VASIL'YEV, V.G.

[Accounting on state farms] Bukhgalterskii uchet v sovkhozakh. 2., perer. i dop. izd. Moskva, Statistika, 1964. 436 p. (MIRA 17:9)

SOV/3-59-3-2/48

22(1)

AUTHOR: Vasil'yev, D.I., Candidate of Technical Sciences, Docent, Chief

TITLE: Correspondence and Evening Education Needs New Organizational Forms (Zaochnomu i vechernemu obrazovaniyu nuzhny novyye organizatsionnyye formy)

PERIODICAL: Vestnik vysshey shkoly, 1959, Nr 3, pp 4-8 (USSR)

ABSTRACT: According to the new Law on Consolidating the Contact Between School and Life and on the Further Development of the System of National Education in the USSR, evening and correspondence education will play a paramount part in the reorganized higher school. Therefore, the problem of how to better organize instruction without the students having to discontinue their work is at present of great importance. The existing organizational forms of correspondence and evening tuition are, in the author's opinion, in a definite contrast to the scope which training-without-leaving-employment has assumed at present. About 1 million

Card 1/4

Correspondence and Evening Education Needs New Organizational Forms

people are being trained at the present time by the higher school correspondence and evening system, constituting 45.3% of the total number of students. The author doubts that the existing system of evening and correspondence education can successfully cope with the task of training this great number of students to become highly qualified specialists. At present, the training of specialists staying on their job is mainly performed by correspondence institutes. The majority of them have branches and training-consultation points (UKP) all over the country, each serving several tens of thousands of students without having at their disposal the required training and material basis. Almost all these vuzes are located in Moscow, Leningrad and Kiyev. It is evident that they are unable to properly supervise such a wide net of branches and UKPs. At the same time resident vuzes, working under considerably better conditions, have noticeably increased the number of evening and correspondence

Correspondence and Evening Education Needs New Organizational Forms

departments only in the last 2-3 years. It is apparently necessary to open correspondence and evening departments with resident vuzes for students uniting study and professional work. The author stresses a thorough change of the training process, suggesting that it be divided into 2 stages. The first one (courses 1 to 3) to provide education on general scientific and engineering subjects. For the second stage, evening and correspondence departments attached to special faculties should be established with the vuzes, where students would be taught the program of the fourth to sixth courses. The author suggests that the training literature for correspondence and evening students be printed in larger editions for which purpose a publishing office, "The Higher School", should be established. He also recommends that radio, television and tape-recorders,

Correspondence and Evening Education Needs New Organizational Forms

which are not being utilized in the training process, be introduced into the system of education-without-leaving-employment.

ASSOCIATION: Metodicheskoye upravleniye ministerstva vysshego obrazovaniya SSSR (Methodological Administration of the Ministry of Higher Education, USSR)

VASIL'YEV, D.I.

Shortened mercury vacuum gauge. Prib. i tekh.eksp. 6 no.6:151 N-D '61. (MIRA 14:11)

1. Institut fizicheskiih problem AN SSSR.
(Vacuum gauges)

ZALESSKIY, V.I.; VASIL'YEV, D.I.; GUBAREV, V.V.

Rotating heads for hydraulic presses. Kuz.-shtam.proizv. 1 no.12:34-35 D '59. (MIRA 13:4)
(Hydraulic presses) (Extrusion process)

ZALESSKIY, V.I., professor; VASIL'YEV, D.I., kandidat tekhnicheskikh nauk.

Investigating the relative strength increase of pressing tools.
Sbor.Inst.stali no.33:358-408 '55. (MLRA 9:6)

1.Kafedra kovki i shtampovki.
(Power presses) (Strains and stresses)

L 17986-66

ACC NR: AP6007846 SOURCE CODE: UR/0120/66/000/001/0217/0217

18
B

AUTHOR: Vasil'yev, D. I.

ORG: Institute of Physical Problems, AN SSSR, Moscow (Institut fizicheskikh problem AN SSSR)

TITLE: Miniature high-pressure bellows valve 10

SOURCE: Pribory i tekhnika eksperimenta, no. 1, 1966, 217

TOPIC TAGS: high pressure valve, valve design

ABSTRACT: The proposed valve is used in work with especially pure gases, and can also be used in vacuum systems and systems with pressures up to 200 atm. The bellows is made of stainless steel and is welded to the frame of the valve and the rod of the needle (see Fig. 1). The gap between the housing and the bellows is 0.4—0.5 mm, which permits the bellows to retain its rigidity at high gage pressures. A steel ball between the screw and the needle rod protects the bellows from twisting during the opening and closing of the valve. The needle, with a 40° angle, covers the 2 mm

