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A NEW USE FOR SCRAP MICA.

(The following paper was read by H. C. Mitchell, manager of the Mica Boiler Covering Co., Ltd., at the meeting in Toronto this week of the Ontario Mining Institute.)

THE new use for scrap or waste mica which I have been asked to describe this evening, is at present confined chiefly to the manufacture of an insulator of steam heat, although it can also be applied for other insulating purposes. It will be well at the outset to define what is commonly termed scrap or waste mica.

As you are all aware mica is found in irregular shaped crystals in almost endless varieties of size and color. It is one of the most perfectly foliated of all materials, the laminae being so delicate in many specimens as to require the almost incredible number ef 300,000 of them to form a thickness of one inch. The mica crystals are more or less seamed or cracked, so that often an apparently perfect crystal when split open parts and subdivides into a number of unfortunately small fragments. This unfortunate characteristic has really been the cause of much of the disaster which seems so often to have dogged the steps of mica mining in this and other countries. It is bad enough to have to deal with any material which occurs in pockets which pinch out without warning, and which leave no particular indication or lead as to where it may be found again. If all the deposits of mica which have been found in Canada had produced crystals more or less free from cracks and flaws, most miners would have been content with their finds, and would not have been so much concerned as to whether or not it was a pocket or a true fissure vein. Then again many deposits of mica disclose a large portion of crystals twisted and destroyed to such a degree as to render their cleavage almost impossible. These together with the fragments already referred to, find their way to the dump having thus far served no other purpose than to add very largely, and in some cases prohibitively to the cost of mining the merchantable article. We shall however resurrect them presently, and I trust be able to demonstrate that, instead of a loss, this hitherto costly waste may become a valuable by-product of mica mines. The proportion of waste or unmerchantable mica in every ton mined is very considerable. I do not know that the percentage of it to the ton has ever been approximated, but the evidence of a large number of miners would seem to indicate that it would average not far short of 70 per cent. of the total product. There are many instances I am aware of where the average waste per ton is considerably less, but there are also as many cases where the percentage is as much higher, so that I think I am justified in venturing that estimate. It will be readily seen then that mica miners have had to contend with a very serious problem in the matter of this abnormal amount of refuse, and they have heretofore been unable to reckon upon a return of any kind for almost three-quarters of their total output.

So far I have referred to mica in general, but now we must notice the particular groups of it in Canada. These we may determine chiefly by the variety and color of the material. There are, as I have said, almost innumerable varieties of color and shade, from the nearly pure white to jet black, but for general purposes, we may divide them into three groups, white, amber and black White mica appears to be very scarce in this country as compared to the quantities of amber and black, and as it is almost perfectly transparent, it has always commanded a much higher price than the other varieties. I may say, too, in speaking of white mica that there is a value for the waste or scrap of it, as when pulverized it has a beautiful lustrous appearance which leads to its being utilized for wall paper silvering and other decorative purposes. As however it does not appear to have been discovered in anything like the same quantity as amber and black in Canada, it has not as much interest to us as the commoner varieties. The great bulk of Canadian mica is included in all these shades of amber, silver, red and brown which range from cloudy or milk white to dense black, which latter as far as I know has no value whatever. I now come to this new use for waste mica. Although we can use the refuse of nearly all these varieties, excepting badly twisted crystals, it is the soft amber and light brown micas which we prefer for our purpose. This is fortunate for all concerned, as it appears to be the most abundant. We find that by taking these scraps or waste pieces and subdiving them as finely as possible, and them quilting them between galvanized wire netting, that we produce a fireproof mat, flexible and clean, and a magnificent non-conductor of heat. It will be noticed that all these flakes are ribbed or corrugated, the object being to increase the number of dead air spaces in the mat, and also to add to its bulk without increasing its weight. The finer we are able to divide these flakes, the more effective they become, as each one in itself is a splendid non-conductor, so that the greater number we are able to get into a given space, the higher the results are in checking the escape of the heat waves.

It will be seen that these mats or quilts are not only fireproof, but are flexible and elastic, which is a most valuable feature as they will expand or contract with the iron they cover without cracking or flaking off. No doubt many of you have seen boilers covered with some of the old-fashioned cements, which being put on wet and allowed to set on the material, often crack and split to make room for the expansion of the material beneath. In time it will loosen and fall off and require constant patching to keep in order. The real value however, in making these mats in sections, is that they can be removed whenever it is desirable to examine the shell of the boiler, and can be replaced easily and quickly without injury. As you will notice they are secured to the boiler by means of hooks attached to iron bands, which are passed round the boiler under the mats. Besides this covering for boilers the waste mica is made into sectional covering for all sizes of steam and hot water pipes, the only difference being that the mica is stitched between a wire core which fits the pipe, and an outer covering of canvas. The sections are secured to the pipe by lacing round the boot hooks which are riveted up the seam at convenient distances. Covering for all sizes and shapes of fittings including elbows, tees, crosses and globe valves, are also made and secured to the iron in the same way. These have been difficult to make owing to the intractable character of the mica flakes themselves, as being very elastic it was found hard to bend them to the various shapes. We found the same difficulty in making the flakes bend round the smaller sizes of pipe, but finally succeeded by separating them into different sizes in the same way as coal is graded, the larger flakes being used on the larger sizes, and so on down to the half-inch pipe.

Perhaps I may be allowed to refer here to the not unnatural idea that using the mica in this loose dry form it would be liable to shift or sag in the wire netting or canvas case. This, however, is not the case, for the reason that the flakes being of irregular shape, with rough edges and ribbed surfaces, they catch and bind one another, matting together as hair does. As a proof of this we may say that after nearly two years in constant service on locomotives where there is probably heavier and more constant vibration than is found anywhere else, the mats have been found in perfect condition, and in the opinion of railway engineers are likely to last an indefinite number of years.

Before passing on to the probable effect of this new use for waste mica on the mining of the mineral in this country, I may be allowed to refer to some of the expert trials which have been made of the manufactured material. It is obvious that unless the results obtained from the use of this new non-conducting covering are really substantial and beyond question, that the efforts now being made to establish a new use for mica must fail. Fortunately, however there is no longer any doubt or uncertainty on this point, and I believe I am justified in asserting that we have discovered absolutely the highest non-conductor of heat in the world, which can be used commercially, and that there is no substance used in the United States or Great Britain which equals this new insulator. It is no small satisfaction to think that it has been brought into use by the enterprise and pluck of Ontario men, and that there appears no reason to doubt that the mines of Canada will be able to produce sufficient of the raw material to permit of an almost unlimited expansion of this new industry in the markets of the world. How vast this market is may be imagined, when I remind you that every locomotive in use the world over, has to be protected with some substance; that every steamer that puts to sea has boilers which require hundreds of tons of coal to feed them. (In one of the great battle ships of Great Britain lately launched, there were no less than 48 of them); and that every stationary steam plant has a boiler or a battery of boilers, which require covering to minimize the loss of steam and power by radiation. How great this loss is few manufacturers, or in-