This experiment is a very incomplete one and I should be glad to see further work (which I can not do myself at present) done on the uses of this interesting fluid.

PHILIP H. POPE

U. S. VETERANS' HOSPITAL,
WALLA WALLA, WASH.

A NEW PROCESS FOR HANDLING SOUTH AFRICAN PLATINUM ORES

THE *South African Mining and Engineering Journal* for September 8 and 15 gives a detailed description of a new process of platinum recovery from the sulfide-norite ores of the Transvaal, which has been originated in the Ferreira laboratory of the Rand Mines metallurgical department. As the process is along new lines, a brief outline is of general interest.

The ores, after crushing and ball-mill grinding, are reduced by flotation to a 5 per cent. concentrate. These concentrates contain, in addition to the platinum metals, copper and nickel sulfides and a small amount of gold. They are first roasted to a negligible amount of sulfur, then mixed with salt and heated with chlorine in a muffle. The temperature used is about 540° C., at which heat the platinum metals, as well as the copper and the nickel, are completely changed into soluble chlorides, while the temperature is too high for the chlorination of the gold. The current of chlorine is so controlled that practically all is absorbed, the amount used being 100 to 120 pounds per ton of concentrates. The platinum metals are changed into the very soluble sodium chloro-salts.

The chlorinated mass is leached with slightly acid water and the copper precipitated as the carbonate by finely ground limestone. This precipitate runs about 20 per cent. copper and can be smelted direct to blister copper. The small amount of platinum and iridium precipitated with the copper is recovered as anode sludge when the copper is electrolytically refined. After filtering from the copper precipitate, the platinum metals are precipitated by zinc dust, and after refiltering the solution is run through a zinc extractor for complete recovery of the platinum metals. The nickel present is then thrown down with bleaching powder. The chlorinated ore, after leaching, is treated by cyanidation for gold.

The novelty of the process consists in the chlorination of the platinum metals and the precipitation of the copper by limestone. The process has already passed beyond the laboratory stage, and works satisfactorily on semi-plant scale. It promises to be a solution of the difficult problem of handling the South African platinum ores.

JAS. LEWIS HOWE

WASHINGTON AND LEE UNIVERSITY

SPECIAL ARTICLES

SCATTERING OF QUANTA WITH DIMINUTION OF FREQUENCY

THE purpose of this note is to point out the correlation of several recent experiments on scattering of quanta with one another and with a very general principle which was foreshadowed some years ago, and has since then become more plausible through the demonstration that quanta and electrons alike possess some of the qualities of waves.

The notable experiments of Raman, verified and extended by several other physicists,[1] have shown that a quantum of sufficient frequency impinging upon a molecule may employ some of its energy in exciting the molecule, and continue on its way with the remainder, rebounding from the impact in the form of a quantum of diminished energy and augmented wave-length. The analogy with the electron is very close, for an electron may use part of its energy in exciting an atom, and rebound from the encounter in the form of an electron of diminished energy and augmented wave-length. In addition, various experimenters[2] have shown that a quantum impinging on a crystal may spend part of its energy in exciting vibrations of the sort which are responsible for Reststrahlen, and which are attributed to inter-atomic forces of the lattice; and having done this, the quantum may emerge with the balance of its energy and a correspondingly modified wave-length.

In the Compton effect—to use this term in its restricted sense—a quantum confers upon a free or nearly free electron a fraction of its energy, and goes onward with the remaining fraction, its wave-length being altered accordingly. In a sense, this case is at the opposite extreme from that which Raman observed, for the transferred energy goes into a non-quantized form. Cases intermediate between these two extremes are disclosed by two recent series of experiments. In those of Davis and Mitchell,[3] the scattered X-rays emerging from carbon (in the form of graphite) irradiated by the $K\alpha_1$ rays of molybdenum were found to comprise quanta which are evidently incident quanta which have given up an amount of energy just sufficient to extract an electron from the K-level of a carbon atom. The wave-length of these agrees within 4 per cent., as the authors point out, with the value predicted from this interpretation. There are two other sets of scattered quanta

[1] C. V. Raman and K. S. Krishnan, *Indian Jl. of Phys.*, March 31 and July 31 (1928); *Nature* (1928) *passim;* P. Pringsheim, *Naturwiss.*, August 3 (1928); R. W. Wood, *Nature*, Sept. 8 (1928).

[2] C. V. Raman, *ibid.;* G. Landsberg, L. Mandelstam, *Naturwiss.*, July 13 (1928).

[3] B. Davis and D. P. Mitchell, *Phys. Rev.*, 31: 1119; 32: 331–335 (1928).