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Card 1/3 UDC: 621.646.2

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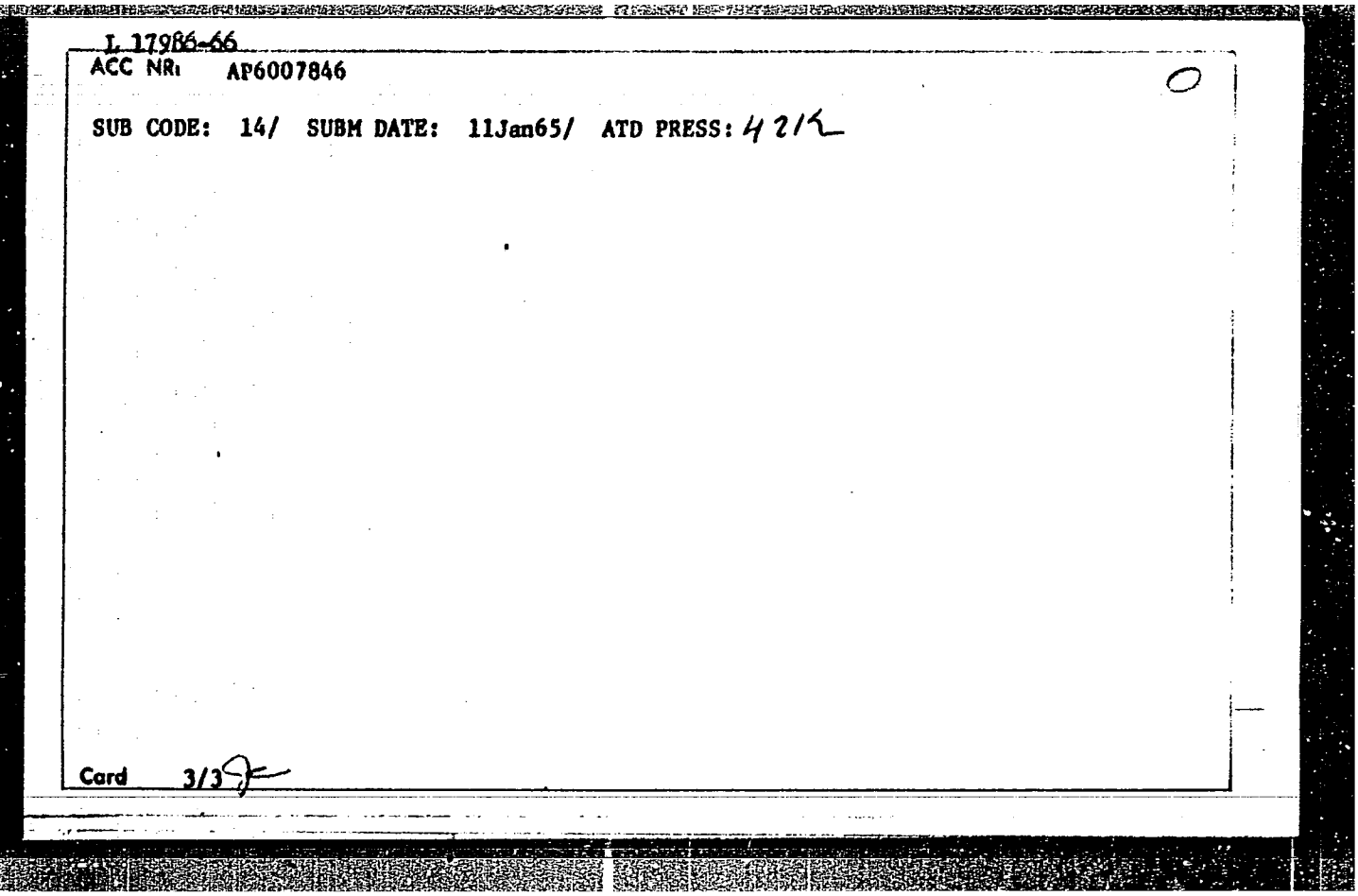


L 17986-66
ACC NR: AP6007846 O

SUB CODE: 14/ SUBM DATE: 11Jan65/ ATD PRESS: 421

Card 3/3

AUTHOR: Vasil'yev, D. I., and Shal'nikov, A. I. 120-2-35/37

TITLE: Small Stream Flow-meter. (Raskhodomer dlya Malykh Potokov)

PERIODICAL: Pribory i Tekhnika Eksperimenta, 1957, No. 2, pp. 118 - 119 (USSR)

ABSTRACT: A short description of a simple and reliable flow meter for small gas streams is described. The instrument (Fig. 1) consists of a differential thermo-couple and a galvanometer, which measure the temperature difference at points equally spaced from the heat source and positioned in the region of the water cooling system. The galvanometer used is of type ГЛЗ-2 with a sensitivity of 140mm/amp and resistance 30 ohms, the thermo-couple consists of a constantan wire, 0.3mm diameter, soldered directly to the working part of the instrument with the differential secondary using the Wood alloy and clamped on to a heat sink. The instrument is not sensitive to the variations of the cooling water temperature, the increase of it by 1°C producing an error of about 1%. The schematic drawing of the arrangement (Fig. 1), the detailed mechanical drawing of it (excluding the galvanometer) and two calibrating charts for the stainless steel and copper flow tubes are given. There are no references.

Card 1/2

Small Stream Flow-meter. 120-2-35/37

SUBMITTED: December 13, 1955.

ASSOCIATION: Institute of Physical Problems, imeni S. I. Vavilov of the Academy of Sciences, USSR (Institut Fizicheskikh Problem im. S. I. Vavilova AN SSSR.)

AVAILABLE: Library of Congress.

Card 2/2

SOV/120-58-4-27/30

AUTHORS: Vasil'yev, D.I. and Shal'nikov, A.I.

TITLE: An Instrument for Continuous Analysis of Ortho-Para-Mixtures of Hydrogen and of Deuterium (Pribor dlya nepreryvnogo analiza smesey orto-para-vodoroda i deuteriya)

PERIODICAL: Pribory i tekhnika eksperimenta, 1958, Nr 4, p 106 (USSR)

ABSTRACT: A specially designed, highly sensitive, thermal gas analyzer has been produced for continuous analysis of ortho-para-mixtures. Platinum wires are used as the sensitive element and the analyzer must be thermostated to ±0.1°C. The sensitivity of the analyzer is 1 mV per 1% para-hydrogen at -77.8°C and full bridge current of 180 ma; 1.44 mV per 1% of ortho-deuterium at -195°C and the same bridge current. When the bridge current is 200 mA, the sensitivity is 1.93 mV per 1% of ortho-deuterium at -185°C. There is 1 figure, no references.

ASSOCIATION: Institut fizicheskikh problem AN SSSR (Institute for Physical Problems of the Academy of Sciences, USSR)

SUBMITTED: October 16, 1957.

Card 1/1

SOV/120-58-4-28/30

AUTHOR: Vasil'yev, D. I.

