

of a perfect lubricant is deceptive. This definition of a true lubricant is a very excellent one, and describes perfectly a liquid or semi-liquid substance where the material adheres to both friction surfaces and the globules between are in constant movement one on the other, but no stretch of our imagination can enable us to conceive such a condition when considering graphite, which is a solid substance and which requires considerable force to render the particles asunder.

What Mr. Dunlop would have this definition apply to is evidently a mixture of oil and graphite such as he describes ;

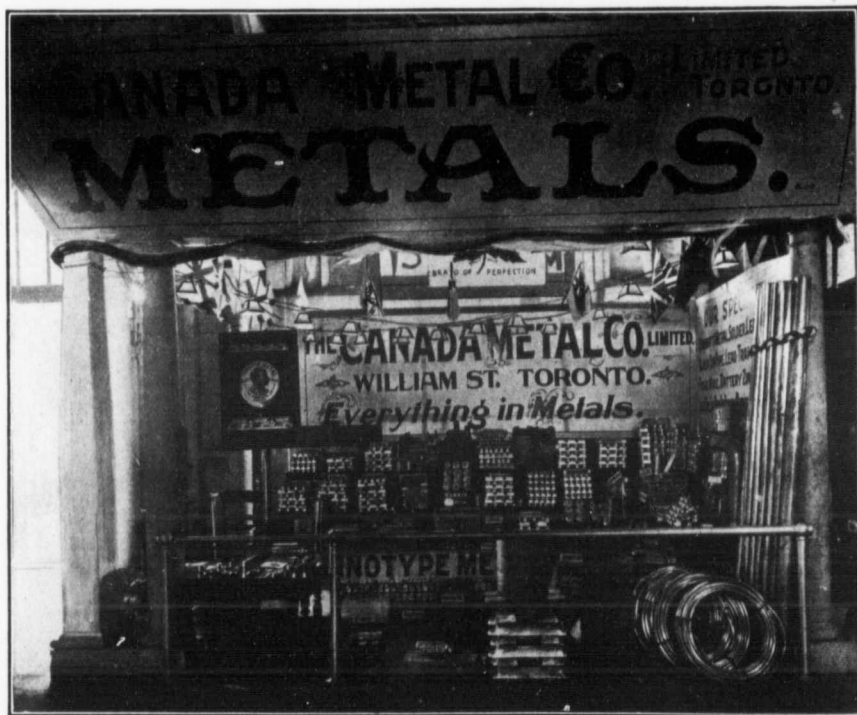
substance, the fallacy of which is of course apparent. The separating substance, in addition to keeping the surfaces apart, must not in any way detract from the smooth frictional surfaces, and on the other hand, must make them smooth when they are rough. Graphite fulfills these requirements provided it becomes permanently attached to the surfaces. A reasonable doubt might be entertained as to whether the deflocculated graphite can readily become attached to the frictional surface since it passes through the pores of filter paper, which would indicate that the particles of graphite are surrounded by an

idea that it is all there. The very fact that the rubbing finger continues to get blackened between washings, shows how easily the amorphous graphite wears away.

Now place some crystalline graphite, preferably flake, in the hand and repeat the experiment, and note how much less rapidly it blackens the rubbing finger.

It has been always understood that wear means friction. Because of this belief, steel wearing parts are tempered. Knife-edge bearings of fine balance are made of hardest agate.

In all friction surfaces there are ir-



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but such a mixture acting in the way he mentions can have no particular advantage over a non-graphitised oil as a lubricating material, because the particles of graphite, being in perfect suspension cannot break through the surrounding film of oil or easily become attached to the metal surfaces. They simply move about in the oil film without at all decreasing the viscosity of the oil itself, the only way in which any reduction of friction could be brought about. In fact, a mixture of finely divided graphite and oil has a higher viscosity than that of oil alone, and so reduction of friction is not to be sought along this line.

Mr. Dunlop points out the real function of graphite as a lubricant when he says that its presence serves to keep the metallic surfaces apart. But so would the presence of any solid material such as sand, carborundum or any abrasive

unbreakable oil film. But if these particles could become attached to the frictional surface, efficient, but not lasting aid to lubrication, would certainly result.

As was said, these amorphous graphites, both artificial and natural, are extremely friable and easily worn away.

"Place a very little amorphous graphite on the palm of the hand and rub with the finger and notice that it cannot be rubbed off." The above has been cited as an evidence of the adhesiveness of amorphous graphite, but go a little farther, wash and dry the finger between repeated rubbings, and it will soon be noticed that the finger slides over the palm with difficulty, though the graphite still appears to be there. Now what has happened? Simply that the graphite, being so friable, has all been worn off the high points, while enough re-

regularities both above and below the normal surface. It is the irregularities above the normal that cause the trouble, and it is important that whatever surfacing material is used should be able to build up the surfaces to the level of the high points, rather than to simply fill up the very minute pores of the metal. It is not conceivable that any particle of graphite small enough to go through a filter paper could become imbedded on one of these projecting peaks, but such a result is entirely possible where the broad flake is used. Even on smooth surfaces the flake form of graphite adheres with wonderful persistence and its resistance to wear due to its smooth crystalline surface and compaction is remarkable.

JOSEPH DIXON CRUCIBLE CO.
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