CHERNOSVITOV, Yu.L.; VASIL'YEV, G.A.; DZENS-LITOVSKIY, A.I.;
MEL'NIKOV, I.I., nauchnyy red.

[Industry's requirements as to the quality of mineral raw materials; handbook for geologists] Trebovaniia promyshlennosti k kachestvu mineral'nogo syr'ia; spravochnik dlia geologov. Izd.2., perer. Moskva. Gosgeoltekhizdat. No.11 [Barite and witherite] Barit i Viterit. 1963. 41 p. No.70. [Bromine and iodine] Brom i iod. 1963. 47 p.
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KASHKAROV, O.D.; FIVEG, M.P.; ORLOVA, Ye.V., nauchn. red.; CHERNOSVITOV, Yu.L., nauchn. red.; FEDOROVA, L.N., red. izd-va; IVANOVA, A.G., tekhn. red.

[Industry's requirement as to the quality of mineral raw materials] Trebovaniia promyshlennosti k kachestvu mineral'nogo syr'ia; spravochnik dlia geologov. Izd.2., perer. Moskva, Gosgeoltekhizdat. No.22. [Potassium and magnesian salts] Kaliinye i magnezial'nye soli. 1963. 54 p. (MIRA 16:12)

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(Potassium salts) (Magnesium oxide)

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[Industry's requirements as to the quality of mineral raw materials; handbook for geologists] Trebovaniia promyshlennosti k kachestvu mineral'nogo syr'ia; spravochnik dlia geologov. Izd.2., perer. Moskva, Gosgeoltekhizdat. No.18.[Flint] Kremen'. 1963. 19 p. (MIRA 17:1)

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[Industry's requirements as to the quality of mineral raw materials; handbook for geologists] No.22.[Potassium and magnesian salts] Kaliinye i magnezial'nye soli. 1963. 54 p. (MIRA 17:1)

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EGEL', Lev Yeven'yevich; YERSHOV, A.D., glavnyy red.; ZUBREV, I.N., zam. glavnogo red.; GUDALIN, G.G., red.; KRASNIKOV, V.I., red. [deceased];KORESHKOV, B.Ya., red.; MOMDZHI, G.S., red.; POZHARITSKIY, K.L., red.; SMIRNOV, V.I., red.; SOLOVOV, A.P., red.; TROYANOV, A.T., red.; FILIPPOVSKAYA, T.B., red.; KHRUSHCHOV, N.A., red.; CHERNOSVITOV, Yu.L., red.; GINZBURG, A.I., red.vypuska; PROKOF'YEV, A.P., red.vypuska; SOKOLOVSKAYA, Ye.Ya., red.izd-va; BYKOVA, V.V., tekhn.red.

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[Titano-tantalo-niobates. Part 2.] Titano-tantalo-niobaty. Moskva, Nedra. Pt.2. 1964. 115p. (Geologiia mestorozhdenii redkikh elementov, no.23) (MIRA 18:1)

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[Industry's requirements as to the quality of mineral raw materials; a handbook for geologists] Trebovaniia promyshlennosti k kachestvu mineral'nogo syr'ia; spravochnik dlia geologov. Moskva, Nedra. Nos.9, 77. 1965. (MIRA 18:9)

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(MIRA 18:8)

CHERNOSVITOVA, T.N., kandidat meditsinskikh nauk (Leningrad, Muchnoy per. d.1/38, kv. 35)

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ALIKHANYAN, S.I.; CHERNOSVITOVA, V.I.; LYUBINSKAYA, S.I.

Some characteristics of the selection of highly active strains of penicillin-producing organisms. Antibiotiki 7 no.6:491-495 Je '62. (MIRA 15:5)

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paper to be presented at 2nd UN Intl. Conf. on the peaceful uses of Atomic Eneray, Geneva, 1 - 13 Sept 1958.

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report submitted for the Eighth Congress, Intl. Society of Surgery (Orthopedic and Traumatology, New York, N.Y., 4-10 Sep 60.

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CHERNOUDOV, Nikolay Nikolayevich; SUKHANOVSKIY, Aleksey Il'ich; GRIGOR'YEV, P.I., red.; MOROZOV, Yu.V., red. izd-va; SHITS, V.P., tekhn. red.

[Principal problems in planning production costs of the lumber industry in economic councils] Osnovnye voprosy praktiki planirovaniia sebestoimosti produktsii lesnoi promyshlennosti v sovnarkhozakh. Moskva, Goslesbumizdat, 1958. 59 p. (MIRA 11:9)
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Determining the maximal hygroscopicity of liamy soils. Pochvovedenie no.1:125-126 Ja '59. (MIRA 12:2)

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Methods of determining the rate of movement of the absorption line. Pochvovedenie no.11:102-104 N '59.
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1. Kaliningradskaya oblastnaya opytno-meliorativnaya stantsiya.

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Classification of phenomena and processes arising in connection with rock pressure in working ore deposits. Sbor. nauch. trud. KGRI no.13:66-69 '62. (MIRA 16:8)

(Rock pressure) (Mining engineering)

CHERNOUS, A.P., gornyy inzh.

Mechanical hardness of rocks from the Krivoy Rog iron ore basin. Sbor. nauch. trud. KGRI no.13:63-66 '62. (MIRA 16:8)

(Krivoy Rog Basin—Rocks—Testing)

MALAKHOV, G.M., prof., doktor tekhn. nauk; CH[illegible], A.P.

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MALAKHOV, G.M., prof., doktor tekhn.nauk; CHERNOUS, A.P., inzh.; SOSEDOV, O.O., otv.red.; SMOLDYREV, A.Ye., red.izd-va; LOMILINA, L.N., tekhn.red.; BERESLAVSKAYA, L.Sh., tekhn.red.

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MALAKHOV, Georgiy Mikhaylovich; CHERNOUS, Aleksandr Petrovich; KISELEV, Vyacheslav Mikhaylovich; SOSEDOV, O.O., otv. red.; SIPYAGINA, Z.A., red. izd-va; BOLDYREVA, Z.A., tekhn. red.

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(Krivoy Rog Basin—Mining engineering)

MALAKHOV, G.M., prof., doktor tekhn.nauk; TARAN, P.N., kand.tekhn.nauk;
CHERNOUS, A.P., gornyy inzh.

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(Timov, V.D.)

MALAKHOV, G.M., prof.; CHERNOUS, A.P., inzh.

Studies on the footwall rock deformation in the Kirvoy Rog Basin. Izv. vys. ucheb. zav.; gor. zhur. 8 no.7:3-8 '65. (MIRA 18:9)

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KNYAZHEVICH, D.M., inzh.; CHERNOUS, G.I., inzh.

Calculating the length of railroad lines instead of measuring them. Transp. stroi. 14 no.5:43 My '64. (MIRA 18:11)

IOGANSON, V.Ye.; CHERNOUS, K.A.

Torrential floods in the Novorossiysk region and their control by afforestation. Vop. geog. no.60:140-148 '63.
(MIRA 16:6)

(Novorossiysk region—Flood control)
(Novorossiysk region—Afforestation)

CHeRNOUS, V. A

130-3-18/21

AUTHORS: Razumovskaya, R. I. and Chernous, V.A., Section Heads of OTK

TITLE: Not given.

PERIODICAL: Metallurg, 1958, No.3, p.34 (USSR).

ABSTRACT: The authors discuss experience at the "Zaporozhstal'" Works in the curtailment of the technical quality control department's operations. They indicate that difficulties arose at these works through the mixing up of different types of steel when controllers were eliminated and stress the need for controllers in all operations where this is possible. They urge research organizations to develop methods of avoiding the mixing of steels and of automating and mechanizing the measurement of dimensions.

ASSOCIATION: "Zaporozhstal'" Works.

AVAILABLE: Library of Congress.

Card 1/1

ACC NR: AP6034553 SOURCE CODE: UR/0421/66/000/005/0152/0156

AUTHOR: Petrov, V. M. (Moscow); Chernous'ko, F. L. (Moscow)

ORG: none

TITLE: Determination of the shape of liquids in equilibrium under the effect of g-forces and surface tension

SOURCE: AN SSSR. Izvestiya. Mekhanika zhidkosti i gaza, no.5, 1966, 152-156

TOPIC TAGS: hydrostatics, fuel, ~~weightlessness, fuel tank,~~ hydrodynamics, ~~fuel supply system~~ gravitation field, fluid surface, incompressible fluid, surface tension

ABSTRACT: The hydrostatics and hydrodynamics of liquids subjected to gravitational and surface forces is of interest in connection with the study of the behavior of liquids in weak gravitational fields and under conditions of weightlessness. In the present study, the shape of the contact surface between two liquids in a vessel was analyzed in the presence of gravitational and surface forces by the method of local variations developed previously by the author (Chenoushko, F. L., Metod lokal'nykh variatsiy dlya chislennogo resheniya variatsionnykh

ACC NR: AP6034553

zadach. Zh. vychislit. matem. i matem. fiziki, 1965, t.5, no.4.). It was assumed that a stationary vessel containing two incompressible fluids with surface tensions α_1 and α_2 and densities ρ_1 and ρ_2 is located in a uniform field of mass forces. The walls of the vessel are assumed to be cylindrical. In the absence of surface tension, the shape of the contact surface is flat. Fig. 1 shows the representations used in the formulation of the problem. In the diagram, z(x,y) is the displacement of the contact surface above the plane xy; D is the projection of the surface S on the surface xy.

