VOROTYNTSEVA, A., nauchnyy sotrudnik

Colorado beetle on tomatoes. Zashch. rast. ot vred. i bol. 10 no.10:49-50 '65. (MIRA 18:12)

1. Moldavskiy filial Vsesoyuznogo nauchno-issledovatel'skogo instituta zashchity rasteniy.

VOROVSKAYA, V. M.

"Origin of Histamine in the Animal Organism. Communication 2," Fiziolg. Zhurnal SSSR (Physiological Journal USSR), XXIX, 96-115, 1940

VOROS'YEV, D. V.

Tipy Lesov Yevropeyskoy Chasti SSSR (Types of Forests in the European Part of the USSR) Kiyev, Izd-Vo Akademii Nauk Ukrainskoy SSR, 1953.
449 P. Diagrs., Maps, Tables.
At Head of Title: Akademiya Nauk Ukrainskoy SSR Institut Lesovodstva.

VOROTILOV, M. A.

Feeding and Feeding Stuffs - Analysis

Vitamin A content of feeds in the Southeast. Korm. baza 3 no. 5, 1952.

Monthly List of Russian Accessions, Library of Congress, September 1952. UNCLASSIFIED.

VOROTILOV, M. A.

Carotin

Vitamin A content of feeds in the Southeast. Korm. baza 3, No. 5, 1952.

Monthly List of Russian Accessions, Library of Congress, September 1952. UNCLASSIFIED.

1. VCROTILOV, M. A.

2. USSR (600)

4. Cattle - Feeding and Feeding Stuffs

7. Progressive methods in pasture fattening of cattle. Dost. sel'khoz. no. 5, 1952

9. Monthly List of Russian Accessions, Library of Congress, January 1953. Unclassified.

1ST AND 2ND ORDERS

PROCESSES AND PROPERTIES INDEX

3RD AND 4TH ORDERS

BC

B-I-8

Adsorption coefficient of hydrogen sulphide by bog-iron ore. I. E. Joschpa [with N. I. Vorotilov] (J. Appl. Chem. Russ., 1938, 11, 1234—1243).—The adsorption coeff. falls rapidly with time, to attain a const. low level, the val. of which depends on the temp. and [H_2S] of the gas; the higher is the temp., the lower is this level. For 0·5—1·5% H_2S max. adsorption is at 45°, for 1·7—2·1% H_2S at 25—35°, and for 2·1—3% H_2S at 55°. R. T.

METALLURGICAL LITERATURE CLASSIFICATION

PROCESSES AND PROPERTIES INDEX

CA

21

Determination of the coefficient of absorption of hydrogen sulfide by bog iron ore. I. E. Ioshina and S. I. Vorobilov. J. Applied Chem. (U. S. S. R.) 11, 1335-42 (in French, 1342-3)(1938).—The bog ore contained water 16.3-25.0, Fe_2O_3 60.0-41.1, volatile substances 9.56-8.77, matter insol. in HCl 11.8-24.9, P_2O_5 up to 10, and S 0.3%. The coeff. of absorption at first sharply decreased with an increase of the S content of the mass; this decrease finally became a const., but different for various temps. and concns. of H_2S. The optimal temp. of absorption is detd. by the initial concn. of gas (the other factors being the same). Thus, at H_2S concn. of 0.6-1.6%, the optimal temp. of the absorption was 45° (95% of the H_2S was absorbed) and 65° was optimal for H_2S concn. of 2.1-3%.

A. A. Podgorny

ASM-SLA METALLURGICAL LITERATURE CLASSIFICATION

VOROTNIKOV, Igor' Nikolayevich; GLYADENOV, Viktor Petrovich, KHRENOV, L.K., redaktor; DAYEV, G.A., redushchiy redaktor; GENNAD'YEVA, I.M., tekhnicheskiy redaktor

[Mechanization of labor-consuming operations on tank farms] Mekhanizatsiia trudoemkikh protsessov na neftebazakh. Leningrad, Gos. nauchno-tekhn. izd-vo neftianoi i gorno-toplivnoi lit-ry, Leningradskoe otd-nie, 1956. 220 p. (MLRA 10:1)
(Petroleum--Storage)

VOROTNIKOV P. Ye.

USSR/ Physics - Accelerated-ion generator

Card 1/1 Pub. 22 - 14/52

Authors : Baev, B. V.; Vorotnikov, P. Ye.; Gokhberg, B. M.; Sidorov, N. I.; Shuf, A. V.; and Ion'kov, G. B.

Title : A high-voltage electrostatic generator in a compressed gas

Periodical : Dok. AN SSSR 101/4, 637-639, Apr 1, 1955

Abstract : A description of a high-voltage electrostatic generator of the Van de Graaf type is presented. The generator is operated at a gas mixture (nitrogen and CO_2) compressed up to 8 atmospheres, and it supplies 2·8 Mv energy. Due to a good focusing device, a narrow (1 mm) beam of ions with 60 mu a current can be obtained at the out-put of the generator. Two USSR references (1955). Diagram.

Institution : Acad. of Sc., USSR, S. I. Vavilov Inst. of Physical Problems

Presented by: Academician A. P. Alexandroff, November 17, 1954

4

Regenerative positive electrode for primary or secondary electric cells. S. D. Vorotnikov. Russ. 20,735, Aug. 31, 1933. The electrode is prepd. from about equal amounts by wt. of oxides of Cu and Pb with the addn. of glycerol as binder.

METALLURGICAL LITERATURE CLASSIFICATION

Storage-battery plate. S. D. Vorotnikov. Russ. 43,088, May 31, 1935. Construction details.

A S M - S L A METALLURGICAL LITERATURE CLASSIFICATION

APPROVED FOR RELEASE: 03/14/2001 CIA-RDP86-00513R001861020001-2"

VOROTNIKOV, S.F.

SAMOYLIVSKIY,M.B., kandidat tekhnicheskikh nauk; VOROTNIKOV,S.F., gornyy inzhener; SHIRAY,Ye.N., gornyy inzhener; KORNIYEVSKIY, D.N., inzhener; GORODNICHEV,V.M.

"Rock freezing in the process of shaft sinking." N.G.Trupak. Reviewed by M.B.Samoilovskii and others. Ugol' 30 no.8:48 Ag'55. (MLRA 8:10)

1. Vsesoyuznyy nauchno-issledovatel'skiy institut organizatsii i mekhanizatsii shakhtnogo stroitel'stva (for Samoylovskiy, Vorotnikov, Shiray). 2. Ukrzapadshakhtostroy (for Korniyevskii) 3. Kombinat Stalinshakhtostroy (for Gorodnichev)
(Shaft sinking) (Frozen ground) (Trupak, N.G.)

KOCHETKOV, N.K.; VOROTNIKOVA, L.A.

Synthesis of phthalazines by the cyclization of acylhydrazones of aromatic aldehydes. Zhur.ob.khim. 26 no.4:1143-1145 Ap '56. (MLRA 9:8)

1. Institut farmakologii Akadmii meditsinckikh nauk SSSR.
(Phthalazine) (Hydrazones)

1ST AND 2ND ORDERS

PROCESSES AND PROPERTIES INDEX

A-3

BC

Catalytic preparation of isoamyl acetate. IV. M. B. Turova-Polak and [illegible] A. Vorozhtsova (J. Appl. Chem. Russ. [illegible] 11, [illegible]).—The highest yield of $C_5H_{11}OAc$ from iso-$C_5H_{11}OH$ and AcOH is obtained at 100—150° ($C_5H_{11}PO_4$ catalyst). The yield falls abruptly as the temp. exceeds 150°, owing to dehydration of the alcohol to yield amylene. R. T.

ASM-SLA METALLURGICAL LITERATURE CLASSIFICATION

Catalytic preparation of isoamyl acetate IV. M. R. Turova-Pollak and L. A. Vorotnikova. J. Applied Chem. (U. S. S. R.) 11, 837-43(in German 843)(1938); cf. C. A. 31, 4644[6].—Previously described exptl. conditions and catalysts were used. The greatest yield (80-81%) of $Me_2CHCH_2CH_2OAc$ was obtained at 160-20°. Increase of the velocity of introduction of the alc.-acid mixt. from 0.15 cc. to 4.0 cc./min. only slightly decreases the yield (83-78%). The yield of ester sharply decreases at 170° because of dehydration of the alc. to amylene.

A. A. Podgorny

METALLURGICAL LITERATURE CLASSIFICATION

VOROTNIKOVA, N. M.

Agriculture.

Young followers of Michurin. Novosibirsk, Novosibirskoe obl. gos. izd-vo, 1951.

9. Monthly List of Russian Accessions, Library of Congress, November 1952, Uncl.

PROCESSES AND PROPERTIES INDEX

20

The stability of the lining at the Leningrad cement plant. Yu. S. Lur'e and S. L. Vorotuintsev. *Tsement* 3, No. 8, 37-8(1935).—High-grade cement is produced from lime tuff, clay and roasted pyrites. The grog brick lining of one kiln was replaced by a clinker-concrete packed lining in the drying and sintering zones. After 5 months, the kiln works normally. F. H. S.

ASB-SLA METALLURGICAL LITERATURE CLASSIFICATION

VOROTYAGIN, V.M., inzhener; ALEKSANDROVICH, V.I., inzhener.

New type of protective device for small diameter valves on gas-pipes. Gor. khoz. Mosk. 27 no.5:34 My '53. (MLRA 6:6)
(Gas pipes)

VOROTYNTSEV, V. T.

Dvoinye kolonkovye truby /Dual column pipes/. Msokva, Ugletekhizdat, 1953. 82 p.

