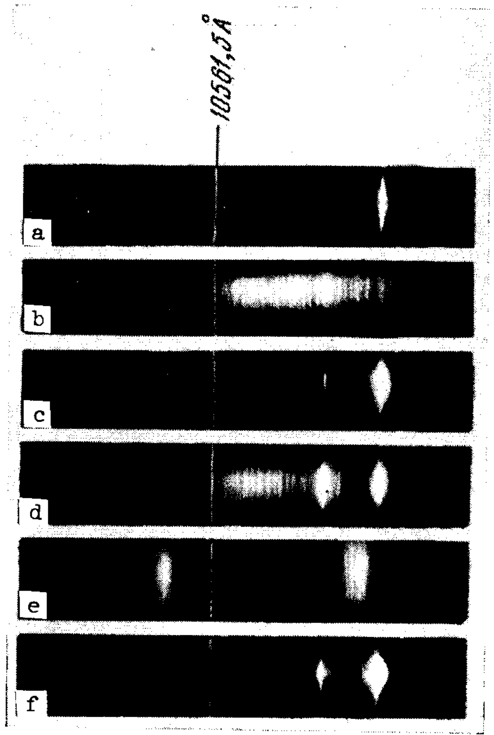
Fig. 3. Emission spectra: a - of $Y_3Al_5O_{12}:Nd^{3+}$ crystal, E_{exc} = 150 J, E_{thr} = 10 J; b - of LGS-6 glass, E_{exc} = 300 J, E_{thr} = 30 J; c - of $Y_3Al_5O_{12}:Nd^{3+}$ + LGS-6, E_{exc} = 500 J; d - of $Y_3Al_5O_{12}:Nd^{3+}$ + LGS-6, E_{exc} = 1200 J; e - of $Ca_2:YF_3:Nd^{3+}$ crystal, E_{exc} = 100 J, E_{thr} = 23 J; f - of $Y_3Al_5O_{12}:Nd^{3+}$ + $CaF_2:YF_3:Nd^{3+}$, E_{exc} = 1000 J. All spectra were obtained from one lasing pulse. The arrow indicates the reference line.



$5NaF:9YF_3$, $BaF_2:LaF_3$ and $SrF_2:LaF_3$, $LaF_3:SrF_2$ and $LaNa(MoO_4)_2$, and also LGS and KGSS glasses activated with Nd^{3+} ions. In the laser with the CAM, the efficiency was higher than in the lasers using simple crystals, and the spectral brightness was higher and E_{thr} lower in lasers based on media of the latter type. The active media for lasers with CAM can be combinations of crystals with liquids, gases, and other substances.

METHOD OF OBTAINING A STABLE SYSTEM OF PLASMA VORTICES

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Considerable interest attaches to an investigation of methods of obtaining plasma formations that are stable in the atmosphere. There are apparently many physical processes that lead to their occurrence. In [1,2] we considered some of the possible methods, based on the electrodynamic deformation of the current lines into plasma vortices.

It was shown, in particular, that in the case of electrodynamic deformation of a current line, the shape of which is described by the equation

$$x = b^{-a^2y^2} \quad (1)$$

there should be observed the formation of three plasma vortices. Owing to the magnetohydrodynamic interaction of the vortices and their interaction with the external medium, they should move to a stable-equilibrium position.

Investigations of the development of electric-discharge processes through a parabolic conducting shell [2] confirmed the foregoing assumptions. But the occurrence of a stable vortex system is possible also under electrodynamic deformation of a linear discharge subjected to longitudinal bending, of a form close to that described by Eq. (1). It is of no fundamental significance here whether this bending is caused by atmospheric inhomogeneity, distribution of the charges in the surrounding medium, or short-duration action of external electric fields.

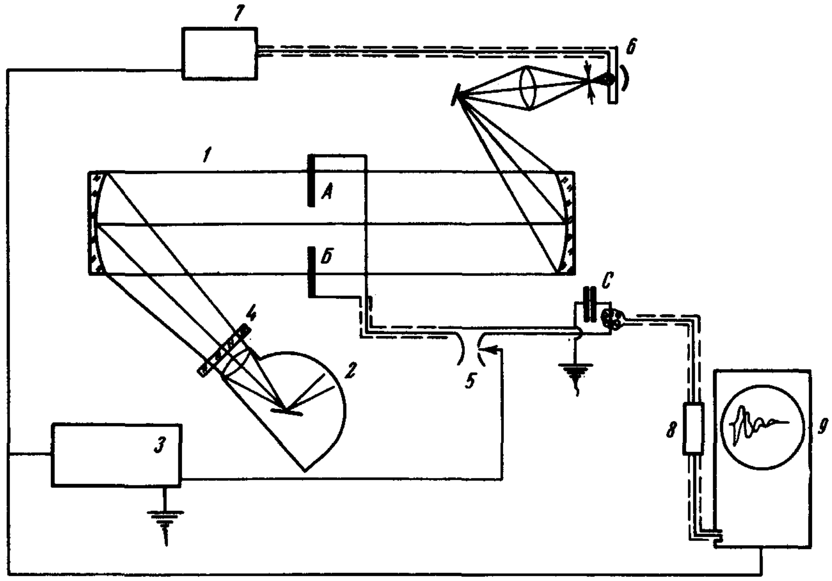

Fig. 1. Schematic diagram of setup for the observation of the electrodynamic deformation of bent current pinches: 1 - Toepler setup (IAB-451), 2 - motion picture camera (SFR-2M), 3 - control panel, 4 - SS-4 light filter, 5 - spark discharge gap, 6 - photoflash, 7 - photoflash power supply, 8 - integrating network, 9 - cathode ray oscilloscope (OK-17M).

