It is noted that the 'age' and distribution of dissolved oxygen in Fig. 1 are of different character, indicating that the concentration of oxygen at depth is here a function of (presumably) biological activity rather than an index of the time since free exchange between air and sea was possible.

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[1] Rafter, T. A, and Fergusson, G. T., *N.Z.J. Sci. Tech.* B38 (8), 874 (1957).
[2] Brodie, J. W., and Burling, R. W., *Nature*, 181, 107 (1958).

Vaporization of Projectiles on Impact

DR. K. H. LIH, director of this Institute, has directed my attention to the article of Dr. F. P. Bowden and Mr. J. H. Brunton about the damage to solids by liquid impact[1]. It would be interesting to know if these authors have noticed the effect of 'explosion' of the water particles when they hit a hard surface at high speeds, similar to that which we observed when making experiments with different metal liners used in so-called 'hollow' or 'shaped' explosive charges; although, of course, the velocities of the liner particles far exceed those which Bowden and Brunton used for propelling their water drops. In the *Scientific Monthly* of February 1951, p. 79, it was remarked that: "Ballistic experiments have shown that particles, travelling at velocities about 4,250 ft./sec., *explode into vapour* on striking the target".

That this is actually so is proved by Fig. 1, which shows the surface of the second steel block (diameter 4 in., height 4 in.) hit by the jet particles which had already passed through the first block of the same dimensions; the vapour of the exploding metal particles condensed on the cold surface and left a white spot around the point of impact. That such spots are not produced by droplets of molten metal forced between the two blocks, but by the condensed vapour, was proved by the following experiment: a brass liner was fired into a steel block provided with several apertures running perpendicular to the jet passage; when the block was cut lengthwise it was discovered that at some places in these holes zinc vapour had condensed, which could only happen if at least part of the metal was in gaseous state.

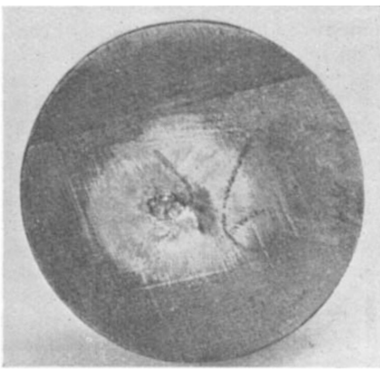

Fig. 1. Condensed metal vapours of exploding jet particles imprinted on the surface of the second steel block

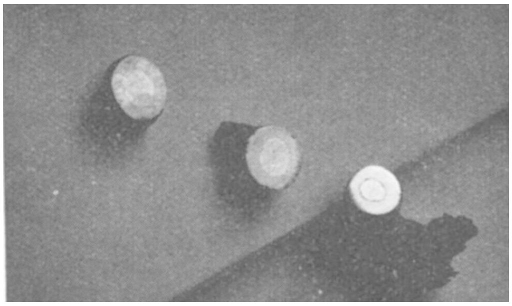

Fig. 2. Cross-sections of 'slugs' showing the copper cores

Fig. 2 explains the formation of the 'slug': small additional copper cones were fixed into the steel liners; the charges were fired horizontally into a sand box, and the metal fragments recovered. The 'slugs' were found to be solid steel bodies with a copper core, which proves that, contrary to some theories, the liners are not turned 'inside out'—at any event at the top—but simply compressed by the force of detonation and torn from the rest of the liners, the lower parts giving most of the high-velocity fragments which penetrate deeply.

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[1] *Nature*, 181, 873 (1958).

Effect of Solar Flares on Earth Satellite 1957β

FIG. 1 appears to demonstrate a correlation between the fluctuations in the rate of decrease of the period of satellite 1957β and contemporaneous variations in total intensity of solar flares.

The upper part of Fig. 1 is a block diagram with ordinates computed from the daily sum, over all observed flares, of their (area × duration). To aid comparison, I have plotted only the arithmetic mean of this sum over periods between successive satellite observations. The scale is shown by the arrow, which denotes the ordinate equivalent to 1,000 sq. deg. min./day (for example, 1 hr.-long class 3 flare per day). The data have been compiled from the Fraunhofer and Meudon daily Sun disks, and I am indebted to Mr. J. H. Reid, of the Royal Observatory, Edinburgh, for this information. For simplicity only flares of class 2 and above were included in the calculations.

The orbital data of the lower part of the figure were prepared from a graph of various observations published by the Royal Aircraft Establishment, Farnborough, for which I am indebted to Mr. D. G. King-Hele. The ordinates denote the difference between the observed rate of decrease of period and a theoretical figure for this quantity (relating to the same stage of the life-time). Because the theoretical rate varies monotonically with time, its introduction in no way obscures the fluctuations of the observed rate, but rather serves to facilitate their presentation. Similarly, the derivation of the theoretical figures used is immaterial in the context.

The similarity of the two sets of fluctuations, even in some small details, is suggestive. If it is conceded that it may not be purely coincidental, it would be