SO: Monthly List of Russian Accessions, Vol. 6 No. 12 March 1954.

VOROTYNTSEVA, N. N.

VOROTYNTSEVA, N.N. (Moskva) probably N.V.

Clinical aspects and therapy of chronic dysentery in children. Fel'd. i akush. no.6:34-38 Je '54. (MLRA 7:7)
(DYSENTERY, BACILLARY, in infant and child ther.)

VOROTYNTSEVA N. V.

SSR/Medicine - Antibiotics

"Treatment of Dysentery of Children With the New Antibiotic Synthomycin," Prof A. I. Dobrokh[illegible], N. V. Vorotyntseva, Infectious Diseases Clin[illegible] Inst of Pediatry, Hosp imeni Rusakov

"Sov Med" Vol XV, No 4, pp 6, 7

Synthomycin (prepn 777) was originally sy[illegible] in the 2d half of 1949. It is new antibi[illegible] tained synthetically from chem crude materials. According to clinical results, it is valuable therapeutic agent for treatment of acute [illegible] of children. Its high therapeutic effect [illegible]

USSR/Medicine - Antibiotics (Contd)

necessarily accompanied by sterilization [illegible] intestine. Synthomycin has no apparent [illegible] on patients.

VOROTYNTSEVA, N.

USSR/Medicine - Infectious Diseases Mar/Apr 52

"Joint Meeting of the Moscow Society of Pediatrists and the Moscow Department (Otdel) of Public Health Devoted to Gastrointestinal Diseases, 10,11, May 1951." S. Shapiro

"Pediatriya" No 2, pp 71-74

In 1950, USSR scientists succeeded in producing exptl dysentery in monkeys (which are resistant to Flexner bacilli) with Sonne bacilli; type-sup immunity in dysentery does not detract from the importance of the problem of immunization, because only Flexner bacilli and Sonne bacilli (the latter since World War II) cause the disease in the USSR [?]; the problem of preserving Sonne bacilli in the immunogenic form has been solved; the enteral method of immunization against dysentery is the most promising (Prof V. L. Troitskiy Corr Mem, Acad Med Sci USSR). Extensive expts demonstrated that treatment of dysentery of children with bacteriophage is without effect (R. B. Kogan. Dr. Med Sci, Inst Pediatry Acad Med Sci USSR). In regard to the effect of antibiotics in dysentery, IEM-1 acts on the intestinal syndrome and should be applied in light and medium forms of the disease; synthomycin is effective in acute and toxic forms; albomycin acts on staphylococci causing complications (N.I. Vorotyntseva, Inst of Pediatry, Acad Med Sci USSR).

PA 207T62

9. Monthly List of Russian Accessions, Library of Congress, December 1952 1953, Unclassified.

VOROTYNTSEVA, N. V.

Dysentery

Levomycetin therapy of dysentery in children. Pediatriia, No. 3, 1952.

VOROTYNTSEVA, N. V.

"Treating Dysentery in Children With Chemicotherapeutic Preparations and Antibiotics." Acad Med Sci USSR, Moscow, 1953. (RZhBiol, No 1, Sep 54)

SO: Sum 432, 29 Mar 55

VCEOTYNTSEVA, N.V.

Antibiotics and the treatment of acute dysentery in children. Fel'dsher & akush no. 2:10-13 Feb 1953. (CLML 24:2)

N. VORONTINTEVA

"Use of levomycetin in the treatment of dysentery in children" Tr. from the Russian p.57 (ANALELE ROMANO-SOVIETICE. SERIA PEDIATRIE Vol. 6, No. 3, May/June 1953 Burcuresti, Rumania)

SO: East European, LC, Vol. 2, No. 12, Dec. 1953

VOROTYNTSEVA, N.V., kandidat meditsinskikh nauk.

Some measures for preventing chronic dysentery and a new combined therapy method. Pediatriia, no.5:49-55 S-O '55. (MLRA 9:2)

1. Iz Instituta pediatrii AMN SSSR (rukovoditel'-chlen-korrespondent AMN SSSR prof. A.I. Dobrokhotova)
(DYSENTERY,
chronic, prev. & ther)

VOROTYNTSEVA, N.V.; VINTOVKINA, I.S.

Duration of dysentery in children. Sov.med. 20 no.8:35-39 Ag '56. (MLRA 9:10)

1. Iz otdela ostrykh detskikh infektsii (zav. - chlen-korrespondent Akademii meditsinskikh nauk SSSR zasluzhennyy deyatel' nauki prof. A.I.Dobrokhotova) Instituta pediatrii Akademii meditsinskikh nauk SSSR (dir. - chlen-korrespondent Akademii meditsinskikh nauk SSSR prof. O.D.Sokolova-Ponomareva)

(DYSENTERY, BACILLARY, in inf. and child ther., eff. on duration of dis.)

VOROTYNTSEVA, N. V.

AUTHOR: Vorotyntseva, N.V., Candidate of Medical Sciences 25-7-2/51

TITLE: They Must not Know the Horrors of War (Pust' oni ne znayut uzhasov voyny)

PERIODICAL: Nauka i Zhizn', 1957, # 7, p 2 (USSR)

ABSTRACT: The author, a young pediatrician and mother of two children, expresses her wish for peace and friendship between the nations. She points out that Soviet scientists are ready to cooperate with their colleagues all over the world, and that physicians by exchanging their experience would greatly contribute to improve the health of children and adults.
The article contains one photo.

AVAILABLE: Library of Congress

Card 1/1

BILIBIN, Aleksandr Fedorovich, prof.; SAKHAROV, Petr Ivanovich; VOROTYNTSEVA, Nina Viktorovna; NECHAYEV, S.V., red.; ZUYEVA, N.K., tekhn.red.

[Treatment of dysentery; manual for practising physicians] Lechenie dizenterii; posobie dlia prakticheskikh vrachei. Pod red.A.F.Bilibina. Moskva, Gos.izd-vo med.lit-ry, Medgiz, 1959. 199 p. (MIRA 12:12)

1. Chlen-korrespondent AMN SSSR (for Bilibin).
(DYSENTERY)

VOROTYNTSEVA, N.V.; VINTOVKINA, I.S.

On the 100th anniversary of the birth of Praskov'ia Vasil'evna Tsiklinskaia: 1850-1923. Pediatriia 37 no.6:94 Je '59. (MIRA 12:9)

(BIOGRAPHIES,
Tsiklinskaia, Praskov'ia V. (Rus))

VOROTYNTSEVA, N.V., kand.med.nauk

Immunity in dysentery. Pediatriia no.5:53-57 '61. (MIRA 14:5)

1. Iz Instituta pediatrii AMN SSSR (dir. - prof. O.D. Sokolova-Ponomareva i otdeleniya ostrykh detskikh infektsii (rukovoditel' - prof. A.I. Dobrokhotova [deceased]).
(DYSENTERY)

VOROTYNTSEVA, N.V., kand.med.nauk

Problems in the pathology and treatment of children with disorders of water - salt metabolism in acute intestinal infections. Pediatriia no.1:20-27 '62. (MIRA 15:1)

1. Iz otdela ostrykh detskikh infektsiy (zav. - prof. S.D. Nosov) Instituta pediatrii AMN SSSR.

(WATER METABOLISM) (INTESTINES—DISEASES)
(SALT IN THE BODY)

VOROTINTSEVA, Ye. N.

Content of procaine and its hydrolysis products in blood and urine after procaine block. E. N. Vorotyntseva, F. V. Mazina, and N. I. Krakovskii (A. V. Vishnevskii Inst. Surg., Acad. Med. Sci. U.S.S.R.). *Farmakol. i Toksikol.* 16, No. 6, 38-44(1953).—Clinical detns. under procaine (I) block showed that elimination of I or of *p*-aminobenzoic acid (II) occurred in 6-7 hrs. The amt. varies with the initial rate and intensity of diuresis. Cortical block generally results in elimination of both I and II. In dogs, paranephral block was followed by elimination of I in 60% of cases, and II in some cases. The clinical detns. showed about 70% elimination of I; evidently II undergoes reactions in the body. Intravenous I in dogs is not all hydrolyzed; some is eliminated unchanged. Julian F. Smith

– Biochem. Lab.

Vorotyntseva, Ye. N.

VOROTYNTSEVA, Ye.N.

Effect of novocaine block on the activity of enzymes catalyzing the conversion of novocaine in endarteritis obliterans [with summary in English]. Biul.eksp.biol.med. 44 no.8:53-58 Ag '57. (MIRA 10:11)

1. Iz Instituta khirurgii imeni A.V.Vishnevskogo (dir. - deystvitel'-nyy chlen AMN SSSR prof. A.A.Vishnevskiy) AMN SSSR, Moskva. Prestavlena deystvitel'nym chlenom AMN SSSR I.G.Rufanovym)

(ESTERASES, effects,
procaine inactivation in endarteritis obliterans (Rus))
(PROCAINE, metabolism,
inactivation by esterases in endarteritis obliterans (Rus))
(THROMBOANGIITIS OBLITERANS, metabolism,
procaine inactivation by esterases (Rus))

VOROTYNTSEVA, Ye.N.

Distribution of radioactive novocaine in the organs and tissues of an animal following its intravenous administration and in case of a lumbar block. Eksper. khir. i anest. 7 no.4:90-95 Jl-Ag '62. (MIRA 17 5)

1. Iz biokhimicheskoy laboratorii Instituta khirurgii imeni A.V.Vishnevskogo (dir. - deystvitel'nyy chlen AMN SSSR prof. A.A.Vishnevskiy) AMN SSSR.

VOROTYNTSEVA, Ye.N.