TITLE: A Laboratory Instrument for the Purity Control of Helium Flow (Laboratornyy pribor dlya kontrolya chistoty potoka geliya)

PERIODICAL: Pribory i tekhnika eksperimenta, 1958, Nr 4, p 107 (USSR)

ABSTRACT: The instrument consists of 4 glass ampoules containing platinum filaments. Two of these ampoules are sealed off and are filled with pure helium under atmospheric pressure and the other two are open to the flow of helium which is being analyzed. The electrical resistance of room temperature and a measuring current of 1 ma is 16 ohms. The operating current of each arm of the bridge circuit is 100 ma. The rate of the flow of helium is 10-15 litres per hour but changes of ±5 litres per hour have no effect on the instrument. At a total working current of 200 ma the sensitivity of the gas analyzer is 1 mV per 0.2% of air impurity in helium. A sectional drawing of the instrument is given

Card 1/2

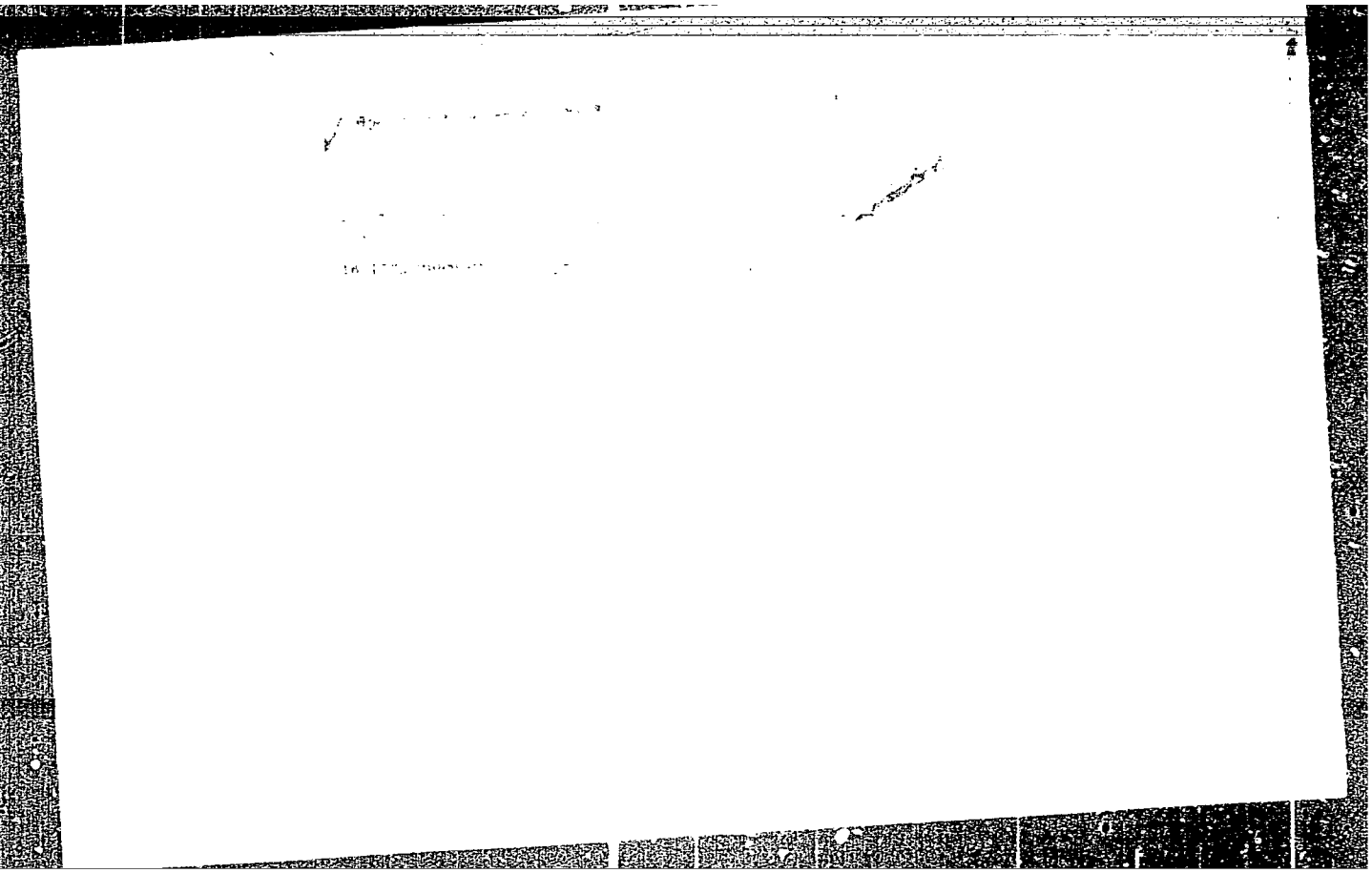
A Laboratory Instrument for the Purity Control of Helium Flow

as well as a photograph of the assembled instrument. A. I. Shal'nikov is thanked for his help and interest. There are 2 figures, no tables and no references.

ASSOCIATION: Institut fizicheskikh problem AN SSSR (Institute for Physical Problems, Academy of Sciences USSR)

SUBMITTED: October 16, 1957.

Card 2/2



VASIL'YEV, D.I.

ZALESSKIY, V.I.; VASIL'YEV, D.I., kand.tekhn.nauk

Stamping pressing dies. TSvet.met. 28 no.3:58-61 My-Je '55 (MIRA 10:11)