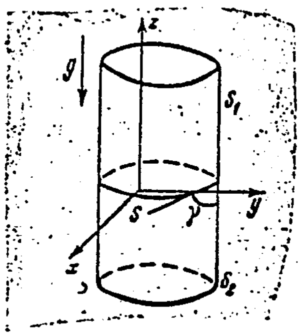

Fig.1 Representations used for formulation of problem

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The solution was based on the minimization of the two functionals:

$$\Pi(u)=\iint\limits_D\left(\sqrt{1+u_x^2+u_y^2}+\frac{B}{2}u^2\right)dx\,dy-\cos\gamma\oint\limits_\Gamma u\,dl$$

$$J(v)=\Pi(v)+\lambda V(v)=\iint\limits_D\left(\sqrt{1+v_x^2+v_y^2}+\frac{B}{2}v^2+\lambda v\right)dx\,dy-\cos\gamma\oint\limits_\Gamma v\,u\,dl$$

where $u=z/l$; $B=\frac{(\rho_2-\rho_1)g\,l^2}{\alpha}$ (Bond number); $v(x,y)$ represents a minimum of the functional $J(v)$; and Γ is the boundary of D. Numerical computer calculations were made for the regions of D in the square $0<x<1, 0<y<1$ and in the rectangle $0<x<1, 0<y<2$. Some of the results are shown in Figures 2 and 3.

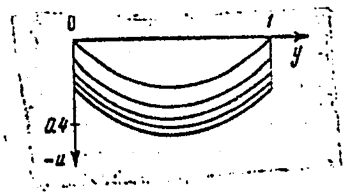

Fig.2. Cross sections at x=0,0.1,0.2,0.3, and 0.5 of the same free surface calculated for the square B=2 and α=60°.

ACC NR: AP6034553

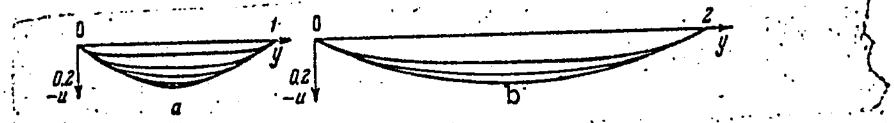

Fig.3 Dependence of the solution on the Bond number a-For Bond numbers 200,40,4.1,0.1; b-Bond numbers 20,4.1. The figure shows that with decreasing B the curvatures of the free surface increases; at B=1 and B=0.1,the surfaces are close to each other. This shows that with decreasing B, the free equilibrium surface rapidly approaches the shape at B=0,i.e., at weightlessness. The method of local variations can also be used for a vessel of arbitrary shape. Orig.art. has: 15 formulas and 5 figures. [WA-88]

SUB CODE: 20/ SUBM DATE: 09Jun66/ ORIG REF: 008/ OTH REF: 000/
SOV REF: 000

Card 4/4

ACC NR: AP7000775 SOURCE CODE: UR/0208/66/006/006/0947/0961

AUTHORS: Banichuk, N. V. (Moscow); Petrov, V. M. (Moscow); Chernous'ko, F. L. (Moscow)

ORG: none

TITLE: A numerical solution of variational and boundary problems by the method of local variations

SOURCE: Zhurnal vychislitel'noy matematiki i matematicheskoy fiziki, v. 6, no. 6, 1966, 947-961

TOPIC TAGS: numerical solution, variational problem, dynamic programming, algorithm, digital computer, variational calculus

ABSTRACT: An algorithm for numerical solution of variational problems for functions of two independent variables is presented. The algorithm makes use of the method of local variations (F. L. Chernous'ko. Metod lokalnykh variatsii dlya chislennogo resheniya variatsionnykh zadach. Zh. vychisl. matem. i matem. fiz., 1965, 5, No. 4, 749--754). The variational problem is stated as: It is required to find a function of two variables u (x,y), defined in the domain D of the xy plane, satisfying the constraints u = g(x,y) on C and

$$(x, y, u) \in U, \text{ in D},$$

$$(x, y, u, u_x, u_y) \in G \text{ in D},$$

 UDC: 519.3:518

ACC NR: AP7000775

and minimizing the functional

$$I = \iint_D f(x, y, u, u_x, u_y)\, dx\, dy.$$

The subscripts x and y denote partial derivatives; C - the boundary of D (a closed edge); U - a given set in three-dimensional space x, y, and u; G - a given set in the five-dimensional space x, y, u, u_x, u_y; f,g - given functions. The logic of the algorithm is broken down into specific steps which correspond to subprograms of a computerized routine. Several problems of this type were analyzed on a "Strela" digital computer. Some example solutions are demonstrated. The authors express thanks to I. A. Krylov and S. A. Solov'yeva for their attention to the development of the program. Orig. art. has: 28 equations and 8 figures.

SUB CODE: 12/ SUBM DATE: 14Dec65/ ORIG REF: 008/ OTH REF: 002

Card 2/2

CHERNOUSENKO, A.P., inzh.

Grinding hard-alloy metal-cutting tools. Mashinostroitel' no.12:10-12 D '59. (MIRA 13:3)
(Metal-cutting tools) (Grinding and polishing)

CHERNOUSENKO, Aleksey Pavlovich; VERZHBINSKAYA, I.I., inzh., red.; SHILLING, V.A., izd.red.; GVIRTS, V.L., tekhn.red.

[Sectional abrasive disk with automatic regulation of the pressure on machined surface] Kombinirovannyi abrazivnyi krug s avtomaticheskim regulirovaniem davleniia na obrabatyvaemuiu poverkhnost'. Leningrad, 1960. 16 p. (Leningradskii dom nauchno-tekhnicheskoi propagandy. Obmen peredovym opytom. Seriia: Mekhanicheskaia obrabotka metallov, vyp. 8). (MIRA 14:3)
(Grinding wheels)

CHERNOUSENKO, A.P.

Abrasive machining of hard alloy plates and tools on flat-surface grinding machines. Mashinostroitel' no.5:29-30 My '60. (MIRA 14:5)

(Grinding and polishing)

LARIN, M.N., doktor tekhn.nauk, prof.; TSYGANOVA, M.P., inzh.; TAMBOVTSEV, S.S., kand. tekhn. nauk; MITYAKOV, A.V., inzh.; PETROSYAN, L.K., kand. tekhn. nauk; CHERNOUSENKO, A.P., inzh.; BUDNIKOV, N.Ye., inzh.; MARTYNOV, A.D., kand. tekhn. nauk; IVANOVA, N.A., red. izd-va; GORDEYEVA, L.P., tekhn. red.

[High-production designs of form cutters and their efficient use] Vysokoproizvoditel'nye konstruktsii fasonnykh frez i ikh ratsional'naia ekspluatatsiia. Pod red. M.N.Larina. Moskva, Mashgiz, 1961. 174 p. (MIRA 14:12)

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(Metal-cutting tools)

CHERNOUSENKO, A.P. 17

PHASE I BOOK EXPLOITATION SOV/5581

Moscow. Dom nauchno-tekhnicheskoy propagandy.

Vysokoproizvoditel'nyy rezhushchiy instrument [sbornik] (Highly Productive Cutting Tools; Collection of Articles) Moscow, Mashgiz, 1961. 354 p. Errata slip inserted. 10,000 copies printed.

Sponsoring Agency: Obshchestvo po rasprostraneniyu politicheskikh i nauchnykh znaniy RSFSR. Moskovskiy dom nauchno-tekhnicheskoy propagandy imeni F. E. Dzerzhinskogo.

Ed. (Title page): N. S. Degtyarenko, Candidate of Technical Sciences; Ed. of Publishing House: I. I. Lesnichenko; Tech. Ed.: Z. I. Chernova; Managing Ed. for Literature on Cold Treatment of Metals and Machine-Tool Making: V. V. Rzhavinskiy, Engineer.