Effect of novocaine on the oxidation-reduction process in the nerve tissue. Eksper. khir. i anest. no.1:91-94 '65. (MIRA 18:11)

1. Biokhimicheskaya laboratoriya (zav. - prof. A.S. Konikova) Instituta khirurgii imeni A.V. Vishnevskogo (direktor - deystvitel'nyy chlen AMN SSSR prof. A.A. Vishnevskiy) AMN SSSR, Moskva.

VOROVICH, A. [A.]
BOROVICH, A.

BOROVICH, A. Over the border.

So: Veterinariya; 23; 7; July 1946; Uncl.
TABCON

VOROVICH, A. [A.]

"Infectious equine encephalomyelitis in USA in 1945."

SO: Vet. 24 (4) 1947, p. 42

APPROVED FOR RELEASE: 03/14/2001 CIA-RDP86-00513R001861020001-2"

VOROVICH, A. [A.]

"A New Vaccine against Rinderpest"

Veterinariya, Vol 24, No 4, Moscow, 1947,
Trans 83

VOROVICH, A. [A.]

"Gastro-Duodenal Probe for Horses," 2nd Edition, Biomedgiz, Tbilisi, 1946, by [illegible] Lecturer Sh. A. Kumsiev

"Castration of Bulls, Rams and Boars," Kazan, Tagoizdat, 1947, by Prof. A. P. Studentsov, Merited Worker of Science. Reviewed by A. Borovich

Veterinariya, Vol 24, No 8, 1947, p47

VOROVICH, A. [A.] co-author with F. Borisovich, A. Glumakov, and A. Shapiro, of VETERINARY MEDICINE IN THE USSR.
SO: Sel'sko Khozyaystvennaya Entsiklopediya, Vol. 1, Ed. 3, pp. 291-294, Moskva, 1949 Unclassified

lme

VOROVICH, A. A.

"What must the President of a kolkhoz know about the Veterinary Code of the USSR."
Moscow, Publication of the Ministry of Agriculture, USSR. 1952. 8 pages. (Main Administration of Agricultural Propaganda, Ministry of Agriculture, USSR)
SO: Vet., Aug 1952, Unclassified.

VOROVICH, A. A.

Foot-and-Mouth Disease

Epizootic hoof and mouth disease in Europe during 1951. Veterinariia 29, No. 6, 1952.

Monthly List of Russian Accessions, Library of Congress, August 1952. Unclassified.

VOROVICH, A. A.

4720. VOROVICH, A. A. Chto nuzhno znat' predsedatelyu kolkhoza o veterinarnom ustave sssr. staliniri, gosizdat yugo-osetii, 1954. 18 s. 18sm. (upr. sel'skogo khozyaystva yugooset. avt. obl. upr. s.-kh. propagandy). 2000 okz. 30 k.---avt. ukazan na oborote tit. L.-na oset. yaz.---(54-57832) 619(47)

SO: Letopis' Zhrunal' nykh Statey, Vol. 7, 1949

VOROVICH, I.I., Doc Phys Math Sci -- (diss) "Certain mathematical problems of the non-linear theory of envelopes shells." Len 1958, 15 pp (Len Order of Lenin State Univ im A.A. Zhdanov) 150 copies (KL, 29-58, 127)

VOROVICH, I.I.

VOROVICH, I.I.

Existence of solutions in the non-linear theory of shells. Izv. AN SSSR. Ser.mat.19 no.4:173-186 Jl-Ag'55. (MLRA 8:10)

1. Predstavleno akademikom S.L.Sobolevym
(Elastic plates and shells) (Mathematical physics)

Vekovič, I. I. On some direct methods in the nonlinear theory of sloping shells

the method of Bubnov-Galerkin is applicable. Existence

SOV/124-57-4-4604

Translation from: Referativnyy zhurnal. Mekhanika, 1957, Nr 4, p 105 (USSR)

AUTHOR: Vorovich, I. I.

TITLE: Some Problems of the Nonlinear Theory of Shells (Nekotoryye zadachi nelineynoy teorii obolochek)

PERIODICAL: Tr. 3-go Vses. matem. s"yezda. Vol I. Moscow, AN SSSR, 1956, pp 201-202

ABSTRACT: Bibliographic entry

Card 1/1

VOROVICH, I.I.

SUBJECT USSR/MATHEMATICS/Theory of probability CARD 1/1 PG - 397
AUTHOR VOROVIČ I.I.
TITLE On the stability of motion for random disturbances.
PERIODICAL Izvestija Akad. Nauk 20, 17-32 (1956)
reviewed 11/1956

Let the motion be described by the system

$$(1) \qquad \dot{x}_i = \sum_{j=1}^{n} a_{ij}x_j + \sum_{k=n+1}^{m} b_{ik}x_k + \varphi_i(x_1,\dots,x_n;t;x_{n+1};\dots,x_m) = F_i.$$

Here x_i $(i=1,\dots,n)$ shall be the sought functions and $(x_{n+1},\dots,x_m)$ be a certain random event. Let the probability theoretical description of it be given by a complete system of correlation functions. Under the solution of (1) the author comprehends the determination of the probability theoretical behavior of the event $(x_1,\dots,x_n,x_{n+1},\dots,x_m)$ from the behavior of $(x_{n+1},\dots,x_m)$. This very difficult problem, in singular cases, has been solved by Kuznecov, Stratonovič and Tichonov (Avtomat. Telemech. 4, 375-391 (1953)). The author obtains the same results, but with a careful mathematical argument.

VOROVICH, I.I.

SUBJECT USSR/MATHEMATICS/Functional analysis CARD 1/2 PG - 510
AUTHOR VOROVIČ I.I.
TITLE On some direct methods in the non-linear theory of slightly curved shells.
PERIODICAL Priklad.Mat.Mech. 20, 449-474 (1956)
reviewed 1/1957

The very interesting paper is a contribution to the theoretical investigation of non-linear differential equations of the theory of slightly curved shells. The author starts from a variant of the theory proposed by Vlasov (General theory of shells, Moscow (1949)). Numerous assumptions (the projection of the shell is a simply connected domain C, for the boundary of which a very appreciable smoothness is required, in C there exists the Green tensor of the plane theory of elasticity etc.) permit to reduce the original system of differential equations to an integro-differential equation. For the investigation of this latter one the functional space L_p and two Hilbert spaces H and H_1 are applied with different scalar products. The proof of existence for the solution of the integro-differential equation is reduced to the proof of existence of critical points of a certain functional. Then the applicability of the methods of Bubnow-Galerkin and Ritz to the theory of the slightly curved shells is theoretically proved. If the approximative solution is set up in the form $W_n = C_{1n}\varphi_1 + \dots + C_{nn}\varphi_n$, where the φ_i form

Priklad.Mat.Mech. 20, 449-474 (1956) CARD 2/2 PG - 510

an orthonormalized base in H_1, then the following theorem is valid: The set of approximations according to Bubnow-Galerkin which is contained in a sufficiently great sphere of the space H_1, is infinite and strongly compact in H_1. Every limit point W_n in H_1 is a solution of the given integro-differential equation. Conditions for the uniform convergence of the sequences W_{nxx}, W_{nxy}, W_{nyy} are set up. Then the power series expansion of the singular and non-singular solutions are considered in terms of a small parameter. Finally it is stated that the real solution can be the limit of complex approximations too.

INSTITUTION: Rostow - Don.

VOROVICH, I I

SUBJECT USSR/MATHEMATICS/Functional analysis CARD 1/3 PG - 701
AUTHOR VOROVIČ I.I.
TITLE On the existence of periodic solutions in some cases.
PERIODICAL Doklady Akad.Nauk 110, 165-168 (1956)
reviewed 4/1957

Let $X(x_1,x_2,\dots)$ be an element of the Hilbert space l_2; $\phi(X,v,w)$ be a functional in l_2 which depends on the parameters v, $|v|\leq 1$, and w, $|w|\leq 1$. Let $S_R x|x|$ be the topologic product of the closed sphere of radius R in the l_2 and of the square $|v|\leq 1, |w|\leq 1$. ϕ is continuous in $X,v,w \in S_R x|x|$ if from

$$X_n \xrightarrow{\text{weakly}} X, \quad \lim v_n\Big|_{n\to\infty} = v, \quad \lim w_n\Big|_{n\to\infty} = w$$

there follows $\lim \phi(X_n,v_n,w_n)_{n\to\infty} = \phi(X,v,w)$. ϕ is called continuously differentiable on $S_R x|x|$ if in every point of $S_R x|x|$ there exists the $\text{grad}_{l_2}\phi$, where a) $\text{grad}_{l_2}\phi$ has continuous components on $S_R x|x|$, b) $|\phi(X+H,\sin t,\cos t) - \phi(X,\sin t,\cos t)| \leq (H\cdot\text{grad}_{l_2}\phi)_{l_2} + \omega(X,H,t)$, where $|\omega|\leq k(t)\,\|H\|^2_{l_2}$ and $k(t)\geq 0$ is summable on $(0,2\pi)$.

Doklady Akad.Nauk 110, 165-168 (1956) CARD 2/3 PG - 701

Theorem: Let the functional $\phi(X,v,w)$ defined on $S_\infty x|x|$ be continuous and continuously differentiable on every $S_R x|x|$, let it further be even in X,v and w and let it satisfy the condition $\sum_{i=1}^{\infty} x_i \frac{\partial\phi}{\partial x_i} \leq 0$, where the sign of equality holds only for X = 0 for all v,w. Then the infinite system

$$\lambda^2 \ddot{X} = \text{grad}_{1_2} \phi(X, \sin t, \cos t)$$

on every sphere $\int_0^{2\pi} \sum_{i=o}^{\infty} \dot{x}_i^2 \, dt = \varrho^2$ has not less than a countable number of 2π-periodic solutions to which there correspond different $\lambda^2 > 0$ and the Fourier series of which consist of sinus terms only. Here there exists a sequence $\lambda_n^2 > 0$ such that $\lim \lambda_n^2 \big|_{n\to\infty} = 0$.

