LETTERS TO THE EDITOR*

COLD-WORKING OF METALS UNDER HYDROSTATIC PRESSURE

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It is generally considered that the work-hardening, which determines the mechanical properties of cold-worked metal, depends mainly on the amount of cold deformation. The nature of the stressed state under which the metal is cold-worked, affects work-hardening to a very much small extent.

In our case an attempt was made to find the effect of cold-working by elongation under conditions of high hydrostatic pressure on the mechanical properties of certain metals. Such experiments apparently make it possible to estimate in a straightforward way the effect of the spherical stress tensor on the process of plastic deformation and work-hardening in metals, which is of considerable value not only for the further clarification of the theoretical ideas developed by Academician Davidenkov [1] but also for solving certain problems associated with the working of metals under pressure.

The tests were carried out on the metals and alloys for which the chemical compositions and heat treatment conditions are shown in Table 1.

The test-pieces were first cold-worked by elongating the metal under high pressure to various degrees of strain and were then tested in uniaxial tension under atmospheric pressure.

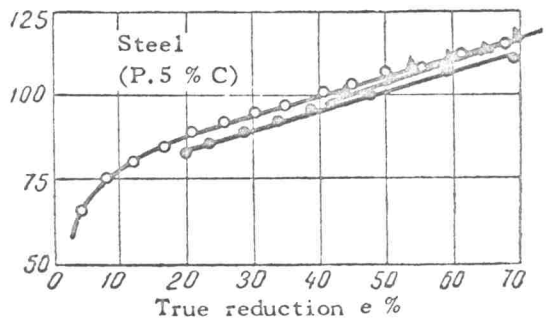

Fig. 1. Tensile test diagrams for St.50 specimens
●-●- after coldworking by elongation (e - 15 per cent) under 3500 atm, pressure;
0-0- no coldworking;
△-△- after coldworking by elongation (e - 40 per cent) under 3500 atm, pressure.

The cold-working under pressure was carried out in a special equipment for studying the mechanical properties of metals under high pressure [2]. The tests on the specimens under atmospheric pressure were carried out on a Type Im-4R machine. The diameter of the

TABLE 1

Material	Chemical composition %						Heat Treatment
	C	Mn	Si	Cu	Fe	Be	
Steel 50. . . .	0.45	0.60	0.05	—	—	—	Quench, temper at 700°C
Copper.	—	—	—	Ост.	0.05	—	Anneal at 600°C
Be bronze . .	—	—	—	Ост.	0.2	1.8	Water quench from 800°C

* *Fiz. metal. metalloved.*, 6, No.4, 761-768, 1958.