PURPOSE : This collection of articles is intended for technical personnel of machine, instrument, and tool plants.

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Highly Productive Cutting Tools (Cont.) SOV/5581

COVERAGE: The collection contains information on the following: new brands of high-speed steels and hard alloys; designs of built-up tools and tools for the machining of holes; tools for machining heat-resisting and light-metal alloys and plastics; tools for unit-head machines and automatic production lines; and methods for the sharpening and maintenance of carbide-tipped tools. No personalities are mentioned. There are 56 references, mostly Soviet. References accompany some of the articles.

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CHERNOUSENKO, N.V.

B.F. Verigo's research in the field of immunity; on the one-hundredth anniversary of his birth. Zhur. mikrobiol., epid. i immun. 40 no.2:117-119 F '63. (MIRA 17:2)

1. Iz Instituta epidemiologii i mikrobiologii imeni Gamalei AMN SSSR.

[illegible] device [illegible]

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ABSTRACT: This Author Certifica[illegible] order and accuracy of operation [illegible] creating an artificial magnetic [illegible] moving it from the object and wi[illegible] magnetic field, the earth's mag[illegible] ficial magnetic field whose magn[illegible] An artificial field of the earth[illegible] plane, can be reproduced; this a[illegible] pass. A device applying this me[illegible] imitating the earth's magnetic fi[illegible]

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ACC NR: AP6000015 WW/EM SOURCE CODE: UR/0208/65/005/006/1049/1070

AUTHOR: Chernous'ko, F. L. (Moscow)

ORG: none

TITLE: Motion of rigid bodies having cavities filled with a viscous liquid at small Reynolds numbers

SOURCE: Zhurnal vychislitel'noy matematiki i matematicheskoy fiziki, v. 5, no. 6, 1965, 1049-1070

TOPIC TAGS: aerospace structure, viscous fluid, fluid mechanics, hydrodynamics, incompressible fluid, boundary value problem, ordinary differential equation, small parameter

ABSTRACT: The general problem of the motion of a viscous, incompressible liquid in a cavity in a solid body and of the motion of a solid body having a cavity filled with liquid is analyzed under the assumption that the Reynolds number of the liquid is small. The solution of the hydrodynamic problem is reduced to the solution of three linear boundary-value problems which can be solved only for the particular shape of the cavity. It is indicated that the Galerkin method can be used for the numerical solution of these boundary-value problems (in a manner analogous to that used for solving the boundary-value problems in the theory of elasticity). The exact solution of linear boundary-value problems is presented for cavities with particular shapes (spheres, ellipsoids, etc.). The obtained solutions of the hydrodynamic problem were used as the basis for deriving a system of ordinary differential equations describing the motion of a body having a cavity filled with

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liquid. It is shown that this system can be considered as a system of equations with a small parameter multiplying the derivatives and that asymptotic methods can be applied to the solution of the system. The plane motion of a body having a cavity filled with liquid around the fixed axis and a free three-dimensional motion of such a body-liquid system around the center of mass are analyzed as particular examples. Orig. art. has: 2 figures and 69 formulas. [LK]

SUB CODE: 20/ SUBM DATE: 03Jul64/ ORIG REF: 014/ OTH REF: 001/ ATD PRESS: 4161

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AUTHOR: Chernous'ko, F.L. (Moscow)

TITLE: Converging Shock Waves in a Gas With a Variable Density

PERIODICAL: Prikladnaya matematika i mekhanika, 1960, Vol. 24, No. 5, pp. 885-896

TEXT: The author considers shock waves converging to the center or the axis of symmetry in a gas with a variable density. It is assumed that the gas is resting in the initial state, that the pressure is constant, and that the density is given by $\varrho = \omega r^s$, where r is the distance from the plane, the axis or the center of symmetry. The situation of the converging shock wave is described by $r(t) = a(-t)^{\delta}$, $\delta > 0$, $a > 0$. It is stated that self-modeling solutions can be constructed only then if $s \leqslant 2(\nu - 1)$ and δ satisfies the condition

$$0 \leqslant \frac{1}{\delta} - \frac{2+s}{2} \leqslant \frac{\gamma(\nu-1)}{2} V_o^2 , \qquad (1.14)$$

where

$$V_o = \frac{2}{2-\gamma}\left\{1 - \sqrt{1 - \frac{2-\gamma}{2}\left[1 - \frac{s}{2(\nu-1)}\right]}\right\},$$

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Converging Shock Waves in a Gas With a Variable Density

Here $\nu = 1$ holds for plane waves, $\nu = 2$ for cylindrical waves and $\nu = 3$ for spherical waves, γ is the adiabatic exponent. Here the case $\delta < 2/(2+s)$ corresponds to strong waves and the case $\delta = 2/(2+s)$ corresponds to moderate waves.
For $s \gtrless 2(\nu - 1)$ the trivial solution is the single self-modeling solution. In this case the author performs a linearizing of the motion equations and states that here the waves decrease towards the center of symmetry. The author mentions Ya.B.Zel'dovich. He thanks S.S.Grigoryan for the leading of the work. There are 2 figures and 7 references: 5 Soviet, 1 German and 1 English.

SUBMITTED: May 18, 1960

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AUTHORS: Grigoryan, S. S., Chernous'ko, F. L. (Moscow)

TITLE: The one-dimensional quasistatic motions of the ground

PERIODICAL: Prikladnaya matematika i mekhanika, v. 25, no. 1, 1961, 86-100

TEXT: The present paper deals with a general investigation of the one-dimensional motion of a medium with slow changing of the external stresses applied, if the acceleration in the equations of motion may be neglected. Such motions are described as quasistatic. They are investigated in cartesian, cylindrical and spherical systems of coordinates for motions with plane, cylindrical and central symmetry. For the stress tensors and deformation rates (1.1), (1.2), (1.3), (1.4) then holds.

$$\sigma_{xx} = \sigma, \quad \sigma_{yy} = \sigma_{zz} = \sigma_1, \quad 3p = -(\sigma + 2\sigma_1) \qquad e_{xx} = \frac{\partial u}{\partial x}, \quad e_{yy} = e_{zz} = 0 \tag{1.1}$$

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для $\nu = 1$

$$\sigma_{xx} = \sigma, \quad \sigma_{\theta\theta} = \sigma_1, \quad \sigma_{zz} = \sigma_2, \quad 3p = -(\sigma_1 + \sigma_2 + \sigma_3)$$

$$e_{xx} = \frac{\partial u}{\partial x}, \quad e_{\theta\theta} = \frac{u}{x}, \quad e_{zz} = 0 \qquad (1.1)$$

для $\nu = 2$

$$\sigma_{xx} = \sigma, \quad \sigma_{\theta\theta} = \sigma_{\varphi\varphi} = \sigma_2, \quad 3p = -(\sigma + 2\sigma_1)$$

$$e_{xx} = \frac{\partial u}{\partial x}, \quad e_{\theta\theta} = e_{\varphi\varphi} = u/x$$

where u is the only non-vanishing component of the velocity vector. For a one-dimensional motion the following holds:

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$$\frac{d\rho}{dt} + \rho\frac{\partial u}{\partial x} + \nu\frac{u\rho}{x} = 0, \quad \rho\frac{du}{dt} = \frac{\partial\sigma}{\partial x} + \nu\frac{\sigma - \sigma_1}{x}$$

$$\frac{d(\sigma + p)}{dt} + \lambda(\sigma + p) = 2G\left[\frac{\partial u}{\partial x} - \frac{1}{3}\left(\frac{\partial u}{\partial x} + \nu\frac{u}{x}\right)\right] \tag{1.2}$$

$$\frac{d(\sigma_1 + p)}{dt} + \lambda(\sigma_1 + p) = 2G\left[\delta\frac{u}{x} - \frac{1}{3}\left(\frac{\partial u}{\partial x} + \nu\frac{u}{x}\right)\right]$$

$$\frac{d(\sigma_2 + p)}{dt} + \lambda(\sigma_2 + p) = 2G\left[0 - \frac{1}{3}\left(\frac{\partial u}{\partial x} + \nu\frac{u}{x}\right)\right]$$

$$p = f(\rho, \rho_*)\,e(\rho_* - \rho)\,e(\rho - \rho_0) \equiv f^\circ(\rho, \rho_*), \quad \frac{d\rho_*}{dt} = \frac{d\rho}{dt}\,e(\rho - \rho_*)\,e\left(\frac{d\rho}{dt}\right)$$

