showed 'extrusion' markings as indicated in Fig. 3, and often other markings at right-angles to these are also observed.

The effect of the loss of this coherent material from the crystal surface must be to leave crevasses which will form very effective stress raisers. The mechanism by which this material is exuded from the surface is not clear, but it may be the result of slip movements as suggested in Fig. 4. Further investigations into this phenomenon are being made.

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¹ Forsyth, P. J. E., *J. Inst. Metals*, **80** (1951-52).

Softening of Cold-worked Metals under Cyclic Strains

It is well known that ductile metals in the soft condition work-harden progressively when subject to cyclic straining, for example, in fatigue testing. On the other hand, I have shown¹ that metals originally cold-worked soften when plastically deformed under conditions in which a Bauschinger effect is operative. Since a Bauschinger effect is to be expected whenever the original and superimposed methods of deformation differ, it can be anticipated that initially cold-reduced metals may soften when later exposed to cyclic plastic strains. This is confirmed by the following experiments (see graph).

Diagram (a) refers to a rod initially cold-drawn 15.6 per cent, and in the as-drawn condition extension curve *O* was obtained. After an additional single reversed torsion cycle of $0 \pm 45^\circ$ per in. of length, the extensometer record altered to *1x*, and after eight such cycles curve *8x* was recorded.

The nickel and Monel strips (*b*, *c*) were first cold-rolled 20 per cent and afterwards bent forwards

Effect of reversed torsion cycles (*a*) and reversed bending (*b*, *c*) on tensile properties of certain cold-worked metals

and backwards over a 4-in. diameter cylinder. Curves *O* refer to the as-rolled condition. The others were obtained after subjecting the strips to the indicated numbers of reversed bending cycles.

There was a fall of surface hardness, yield and tensile values in each case, and a pronounced increase of elongation in most cases. Similar results were obtained with copper and carbon steel and for initial reductions up to 60 per cent (to be reported in detail elsewhere). Relevant effects noted in industrial straightening of rod and wire² can thus be accounted for on a rational basis.

Thanks are due to Mr. H. W. G. Hignett (The Mond Nickel Co., Ltd., Birmingham) for presenting samples of nickel and 'Monel' metal.

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¹ Polakowski, N. H., *Nature*, **168**, 838 (1951); *J. Iron and Steel Inst.*, **169**, 337 (1951).

² Buck, M. P., and Britz, N. C., "Rod and Wire Production Practice", 30 (A.I.M.M.E., New York, 1949).

Perfluoroalkyl Nitroso Compounds

A PRELIMINARY study¹ of the photochemical properties of the first fluorocarbon iodide, trifluoroiodomethane, showed that a trifluoromethyl radical is produced the primary reactions of which parallel those of the hydrocarbon free radicals. A direct method thus became available for the preparation of perfluoroalkyl nitroso compounds, by irradiation of the iodide in the presence of nitric oxide and of mercury (to remove iodine), with the difference that the product would then be stable, in contrast to alkyl nitroso compounds, which dimerize, and re-arrange to form oximes². (Ruff and Giese³ had previously reported as a by-product of the action of elementary fluorine on silver cyanide containing the oxide and nitrate as impurities, a 1:1 mixture of CF_3NO and FCONF_2 , from which the former could not be separated. Some properties and reactions were recorded, not all of which agree with the present work, or with what one would expect of the compound perfluoroformamide.)

Assuming, as seems likely, that the aliphatic nitroso compound dimers have the same constitution as their aromatic analogues, the structures of which are known⁴, dimerization would here be inhibited by the strong inductive pull of the perfluoroalkyl group (cf. Pauling's adjacent charge rule⁵), and isomerization to form the aldoxime analogue would be impossible with the electronegative fluorine replacing hydrogen.

Perfluoro-1-nitrosopropane has been made by irradiating gas mixtures, at just below atmospheric pressure, of perfluoro-*n*-propyl iodide and nitric oxide (with a slight excess of the latter) in a silica bulb of 220 c.c. capacity containing about 5 c.c. of