Theorem: On $S_\infty x|x|$ let be given the functional

$$\phi = -\frac{1}{2} \sum_{i=1}^{\infty} \mu_i x_i^2 + U(X, \sin t, \cos t),$$

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where $\mu_1 < \delta < 1$ and $U \geqslant 0$ is continuous, continuously differentiable and even in X,v,w. Let the 2π-periodic function F(t) have the components $f_i \in L_2(0,2\pi)$, where

$$\sum_{i=1}^{\infty} \int_0^{2\pi} f_i^2 \, dt < \infty ; \quad \int_0^{2\pi} f_i \cos m t \, dt = 0, \qquad \begin{array}{l} i=1,\ldots\infty \\ m=\emptyset,\ldots\infty . \end{array}$$

Then the equation

$$\ddot{X} = \mathrm{grad}_{l_2} \phi + F(t)$$

in the sphere

$$\int_{\varphi}^{2\pi} \sum_{i=1}^{\infty} x_i^2 = \frac{4}{(1-\delta^2)} \int_0^{2\pi} \sum_{i=1}^{\infty} f_i^2 \, dt$$

has at least one 2π-periodic solution the Fourier series of which contains sinus terms only.
These two and two further similar theorems are proved by reduction of the appearing equations with the aid of Galerkin's method to certain operator equations the solutions of which can be obtained by aid of results of Sobolew, Krasnosel'skij, Ljusternik etc.

INSTITUTION: University Rostow/Don.

VOROVICH, I.I.

AUTHOR: VOROVICH, I.I., YUDOVICH, V.I. (Rostov-na-Donu) 40-4-10/24

TITLE: The Impact of a Round Disk Upon a Liquid of Finite Depth (Udar kruglogo diska o zhidkost' konechnoy glubiny).

PERIODICAL: Prikladnaya Mat.i Mekh., 1957, Vol.21, Nr 4, pp.525-532 (USSR)

ABSTRACT: With the aid of the Fourier method and under application of the contracting mappings the authors investigate the impact of a round disk of radius a upon a resting ideal liquid of depth h. From the obtained relations it follows that for vertical impact the influence of the finite depth can be neglected and it must be set $h=\infty$, if $h \gg 1,1a$. The error in the determination of the maximum pressure etc. remains below 6% in this case. If $z=0$ is the free surface, $a=1$, the density $\rho=1$, U the velocity of the disk, φ the velocity potential of the liquid particles, then it is e.g.:

$$-\varphi\Big|_{\substack{z=0\\ r\leq 1}} = \frac{2U}{\pi}\left[1+\frac{S_3}{3\pi}\frac{1}{h^3}-\frac{S_5}{45\pi}(7+5r^2)\frac{1}{h^5}+\frac{S_3^2}{9\pi^2}\frac{1}{h^6}+\frac{S_7}{210\pi}(17+21r^2+7r^4)\frac{1}{h^7}+\ldots\right]\sqrt{1-r^2}$$

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SUBMITTED: November 9, 1956

AVAILABLE: Library of Congress

VOROVICH, I.I.

AUTHOR: VOROVICH, I.I. 38-6-2/5

TITLE: On Some Direct Methods in the Nonlinear Theory of Oscillations of Flat Shells (O nekotorykh pryamykh metodakh v nelineynoy teorii kolebaniy pologikh oboloch...)

PERIODICAL: Izvestiia Akademii Nauk, SSR, Seriya Matematicheskaya, 1957, Vol. 21, Nr.6, pp.747-784 (USSR)

ABSTRACT: At first the author considers a very general nonlinear operator equation

$$(1) \qquad \bar{\omega}_{tt} = -A_1\bar{\omega} - A_2\bar{\omega} - K\bar{\omega}_t + \bar{F}(P,t)$$

with the initial conditions

$$\bar{\omega}\big|_{t=0} = \bar{g}(P), \qquad \bar{\omega}_t\big|_{t=0} = \bar{h}(P), \qquad P \in \bar{\Omega}.$$

Here $A_2\bar{\omega}$ is assumed to be nonlinear and the other operators are defined in special spaces where they have to satisfy certain additional conditions. Then, with the aid of the principle of Ostrogradski-Hamilton, for (1) a generalized solution is defined which not necessarily has the second derivatives with respect to the time. For the determination of this solution the method of Bubnov-Galerkin is applied; the solution is sought in the form

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of a linear combination of functions forming a complete system. An existence theorem is proved. It is shown that the set of all approximative solutions in a certain space is weakly compact and that it contains an infinite subset each accumulation point of which is a generalized solution of (1).
With the aid of the general theory developed in this way, the author considers two problems on nonlinear flat shells (with and without consideration of the inertia of the longitudinal motions).
13 Soviet and 1 foreign references are quoted.

PRESENTED: By S.L.Sobolev, Academician
SUBMITTED: March 8, 1956
AVAILABLE: Library of Congress

VOROVICH, I.I.

On the existence of solutions in the nonlinear theory of shells. Dokl. AN SSSR 117 no.2:203-206 N '57. (MIRA 11:3)

1. Rostovskiy na Donu gosudarstvennyy universitet. Predstavleno akademikom S.L. Sobolevym.

(Elastic plates and shells)

14(10)

SOV/20-122-1-9/44

AUTHOR: Vorovich, I. I.

TITLE: Some Problems of the Stability of Shells in the Large (Nekotoryye voprosy ustoychivosti obolochek v bol'shom)

PERIODICAL: Doklady Akademii nauk SSSR, 1958, Vol 122, Nr 1, pp 37-40 (USSR)

ABSTRACT: A linearization method, according to which the instant of the loss of the stability is determined by the first eigenvalue of a certain linear boundary problem is very often used for the solution of many problems concerning the stability of elastic systems. It is known that the linearization of the equations cannot always be applied to the problem of the stability of shells. This paper deals with some general facts concerning this problem which were found by an exact analysis of the fundamental equations of the nonlinear theory of the shells. The author makes the following assumptions: 1) The central surface of the shell Σ is given by the equation $\vec{r} = \vec{r}(\alpha,\beta)$; $\alpha,\beta \in \bar{\Omega}$; Ω is a finite region of the plane α,β; 2) The boundary T_{Ω} of Ω consists of a

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finite number of arcs and the tangents of any of them turn continuously. 3) $\vec{r}$ has continuous derivatives of the second order in Ω . The external forces which act upon the shell are assumed to have the form λX, λY, λZ where λ is a numerical parameter. The following operations must be carried out in order to solve the above-mentioned problem: 1) Find the number $n(\lambda)$ of the possible stressed states of the shell for various λ. 2) Determine the degree of the reality of any equilibrium shape of the shell if the number of these shapes is higher than 1. As an example, the author investigates a closed shell. In this case, the first part of the stability problem may be reduced to the investigation of the number $n(\lambda)$ of the solutions of the non-linear boundary problem of a system of equations given in this paper. A lemma and 6 theorems concerning this subject are given. Finally, the author reports in a few lines on the degree of reality of any equilibrium shape. The results of this paper are valid also for some other cases of shell embedding. There are 12 references, all of which are Soviet.

Card 2/2

PRESENTED: May 12, 1958, by V. I. Smirnov, Academician

SUBMITTED: June 28, 1958

14(10)

SOV/20-122-2-9/42

AUTHOR: Vorovich, I. I.

TITLE: The Error of the Direct Methods in the Non-Linear Theory of Shells (Pogreshnost' pryamykh metodov v nelineynoy teorii obolochek)

PERIODICAL: Doklady Akademii nauk SSSR, 1958, Vol 122, Nr 2, pp 196-199 (USSR)

ABSTRACT: The author first writes down the solutions of a system which describes great deformations of a shell. The direct methods for the approximate solution of this boundary problem are used either according to P. F. Papkovich or in the form developed by Kh. M. Mushtari. First, the method developed by Papkovich is investigated. The approximate solution w_n of the problem is given as

$$w_n = \sum_{k=1}^{n} a_{nk}\chi_k(P), \quad a_{nk} = \int_{\Omega} f_3\{w_n\}\chi_k(P)\, AB\, d\alpha\, d\beta$$

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where $\chi_k(P)$ is an orthogonal normalized basis in the space

$H_{1\Omega}$. The meaning of the terms of the initially mentioned system of equations was given in a previous paper (Ref 1). The authors then mention some facts which are arguments in favor of the application of the Papkovich method. In some cases the velocity of the convergence of the expansions with respect to $\{w_n\}$ may be estimated. These estimations rely on data concerning the degree of smoothness of the solutions of this problem. The author then mentions some theorems which are based upon these estimations. In the second part of this paper, the method developed by Mushtari is investigated. In this case, the approximate solution is given as

$$w_n = \sum_{k=1}^{n} a_{nk} \chi_k (P); \ \vec{\omega}_n^* (u_n, v_n) = \sum_{k=1}^{n} c_{nk} \vec{b}_k (\varphi_k, \psi_k)$$

where χ_k, φ_k, and ψ_k form an orthogonal and normalized basis in the space $H_{3\Omega}$. The author then mentions some facts which are arguments in favor of the application of Mushtari's method. Similar results may be found if direct methods are applied to a system of equations containing a function of

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The Error of the Direct Methods in the Non-Linear Theory of Shells

the tensions. This gives a modification of the method by P. F. Papkovich and V. Z. Vlasov. There are 6 references, 6 of which are Soviet.