где $J_2 < F(p)$ и

$$J_2 \equiv \tfrac{1}{2}[(\sigma + p)^2 + (\sigma_1 + p)^2 + (\sigma_2 + p)^2] \text{ при } \nu = 1$$

$$J_2 \equiv \tfrac{1}{2}[(\sigma + p)^2 + 2(\sigma_1 + p)^2] \text{ при } \nu \neq 1 \tag{1,3}$$

The one-dimensional quasistatic ...

$$\lambda = \frac{2GW - F'(p)\,dp/dt}{2F(p)} e\,[J_2 - F(p)]\, e\left[2GW - F'(p)\frac{dp}{dt}\right]$$

$$2GW \equiv 2G(\sigma + p)\left(\frac{\partial u}{\partial x} - \delta\frac{u}{x}\right) \text{ при } \nu \neq 1 \qquad (1.4)$$

$$2GW \equiv 2G\left[(\sigma + p)\frac{\partial u}{\partial x} + (\sigma_1 + p)\frac{u}{x}\right] \text{ при } \nu = 1 \qquad (1.4)$$

$$e(a) = \begin{cases} 1, & a \geqslant 0, \\ 0, & a < 0, \end{cases} \qquad \delta = \begin{cases} 0, & \nu = 0 \\ 1, & \nu = 1,2 \end{cases}$$

The authors then go over to Lagrange variables and obtain (1.6).

$$\frac{\partial}{\partial t}(\rho x_a x^\nu) = 0, \qquad \rho x_a x_{tt} = \sigma_a + \nu\frac{\sigma - \sigma_1}{x} x_a \qquad (1.6)$$

$$\frac{\partial}{\partial t}(\sigma + p) + \lambda(\sigma + p) = \frac{4G}{3}\left(\frac{\partial \ln x_a}{\partial t} - \frac{\nu}{2}\frac{\partial \ln x}{\partial t}\right)$$

$$\frac{\partial}{\partial t}(\sigma_1 + p) + \lambda(\sigma_1 + p) = -\frac{2G}{3}\left[\frac{\partial \ln x_a}{\partial t} - (3\delta - \nu)\frac{\partial \ln x}{\partial t}\right]$$

With a further substitution there follows (1.8).

$$\rho y_z = \varphi(z)$$

$$\frac{\rho y_z}{(\nu+1)^2} y^{-\frac{2\nu}{\nu+1}}\left(y_{tt} - \frac{\nu}{\nu+1}\frac{y_t^2}{y}\right) = \sigma_z + \frac{\nu}{\nu+1}\frac{\sigma-\sigma_1}{y} y_z \qquad (1.8)$$

$$\frac{\partial}{\partial t}(\sigma+p) + \lambda(\sigma+p) = \frac{4G}{3}\frac{\partial}{\partial t}\left[\ln y_z - \frac{3\nu}{2(\nu+1)}\ln y\right]$$

$$\frac{\partial}{\partial t}(\sigma_1+p) + \lambda(\sigma_1+p) = -\frac{2G}{3}\frac{\partial}{\partial t}\left[\ln y_z - \frac{3\delta}{\nu+1}\ln y\right]$$

First, the plane case ($\nu = 0$) is investigated. With an elastic displacement (i.e. with $\lambda = 0$) it follows from (1.8) and (1.9) with $G = G(\rho)$ and with $t = 0$, $\rho = \rho_{00}$, $\sigma + p = 0$ (2.1), where $\rho(t)$ and $y_1(t)$ are arbitrary functions.

$$\rho y_z = \rho_{00}, \quad \sigma_z + \frac{\nu}{\nu+1}\frac{\sigma - \sigma_1}{y} y_z = 0 \tag{1.9}$$

$$\sigma = -f^\circ(\rho, \rho_*) - \frac{4}{3}\int_{\rho_{00}}^{\rho} \frac{G(\rho)}{\rho} d\rho, \quad \sigma_1 = -f^\circ(\rho, \rho_*) + \frac{2}{3}\int_{\rho_{00}}^{\rho} \frac{G(\rho)}{\rho} d\rho, \tag{2.1}$$

$$\rho = \rho(t), \quad y = \frac{\rho_{00}}{\rho} z + y_1(t)$$

A plastic displacement occurs with $\int_{\rho_{00}}^{\rho} \frac{G}{\rho} d\rho = \pm\sqrt{\frac{3}{4} F\left[f^\circ(\rho, \rho_*)\right]}$.

The upper sign here corresponds to the compression of the medium. With plastic displacement, $\frac{3}{4}(\sigma + p)^2 = F(p)$ holds, and in the first two formulas in (2.1) then $\sigma = -f^\circ(\rho, \rho_*) \pm \sqrt{3F\left[f^\circ(\rho, \rho_*)\right]}$,

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$\sigma_1 = -f^0(\rho,\rho_*) \pm \sqrt{3F[f^0(\rho,\rho_*)]}$ (2.3) holds. If the plastic motion begins with an expansion, i.e. with $\partial\rho/\partial t = 0$, it remains conserved up to the end of the expansion, viz. up to fracture ($\rho = \rho_0$). If, however, it began with compression, it may remain conserved according to the nature of the functions f^0 and F or it may go over to an elastic displacement. The latter is the case especially if p increases infinitely with increasing ρ, but $F(\rho)$ remains bounded. For the spherical case, monotonic cases of stress and relieving of stress are investigated on the basis of the initial homogeneous state. There then exists also a unique relation $p = \varphi(\rho)$. In the initial stage (3.1), (3.2), (3.3) hold.

$$\sigma + p = \tfrac{4}{3}G\left(\ln y_z - \ln\frac{y}{z}\right), \quad \sigma = -\varphi\left(\frac{\rho_{00}}{y_z}\right) + \tfrac{4}{3}G\ln\frac{y_z z}{y} \qquad (3.1)$$

$$\sigma_1 = -\varphi\left(\frac{\rho_{00}}{y_z}\right) - \tfrac{2}{3}G\ln\frac{y_z z}{y}, \quad y_z = \frac{\rho_{00}}{\rho}$$

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$$y_{zz} = \psi(y_z)\frac{y_z}{z}\left[\frac{zy_z}{y}\left(1-\ln\frac{zy_z}{y}\right)-1\right] \qquad (3.2)$$

$$\psi(y_z) = \left[1+\frac{3\rho_{00}\varphi'(\rho_{00}/y_z)}{4Gy_z}\right]^{-1} = \left(1+\frac{3\varphi'\rho}{4G}\right)^{-1} \leqslant 1 \qquad (3.3)$$

By determining y(z) with the corresponding boundary conditions, one obtains the complete solution of the problem. With elastic deformation, density is a non-decreasing function of the distance from the center. The remaining properties result from (3.7). $\rho = \rho_{00}/q$, $p = \varphi(\rho_{00}/q)$,

$$\sigma = -\varphi(\rho_{00}/q) + \frac{4}{3}G\ln\frac{q}{\alpha}, \quad \sigma_1 = -\varphi(\rho_{00}/q) - \frac{2}{3}G\ln\frac{q}{\alpha};$$

$$\ln z = \int\frac{d\alpha}{q-\alpha}, \quad y = z\alpha \qquad (3.7).$$ In the case of plastic displacements

$$\sigma = -p \pm \frac{2}{3}\sqrt{3F(p)}, \quad \sigma_1 = -p \mp \frac{1}{3}\sqrt{3F(p)} \qquad (4.1)$$ holds. The fundamental

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equation in plastic deformation reads

$$-\left[-1\mp\frac{F'(p)}{\sqrt{3F(p)}}\int\varphi'\,\frac{\varrho_{00}}{2}\right]\frac{y_{zz}}{y_z}\pm\frac{2}{3}\sqrt{3F(p)}\,\frac{y_z}{y}=0 \quad (4.2).$$

By integration one obtains:

$$y=\frac{A}{\sqrt{3F(p)}}\exp\left[\pm\frac{3}{2}\int\frac{dp}{\sqrt{3F(p)}}\right] \quad (4.3).$$

$A = A(t)$ denotes an integration constant. (4.3) and (4.4) supply the solution of (4.2) with the two arbitrary constants A. and B.

$$\frac{dz}{dp}=\frac{dJ}{dp}\frac{1}{y_z}=\frac{\rho(p)}{\rho_{00}}\left\{\pm\frac{A}{2F(p)}\left[1\mp\frac{F'(p)}{\sqrt{3F(p)}}\right]\exp\left[\pm\frac{3}{2}\int\frac{dp}{\sqrt{3F(p)}}\right]\right\}$$
$$z=\pm\frac{A(t)}{2\rho_{00}}\int\left\{\frac{\rho(p)}{F(p)}\left[1\mp\frac{F'(p)}{\sqrt{3F(p)}}\right]\exp\left[\pm\frac{3}{2}\int\frac{dp}{\sqrt{3F(p)}}\right]\right\}dp+B(t) \quad (4.4)$$

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An integral curve beginning at a point of the boundary no longer intersects this boundary. The continuation of an arbitrary integral curve from the elastic into the plastic region, which is realizable in a single way, remains fully in the plastic region. In the plastic region $\lambda > 0$ everywhere holds. In the plastic region, further

$$\lambda = \pm\frac{1}{\sqrt{3F(p)}}\left\{\frac{\partial}{\partial t}\left[2G\ln\frac{q}{\alpha}\mp\sqrt{3F(p)}\right]\right\}e\,[J_2 - F(p)]\times$$

$$\times\, e\left\{\pm\frac{\partial}{\partial t}\left[2G\ln\frac{q}{\alpha}\mp\sqrt{3F(p)}\right]\right\} \quad (5.1)$$

always holds. Differentiation with respect to t means differentiation with fixed z and is equivalent to differentiation on monotonically changing boundary parameters. Finally, the solutions of the boundary problems determined in the present paper are described in detail. There are 6 figures and 3 Soviet-bloc references.

