revolutionize metallurgy, and they, even though searching for a process to solve their troubles, failed to grasp the significance of what they saw. So are epochs born—and so are they lost.

III.—The Present.

The flotation process is now being generally adopted for the concentration of graphite ores. Its adoption has, however, been somewhat slow, and graphite is probably one of the last of the amenable minerals to which the process has been applied.

It was probably the remarkable results obtained by flotation upon molybdenite that first drew wide attention, in this country, to the possibility of applying the process to graphite. Concentrates running ninety per cent MoS_2 were obtained by flotation, and, as graphite much resembles molybdenite in appearance, a widespread idea became prevalent that graphite concentrates running ninety per cent graphitic carbon could be obtained by oil flotation in every day milling practice.

If such were the case, the milling of graphite would be a very simple operation. This idea still persists in some quarters, and the writer ventures to assert at this point that a graphite concentrate averaging ninety per cent carbon, obtained by flotation alone, in ordinary milling operations, is a myth. Such a concentrate has been obtained in the laboratory, and it will, undoubtedly, be obtained again; but anyone hoping to produce such a result in milling practice is pursuing an ignis fatuus.

In a very broad sense, it may be stated that the flotation process presents a solution of the vexing problem of economically concentrating graphite. The operator contemplating the installation of the process has one solid rock to cling to: Froth flotation produces a clean tailing. Given the correct ore pulp conditions, he may rest assured on this point; but from here on nothing is stable.

Mechanical or pneumatic machines give practically the same results. The former giving a shade better tailing, while the latter generally shows a slightly better concentrate.

Mr. Chas. Spearman remarked in a recent article upon graphite published in The Canadian Mining Journal, that the problem was more one of grinding than of concentrating. I, for one, agree with him upon this point. As pointed out previously, Canadian graphite, as a general rule appears to be very intimately associated with its accompanying rocks, and no system of wet grinding appears to free the particles of graphite completely from the accompanying gangue. It must be borne in mind, when considering this point, that sliming must be avoided. Preservation of flake is one of the graphite mill man's chief objects.

Under existing methods the product of any grinding plant may be roughly classified as follows:—

a. Free flakes of graphite.

b. Flakes of graphite with small pieces of attached gangue.

c. Particles of gangue with small pieces of attached graphite.

d. Free gangue.

This classification is more noticeable in undecomposed ores Decomposition appears to free the flake in a manner impossible to duplicate mechanically. Tests run on such ores often give remarkable results that cannot be duplicated upon undecomposed ores, and, for this reason, it is desirable that all tests, in connection with flow sheet design, should be run on ore taken from below the zone of decomposition.

According to flotation practice, classes "a" and "b" and part of "c," of the above classification, will float. This is entirely desirable from a recovery point of view; but it tends to produce a dirty concentrate.

Thus, it will be gathered that the purity of a graphite flotation concentrate is in direct proportion to the degree of liberation of flake accomplished by grinding, and that the degree of concentration attainable by flotation is governed by factors which are, in themselves, quite apart from the process under discussion.

The ideal machine for preparing graphite pulp for flotation would be one that woud pulverize all gangue and yet leave the flakes of graphite intact. Such a machine does not exist, and probably never will. The only remaining alternative is to pick the machine that will accomplish the grinding with a minimum destruction of flake. Here a diversity of opinion is met with. Some engineers prefer ball mills, some rolls. Among those preferring ball mills there is a further split; one faction favouring peripheral discharge mills, while the others can only think of centre discharges. It is therefore impossible to lay down any rule in connection with this most important point. The ultimate scheme to be adopted by any operator can only be determined by tests, and local conditions; but in any case grinding and classification should receive very careful consideration, and nothing should be left to theory, every step being tested out, if possible, by mill scale tests.

Rougher, or primary concentrates, will generally run from thirty to forty-five per cent carbon. Three methods of raising these present themselves:

(1) Successive floatings, returning tailings for retreatment.

(2) Stage grinding and floating.

(3) Tabling.

The first consists of a series of cleaners, and is undoubtedly the simplest; but it is doubtful whether it will, under any circumstances, result in a really high grade concentrate.

In the second method the entire primary concentrate is reground in a pebble mill, and refloated, the concentrate obtained by refloating being again ground, and further floated. This may be carried on indefinitely, as the successive regrindings and refloatings are all operated in closed circuit. A high grade concentrate is the inevitable result; but the destruction of valuable flake must be tremendous. The destruction of flake occurring during tube mill grinding is a much debated point. Many claim that the loss is negligible; but the writer has found that, in a thirteen foot mill, fourteen per cent of the flake was ground to minus 150 mesh. This with a dilute pulp, and a special large discharge.

The third alternative—tabling—appears to be best suited to general requirements. Theoretically, the free flake, having a different specific gravity to flake carrying attached gangue, would be taken off, and thus saved from the chances of tube mill grinding, while the tailing containing unfree flake would be returned for regrinding and refloating. But practice does not altogether bear out theory. It is difficult to quite break the primary froth, and an oil streak, which passes straight down with the head water on the table, is the result. This oil streak looks rather fine; but it entraps a proportion of unfree flake and gangue and a lowering of the table concentrate is the