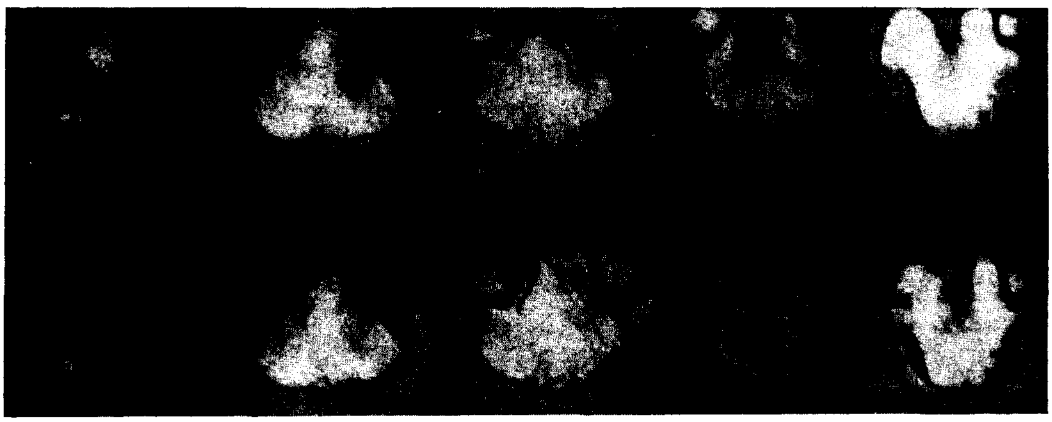

Fig. 2. Motion-picture frames of the processes occurring in electric explosions of a bent copper wire of 0.07 mm diameter. Photography speed 125 000 frames per second. We show groups of two frames each, the time interval between groups being 48 μsec.

It seemed of interest to investigate this possibility. We therefore used the setup illustrated in Fig. 1 to perform experiments on the electrodynamic deformation of the discharge channel obtained following an electric explosion of a copper wire of 0.07 mm diameter.

The developing processes were registered with the aid of a high-speed motion-picture camera (SFR-2M) using the IAB-451 Toepler setup. The wires were exploded by discharging a capacitor bank of 38.46 μF charged to 14 kV. The self-inductance coefficient of the discharge circuit was 6.9 μh and the maximum discharge current reached 36 kA. We registered in the experiments the oscillations of the current in the circuit and of the voltage directly across the discharge gap. An oscillatory discharge was observed.

It can be concluded from the experimental results that electrodynamic deformation of the discharge channel actually produces three vortices. As shown in the motion-picture frames (Fig. 2), the upper vortex, turning through some angle relative to the picture plane, shifts downwards. The two lateral vortices also change their position somewhat. A system of three vortices is produced and remains stable during the entire photography time (more than 1 msec).

Comparison of the motion picture with those of the explosion of straight wires bent in a different manner, and also with a series of motion pictures identical with those of Fig. 2, confirm the regularity of the observed phenomenon. It must be noted, however, that the process of vortex formation by this method is sensitive to the symmetry of the initial shape of the wire and to the magnitude of the discharge current.

[1] V. V. Balyberdin, in: Samoletostroenie i tekhnika vozdushnogo flota (Airplane Building and Aviation Engineering), Khar'kov State University, No. 4, 1965, p. 17.
[2] V. V. Balyberdin, ibid. No. 5, 1966, p. 3.

CHANGE OF CARRIER DENSITY IN ANTIMONY AND ARSENIC UNDER HYDROSTATIC COMPRESSION

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1. A new method was recently developed for the determination of the carrier density in semimetals. This method is convenient for the determination of the pressure dependence of the carrier density N(p) [1].

For compensated metals, whose Fermi surface is close to ellipsoidal, the following relation holds

$$\frac{2}{\pi e c}\int_0^\infty \sigma_{xx}(H)\,dH = N(q^{(+)} + q^{(-)}),$$

where $\sigma_{xx} = \rho_{xx}/(\rho_{xx}^2 + \rho_{xy}^2)$ is the conductivity in the basal plane of the crystal, ρ_{xx} and ρ_{xy} are the experimentally measured resistivity tensor component, $\vec{H}$ is the magnetic field, which is directed along the trigonal axis of the crystal, $N = N^{(+)} = N^{(-)}$ is the density of the holes or electrons, respectively, and $q^{(+)}$ and $q^{(-)}$ are certain dimensionless parameters (for the holes and electrons). An important factor is that these parameters depend only on the degree of anisotropy of the carrier-mobility tensor, and are quite stable against changes in