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AUTHOR: Chernous'ko, F.L. (Moscow)

TITLE: The reflection of converging weak shock waves in a gas of variable density

PERIODICAL: Prikladnaya matematika i mekhanika, v. 25, no. 2, 1961, 209 - 217

TEXT: This article is a continuation of the author's previous work (Ref. 1: Skhodyashchiyesya udarnyye volny v gaze peremennoy plotnosti, PMM, 1960, v. XXIV, vyp. 5), in which spherical, cylindrical and plane shock-waves in a gas of variable density are considered. The initial (unperturbed) state of the gas is given by

$$p \equiv p_0, \quad \rho = \omega r^s, \quad v \equiv 0 \qquad (1)$$

where r, p, ρ, v, measured from the center (axis or plane) of symmetry, are the pressure, density and velocity [Abstractor's note: One quantity seems not to be defined], and p_0, s, ω are con-

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stants. The number $\nu = 1, 2, 3$ corresponds to the case of plane, cylindrical, and spherical waves respectively. In the case $s > 2(\nu - 1)$ a linearized solution is possible. In this article use is made of the basic Poincaré-Lighthill-Go method and of the results observed by L.D. Landau (Ref. 3: Ob udarnykh volnakh na dalekikh rasstoyaniyakh ot mesta ikh vozniknoveniya, PMM, 1945, t. IX, vyp. 4) and K.Ye. Gubkin (Ref. 4: Rasprostraneniye razryvov v zvukovykh volnakh, PMM, 1958, t. XXII, vyp. 4). With $s > 2(\nu - 1)$ and $u(r,t)$ - the displacement from the initial position, the equation of 1-dimensional adiabatic motion of an ideal gas is

$$\rho(r + u)^{\nu-1}\left(1 + \frac{\partial u}{\partial r}\right) = \omega r^{s} r^{\nu-1}, \quad \left(1 + \frac{\partial u}{\partial r}\right)\rho\frac{\partial^2 u}{\partial t^2} + \frac{\partial p}{\partial r} = 0 \qquad (2)$$

$$p\rho^{-\gamma} = p_0(\omega r^{s})^{-\gamma}$$

(r is the Lagrangian coordinate), γ is the adiabatic exponent. The first two equations of (2) give the conservation of mass and impul-

se, the third gives the conservation of entropy. The author then arrives at a system of equations

$$
\begin{gathered}
\frac{\partial u}{\partial x} - z = 0 \\
\left\{x(1-x) + \frac{1}{4}\left[\left(1 + \frac{\partial u}{\partial r} + \frac{2+z}{4}\frac{1-2x}{r}z\right)^{\gamma+1}\left(1+\frac{u}{r}\right)^{(\gamma-1)(\nu-1)} - 1\right]\right\}\frac{\partial z}{\partial x} - \\
- \frac{4r^2}{(2+z)^2}\frac{\partial^2 u}{\partial r^2} - \frac{2(1-2x)}{2+z} r \frac{\partial z}{\partial r} + \frac{6+z-2\nu}{2(2+z)}(1-2x)z - \\
- \frac{4(\nu-1)}{(2+z)^2}\left(r\frac{\partial u}{\partial r} - u\right) - \frac{\nu-1}{r+u}\left[\frac{2}{2+z}\left(r\frac{\partial u}{\partial r} - u\right) + \frac{1-2x}{2}z\right]^2 = 0
\end{gathered}
\tag{7}
$$

whose solution is

$$
\begin{aligned}
u &= C\eta^{1+k}w^{(0)}(\xi) + C^2\eta^{1+2k}w^{(1)}(\xi) + \cdots \\
z &= C\eta^{1+k}q^{(0)}(\xi) + C^2\eta^{1+2k}q^{(1)}(\xi) + \cdots \\
x &= \xi + C\eta^{k}\varphi^{(1)}(\xi) + \cdots \\
r &= \eta
\end{aligned}
\tag{8}
$$

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where C is an arbitrary constant of dimension [cm^{-k}], and $w^{(n)}$, $q^{(n)}$, $\varphi^{(n)}$ - are all dimensionless functions of a dimensionless argument ξ. Differentiation gives

$$\frac{\partial}{\partial x}=(1-C\eta^{k}\varphi'-\cdots)\frac{\partial}{\partial\xi},\qquad \frac{\partial}{\partial r}=\frac{\partial}{\partial\eta}-(Ck\eta^{k-1}\varphi+\cdots)\frac{\partial}{\partial\xi} \tag{9}$$

Expressing the left-hand side of (7) as a power series, equating coefficients, and solving gives, in the n-th approximation,

$$\frac{dw^{(n)}}{d\xi}-q^{(n)}=f^{(n)},\quad \xi(1-\xi)\frac{dq^{(n)}}{d\xi}+(1-2\xi)\left[\frac{1}{2}-\frac{2(n+1)k+\nu}{2+s}\right]q^{(n)}-\frac{4k(n+1)[(n+1)k+\nu]}{(2+s)^{2}}w^{(n)}=g^{(n)}, \tag{10}$$

which is linear with respect to $w^{(n)}$ and $g^{(n)}$, $f^{(n)}$ depends only on $w^{(i)'}$, $\varphi^{(j)'}$, and $g^{(n)}$ depends only on $w^{(i)}$, $\varphi^{(j)}$, $q^{(i)}$, $q^{(i)'}$

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$(0 \leqslant i \leqslant n-1,\ 1 \leqslant j \leqslant n)$. $\varphi^{(n)}(\xi)$ may be chosen arbitrarily. (The prime denotes differentiation with respect to ξ). In the zero approximation $f^{(o)} = g^{(o)} \equiv 0$ and $q = w'$. Equations are also given in the first approximation. In the non-linear case, denoting by the suffixes 1, 2, 3, the regions $\xi \leqslant 0$, $0 \leqslant \xi \leqslant 1$, $1 \leqslant \xi \leqslant \infty$, respectively, the solution is obtained

$$\begin{gathered} w_2 = \xi F(1-\varepsilon,\ \varepsilon;\ 2;\ \xi), \qquad q_2 = F(1-\varepsilon,\ \varepsilon;\ 1;\ \xi) \\ w_3 = \frac{\Gamma(1-\varepsilon)}{\Gamma(1+\varepsilon)\Gamma(2-2\varepsilon)}\xi^{\varepsilon}F(-\varepsilon,\ 1-\varepsilon;\ 2-2\varepsilon;\ \xi^{-1}) \\ q_3 = \frac{\Gamma(1-\varepsilon)}{\Gamma(\varepsilon)\Gamma(2-2\varepsilon)}\xi^{\varepsilon-1}F(1-\varepsilon,\ 1-\varepsilon;\ 2-2\varepsilon;\ \xi^{-1}) \\ \varepsilon = \frac{1}{2} - \frac{\nu}{2+s} > 0 \end{gathered} \tag{14}$$

where F is a hypergeometric series, and hence

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$$u = C\eta^{1+k}w, \qquad v = \frac{\partial u(r,t)}{\partial t} = C\frac{2+s}{4}\sqrt{\frac{\gamma p_0}{\omega}}\,\eta^{k-s/2}w' \tag{15}$$

$$p - p_0 = -\gamma p_0 C\frac{2+s}{4}\eta^k\left[(1-2\xi)w' + \left(1+\frac{2\nu}{2+s}\right)w\right]$$

