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On Explosion of Linearly Distributed Charge of Curvilinear Form Beneath the Ground Surface

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Abstract—In impulse statement, we consider a two-dimensional problem on explosion of a linearly distributed charge of curvilinear form beneath the ground surface. The problem is reduced to the study of the flow of an ideal fluid with a free surface. The flow area is conformally mapped onto a ring. A mapping is constructed by numerical-analytic method. We give the results of the calculation of the blowout funnel at various geometric and physical parameters.

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The impulse model of explosion has been proposed by M. A. Lavrent'ev [1]. In accordance with this model, the ground is assumed to be an ideal fluid with rates which are more than some limit rate V_0 on the boundary of explosion funnel. The problem about explosion of a linearly distributed charge on the ground surface has been solved in [2]. Solutions of a great number of problems by different models and sufficiently complete bibliography of boundary-value problems of theory of explosion are presented in [3] (P. 179). The inverse problem of theory of explosion has been considered in [4]. The problem about explosion of curvilinear charge has been solved in [5] based on the method proposed in [6].

Let us consider a flat potential stable flow of ideal weightless fluid in a part of plane $z = x + iy$, bounded by a curvilinear part AE (the boundary of charge), a straight part DC, on which the potential of rate equals zero, and a line of current BC (the boundary of explosion funnel, on which the module of rate is constant equals V_0). The axis x is directed down vertically; the axis y is directed on the horizontal surface (see Fig. 1).

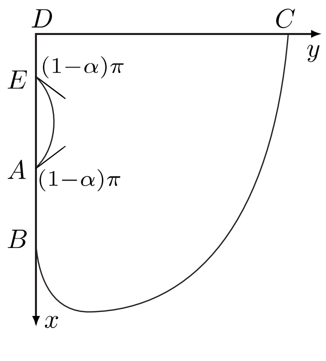

Fig. 1. Scheme of the flow.

Tangents to the curvilinear part AE at points A and E form angles $(1-\alpha)\pi$ and $\alpha\pi$, respectively, with the axis x, $|DE|/|AE| = h$.

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