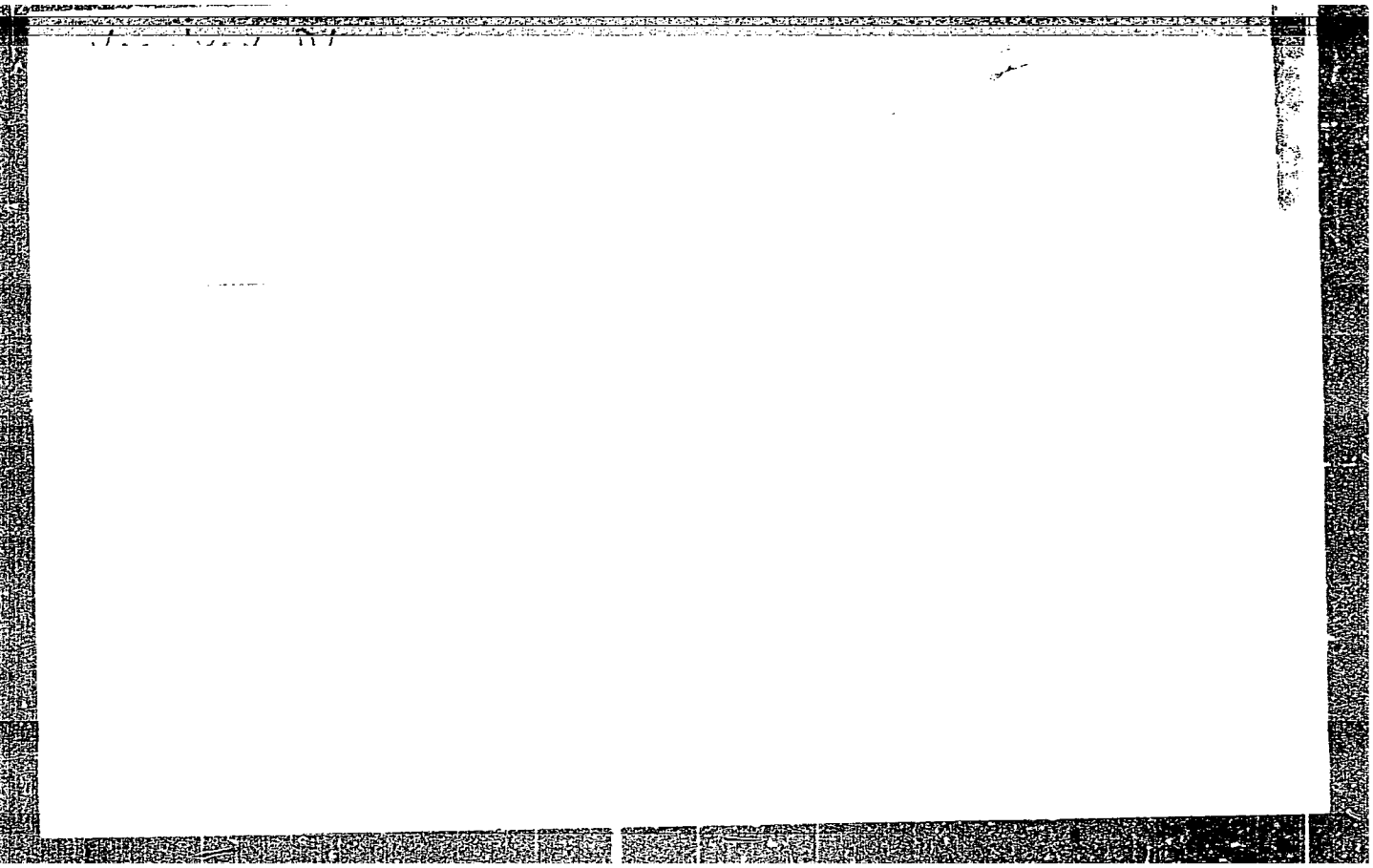
1. Moskovskiy institut stali im. I.V.Stalina.
(Dies (Metalworking))

VASIL'YEV, D. I.

Vasil'yev, D. I.

"The transverse stability of cranes for installing the span structure of railroad bridges." Min Railways USSR. Leningrad Order of Lenin Inst. of Railroad Transport Engineers imeni Academician V. N. Obraztsev. Leningrad, 1956. (Dissertation for the Degree of Candidate in Technical Sciences).

Knizhnaya letopis'
No. 21, 1956. Moscow.



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BODROV, G.D., inzhener; VASIL'YEV, D.I., inzhener.

Reinforced concrete pile designed with a widened base. Stroi.prom.34 no.6:44-46 Je '56. (MLRA 9:9)
(Concrete piling)

VASIL'YEV, D.I., kand.tekhn.nauk; NEMZER, A.M., inzh.

Unballasted bridge road on reinforced concrete slabs. Sbor.trud.MII mostov no.7:5-25 '62. (MIRA 16:12)

VASIL'YEV, D.I., kand.tekhn.nauk; NEMZER, A.M., inzh.

Study of a bridge road on wooden cross beams. Sbor.trud.NII mostov no.7:26-57 '62. (MIRA 16:12)

VASIL'YEV, D.I., kand.tekhn.nauk

Track profile on bridges and high traveling speed of trains.
Sbor.trud.NII mostov no.7:77-101 '62. (MIRA 16:12)

VASIL'YEV, D.I., kand. tekhn. nauk; NEMZER, A.M., inzh.

Bridge road laid on reinforced concrete slabs without the use of ballast. Zhel. dor. transp. 46 no.1:40-42 Ja '64. (MIRA 17:8)

DZUGUTOV, Mikhail Yakovlevich; VASIL'YEV, D.I., red.; GOLYATKINA, A.G., red. izd-va; DOBUZHINSKAYA, L.V., tekhn. red.

[Internal ruptures occurring during pressure working of metals] Vnutrennie razryvy pri obrabotke metallov davleniem. Moskva, Gos. nauchno-tekhn. izd-vo lit-ry po chernoi i tsvetnoi metallurgii, 1958. 207 p. (MIRA 11:9)

(Forging) (Rolling (Metalwork))

VASIL YEV, D.I.

PHASE I BOOK EXPLOITATION SOV/4252

Akademiya nauk SSSR. Komissiya po tekhnologii mashinostroyeniya

Obrabotka sharoprochnykh splavov (Treatment of Heat-Resistant Alloys) Moscow, Izd-vo AN SSSR, 1960. 231 p. 3,500 copies printed.

Sponsoring Agency: Akademiya nauk SSSR. Nauchnyy sovet po problemam sharoprochnykh splavov.

Resp. Ed.: V.I. Dikushin, Academician; Ed. of Publishing House: V.A. Kotov; Tech. Ed.: V.V. Brizgul'.

PURPOSE: This collection of papers is intended to summarize current information on the treatment of heat-resistant alloys with a view toward coordination further research.

COVERAGE: The book is a collection of papers presented at the Conference on Heat-Resistant Alloys, held 18-21 December 1957 by the Commission on Machine-Construction Technology of the Institut mashinovedeniya AN SSSR (Institute of Machine Science, Academy of Sciences USSR). The thirty papers in the collection deal with the casting, pressure working, welding, and cutting of heat-resistant alloys. No personalities are mentioned. References accompany several of the articles.