The solution of (14) in the neighborhood $\xi = 1$ is considered, the author arriving after substitution at

$$P = -\frac{(\gamma+1)(2+s)}{16}A^2\frac{\ln|1-\xi|}{1-\xi} + \frac{G}{1-\xi} + O(\ln^2|1-\xi|) \qquad (21)$$

$$Q = \left(\frac{3}{2} - \frac{\nu}{2+s}\right)\frac{A}{1-\xi} + O(\ln|1-\xi|), \qquad R = A + O[(1-\xi)\ln|1-\xi|] \qquad (21)$$

$$G_{2,3} = -\frac{(\gamma+1)(s+2)}{16}A^2D_{2,3} - \left[(\gamma-1)(\nu-1) + (\gamma+1)\frac{6+s-2\nu}{4}\right]\frac{A^2}{4B}$$

Applying the Poincaré-Lighthill-Go method one obtains in the first approximation $w^{(1)} = 0\ (\ln^2/1 - \xi/)$, $q^{(1)} = 0\ (\ln^2/1 - \xi/)$, and

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hence in (8),

$$\frac{C^2\eta^{1+2k}w^{(1)}}{C\eta^{1+k}w} = \eta^k O(\ln^2|1-\xi|), \qquad \frac{C^2\eta^{1+2k}q^{(1)}}{C\eta^{1+k}q} = \eta^k O(\ln|1-\xi|).$$

The shock wave must fulfill the following condition: The angles made by the wave trajectories in the rt plane with the characteristics must be equal on both sides of the wave. If $t_*(r)$ is the trajectory of the reflected front, then, approximately

$$\frac{dt_*}{dr} = \sqrt{\frac{\omega r^\nu}{\gamma p_0}}\left\{1 + \frac{\gamma+1}{4}\left[\frac{\partial u_2(r,t)}{\partial r} + \frac{\partial u_3(r,t)}{\partial r}\right] + \right.$$
$$\left. + \frac{(\gamma-1)(\nu-1)}{4r}[u_2(r,t) + u_3(r,t)]\right\}$$

and hence

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The reflection of converging ... S/040/61/025/002/004/022
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$$-2(1-\xi_2)+2\left(1+\frac{2k}{2+s}\right)(\Phi\ln|1-\xi_2|+T_2)C\eta^k+$$
$$+\frac{4\eta}{2+s}\left(\frac{C\Phi\eta^k}{1-\xi_2}-1\right)\frac{d(1-\xi_2)}{d\eta}=\left[(\gamma-1)(\nu-1)+\frac{\gamma+1}{4}(6+s-2\nu)\right]\frac{A}{2B}C\eta^k+$$
$$+\frac{(\gamma+1)(s+2)}{16}C\eta^k A\,[\ln|1-\xi_2|+\ln|1-\xi_3|+D_2+D_3] \qquad (26)$$

(26)

The author concludes that for the reflection of a converging wave in a gas of variable density, with $s > 2(\nu - 1)$, the motion in the neighborhood $r = 0$, $t = 0$ represents a weak disturbance. The author thanks S.S. Grigoryan for his advice and assistance. There are 3 figures and 7 references: 6 Soviet-bloc and 1 non-Soviet-bloc. The reference to the English-language publication reads as follows: Higher transcendental functions, vol. 1, McGraw-Hill Book Company, Inc., N.Y., Toronto, L., 1953.

SUBMITTED: July 15, 1960

Card 8/8

GRIGORYAN, S.S. (Moskva); CHERNOUS'KO, F.L. (Moskva)

Piston problem for equations of the dynamics of soils.
Prikl. mat. i mekh. 25 no.5:867-884 S-O '61. (MIRA 14:10)
(Mechanics)
(Differential equations)

36047
S/040/62/026/002/021/025
D299/D301

24.4300

AUTHOR: Chernous'ko, F.L. (Moscow)

TITLE: On the flow of an ideal fluid with a pressure-discontinuity along the boundary

PERIODICAL: Prikladnaya matematike i mekhanika, v. 26, no. 2, 1962, 373 - 375

TEXT: Fluid flow in the neighborhood of a pressure discontinuity is investigated in the nonlinear formulation. It was found that the free boundary has (in the case under consideration) the form of a twisted spiral. Plane, steady, potential flow is considered in a region bounded by the free surface AFB only; (Fig. 1). The sections AF and FB are logarithmic spirals. The relationship between z and the complex potential w is:

$$(1 - ia)v_2 z = w_0^{ia} w^{1-ia}, \quad a = \frac{1}{\pi} \ln \frac{v_1}{v_2}. \qquad (1.3)$$

With /a/ = 1, the fluid occupies the entire z-plane with a discon-

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tinuity along the spiral; with $/a/ > 1$, the region of flow is no longer univalent. By means of Bernoulli's integral and Eq. (1.3), the univalence condition becomes

$$\frac{2(p_2 - p_1)}{\rho v_1^2} = 1 - \left(\frac{v_2}{v_1}\right)^2 \leq 1 - e^{-2\pi} \approx 0.998\ 133 \quad (1.5)$$

In case of an atmospheric shock wave, moving on a water surface, the observed discontinuity-effect is negligible if the water and the air are quiescent prior to the shock. On the other hand, if the fluid is flowing towards the shock wave with a certain velocity, the spiral becomes more twisted; the spiral effect may become arbitrarily large as a result of increasing flow-velocity. Further, it is assumed that the flow is bounded by a flat wall MN and by the free surface AFB (Fig. 2). The magnitude of the distance d between the terminal points, at which the fluid velocity is parallel to the y-axis, is estimated; this distance decreases much faster, for $a \to + 0$, then the gradient $y_2 - y_1$. Further, unsteady self-similar mo-

tion is considered. A change of variables is effected. The conditions at the discontinuity-point assume the form

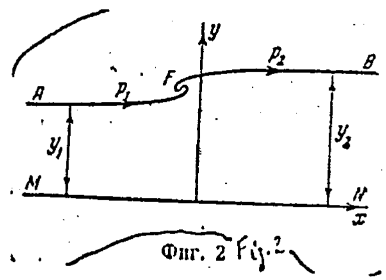
$$\mathrm{Im}\, w = \mathrm{const}, \quad \frac{1}{2}\left|\frac{dw}{dz}\right|^2 + P_0 = \mathrm{const}_1. \qquad (3.6)$$

which coincide with the conditions for the complex potential at the free boundary in the steady-flow problem. Hence, the boundary surface is also spiral-shaped (like in Fig. 1) near the discontinuity, is time-dependence following a power law (as in the case of steady flow). There are 2 figures and 3 Soviet-bloc references.

SUBMITTED: December 29, 1961

Fig. 1.

Fig. 2.



Card 3/3

CHERNOUS'KO F. L.,

"Investigation of motion of a satellite around its center of mass by means of asymptotic methods"

report to be submitted for the 14th Congress Intl. Astronautics Federeation, Paris, France, 25 Sep-1 Oct 1963

CHERNOUS'KO, F.L. (Moskva)

On resonance in an essentially nonlinear system. Zhur.vych.
mat.i mat.fiz. 3 no.1:131-144 Ja-F '63. (MIRA 16:2)
(Differential equations)

L 12620-63 EPA(b)/EWT(1)/FCC(w)/FS(v)/BDS/ES(v) AFFTC/AFMDC/ESD-3/
APGC/SSD Pd-4/Pg-4/Pe-4/Po-4/Pq-4 TT/TF
ACCESSION NR: AP3001104 S/0208/63/003/003/0528/0538

AUTHOR: Chernous'ko, F. L.

TITLE: Resonance phenomena for motion of the sputnik relative to its center of mass

SOURCE: Zhurnal vychislitel'noy matematiki i matematicheskoy fiziki, v. 3, no. 3, 1963, 528-538

TOPIC TAGS: sputnik, resonance, oscillations, mass center, perturbation, averaging method

ABSTRACT: The author finds the motion of the sputnik about its center of mass using perturbation techniques and a method of averaging developed by Krylof and Bogoliubov and extended by Mitropolsky, Volosov, and others. In particuler, for the rapid oscillations about the center of mass, if e is the eccentricity of the orbit, the largest amplitude is at the perigee, the smallest at the apogee, the ratio of these magnitudes being the cube of one plus e divided by the cube of one minus e. The author extends his deep gratitude to Moiseyev, N. N. for his valuable advice and discussions. Orig. art. has: 45 formulas and 3 figures.