ASSOCIATION: Rostovskiy-na-Donu gosudarstvennyy universitet (Rostov-na-Donu State University)

PRESENTED: May 12, 1958, by V. I. Smirnov, Academician

SUBMITTED: June 28, 1957

Card 3/3

24(6) SOV/179-59-4-9/40

AUTHORS: Vorovich, I. I., Kosmodamianskiy, A. S. (Rostov-na-Donu, Saratov)

TITLE: Elastic Equilibrium of an Isotropic Plate Weakened by a Number of Equal Curvilinear Borings

PERIODICAL: Izvestiya Akademii nauk SSSR. Otdeleniye tekhnicheskikh nauk. Mekhanika i mashinostroyeniye, 1959, Nr 4, pp 69-76 (USSR)

ABSTRACT: The method of Kolosov and Muskhelishvili is used here for solving the periodic problem of the theory of elasticity for a plate with an infinite number of curvilinear borings. It is shown that this method is simpler and more general than that of R. C. J. Howland (Ref 1). The theoretical investigation of the present problem was carried out in the papers by G. N. Savin (Ref 2) and S. G. Mikhlin (Ref 3). The functions of Kolosov and Muskhelishvili are expressed by the formulas (1.1) (Refs 3,4). The equations (3.3) and (3.4) are derived for the two functions $\varphi(z)$ and $\psi(z)$ of these formulas. They are substituted into the boundary conditions of the first main problem of the paper (Ref 4), and (3.5) is obtained. The outline problem (3.5) is solved by use of (3.6). The further analysis is made for the concrete case where γ_0 (boring outline, through

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the center of which the origin of coordinates is laid) is an ellipse, the outline of which is reflected by the function (4.1) onto the outline of the unit circle Γ_0. The formulas (4.5) - (4.8) are derived. With the help of the latter and of (3.6), approximation formulas for the functions φ and ψ are obtained from (3.3) and (3.4). By means of these functions, the strains in the plate are found from (1.2). Two cases are investigated: stretching of the plate along the x-axis, and along the y-axis. Diagrams are drawn on the basis of these investigations. They show that in the former case the number of borings exerts its greatest influence on an individual boring when the ratio a/b of the semiaxes of the ellipse is small. In this case, the maximum strains in the plate decrease as compared with the case where the plate is only weakened by one boring. In the other case of strain, the picture is inverted. The greatest influence is exerted by the number of borings on the individual boring in a high ratio a/b.- The second main problem of the paper (Ref 4) is then investigated. In this case, the formula (6.1) is put in the place of (3.5). The solution of the problem of

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the state of strain in an isotropic plate with circular borings in which hard balls are soldered is given as an example. The two above-mentioned cases: stretching along the x- and y-axes, are also investigated here. In the present case, the stretching forces p act in infinity at the angle α to the center line of the borings (Fig 4). It is shown that the influence of the infinite number of the equal circular borings on the state of strain consists in the fact that at $\alpha=0$ the concentration of strains on the boring outlines becomes higher, and at $\alpha=1/2\ \pi$ it becomes smaller. There are 6 figures, 3 tables and 4 references, 3 of which are Soviet.

SUBMITTED: April 17, 1958

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ROZOV, Yu. (Moskva); BORODIN, V. (pos.Tuchkovo); SHIFRIN, A. (Leningrad); BONDARENKO, P. (pos.Belyy Kolodez'); VOROVICH, B. (st. Yarmolintsy)

Readers exchange practices. Sov.foto 19 no.11:61-62 N '59. (MIRA 13:4)

(Photography--Equipment and supplies)

10(2)

AUTHORS: Vorovich, I. I., Yudovich, V. I. SOV/20-124-3-13/67

TITLE: The Steady Flow of a Viscous Fluid (Statsionarnoye techeniye vyazkoy zhidkosti)

PERIODICAL: Doklady Akademii nauk SSSR, 1959, Vol 124, Nr 3, pp 542-545 (USSR)

ABSTRACT: The authors investigate a steady laminary flow of a viscous fluid within a certain range Ω. This problem is reduced to determining the velocity vector $\vec{v}(x)$ from the equations $\mathcal{L}\vec{v} = \nu\Delta\vec{v} - (\vec{v},\nabla)\vec{v} \pm \vec{F} = (1/\rho)\nabla p$ $((\nu,\rho) = \text{const} > 0)$; $\operatorname{div}\vec{v} = 0$ $\vec{v}|_S = \vec{b}$. Here $\vec{F}$ and $\vec{b}$ are given vectors, and x is a point of the range Ω. The present paper deals with the differential properties of the solution within a closed range and with the rate of convergence of the Galerkin-method. For the given problem the authors introduce a generalized solution, prove herefore a theorem of existence, and show that there exists an arbitrary number of continuous derivatives in the closed range if the limit of the range and the right sides of the equations are sufficiently smooth. A theorem of existence is obtained especially for the classical solution, but without the use

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of estimates for Green's tensor of the corresponding linear problem. There are 5 references, 4 of which are Soviet.

ASSOCIATION: Rostov-na-Donu gosudarstvennyy universitet (Rostov-na-Donu State University)

PRESENTED: September 20, 1958, by G. I. Petrov, Academician

SUBMITTED: September 20, 1958

24(6) SOV/20-126-4-14/62

AUTHORS: Vorovich, I. I., Krasovskiy, Yu. P.

TITLE: On a Method of Elastic Solutions (O metode uprugikh resheniy)

PERIODICAL: Doklady Akademii nauk SSSR, 1959, Vol 126, Nr 4, pp 740 - 743 (USSR)

ABSTRACT: In the present paper the application of the method of elastic solutions to the main problem of elastically-plastic deformation is to be dealt with without any assumptions on the littleness of parameters. The problem of minor elastically-plastic deformations consists in solving a system of differential equations (1). The two boundary conditions are given under which solutions of (1) are found. The (limited) functional space Ω for these two solutions is then defined, and two conditions are made concerning the vector functions. Two operators, A and B, are introduced, by means of which the two boundary problems may be solved. Further, three theorems are developed with respect to the operators, from which it follows that the sequence of elastic solutions converges in the space Ω like the first derivation of a geometric progression. There are 4 Soviet

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On a Method of Elastic Solutions

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references.

ASSOCIATION: Rostovskiy gosudarstvennyy universitet (Rostov State University)

PRESENTED: February 19, 1959, by S. L. Sobolev, Academician

SUBMITTED: February 19, 1959

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VOROVICH, I.I.

report presented at the 1st All-Union Congress of Theoretical and Applied Mechanics, Moscow, 27 Jan - 3 Feb '60.

35. B. M. Berdichev (Chiboksary): On the solution of the dynamic contact problem for a half-space under conditions of axial symmetry.

36. J. Brilla (Bratislava). Anisotropic plates with discontinuous supports.

37. B. M. Broude (Moscow): On the essential non-linearity of certain problems on column stability.

38. K. S. Buglov (Kiev), S. V. Serensen (Moscow): On the determination of safety factors under alternating random loads.

39. A. V. Burlakov (Kharkov): An experimental investigation of creep of turbine diaphragm models.

40. K. F. Bursiutov (Saratov): On the stability of constructionally anisotropic circular ring plates.

41. St. Balan, V. Petcu, G. Bartu (Bucharest): The field of application of chromoplasticity.

42. D. R. Bainberg (Kiev): The state of stress of lamellar systems of regular configuration.

43. V. V. Sinitskii (Moscow): Thixotropic properties of lubricants as basis of their rheological characteristics.

44. G. A. Van-Fo-Fi, G. N. Savin (Kiev): Application of Mathieu functions to the investigation of shells.

45. F. M. Varvak (Kiev): Determination of stresses and deformations in massive bodies.

46. R. V. Bedonsky (Gorkii): The flow of bitumens and filled bitumens in pipes.

47. I. I. Vekua, V. I. Mgebrishvili (Tbilisi): Applications of analytic functions in the theory of elasticity.

48. L. Ia. Vinogr (Tbilisi), V. V. Pinadzhian (Erevan): Experimental investigation of the behavior of eccentrically compressed short columns for long loading times.

49. G. V. Vinogradov (Moscow), A. A. Fomichev (Kazan), V. P. Pavlov (Moscow): Investigation of soft plastic bodies under combined states of stress.

50. G. V. Vinogradov, V. P. Pavlov (Moscow): Basic peculiarities of the mechanical properties of plastic lubricants.

51. A. I. Vinokur (Leningrad): Fundamentals of the linear theory of visco-elastic impact.

52. I. I. Vinokurov (Kharkov): The solution of dynamic contact problems for foundations using a simplified model.

53. B. F. Vlasov (Moscow): On the equilibrium equations of thick elastic plates.

54. K. F. Voitkovskii (Iakutsk): The creep of ice and frozen soils under combined stresses.

55. M. P. Volarovich, G. Ia. Voronkov, K. P. Kovalevskii, G. L. Tsukanov (Moscow): Studies of viscoelastic properties of porous bodies (e.g. peat) by the ultrasonic pulse method.

56. M. P. Volarovich (Moscow), A. Kh. Kim (Minsk): The plane flow of a visco-plastic medium between two planes forming an acute angle.

57. M. P. Volarovich, K. V. Opekin (Moscow): Kinematics and dynamics of the flow of visco-plastic dispersed media past bodies of different shapes.

58. A. S. Vol'mir (Moscow): On the analysis of a short closed cylindrical shell.

59. A. D. Volkov, N. A. Kitaevich (Sverdlovsk): On the distribution of elastic constants in quasi-isotropic polycrystalline media.