Reznikov, A.N. Heat Distribution Between Workpiece and Tool in the Machining of Heat-Resistant Alloys and Steels 162

Kurochkin, A.S. Investigation of Some Factors in the Machinability of the EI617 Alloy 175

Kravets, A.T. Electric-Pulse Machining of Heat-Resistant Alloys 182

Zharkov, I.G. High-Speed Milling of Heat-Resistant Materials With Plain Helical Cutters 190

Uryvskiy, F.P. Productivity Increase in the Machining of Heat-Resistant Steels and Alloys With Face Milling Cutters 195

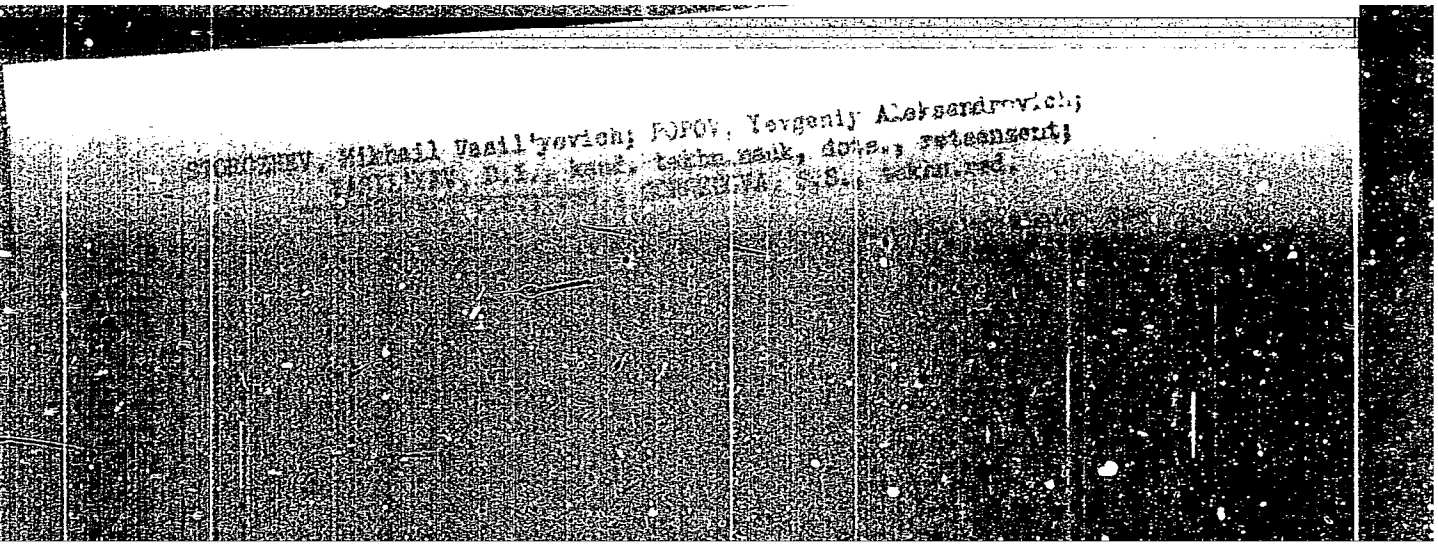
Shifrin, A.Sh. Non-Soviet Experience in the Machining of Stainless and Heat-Resistant Steels and Alloys 202

Vasil'yev, D.I. Tool Life in the Machining of High-Strength Metals 207

POLUKHIN, P.I., prof., doktor tekhn.nauk, red.; GRINBERG, B.G., dotsent, kand.tekhn.nauk; KANTENIK, S.K., dotsent, kand.tekhn.nauk; ZHADAN, V.T., dotsent, kand.tekhn.nauk; VASIL'YEV, D.I., dotsent, kand.tekhn.nauk; LEBEDEV, B.G., dotsent, kand.tekhn.nauk, nauchnyy red.; LAKHTIN, Yu.M., prof., doktor tekhn.nauk, retsenzent; KITAYTSEV, V.A., dotsent, kand.tekhn.nauk, retsenzent; RAZYGRAYEV, A.M., inzh., retsenzent; YUDINA, L.A., red.izd-va; RYAZANOV, P.Ye., tekhn.red.

[Technology of metals] Tekhnologiia metallov. Pod obshchei red. P.I.Polukhina. Moskva, Gos.izd-vo lit-ry po stroit., arkhit. i stroit.materialam, 1960. 460 p. (MIRA 14:3)

1. Kafedra metallovedeniya Moskovskogo avtomobil'no-dorozhnogo instituta (for Lakhtin, Kitaytsev, Razygrayev).
(Metals) (Metalwork)



VASILYEV, D.K.

USSR/ Miscellaneous - Book review

Card 1/1 Pub. 128 - 28/31

Authors : Denisov, A. P.

Title : About the deficiencies of a certain brochure

Periodical : Vest. mash. 35/5, 88-89, May 1955

Abstract : Critical review is presented on a booklet by D. K. Vasilyev, entitled, "Acceptance Test of Ship Boiler Installations".

Institution : .....

Submitted : .....

VASIL'YEV, Dmitriy Konstantinovich; KARPOV, M.N., nauchnyy red.; LAPIN, V.I., red.; KAMOLOVA, V.M., tekhn.red.

