5% Cr and also molybdenum, vanadium, and tungsten, the effect of low-temperature thermomechanical treatment is retained after tempering at temperatures up to 500°C, the plasticity remaining rather high. Low-temperature thermomechanical treatment of batches 8 and 10 followed by tempering at 500°C resulted in the following mechanical characteristics: \( \sigma_b = 240-255 \text{ kg/mm}^2 \) when \( \delta = 10-13\% \) and \( \psi = 30-35\% \); after tempering at 350°C \( \sigma_b = 255-265 \text{ kg/mm}^2 \), \( \delta_s = 8-12\% \), and \( \psi = 28-36\% \).

LITERATURE CITED

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EFFECT OF THERMOMECHANICAL TREATMENT
ON THE CUTTING ABILITY AND RESILIENCE
OF R9, R9F5, AND R10K5F5 STEELS

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It was found that low-temperature thermomechanical treatment at 400°C increases the cutting ability and resilience of R9 and R18 steels. Low-temperature thermomechanical treatment does not affect the cutting ability of high speed cutting tool steels containing cobalt, but does affect their resilience [1].

We investigated the effect of low-temperature thermomechanical treatment on the cutting ability and resilience of R9, R9F5, and R10K5F5 steels (Table 1). We attempted to determine the reason for the dependence of the cutting ability of R9 steel on the degree of swaging.

We also investigated the effect of high-temperature thermomechanical treatment on the cutting ability and resilience of these three steels.

The cutting ability of R9 steel can be increased considerably by low-temperature thermomechanical treatment, depending on the degree of swaging. The maximum cutting ability results from 15% swaging. When the degree of swaging is increased to 30% the cutting ability decreases somewhat, though not so much as found previously. Probably the cutting ability of R9 steel swaged more than 15% decreases at different rates for different batches of steel.

It was assumed that the increase of the cutting ability with the degree of swaging up to 15% is due to the increase of the wearability of the cutting edge and also to the increasing hot hardness of the ferrite base of the steel. Defects of the crystal lattice induced by plastic deformation at 400°C are quite stable at the temperatures reached...
by the cutting edge, and this increases the red hardness by 15-20°. The decrease of the cutting ability when the degree of swaging is increased to 30% may be due to an increased rate of carbide formation and spheroidization.

We determined whether low-temperature thermomechanical treatment affects the wearability of R9 steel at low temperatures, when the decisive factor is the resistance to abrasion. For this purpose we made pointed rods from steel subjected to low-temperature thermomechanical treatment at 400°C with 5-30% swaging. The rods were pressed into steel sockets. The pointed ends of the rods were flattened with a hammer to make chisels. The wearability of the samples was tested with a special apparatus [2]. The samples were subjected to wear on a disk of KhVG steel (HRC 45). The speed of the disk was 19 m/min.* The resistance to abrasion was tested at various specific pressures without cooling (under this condition the surfaces in contact reached 300-400°C — see Fig. 2) and also cooled with water (where the surface remained at room temperature). The wearability increases considerably with increasing degree of swaging, particularly at low degrees of swaging. Thus, the effect of 15% swaging is to increase the wearability by 230%. At 30% swaging the wearability increases another 10%. The dependence of the size of mosaic blocks on the degree of deformation in metals and alloys is similar to the dependence of the wearability on the degree of swaging. The smallest blocks occur at relatively low degrees of swaging.

The fact that the wear is a linear function of the specific pressure in logarithmic coordinates indicates that the wear is due to abrasion, and that there is no thermal effect.

We investigated the processes of carbide formation and the rate of the redistribution of elements between the α-solid solution and the carbide phase with the D. S. Shteinberg magnetometer [3].

It was found that low-temperature thermomechanical treatment decreases the tempering temperature at which the Curie point decreases by 100°, which indicates the decrease of the temperature at which the process of carbide

*The unit of specific wear was considered to be the wear of the volume of the sample corresponding to an area of 1 mm² over a length of 1 km.