60. I. I. Vorovich (Rostov-na-Donu): A statistical method in the stability theory of shells.

61. I. I. Vorovich (Rostov-na-Donu), A. S. Kosmodamianskii (Saratov): On stress concentration in a plane with an infinite number of holes.

62. M. F. Vlasenko (Leningrad): Foundations of the general engineering theory of elastic beams.

63. S. S. Vialov (Moscow): The laws of deformation of ice.

64. S. S. Vialov (Moscow): The laws of motion of ice crusts and the theory of visco-plastic flow based on research in the Antarctic.

65. N. B. Galliamov (Leningrad): A method of obtaining polynomial stress and displacement functions.

66. K. Z. Galimov (Kazan): A contribution to the theory of the finite deformations of thin shells.

67. N. P. Galin (Moscow): The propagation of elastic-plastic bending and shear waves in the axisymmetrical deformations of shells.

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AUTHORS: Vorovich, I.I., and Yudovich, V.I. (Rostov-na-Donu)

TITLE: Stationary flow of a tenacious incompressible fluid

PERIODICAL: Matematicheskiy sbornik, v.53, no.4, 1961, 393-428

TEXT: The main results of the paper are published in (Ref.14: I.I.Vorovich, and V.I.Yudovich, Statsionarnoye techeniya vyazkoy zhidkosti [Stationary flow of a tenacious fluid] DAN SSSR, v.126, no.3 (1959), 542-545).
The authors consider the stationary motion of a tenacious fluid in a bounded container. They investigate the dependence of the differential properties of the solutions on the smoothness of the initial data; furthermore the error is estimated which arises for the solution of the problem according to the method of Babnov-Galerkin. The existence of a generalized solution is proved under weaker assumptions than in (Ref.1: J.Leray, Étude de diverses équations intégrales non linéaires et de quelques problèmes que pose l'Hydrodynamique, Journ.Math.pures et appl., 9, no.12 (1933), 1-82).
The flow of an incompressible tenacious fluid in a region is described by

$$\nu \Delta \overline{v} = (\overline{v}, \nabla)\overline{v} + \frac{1}{\varsigma} \nabla P + \overline{F}, \qquad (1.1)$$

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$$\operatorname{div} \bar{v} = 0, \tag{1.2}$$

where $\bar{v}$ -- velocity; P -- pressure; ν, ς -- positive constants, $\bar{F}$ -- non-potential part of the forces due to inertia. On the boundary S of the region Ω let

$$\bar{v}|_S = \bar{\alpha}, \tag{1.3}$$

where $\bar{\alpha}$ is a given vector.

Problem: Determine $\bar{v}$,P so that they satisfy (1.1)-(1.3).

Let the following assuptions be satisfied:

a) Ω -- bounded region of the 2- or 3-dimensional space; S consists of m closed surfaces $S_1, S_2, \ldots, S_m$ with a continuous curvature.

b) In Ω there exists a continuously differentiable solenoidal vector $\bar{a}$, where $\bar{a}$ is identical with $\bar{\alpha}$ on S.

c) On all S_k (k=1,2,...,m) it holds

$$\int_{S_k} \alpha_n dS = 0. \tag{1.4}$$

Functional spaces:

1) Hilbert space H_1 -- closure of the set of vectors being smooth and

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solenoidal in Ω which vanish in the neighborhood of S; the norm is generated by

$$(\bar{u}_1 \cdot \bar{u}_2)_{H_1} = \int_{\Omega} (\text{rot } \bar{u}_1 \cdot \text{rot } \bar{u}_2) d\Omega . \quad (1.7)$$

2) Space L_p of the vector functions $\bar{u}$ with the norm

$$\|\bar{u}\|_{L_p} = (\int_{\Omega} |\bar{u}|^p \, d\Omega)^{\frac{1}{p}} . \quad (1.8)$$

Let
d) $\bar{F} \in L_p$ ($p \geqslant \frac{6}{5}$ in the 3-dimensional case and $p > 1$ in the two-dimensional case).

Definition 1.1: A vector $\bar{v} = \bar{a} + \bar{u}$, where $\bar{u} \in H_1$ and

$$-\nu(\bar{u}\cdot\bar{\ })_{H_1} =$$

$$= \int_{\Omega} [(\bar{u}, \nabla)\bar{u}\cdot\bar{\Phi} + (\bar{u}, \nabla)\bar{a}\cdot\bar{\Phi} + (\bar{a}, \nabla)\bar{u}\cdot\bar{\Phi} + (\bar{a}, \nabla)\bar{a}\cdot\bar{\Phi} + \nu \,\text{rot}\,\bar{a}\cdot\text{rot}\,\bar{\Phi} + \bar{F}\cdot\bar{\Phi}] d\Omega \quad (1.10)$$

is satisfied for an arbitrary $\bar{\Phi} \in H_1$ is called a generalized solution of (1.1)-(1.3).

Theorem 1: Under the assumptions a), b), c), d) the problem (1.1)-(1.3) has at least one generalized solution in the sense of the definition 1.1.

Let $\bar{a} \in W^{(2)}_{3/2}$, $\bar{F} \in L_{3/2}$. Then the vector $\bar{u}$ determined from (1.3) can be understood as a generalized solution of the linear boundary value problem

$$\nu \Delta \bar{u} = \frac{1}{\varrho} \nabla P + T, \quad (2.1)$$

$$\operatorname{div} \bar{u} = 0, \quad (2.2)$$

$$\bar{u}|_S = 0, \quad (2.3)$$

where $\bar{T} = \bar{F} + (\bar{u}+\bar{a}, \nabla)(\bar{u}+\bar{a}) - \nu \Delta \bar{a} \in L_{3/2}$. The vector $\bar{u}$ satisfies

$$\nu \int_\Omega \operatorname{rot} \bar{u} \cdot \operatorname{rot} \bar{\Phi}\, dx = - \int_\Omega \bar{T} \cdot \bar{\Phi}\, dx \quad (2.4)$$

for every $\Phi \in H_1$.

Let the surface S be describable in the neighborhood of an arbitrary one

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of its points in the local coordinates by

$$x_3 = \varphi(x_1, x_2), \qquad (2.6)$$

where φ shall have continuous k-th derivatives with respect to x_1, x_2. Then let S belong to the class $C^{(k)}$.

Theorem 2: If $\overline{T} \in L_p$ $(p \geqslant \frac{6}{5})$ and $S \in C^{(3)}$ then the vector $\overline{u}$ -- the generalized solution of (2.1)-(2.3) in the sense of (2.4), in the region Ω belongs to the class $W_p^{(2)}$ and it holds

$$\|\overline{u}\|_{W_p^{(2)}(\Omega)} \leqslant m \|\overline{T}\|_{L_p(\Omega)} \qquad (2.7)$$

(m denotes a constant depending only on Ω and ν).

A function p(x) given in the region ω belongs to the class $H(k,m,\lambda)$ if in $\overline{\omega}$ it has all derivatives of k-th order which here satisfy the Hölder condition with the exponent λ and the constant m. Let $B^{k,\lambda}$ be the space of functions of $H(k,m,\lambda)$ with the norm

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$$\|p\|_{B^{k,\lambda}} = \sum_{l=0}^{k} \sum_{\alpha_1+\alpha_2+\alpha_3=l} \max \left| \frac{\partial^l p}{\partial x_1^{\alpha_1} \partial x_2^{\alpha_2} \partial x_3^{\alpha_3}} \right| +$$

$$+ \sum_{n_1+n_2+n_3=k} \sup \frac{\left| \frac{\partial^k p(x)}{\partial x_1^{n_1} \partial x_2^{n_2} \partial x_3^{n_3}} - \frac{\partial^k p(y)}{\partial y_1^{n_1} \partial y_2^{n_2} \partial y_3^{n_3}} \right|}{r_{xy}^{\lambda}} \qquad (3.1)$$

$$(x, y \in \bar{\omega}).$$

Let $S \in \Lambda_k(m, \lambda)$ if $\varphi(x_1, x_2)$ of (2.6) belongs to $H(k, m, \lambda)$, where k, m, λ are the same for all points of S.

Theorem 3: Let $\bar{F} \in B^{k,\lambda}$, $S \in \Lambda_{k+3}(m, \lambda)$, $k \geqslant 0$, $\bar{a} \in B^{k+2,\lambda}$. Then the generalized solution $\bar{v} = \bar{u} + \bar{a}$ of (1.1)-(1.3) belongs to $B^{k+2,\lambda}$ if $0 < \lambda < 1$ and it belongs to $B^{k+2,1-0}$ if $\lambda = 1$.