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L 10095-63 EPA(b)/EWT(1)/FCC(w)/FS(v)/BDS/ES(v) AFFTC/AFMDC/ESD-3/APGC/SSD
Pd-4/Pg-4/Po-4/Pe-4/Pq-4 TF
ACCESSION NR: AP3003242 S/0040/63/027/003/0474/0483

81
80

AUTHOR: Chernous'ko, F. L. (Moscow)

TITLE: On the motion of a satellite relative to a mass center under the action of gravitational forces

SOURCE: Prikladnaya matematika i mekhanika, v. 27, no. 3, 1963, 474-483

TOPIC TAGS: motion of a satellite, relative motion, action of gravitational moments, Euler-Poinsot

ABSTRACT: The relative motion of a solid body in a central gravitational field is investigated. Equations of motion, with kinetic moment G, three Euler angles, and two angles determining the direction of a G vector in a stationary space as unknown functions, are set up in a form convenient for their solution by asymptotic methods. The Krylov--Bogolyubov method of averaging modified by V. M. Volosov is utilized by taking as the small parameter Epsilon the ratio of the linear dimensions of the satellite and its orbit. Two cases are investigated: 1) The three principal central moments of inertia have close but

L 10095-63
ACCESSION NR: AP3003242

distinct values and the eccentricity of the orbit and the rotational velocity of the satellite are arbitrary. 2) The kinetic energy of the relative motion of the satellite is large compared with the work of gravitational moments, and there are no restrictions imposed upon the eccentricity of the orbit and the moments of inertia of the body. Asymptotic solutions are constructed in the form of series in powers of Epsilon by averaging the right-hand sides of the motion equations, and a system of first-approximation equations is derived the solutions of which approximate exact ones. The approximation errors are evaluated in terms of the small parameter. It is shown that in the first case the relative motion decomposes into the rotation of the satellite around the vector G, the motion of the vector relative to the satellite, and the motion of the vector in space. In the second case the motion of the satellite decomposes into the Euler-Poinsot motion around the vector G and the motion of vector G itself. Peculiarities of these motions are analyzed. "The author thanks N. N. Moiseyev for valuable advice." Orig. art. has: 3 figures and 44 formulas.

ASSOCIATION: none

SUBMITTED: 31Jan63 DATE ACQ: 23Jul63 ENCL: 00

SUB CODE: 00 NO REF SOV: 009 OTHER: 000

Card 2/2

CHERNOUS'KO, F. L. (Moscow)

"Some problems of satellite motion about its centre of mass".

report presented at the 2nd All-Union Congress on Theoretical and Applied Mechanics, Moscow, 29 January - 5 February 1964.

VOLOSOV, V.M.; MOISEYEV, N.N.; MORGUNOV, B.I.; CHERNOUS'KO, F.L. (Moscow)

"Asymptotic methods of non-linear mechanics associated with the process of averaging"

report presented at the 2nd All-Union Congress on Theoretical and Applied Mechanics, Moscow, 29 January - 5 February 1964

S/0040/64/028/001/0155/0157

ACCESSION NR: AP4013389

AUTHOR: Chernous'ko, F. L. (Moscow)

TITLE: Stability of regular precession of a satellite

SOURCE: Prikladnaya matematika i mekhanika, v. 28, no. 1, 1964, 155-157

TOPIC TAGS: precession, regular precession, satellite, stability, necessary stability conditions, sufficient stability conditions

ABSTRACT: The motion of a satellite in a gravitational field is considered. Sufficient conditions for the stability of regular precessions are found and are compared with the necessary conditions. It is shown from basic considerations that the sufficient conditions are

$$\Omega_0 > (A - C)\omega_0 / C \quad \text{при } A < C$$

$$\Omega_0 > 4(A - C)\omega_0 / C \quad \text{при } A \geqslant C$$

where Ω_0 is the rotational angular velocity of the satellite, ω_0 is its orbital angular velocity, C and D are its moments of inertia about its axis of symmetry and

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ACCESSION NR: AP4013389

about an axis perpendicular to the axis of symmetry, respectively. The necessary conditions are shown to be either $C/A = x \leq 1$ or

$$x \geq \frac{4}{3}, \quad \cos^2\theta_0 \geq \frac{18x^3 - 27x + 8 + 2(3x-2)\sqrt{(3x-1)(3x-4)}}{27x^3(x-1)}$$

where θ_0 is the angle of nutation. Several special cases are reviewed on the basis of the above comparison. Orig. art. has: 19 equations and 2 figures.

ASSOCIATION: none

SUBMITTED: 15May63 DATE ACQ: 26Feb64 ENCL: 00

SUB CODE: AS NO REF SOV: 002 OTHER: 001

Card 2/2

ACCESSION NR: AP4043293 S/0040/64/028/004/0735/0745

AUTHOR: Chernous'ko, F. L. (Moscow)

TITLE: Motion of a solid body with a cavity containing an ideal liquid and an air bubble

SOURCE: Prikladnaya matematika i mekhanika, v. 28, no. 4, 1964, 735-745

TOPIC TAGS: air bubble, solid liquid bubble motion, surface tension coefficient, liquid viscosity, hydrodynamics, aerodynamics, sattelite dynamics

ABSTRACT: The author considers the case of the motion of a solid body with a liquid almost completely filling a cavity thus leaving an almost spherical air bubble. The problem consists of determination of the motion of the liquid and of the bubble in the cavity, and of the solid body. Let a be the radius of the bubble, ρ and μ - the density and the viscosity of the liquid, resp., σ - coefficient of surface tension, v - the average velocity of liquid in the cavity. The equation of motion are derived for the conditions $va \gg \mu/\rho$ and $v^2 a \ll \sigma/\rho$. These conditions are fulfilled for water and many other liquids. Several cases are considered, among them the behavior of the system upon an impact. The equations

ACCESSION NR: AP4043293

are not valid if the air bubble is in contact with the solid. Orig. art. has: 2 figures and 51 equations.

ASSOCIATION: Vychislitelvnyy* sentr AN SSSR (Computer Center AN SSSR)

SUBMITTED: 24Jan64 ENCL: 00

SUB CODE: ME, SV NO REF SOV: 005 OTHER: 002

YEVTUSHENKO, Yu. G.; CHERNOUSKO, F. L.

"Asymptotic methods for solution of some problems of satellite dynamics."

report submitted for 15th Intl Astronautical Cong, Warsaw, 7-12 Sep 64.

L 00349-66 EWT(d) IJP(c)

ACCESSION NR: AP5020300 UR/0208/65/005/004/0749/0754
518:519.31/.33 28
22
B

AUTHOR: Chernous'ko, F. L. (Moscow) 44,55

TITLE: Method of local variations for numerical solution of variational problems

SOURCE: Zhurnal vychislitel'noy matematiki i matematicheskoy fiziki, v. 5, no. 4, 1965, 749-754

TOPIC TAGS: approximation calculation, calculus of variations 16,44,55

ABSTRACT: The author proposes a scheme for finding $u(t)$, $u(a) = A$, $u(b) = B$, minimizing

$$\int_a^b f(t,u,\dot{u})dt \qquad (1)$$

which consists essentially of replacing this problem by a natural finite dimensional polygonal one. He asserts that his scheme is much more efficient on a digital computer than those of N.N. Moiseyev (Metody dinamicheskogo programmirovaniya v teorii optimal'nykh upravleniy, I, II. Zh. Vychisl. matem. i matem. fiz., 1964, 4, No. 3, 485-494; 1965, 5, No. 1, 44-56) and of N. Ya.

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L 00349-66

ACCESSION NR: AP5020300

6

Bagayeva and N. N. Moiseyev (Ob odnom sposobe chislennogo resheniya zadach optimal'nogo upravleniya. (Dokl. AN SSSR, 1963, 153, No. 4, 747-750). He also asserts that it generalizes easily to similar problems in many independent variables. "The author heartily thanks N. N. Moiseyev and R. P. Fedorenko for their valuable comments." Orig. art. has: 2 figures and 9 formulas. 44,55

ASSOCIATION: none

SUBMITTED: 18Dec64 ENCL: 00 SUB CODE: MA

NO REF SOV: 003 OTHER: 002

Jw

Card 2/2

CHERNOUS'KO, F.L. (Moskva)

Self-similar motion of a liquid under the action of surface tension. Prikl. mat. i mekh. 29 no.1:54-61 Ja-F '65.