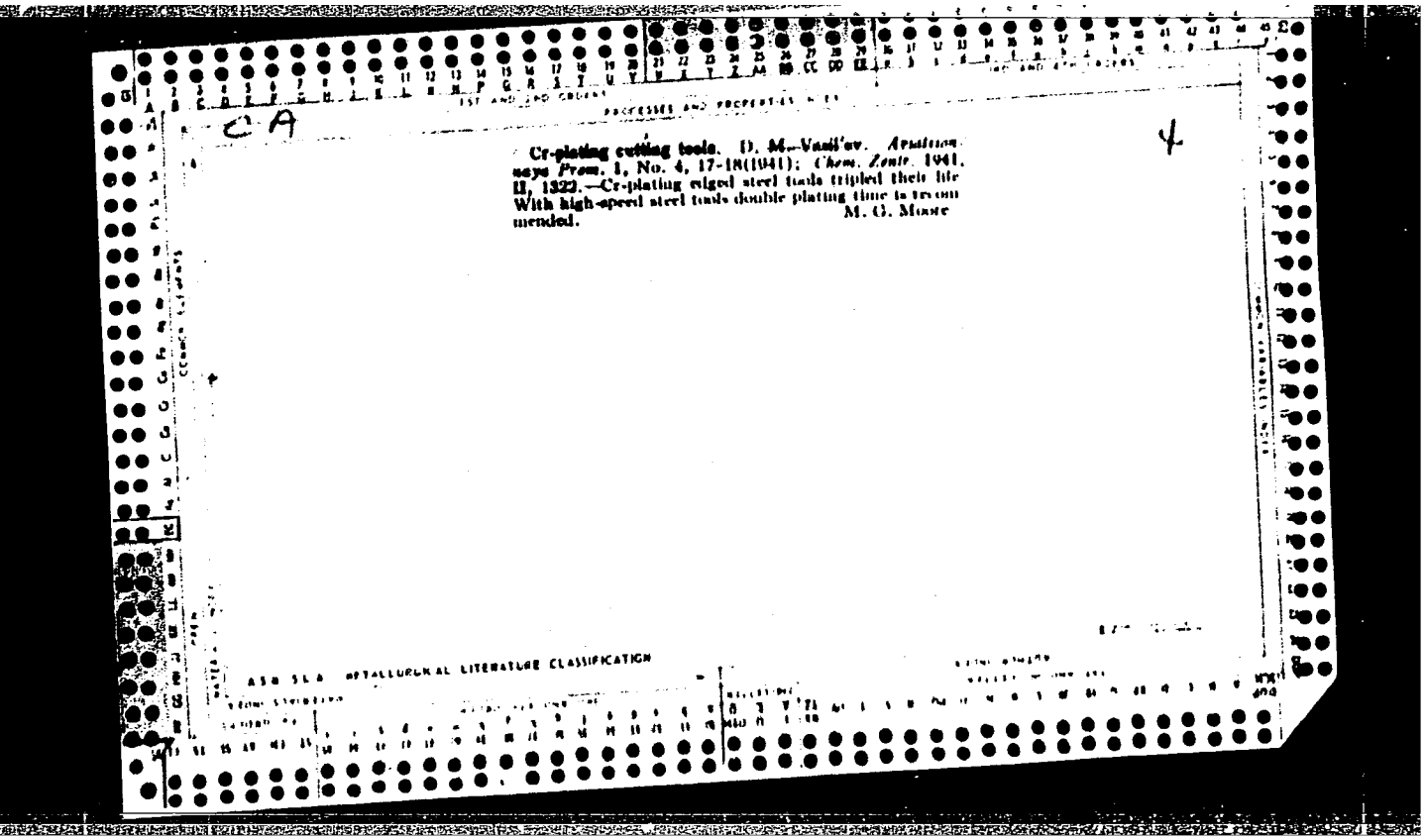
[Testing marine boiler installations] Ispytanie sudovykh parovykh ustanovok. Leningrad, Gos.soiuznoe izd-vo sudostroit.promyshl., 1957. 113 p. (MIRA 10:12)

(Boilers, Marine)

VASIL'YEV, Dmitriy Konstantinovich; PROKONENKO, A.I., inzh., retsenzent; NEDELIN, N.K., nauchnyy red.; OZEROVA, Z.V., red.; KRYAKOVA, D.M., tekhn. red.

[Equipment and devices in ship repairs]Osnastka i prisposobleniia v sudoremonte. Leningrad, Sudpromgiz, 1963. 196 p. (MIRA 16:3)

(Ships—Maintenance and repair)



CA

4

Cr-plating cutting tools. D. M.-Vasil'ev. *Aviatsionnaya Prom.* 1, No. 4, 17-18(1941); *Chem. Zentr.* 1941, II, 1323.—Cr-plating edged steel tools tripled their life. With high-speed steel tools double plating time is recommended. M. G. Moore