Let the operator K be defined by

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$$-\nu(K\bar{u}, \Phi)_{H_1} = \tag{1.11}$$

$$= \int_\Omega \left[(\bar{u}, \nabla)\bar{u}\cdot\bar{\Phi} + (\bar{u}, \nabla)\bar{a}\cdot\bar{\Phi} + (\bar{a}, \nabla)\bar{u}\cdot\bar{\Phi} + (\bar{a}, \nabla)\bar{a}\cdot\bar{\Phi} + \nu \operatorname{rot} \bar{a}\cdot\operatorname{rot}\bar{\Phi} + \bar{F}\cdot\bar{\Phi}\right] d\Omega.$$

Theorem 4: Let all assumptions of theorem 1 be satisfied; $\bar{\varphi}_k \in W_2^{(2)}$ form a base in H_1. The approximate solution of (1.1)-(1.3) is sought with the arrangement

$$\bar{v}_n = \bar{a} + \bar{u}_n, \quad \bar{u}_n = \sum_{k=1}^{n} \lambda_{kn} \bar{\varphi}_k(x), \tag{4.1}$$

where λ_{kn} are calculated from

$$\int_\Omega L\, \bar{v}_n \cdot \bar{\varphi}_k(x)\,dx = \int_\Omega \bar{F}\cdot\bar{\varphi}_k\,dx \qquad (k=1,2,\ldots,n). \tag{4.2}$$

Then it holds: 1) For every n the system (4.2) has at least one real solution. 2) The set $\{\bar{u}_n\}$ lies in a sphere and is strongly compact, where every weakly converging sequence of $\{\bar{u}_n\}$ converges strongly. 3) If $\bar{u}_0$ is an accumulation point of $\{\bar{u}_n\}$ in H then $\bar{v} = \bar{a} + \bar{u}_0$ is a generalized solution of (1.1)-(1.3). 4) Every isolated solution $\bar{u}_0$ of

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$$\bar{u} = K\bar{u} \qquad (1.13)$$

the index of which is different from zero is an accumulation point of $\{\bar{u}_n\}$ in H_1. Here for every $\varepsilon > 0$ an N can be given so that for all $n \geq N$ there exist approximate solutions of (4.1) lying in the ε-neighborhood of the point $\bar{u}_0$ of the space H_1.

Theorem 5 contains an estimation of the velocity of convergence of the Galerkin-method under additional assumptions.
The proofs of the theorems are based on 26 lemmas.
The authors mention M.A.Krasnosel'skiy, O.A.Ladyzhenskaya, V.Solonnikov, E.Bykhovskiy, A.I.Koshelev, L.N.Slobodetskiy and I.Yu.Kharrik. There are 15 Soviet-bloc and 2 non-Soviet-bloc references.

SUBMITTED: February 10, 1959

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26741

14 4200 1080 1344 1327 S/040/61/025/003/018/026
D208/D304

AUTHOR: Vorovich, I.I. (Rostov-on-Don)

TITLE: On the general representation of solutions of equations of the conic shell theory

PERIODICAL: Akademiya nauk SSSR. Otdeleniye tekhnicheskikh nauk. Prikladnaya matematika i mekhanika, v. 25, no. 3, 1961, 543 - 547

TEXT: In the linear theory the problems of shells, auxiliary functions are frequently introduced which make it possible to describe the problem by a single higher order equation. The general method of introducing such functions given by A. Gol'denveyzer (Ref. 2: Teoriya uprugikh tonkikh obolochek (Theory of Thin Elastic Shells) GITTL, 1953) is presented and developed to give

$$w = \nabla^4\Phi, \qquad \varphi = Eh\nabla_k^2\Phi \tag{1.15}$$

which reduces to

$$\nabla^4\Phi + \frac{12(1-\nu^2)}{h^2}\nabla_k^2\nabla_k^2\Phi - \frac{Z}{D} = 0 \tag{1.16}$$

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while

$$\left(\frac{\partial^2}{\partial x^2}+\frac{1-\nu}{2}\frac{\partial^2}{\partial y^2}\right)u+\frac{1+\nu}{2}\frac{\partial^2 v}{\partial x\partial y}+\nu\frac{\partial w}{\partial x}-c^2\left(\frac{\partial^3}{\partial x^3}-\frac{1-\nu}{2}\frac{\partial^3}{\partial x\partial y^2}\right)w=0 \quad (1.17)$$

$$\frac{1+\nu}{2}\frac{\partial^2 u}{\partial x\partial y}+\left(\frac{\partial^2}{\partial y^2}+\frac{1-\nu}{2}\frac{\partial^2}{\partial x^2}\right)v+\frac{\partial w}{\partial y}+\frac{3-\nu}{2}c^2\frac{\partial^3 w}{\partial x^2\partial y}=0 \quad (1.18)$$

$$\nu\frac{\partial u}{\partial x}+\frac{\partial v}{\partial y}-c^2\frac{\partial}{\partial y}\left[\frac{\partial^2}{\partial y^2}-(2-\nu)\frac{\partial^2}{\partial x^2}\right]v+c^2(\nabla^4+1)w+\frac{1-\nu}{Eh}R^2Z=0$$

$$c^2=\frac{h^2}{12R^2} \quad (1.19)$$

by

$$u=c^2\left(\frac{\partial^5}{\partial x^5}-\frac{\partial^5}{\partial x\partial y^4}\right)\Phi+\frac{\partial^3\Phi}{\partial x\partial y^2}-\nu\frac{\partial^3\Phi}{\partial x^3} \quad (1.20)$$

$$v=2c^2\left(\frac{\partial^5}{\partial x^4\partial y}+\frac{\partial^5}{\partial x^2\partial y^3}\right)\Phi-(2+\nu)\frac{\partial^3\Phi}{\partial x^2\partial y}-\frac{\partial^3\Phi}{\partial y^3} \quad (1.21)$$

$$w=\nabla^4\Phi \quad (1.22)$$

gives

$$c^2(\nabla^2+1)^2\nabla^4\Phi-2c^2(1-\nu)\left(\frac{\partial^4}{\partial x^4}-\frac{\partial^4}{\partial x^2\partial y^2}\right)\nabla^2\Phi+(1-\nu)\frac{\partial^4\Phi}{\partial x^4}=\frac{(1-\nu^2)h}{12Ec^2}Z \quad (1.23)$$

In the case of a spherical shell (1.15) cannot always be utilized, and the following cases are discussed: 1) For which types of shells does the introduction of the auxiliary function by Eq. (1.15) make investigation of stresses possible ? 2) If, for some shells (1.15) cannot always be used, which states of stress can be described by them ? 3) Can any state of stress of cylindrical shell be described by (1.20) - (1.22) ? 4) What is the degree of arbitrariness of Φ in the derivations given above ? It is concluded that a) If $k_x - k_y + ik_{xy} \neq 0$, then for any sufficiently smooth functions connected by

$$\frac{1}{Eh} \nabla^4 \varphi - \nabla_k^2 w = 0, \quad \nabla_k^2 \varphi + D \nabla^4 w - Z = 0, \qquad (1.13)$$

then (1.15) is always feasible; b) If Φ_1, Φ_2 satisfy (1.15) simultaneously, then

$$\Phi_1 - \Phi_2 = a_1 x^2 + a_2 y^2 + a_3 xy + a_4 x + a_5 y + a_6 \qquad (3.1)$$

where a_4, a_5, a_6 are arbitrary and a_1, a_2, a_3 are connected by

$$a_1 k_x + a_2 k_y - 2k_{xy} a_3 = 0; \qquad (3.2)$$

c) If the shell is spherical ($k_x = k_y = k$, $k_{xy} = 0$) then (1.15) is possible only if

$$w = Ehk \nabla^2 \Phi. \qquad (3.3)$$

Also if Φ_1 and Φ_2 satisfy (1.15) simultaneously, then $\Phi_1 - \Phi_2 = \Phi^0$, where Φ^0 - some harmonic function. For the (1.20)-(1.22) the conclusion reaches is that for any three functions connected by (1.17) (1.18), (1.20)-(1.22), simultaneously

$$\Phi_1 - \Phi_2 = a_1(x^3 + 3vxy^2) + a_2[-3x^2y + (2 + v)y^3] + P(x, y),$$

where P - arbitrary polynomial of 2nd degree. There are 4 Soviet-bloc references.

SUBMITTED: December 10, 1960

Card 4/4

ALEKSANDROV, V.M., VOROVICH, I.I. (Rostov-na-Donu)

Contact problems for a thin elastic layer. Prikl. mat. i mekh. 28 no.2:350-351 Mr-Ap '64. (MIRA 17:5)

L 26002-66 EWT(d)/EWT(m)/EWP(w)/EWP(v)/EWP(k)/EWA(h)/ETC(m)-6 IJP(c) WW/EM

ACC NR: AP6012547 SOURCE CODE: UR/0040/66/030/002/0278/0295

AUTHORS: Vilenskaya, T. V. (Rostov-na-Donu); Vorovich, I. I. (Rostov-na-Donu)

ORG: none

TITLE: Asymptotic behavior in the solution of a problem in elasticity theory for spherical shells of small thickness

SOURCE: Prikladnaya matematika i mekhanika, v. 30, no. 2, 1966, 278-295

TOPIC TAGS: elasticity theory, spherical shell structure, asymptotic property, approximation method, stress analysis

ABSTRACT: The stress and deformation in thin-walled spherical shells under a symmetric, uniformly distributed load are analyzed. Generalized solutions are obtained for the governing equations using spherical coordinates and Euler-type equations. In compact form the characteristic equation of this system gives

$$\left(\frac{\operatorname{sh}\gamma\beta}{\operatorname{sh}\gamma}\right)^2 = \beta^2 f(\beta); \quad \gamma = \ln\lambda, \quad f(\beta) = \frac{\beta^4 - \frac{5}{2}\beta^2 + \frac{13}{16} - 4\nu^2}{\beta^4 + \beta^2[4(1-\nu^2) - \frac{5}{2}] + \frac{9}{16}}$$

where γ is the shell thickness, $\beta = \frac{1}{2}\sqrt{1-4\mu^2}$, and the parameter μ is determined from the boundary conditions. It is shown that this equation has three groups of roots. One group is independent of γ, one group increases as $1/\sqrt{\gamma}$ as $\gamma \to 0$, and a third group increases as $1/\gamma$ as $\gamma \to 0$. The stress and deformation for the shell are

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obtained for each group of roots. The asymptotic behavior of each solution is analyzed, and a method is shown for reducing expansion errors to an arbitrarily small value ε. The method outlined by A. I. Lur'ye (Ravnovesiye uprugoy simmetrichno nagruzhennoy sfericheskoy obolochki. PMM, 1943, T. 7, vyp. 6) is used in the analysis as it applies to spherical geometries. Orig. art. has: 86 equations and 3 figures.

