plant was turning out, under the same formula of batch weights, a mixture that was not even third-rate. The reason was that no attention was being paid to the sand. At one o'clock, the supply was being drawn from a section of the pile that by chance happened to be of a very good grading, but by four o'clock the laborers had worked into a large pocket where the sand was very coarse.

The result of this carelessness was a poorly graded, sloppy mixture, that could not be expected to give good service under heavy traffic, and that cost as much as the better mixture even for light traffic. It will mark badly in warm weather, and probably shove, whether it has a binder course or not. The quantity of asphalt cement that is correct for a mixture having the standard grading of mineral aggregate is far too much for a mixture in which the sand is coarse. A plant crew that was not well enough organized and trained to watch the sand pile could not be expected to know when the proportion of asphalt cement should have been reduced to prevent a sloppy mixture.

Three grades of sand are needed in most cases to approximate sufficiently the standard or model sand grading. These may, for convenience, be termed fine, medium and coarse grade sands for asphalt paving purposes. It may assist the layman to an understanding of the matter if we say that the fine is of that size which is sometimes spoken of as blow sand, the medium a good plasterer's sand, and the coarse a sand of the type we all recognize as suitable for Portland cement concrete work.

The Various Grades of Sand

One sand is occasionally found that is in itself a sufficient approximation of the standard grading; but such cases are rare, and, even then, it is a good precaution to have on hand small stocks of fine and coarse sands for tempering purposes in case the main supply does not at all times prove sufficiently uniform. Sometimes a well-graded sand may be secured from a stratified bank by working a face to a certain depth that will take in layers the mixture of which in falling and handling will give a satisfactory approximation of the model. This we succeeded in doing with good effect last season at Woodstock, Ont.

Fine sand for asphalt paving is one in which there is a decided predominance above the percent. required in the model grading of those sized grains that will pass a standard 80-mesh and be held on a standard 200-mesh sieve. The requirement of the model sand grading is 34 per cent. of the total sand.

(Continued on page 452)