where $\Delta r_k$ is the variation in the resistance of a single cable line.

The variations in the "scale factor" of the scale resistor amount to 2$\%$ for $r = 200 \, \Omega$ and $\Delta r_k = 1 \, \Omega$. Hence, for high precision measurements it is necessary to account for the effect of the cable, and for that purpose it is necessary to know its resistance.

By applying the above temperature-compensation method and taking into consideration the effect of the cable resistance on the measurements it becomes possible to employ, for measuring power assembly parameters, a technique which considerably simplifies the use of the measuring equipment.

**SEMIAUTOMATIC INSTRUMENT FOR DETERMINING THE ELASTIC LIMIT OF WIRE**

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It is necessary according to the specification for thin spring wire to determine with a high degree of accuracy its nominal torsional elastic limit $\tau_{0.06}$.

The Siebel-Pompa measurement technique and equipment are at present used for this purpose in mixed-production enterprises. The essence of this technique consists of the following. The free end of a vertically suspended wire is attached to a dial by means of which the wire is twisted through increasingly large angles until the residual angle amounts to its tolerance of 0.06%.

The sought-for elastic limit is calculated from the formula

$$\tau_{0.06} = 70 \frac{d}{l} \varphi_e,$$

where $d$ is the diameter of the sample; $l$ is the length of the operative part of the sample; $\varphi_e$ is the elastic torsion angle.

The drawbacks of this method consist of the instability of the instrument's operation, the lack of a dynamometer, a large dispersion and subjectivity in measurements, laboriousness, and the impossibility of conducting research by means of it.

The Ufa aviation institute and the Beloretsk steel wire plant have, therefore, developed a new method and produced a semiautomatic instrument for determining the technical torsional elastic limit of wire. By means of this instrument it is possible to measure accurately small torsion moments and plot torsion diagrams for wires 0.2 to 1.5 mm in diameter.

The new method is based on a parabolic approximation of the required part of the torsion diagram by means of a function of the form

$$M = B\varphi^m,$$

where $M$ is the torsional moment; $\varphi$ is the angle of torsion; $B$ and $m$ are the parameters of a parabola.

The value of parameter $m$ for thin spring wire is found from numerous experiments and printed data to be in the range of 0 to 1.

Two measurements of parabolic parameters $M_1$, $\varphi_1$ and $M_2$, $\varphi_2$ are required for drawing the curve through them and thus determining the approximating parabola:
In order to find quickly the elastic limit region, the full angle of the first twisting is determined from the formula

\[ \theta_1 = \theta_0 + \theta_c = \frac{2l}{d} \left( \frac{\tau_{\text{min}}}{G} \right) \]

where \( \tau_{\text{min}} \) is the minimum elastic limit according to the technical conditions; \( \theta_0 \) is the residual tolerated torsion angle; \( \theta_c \) is the torsion angle corresponding to the required elastic limit; \( G \) is the modulus of rigidity.

The relation between the total and the corresponding residual torsional angle is established by means of the theory of small elasto-plastic deformations.

From the similarity of the loading and unloading diagrams it follows that

\[ \left( \frac{M}{M_1} \right)^m = \frac{M}{M_1} \cdot \frac{\theta_1 - \theta_3}{\theta_1} + \frac{\theta_3}{\theta_1} \]

Since the value of the tolerated residual deformations is very small, the elastic limit can be determined from the formula

\[ \tau = \frac{16M}{\pi d^3} \]

An instrument has been developed to suit this method.

The torsional moment is measured on this instrument by means of torsion bar 1 (Fig. 1) which is twisted together with sample 2 fixed in the jaws of the grip. Moving coil 4 is rotated together with bar 1 in the field of electromagnet 3, thus disturbing the balance of currents in the ring detector of an electronic circuit. The difference current is amplified and fed to a microammeter (50 \( \mu \)A) whose scale is calibrated in torsional moments. The coil and electromagnet are fed from a voltage stabilizer consisting of SG3S tubes and an audio-frequency oscillator which uses tube 6N1P.

The loading mechanism is operated by a reversible motor DShS-2. Weights 5 are used for the axial tensioning of the sample. Dial 6 serves to read the full and residual twist angles.