(MIRA 18:4)

L 17839-66 EWP(m)/EWT(1)/EWT(m)/ETC(m)-6/T/EWA(d)/EWA(1) WW/DJ

ACC NR: AP6004070 SOURCE CODE: UR/0040/65/029/005/0856/0862

AUTHOR: Chernous'ko, F. L. (Moscow)

ORG: none

81

B

1,55

TITLE: The movement of a thin fluid layer under the effect of gravity forces and surface tension

SOURCE: Prikladnaya matematika i mekhanika, v. 29, no. 5, 1965, 856-862

TOPIC TAGS: wave equation, wave surface, fluid mechanics, flow profile, surface tension, motion equation, incompressible fluid, gravity, fluid density, fluid velocity, acceleration force

ABSTRACT: Equations of motion of a thin layer of an ideal incompressible fluid under the effect of gravity forces and of surface tension are derived. The density of the fluid is ρ; t denotes time; x, y, and z are Cartesian coordinates; u, v, and w are the projections of fluid velocities on the x, y, and z axes; p is pressure, and g is constant gravitational acceleration, or the acceleration of other mass forces, directed in the negative z direction. With this notation the author expresses the equations of motion as

$$u_t + uu_x + vu_y + wu_z + p_x / \rho = 0,$$

$$v_t + uv_x + vv_y + wv_z + p_y / \rho = 0$$

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L 17839-66

ACC NR: AP6004070

$$w_t + uw_x + vw_y + ww_z + p_z / \rho + g = 0,$$
$$u_x + v_y + w_z = 0$$
$$w_y = v_z,\ u_z = w_x,\ v_x = u_y\ ,$$

where the subscripts denote partial derivatives. The fluid (see Fig. 1)

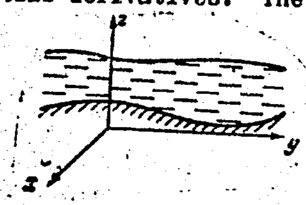

Fig. 1.

is bounded beneath by a fixed bottom surface $z = h(x,y)$, and above by the free surface $z = f(x,y,t)$. Impermeability conditions at the bottom and dynamic and kinematic conditions at the free surface are given by

$$w = h_x u + h_y v \quad \text{for } z = h(x, y)$$
$$p = p_0 - \sigma(1 + f_x^2 + f_y^2)^{-3/2}[f_{xx}(1 + f_y^2) - 2f_x f_y f_{xy} + f_{yy}(1 + f_x^2)]$$
$$w = f_t + f_x u + f_y v \quad \text{for } z = f(x, y, t)\ ,$$

where p_0 is constant external pressure on the fluid, and σ is the coefficient of

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surface tension. These equations are the basis for further inferences on the theory of "shallow water", presented by J. Stoker (Volny na vode. Izd-vo inostr. lit., 1959). A system is derived for vortex free motion of the fluid and expressed as

$$u_t + uu_x + vu_y + gf_x - (\sigma/\rho)\Delta f_x = 0$$

$$v_t + uv_x + vv_y + gf_y - (\sigma/\rho)\Delta f_y = 0$$

$$f_t + [(f-h)u]_x + [(f-h)v]_y = 0, \quad u_x = v_y,$$

where Δ is the Laplace operator. This system is solved for a given set of initial and boundary conditions. Certain statics and dynamics problems are studied using the equations derived. Orig. art. has: 24 equations and 5 figures.

SUB CODE: 20/ SUBM DATE: 28May65/ ORIG REF: 005/ OTH REF: 003

Card 3/3 nst

L 43023-66 EWT(d)/EWP(v)/EWP(k)/EWP(h)/EWP(1) BC

ACC NR: AP6011354 SOURCE CODE: UR/0208/66/006/002/0203/0217

AUTHOR: Krylov, I. A. (Moscow); Chernous'ko, F. L. (Moscow)

30
B

ORG: none

TITLE: Solution of optimal control problems by the method of local variations

14

SOURCE: Zhurnal vychislitel'noy matematiki i matematicheskoy fiziki, v. 6, no. 2, 1966, 203-217

TOPIC TAGS: optimal control, machine language

ABSTRACT: An algorithm is described for the numerical solution of problems of optimal control by the method of local variations (cf. article by co-author Chernous'ko in *Zh. vychisl. matem. i matem. fiz.*, 1965, 5, No. 4, 749-754). The results of the numerical solution of a number of variation problems are introduced to show the effectiveness of the method. A computer algorithm of the method of local variations is given in ALGOL-60 language. The control process is described by the equation

$$\dot{x} = f(t, x, u). \qquad (1.1)$$

where t is an independent variable (time), x is the phase coordinate vector, u is the control function vector, and f is a vector function. The time of the process is con-

UDC: 518:51:62-50

Card 1/2

L 43023-66

ACC NR: AP6011354

sidered fixed; the beginning is designated as $t=0$, the end as $t=T$. A phase trajectory is sought, along with the corresponding control, to satisfy (1.1), to meet the conditions

$$x(t) \in G(t), \quad u(t) \in U(t, x) \quad (0 \leqslant t \leqslant T).$$

here G and U are variable closed regions of n- and m-dimensional spaces, respectively; and to minimize the functional

$$J = \int_0^T f_0(t, x, u)\,dt,$$

Orig. art. has: 8 figures, 2 tables.

SUB CODE: 12/ SUBM DATE: 10Jun65/ ORIG REF: 004

Card 2/2 dd

ACC NR: AP6022524 SOURCE CODE: UR/0040/66/030/003/0476/0494

AUTHOR: Chernous'ko, F. L. (Moscow)

ORG: none

54
B
26

TITLE: The motion of a body having a cavity filled with a viscous liquid at high Reynolds numbers

SOURCE: Prikladnaya matematika i mekhanika, v. 30, no. 3, 1966, 476-494

TOPIC TAGS: Navier Stokes equation, Reynolds number, motion stability, LIQUID FLOW, FLUID VISCOSITY, SHELL STRUCTURE

ABSTRACT: The motion of a rigid body is studied under the condition that it contains a cavity of arbitrary shape which is completely filled with a viscous liquid. It is assumed that the amplitude is small (thus allowing the linearization of the Navier-Stokes equations) and that the Reynolds number is large. The boundary layer method is used to solve the linearized Navier-Stokes equations. Supplementary terms are introduced for the viscosity of the liquid in the cavity. It is shown that these terms are dependent on the form of the cavity in a manner defined by a tensor, analogous to a tensor of joined masses, which characterizes the dissipation of energy. The components of this tensor are expressed only by means of Zhukovskiy potentials, i.e., through solving the problem of the motion of an ideal liquid in a cavity of the given form. General equations for the motion of a body containing a liquid are derived on the basis

ACC NR: AP6022524

of previous results involving bodies with an ideal liquid and with low Reynolds numbers. Several concrete forms of cavities are considered. Small fluctuations of a body containing a viscous liquid are studied. Orig. art. has: 120 formulas, 3 figures, 2 tables.

SUB CODE: 12,20/ SUBM DATE: 22Oct65/ ORIG REF: 013/ OTH REF: 001

Card 2/2 JS

L 03000-67 EWT(1)/EWP(m) WW

ACC NR: AP6033201 SOURCE CODE: UR/0040/66/030/005/0836/0847

55
B

AUTHOR: Chernous'ko, F. L. (Moscow)

ORG: none

TITLE: Free oscillations of a viscous liquid in a container

SOURCE: Prikladnaya matematika i mekhanika, v. 30, no. 5, 1966, 836-847

TOPIC TAGS: fluid dynamics, ~~liquid~~ free oscillation, eigenvalue, ~~problem~~, boundary layer PROBLEM, INCOMPRESSIBLE FLUID, VISCOUS FLUID

ABSTRACT: Free small oscillations of a viscous incompressible liquid in a fixed container of arbitrary form in a gravitational force field are analyzed under the assumption that the Reynolds number R >> 1 (the viscosity is small). The equations of motion of the liquid and the boundary conditions are linearized and the linearized boundary-value problem is solved by the boundary layer method developed by M. I. Vishik and L. A. Lyusternik for linear differential equations containing a small parameter. The complex eigenvalue $\lambda = 0$ at which the boundary-value problem admits a nonzero solution and the corresponding eigenfunctions u, q are sought. Asymptotic expressions for eigenvalues and eigenfunctions in powers of a small parameter ν are derived and damping decrements and corrections to eigenfrequencies are established in terms of corresponding eigenfrequencies and eigenfunctions of the problem of the oscillations of an ideal liquid. The final formula derived for the eigenvalue

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ACC NR: AP6033201

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$\lambda = \lambda m$ of the boundary-value problem is close to the m-th eigenvalue of the problem of oscillations of an ideal liquid. Calculations for containers of a particular form are carried on the basis of the derived formulas. The behavior of the solution of the boundary-value problem (that is, the character of motion of a viscous liquid) in the neighborhood of the line of contact of the free surface of the liquid and the container wall is analyzed under the assumption that the Reynold's number of the liquid is arbitrary. Orig. art. has: 2 figures and 47 formulas.

SUB CODE: 20/ SUBM DATE: 30Dec65/ ORIG REF: 012/ OTH REF: 001/ ATD PRESS: 5099

Card 2/2 awm