$$D = \frac{v'd' + v''d'' + v'''d''' + \dots}{100},$$

an equation applicable to the first table mentioned.

If, on the other hand, we have to start with values of w' , w'' , etc., *percentages by weight* (i. e., $W = 100$ grams) we have

$$D = \frac{100}{\frac{w'}{d'} + \frac{w''}{d''} + \frac{w'''}{d'''} + \dots},$$

applicable to the second table quoted.

In no case can the expression

$$D = \frac{w'd' + w''d'' + w'''d''' + \dots}{W}$$

afford more than a rough approximation to the true average specific gravity of the mixture, unless the individual minerals differ but slightly among themselves.

My only excuse for pursuing the subject so far is the frequency with which a similar error is made in computations of this character, notably in attempting to calculate the value of nuggets or specimens of native gold mixed with quartz, and of mixtures of coal and slate, by methods based on a determination of specific gravity. A consideration of a gold specimen of exactly one cubic centimeter volume, one half the bulk quartz (sp. gr. 2.60) and one half native gold (sp. gr. 18.20), usually makes the fallacy obvious, the gold forming half the volume and seven eighths of the weight of the mass.

W. J. SHARWOOD.

RECENT DEVELOPMENTS AT LEADVILLE, COLO.

Sir: I was glad to read in a recent issue of *ECONOMIC GEOLOGY* (Vol. VII., No. 4) the article by Professor Butler on the most profitable fissure vein in the Leadville District, although disagreeing with some of his conclusions.

The knowledge of the existence of these fissure veins is not so recent as Professor Butler states. In 1889-90 I drew the attention of the late S. F. Emmons to such as I had already developed on Iowa Gulch 2 miles southward from the New Monarch-Luema vein described by Professor Butler, one of which is undoubtedly in the same fissure; on Iowa Gulch it is probably the Clear Grit vein in the Union fault.

All the region eastward from the Mike fault produces gold and copper in addition to silver, lead, and zinc, both in the replacement deposits and in the fault fissures, and in the case of the latter the ore is deposited *in situ* as a true fissure vein, not merely "dragged ore" or fragments from the replacement deposits formed at the contacts of the limestones and porphyries.

These facts suggested the theory that in this portion of the Leadville district mineralization occurred distinct from and later than that which formed the contact deposits, and in which the solutions carried gold and copper as their chief metallic elements. These solutions came from below upwards and circulating through the faults and other fissures enriched the preëxisting silver-lead-zinc deposits wherever such were reached. The exceedingly rich gold deposits in the Ibex or Little Johnny and other properties are thus accounted for by a *late enrichment* but not a *secondary enrichment* as ordinarily understood. Mr. Emmons could not accept this view, but he did not personally visit the workings on which I base the theory, with the exception of those in the Ibex property, in which the gold-bearing fissure veins are clearly seen to enter and penetrate the older contacts or limestone replacement deposits.

A short paper on "The Genesis of the Leadville Ore Deposits" in Vol. XLI. of the *Trans. Am. Inst. M.E.* by Mr. Max Boehmer contains a generalized section through the Ibex property well illustrative of Professor Butler's conclusions, and in agreement with him as to the single period of mineralization, but the facts on the ground show that the so-called "post-mineral" faults are actually ore-bearing veins deposited subsequent to the main faulting of the District.

There is no reason to doubt that the Luema vein is but one of a series or system which will be opened and worked profitably. In fact in the Iowa Gulch region before mentioned, no less than four have been worked intermittently for 30 years, and in an examination of the Ibex property made in 1904 no less than six fissure veins were distinguished all lying west of and approximately parallel to the New Monarch-Luema vein.

In Iowa Gulch there is an extrusion of porphyry apparently in the form of a "stock" which has extended southward in the Weston fault for a long distance and probably also northward in a similar manner. This is a mineralized, sheeted zone, similar to the vein described by Professor Butler, and either it or that in the Union fault may be the southern extension of the New Monarch-Luema. I am inclined to believe the latter is the true extension as the Union fault certainly crosses the Weston fault instead of ending at the intersection, as shown by Emmons.

Professor Butler's statement that the material between the fault walls is not a decomposed porphyry dyke, as heretofore generally believed, but is "country rock" is not conclusive; the mass of "kaolin and quartz" at the 450 ft. level would indicate an original porphyry rather than limestone, quartzite or granite, which form the principal portion of the country immediately adjacent to the vein.

CHAS. J. MOORE.

THE CORO-CORO, BOLIVIA, DEPOSITS.

Sir: The paper of Waldemar Lindgren in the September (1911) issue of *ECONOMIC GEOLOGY* refers to the Coro-Coro (Bolivia) deposits.

These deposits have been worked continuously since 1873 and have yielded about 200,000,000 pounds of copper.

The presence of "silver, domeykite and chalcocite" is of rare occurrence; specimens are limited in number. The copper concentrates (locally called "Barrilla") carry neither silver nor gold of economic value.