certain degree equivalent to raising the mechanical pressure. In this respect we achieved analogy with mechanical tests for tendencies to brittleness, when lowering the temperature is equivalent to raising the deformation rate.

There is every reason to suppose that deformation conditions like those formulated in [8] have been achieved in the experiments described with copper (and with aluminium if one allows for plastic deformation). A rise in temperature reduces the elasticity of the metal, lowers the yield point and greatly increases the tendency to stress relaxation. A peculiar phase transition of the recrystallization type occurs, relieving the shock hardening and softening the metal despite superficial refinement of the grains. In essence, such treatment is thermomechanical strengthening by shock waves.

CONCLUSIONS

1. On heating to a certain temperature total secondary recrystallization is observed in all the metals tested; it is caused by a high-pressure elastoplastic shock wave and related to the additional rise in the temperature of the compressed metal.

2. Very definite softening is observed in Armco iron and copper in a narrow range of pre-heating temperatures, and it is accompanied by refinement of the grains as compared with the original.

3. As a result of high-temperature thermomechanical shock wave treatment there is a considerable rise in the proof stress, tensile strength and hardness of iron.

4. The phenomena observed can be attributed to the existence of a peculiar form of phase transition at a certain critical pressure.

REFERENCES

1. F. A. Baum, K. P. Stanyukovich and B. I. Shekhter, *Fizika vzryva* (*Explosion Physics*) Moscow, Fizmatgiz (1959).

2. H. B. Dieter, *Sb. Mekh. uprochneniya tverd. tel* (Collection. *Strengthening Mechanisms of Solids*) Moscow, Izd. Metallurgiya (1965).

3. P. O. Pashkov, *Nauchnaya trudi Volgogradskogo Polytekh.* In-ta (1967).

4. P. Johnson, B. Stane and R. Davis, *Dinamich. issled. tverdykh tel pri vysok. davleniyikh* (Collection. *High-Pressure Dynamic Studies of Solids*) Moscow, Izd. Mir, 220 (1965).

5. T. Takahashi and W. A. Basset, *Science*, 145, No. 3641, 483 (1964).

6. N. N. Davidenkov, S. Ye. Belyayev and M. P. Markovets, *Zavodsk. Lab.*, 11, 964 (1945).

7. P. O. Pashkov, *Plastichnost' i razrush. metallov* (*Plasticity and Failure of Metals*) Moscow, Sudpromgiz (1950).

8. V. M. Volchkov, Z. M. Gelunova and P. O. Pashkov, *Fizika i khim. obrabotki meterialov*, 4, 101 (1967).

9. E. S. Atroshchenko, P. O. Pashkov and I. M. Ryadinskaya, *Fiz. metal. metalloved.*, 21, 92 (1965).

10. F. G. Zukas and C. M. Fowler, *Metall. Soc. Conf.*, 9. 343 (1961).

11. V. V. Brazhnev, and Z. M. Gelunova, *Metalloved i prochnost' materialov* (*Metallography and Strength of Materials*) Volgograd. Nizhne-Volzhskoye Izd-vo (1968).