SUB CODE: 20,13/ SUBM DATE: 17Sep65/ ORIG REF: 006

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L 17837-66 EWA(h)/EWP(k)/EWT(d)/EWT(m)/ETC(m)-6/EWP(w)/EWP(v) IJP(c) EM/WW
ACC NR: AP6004073 SOURCE CODE: UR/0040/65/029/005/0894/0901

AUTHORS: Vorovich, I. I. (Rostov-na-Donu); Zipalova, V. F. (Rostov-na-Donu)

ORG: none

61
B

TITLE: On the solution of nonlinear boundary value problems in the theory of elasticity by the method of transforming them into Cauchy problems

SOURCE: Prikladnaya matematika i mekhanika, v. 29, no. 5, 1965, 694-901

TOPIC TAGS: Cauchy problem, boundary value problem, elasticity theory, nonlinear elasticity, numeric integration, digital computer, function, shell deformation

ABSTRACT: A method is described for transforming a boundary value problem in non-linear elasticity theory into a Cauchy problem to allow for a direct numerical integration on digital computers. Given the deformation equation of a shell, symbolically

$$A_i(u,v,w,p) = 0 \qquad (i = 1,2,3),$$

it is required to determine a function $\Phi(u,v,w)$ which can be expressed as a function of the loading parameter p. This can be done by differentiating Φ with respect to p such that

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ACC NR: AP6004073

$$\frac{d\Phi}{d\rho} - \sum_{k=1}^{n} \frac{\partial\Phi}{\partial C_{nk}} \frac{dC_{nk}}{d\rho} = 0$$

where C_{nk} are transformation constants. The above equation represents a set of linear ordinary differential equations in Φ and C_{nk}. The above analysis is applied to the deformation of a spherical dome under uniform loading conditions. The governing equations are given by

$$\rho\psi'' + \psi' - \frac{\psi}{\rho} = \theta\left(\frac{2H}{h}\rho + \frac{1}{2}\theta\right) \qquad \left(\psi = -\frac{T_1 a^2 \rho}{Eh^3},\ \theta = \frac{a}{h}\theta_1\right)$$

$$\rho\theta'' + \theta' - \frac{\theta}{\rho} = -12(1-\mu^2)\psi\left(\frac{2H}{h}\rho + \theta\right) + 6(1-\mu^2)p_0\rho^2 \left(p_0 = \frac{pa^4}{Eh^4}\right)$$

where Φ plays the role of the integral

$$f = \int_1^0 \theta\, d\rho\ .$$

The resulting ordinary differential equations are solved numerically on the Minsk-12 digital computer using the Runga-Kutta integration scheme. Orig. art. has: 26 equations, 10 figures, and 1 table.

SUB CODE: 12,20,09/ SUBM DATE: 31May65/ ORIG REF: 010
Card 2/2 nst

BAZARENKO, N.A. (Rostov-na-Donu); VOROVICH, I.I. (Rostov-na-Donu)

Asymptotic behavior of the solution to a problem in elasticity theory for a finite hollow cylinder of small thickness. Prikl. mat. i mekh. 29 no.6:1035-1052 N-D '65. (MIRA 19:2)

1. Submitted June 25, 1965.

L 9630-66 EWT(d)/T IJP(c)

ACC NR: AP6000542 SOURCE CODE: UR/0040/65/029/006/1035/1052

AUTHORS: Bazarenko, N. A. (Rostov-na-Donu); Vorovich, I. I. (Rostov-na-Donu)

ORG: none

TITLE: Asymptotic behavior of a solution from the theory of elasticity for a flat cylinder of finite length and small thickness

SOURCE: Prikladnaya matematika i mekhanika, v. 29, no. 6, 1965, 1035-1052

TOPIC TAGS: stress analysis, shell theory, asymptotic property, characteristic equation, elasticity theory

ABSTRACT: A study was made of the stress distribution in a flat homogeneous cylinder of finite dimensions (see Fig. 1)

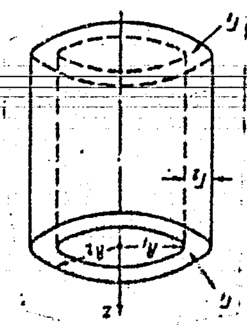

Fig. 1.

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under a uniformly distributed axisymmetric load. It is assumed that the cylinder has thin walls and that the stress distribution is governed by the set of equations

$$\frac{1}{1-2\nu}\frac{\partial\theta}{\partial z}+\Delta w=0, \qquad \frac{1}{1-2\nu}\frac{\partial\theta}{\partial r}+\Delta u-\frac{1}{r^2}u=0$$

where

$$\theta=\frac{\partial w}{\partial z}+\frac{\partial u}{\partial r}+\frac{u}{r}, \qquad \Delta=\frac{\partial^2}{\partial z^2}+\frac{\partial^2}{\partial r^2}+\frac{1}{r}\frac{\partial}{\partial n}.$$

Using the fact that the solution of the above equations can be obtained in Bessel functions, the following characteristic equation is arrived at

$$\Delta(\mu)=\mu^2\{[\xi_1^2+2(\nu-1)][\xi_2^2+2(\nu-1)]L_{11}^2+\xi_1^2\xi_2^2L_{00}^2+$$
$$+[\xi_1^2+2(\nu-1)]\xi_2^2L_{10}^2+[\xi_2^2+2(\nu-1)]\xi_1^2L_{01}^2-$$
$$-4(\nu-1)-\xi_1^2-\xi_2^2\}=0$$

$$(L_{jk}=J_j(\xi_2)Y_k(\xi_2)-J_k(\xi_2)Y_j(\xi_1),\ \xi_1=\mu R_1,\ \xi_2=\mu R_2)$$

where μ is a parameter whose value is determined on the basis of conditions satisfied at the cylinder boundaries, and $\xi=\mu r$. This characteristic equation is rewritten after the following substitutions are made: $\gamma=\mu R_1$, $\varepsilon=(R_2-R_1)/R_1$, and its various roots are discussed in great detail. These roots are divided into three groups: 1) double roots that are independent of ε, $\gamma_0=0$; 2) four roots defined by

$$\gamma_k=\frac{\delta_k}{\sqrt{\varepsilon}}, \qquad \delta_k=\gamma_{0k}+\varepsilon\gamma_{1k}+\varepsilon^2\gamma_{2k}+\cdots, \qquad \gamma_{0k}^4-12(\nu^2-1)=0$$

$$\gamma_{1k}=\frac{3}{5}(1-\nu^2)\frac{1}{\gamma_{0k}}-\frac{1}{4}\gamma_{0k}$$

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ACC NR: AP6000542

$$\gamma_{1k} = \left(\frac{229}{2100} + \frac{1}{15}\nu + \frac{863}{16800}\nu^2\right)\gamma_{0k} + \frac{9}{20}(\nu^2 - 1)\frac{1}{\gamma_{0k}}$$

increasing as $1/\sqrt{\varepsilon}$ as $\varepsilon \to 0$; 3) even-multiple roots defined by

$$\gamma_k = \frac{\Delta_k}{\varepsilon}; \quad \Delta_k = \delta_{0k} + \varepsilon^2\delta_{2k} + \varepsilon^3\delta_{3k} + \cdots, \quad \frac{1}{\delta_{0k}^4}(\sin^2\delta_{0k} - \delta_{0k}^2) = 0$$

$$\delta_{2k} = \frac{2(1-\nu^2)}{\sin 2\delta_{0k} - 2\delta_{0k}} + \frac{7-8\nu}{16\delta_{0k}}, \quad \delta_{3k} = -\delta_{2k}$$

increasing as $1/\varepsilon$ for $\varepsilon \to 0$. Stress-deformation relations are then obtained for each group of roots. A set of homogeneous solutions is then obtained to satisfy boundary conditions at the cylinder ends under symmetric and skew-symmetric loadings. The homogeneous solution is then compared to a more exact analysis with stress relaxation on the cylindrical part of the boundaries. Orig. art. has: 76 equations and 1 figure.

SUB CODE: 20/ SUBM DATE: 25Jun65/ ORIG REF: 007

Card 3/3

VOROVICH, I.I., doktor fiz.-matem. nauk, prof.; LYUBIMOV, V.Ya.; SAFRONOV, Yu.V., kand. fiz.-matem. nauk, dotsent; SOFRONOV, Ye.I., kand. tekhn. nauk; USTINOV, Yu.A., kand. fiz.-matem. nauk

Reliability of fitting rim bands on gear-wheel centers. Vest. mashinostr. 45 no.7:23-26 Jl '65. (MIRA 18:10)

AKSENTYAN, O.K. (Rostov-na-Donu); VOROVICH, I.I. (Rostov-na-Donu)

Determining the concentration of stresses on the basis of applied theory. Prikl. mat. i mekh. 28 no.3:589-596 My-Je'64. (MIRA 17:7)

VOROVICH, I.I. (Rostov-na-Donu)

General representations of the solutions to equations in the theory of multilayer anisotropic shells. Prikl. mat. i mekh. 29 no.4:690-700 Jl-Ag '65. (MIRA 18:9)

VOROVICH, I.I., doktor fiz.-matem.nauk, prof.; SAFRONOV, Yu.V., kand.fiz.-matem.nauk, dotsent; USTINOV, Yu.A.

Axial slipping of tires on large-diameter spiral gear wheels. Vest.mashinostr. 44 no.12:13-17 D '64. (MIRA 18:2)