ASM SLA METALLURGICAL LITERATURE CLASSIFICATION

Applied Mechanics Review

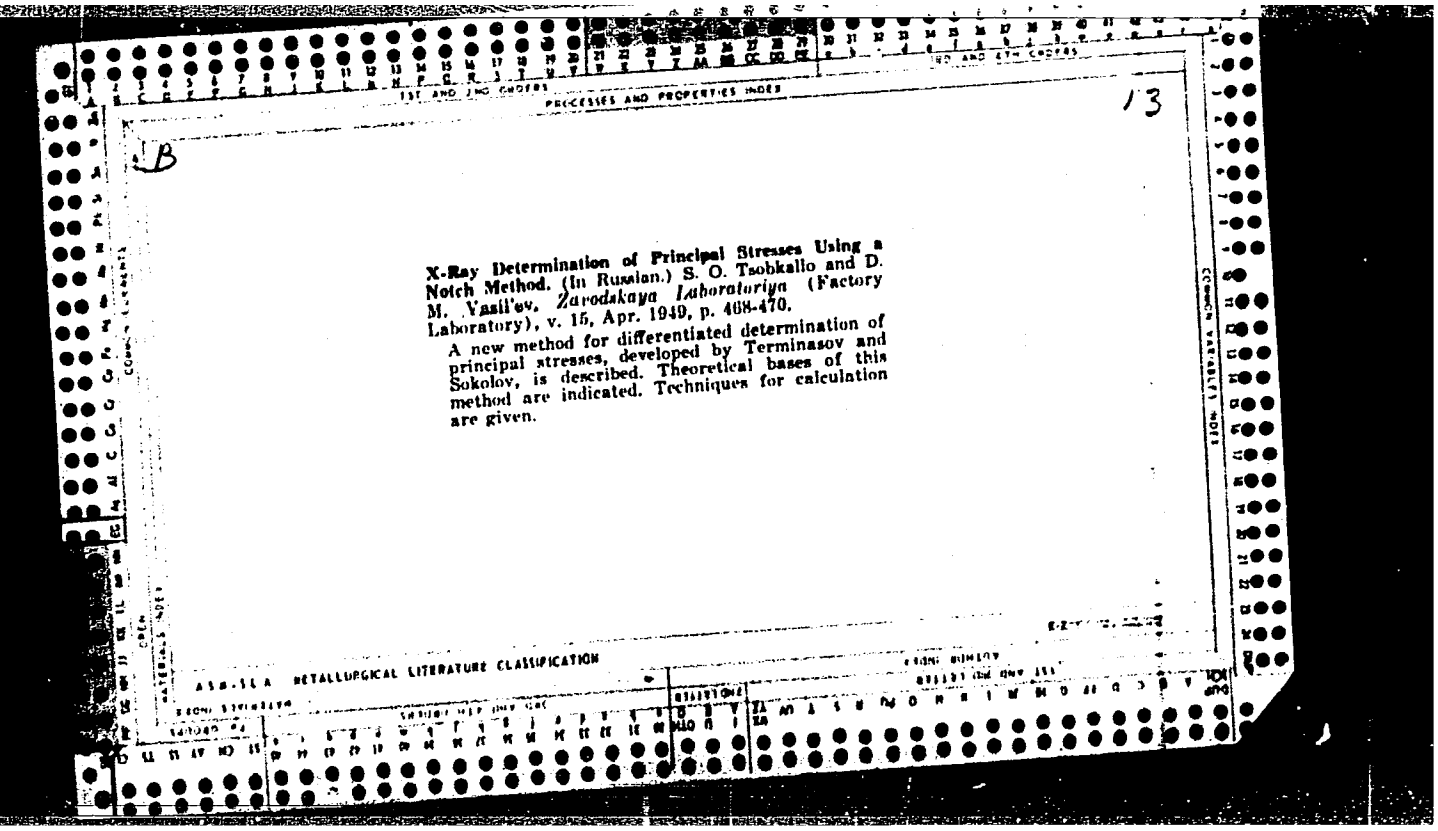
Experimental Stress Analysis

854. S. O. Tsobkallo and D. M. Vasiliev, Residual-stress measurement by excision of small cylinders (in Russian.), Zavodskaya Lab. 15, 199-207 (Feb. 1949).

A method is described of measuring residual surface stresses in large pieces. By means of a machined circular slot a cylindrical portion is isolated from the material but remains undetached at its base. Residual stresses on the free, plane surface of the cylinder are measured by cementing electric-resistance gages to the surface before cutting, and measuring the strains produced by the cut. The authors attempt to establish the required ratio of depth of cut to diameter of cylinder such that the stresses acting on the uncut base of the cylinder will not significantly influence the measured strains. To treat the problem analytically, they introduce rather far-reaching simplifications in replacing the actual situation by a solid infinite cylinder, part of whose surface is acted upon by uniform, radial pressure. They find that at a distance from the loaded portion equal to about half the diameter, the radial strain is about 1% of the maximum radial strain on the loaded portion, a result which is hardly surprising in view of Saint Venant's principle. They conclude, by implicit analogy, that a depth of cut equal to the diameter is more than sufficient to insure undisturbed surface strains. A test is described to verify this contention. However, as the test two long straight slots were used to isolate the test portion, rather than the cylindrical slot for which the analysis was made. Difficulties are described of obtaining reliable strain measurements over a sufficient length of time (zero-shift), this error, for 100 hr, amounted to 2% when bakelite cement heated to 70 C for 20 hr was used, and to 15% for both bakelite and celluloid-acetone cements dried at room temperatures. It is maintained that if X-ray stress measurements were made instead, a cylinder diameter of 1 mm would suffice, but problems of accuracy of this method are not discussed.

George Winter, USA

1950



X-Ray Determination of Principal Stresses Using a Notch Method. (In Russian.) S. O. Tsobkallo and D. M. Vasil'ev. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 15, Apr. 1949, p. 468-470.

A new method for differentiated determination of principal stresses, developed by Terminasov and Sokolov, is described. Theoretical bases of this method are indicated. Techniques for calculation are given.

VASIL'YEV, D.M.

Thermoplastic After-Effect in Metals.—I. N. N. Davidenkov and D. M. Vasil'ev (*Zhur. Tekhn. Fiziki*, 1955, 25, (4), 671-679).—[In Russian]. D. and V. used a dilatometric method to measure the after-effect in metals deformed plastically as a result of heating. Metals studied were: plain-C steels of 17 compn. and 10 special alloy steels. Measurements are given in detail in tables and graphs. The sign and magnitude of the after-effect depends critically on the C content, the content of alloying elements, and the previous thermal treatment. Armco Fe and low-C steels in annealed condition have positive after-effects. Increasing the C content increases the tendency of the after-effect to become negative. The largest negative effect occurs in eutectoid steel and is ~0·1% as a result of heating to 650° C. specimens deformed plastically by 10%. Alloying with Cr produces a negative after-effect both in plain-C steels and in special steels. Alteration of the grain-size from large (as in annealed specimens) to small (normalized or quenched) often changes the sign of the effect and the abs. magnitude of the remanent deformation may also increase. Experiments show that the effect as observed by the dilatometers cannot be due to changes in the coeff. of linear expansion nor to a change in area of the specimen. The cause must be sought in relaxation of stresses remaining in the specimen after plastic deformation. It is not possible, with the dilatometric apparatus described, to judge the effect of vol. changes taking place during tempering. D. and V. finally point out that as a result of the after-effect metal parts which have been treated in such a manner as to produce it, may change their dimensions in service.

—A. F. B.

(1)

FD-2845

USSR/Physics - Distance Meter

Card 1/1 Pub. 153-28/30

Author : Vasil'yev, D. M. and Vashchenko, Z. A.

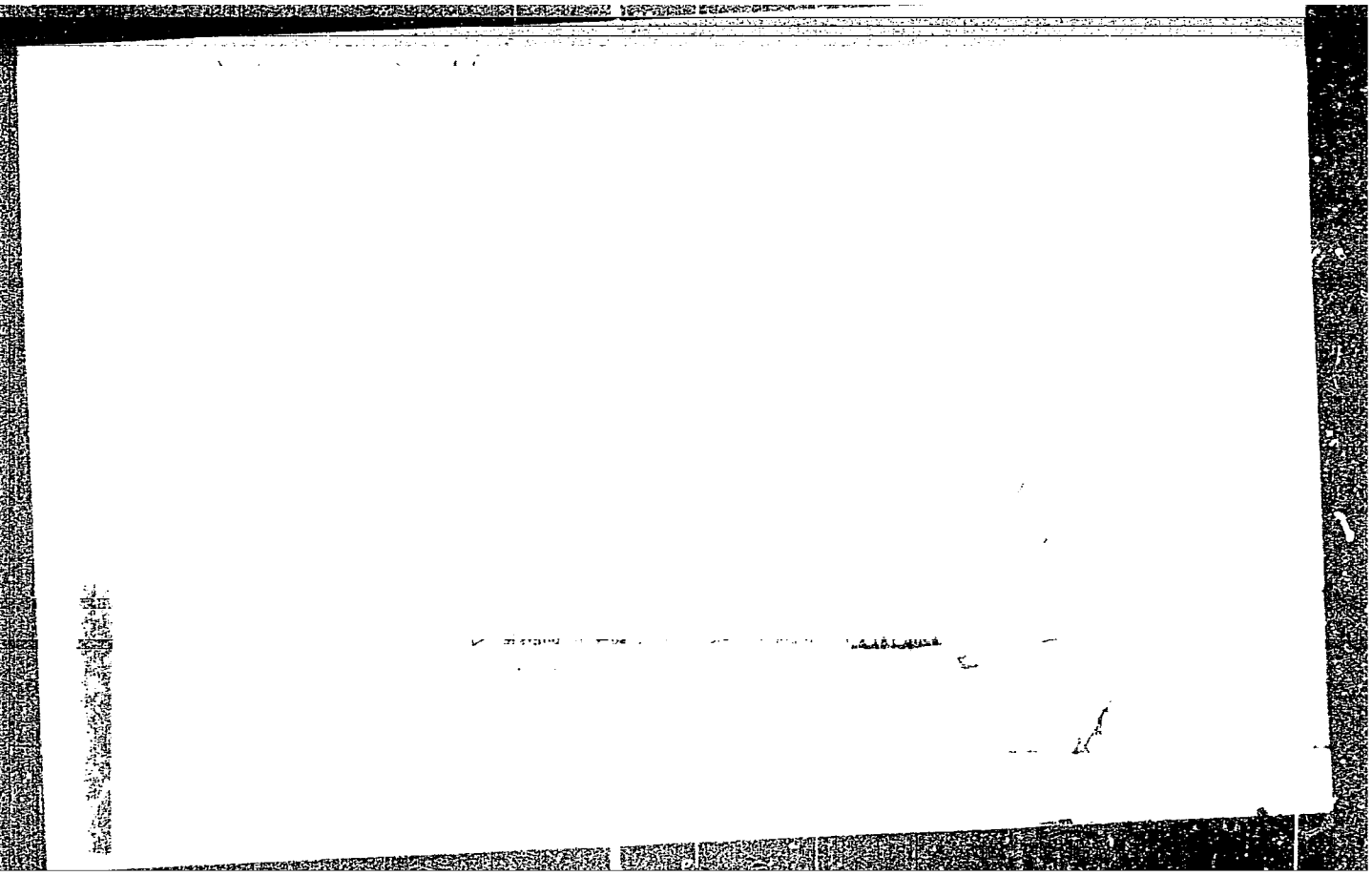
Title : Method of Determining Small Variations of Interplane Distances

Periodical : Zhur. Tekh. Fiz, 25, 765-767, 1955

Abstract : The equation of Wolf-Bragg is used to express the distance between interference lines of light to study small variations in interplane distances of the lattice of the specimen. One reference.

Institution :

Submitted : February 5, 1955



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Vasil'yev, D.M

USSR/Solid State Physics - Structure of Deformable Materials. E-9

Abs Jour : Referat Zhur - Fizika, No 5, 1957, 11853

Author : Vasil'yev, D.M., Yerashov, A.F.

Inst : Leningrad Institute of Engineers of Railroad Transport, USSR.

Title : Residual Variation in Interplanar Distances of Polycrystalline Specimens After Plastic Deformation.

Orig Pub : Izv. AN SSSR, ser. fiz., 1956, K56, 20, No 6, 659-663

Abstract : X-ray diffraction methods were used to investigated the dependence of the relative change Δ d/d of the interplanar distance of the lattice on the angle ψ between the reflected plane and the axis of deformation and of the magnitude of strain ε_{pl} on steel specimens St25, first subjected to plastic deformation by tension of 0.6, 2.4, 4.9, 9.3, and 14% of compression of 6.4 and 19%. The general character

Card 1/2

VASIL'YEV, D.M.

Category : USSR/Solid State Physics - Structure of Deformable Materials E-8

Abs Jour : Ref Zhur - Fizika, No 1, 1957, No 1303

Author : Vasil'yev, D.M.

Title : Concerning a Procedure for X-ray Investigation of Polycrystalline Specimens Having a Texture

Orig Pub : Zh. tekhn. fiziki, 1956, 26, No 3, 695-697

Abstract : A discussion of the shortcomings of the existing methods for the study of distortions of the third kind. Based on an analysis of the diffraction of x-rays by a crystal lattice in the inverse vector space, a new method is proposed with which it becomes possible to investigate the process of the development of the distortion over all the reflections shown on the x-ray photograph. The method is usable only for an axial texture in which the grains are not too large.

Card : 1/1

VASIL'YEV, D.M.

Category : USSR/Solid State Physics - Mechanical Properties of Crystals and Crystalline Compounds E-9

Abs Jour : Ref Zhur - Fizika, No 3, 1957, No 6793

Author : Vasil'ev, D.M., Yovleshin, L.S.
Title : Plastic Aftereffect in Metals.

Orig Pub : Zh. tekhn. fiziki, 1956, 26, No 6, 1351-1356

Abstract : Steels No. 25, 40, 40Kh, 50, and U-8 have been tested for changes in dimensions upon heating (at a rate of 2°/minute up to 680°) after preliminary plastic deformation by bending or twisting (the specimen being annealed or normalized and deep-tempered before the test). The summary aftereffect curve (change in dimensions for a given heating cycle) represented the superposition of aftereffect curves, obtained by relaxation of the macro and micro stresses, which are determined seperately by the superposition principle. The component of micro stresses was either positive or negative depending on the composition of the steel. The variation of the macro stress component with time was of the same character for all types of steel, namely, a negative after-

Card : 1/2

Category : USSR/Solid State Physics - Mechanical Properties of F-9
Crystals and Crystalline Compounds

Abs Jour : Ref Zhur - Fizika, No 3, 1957, No 6793

effect at first, which first slows down and sometimes becomes positive at the end of the heating. It is shown that low-carbon and unalloyed medium-carbon steels have a positive aftereffect (increase the strain); eutectoid and alloyed medium-carbon steels give a negative aftereffect.

Card : 2/2

VASIL'YEV, D.M.

Category : USSR/Solid State Physics - Mechanical Properties of Crystals and Crystalline Compounds E-9

Abs Jour : Ref Zhur - Fizika, No 3, 1957, No 6794

Author : Vasil'ev, D.M.,
Title : On the Nature of Afteroffect in Metals

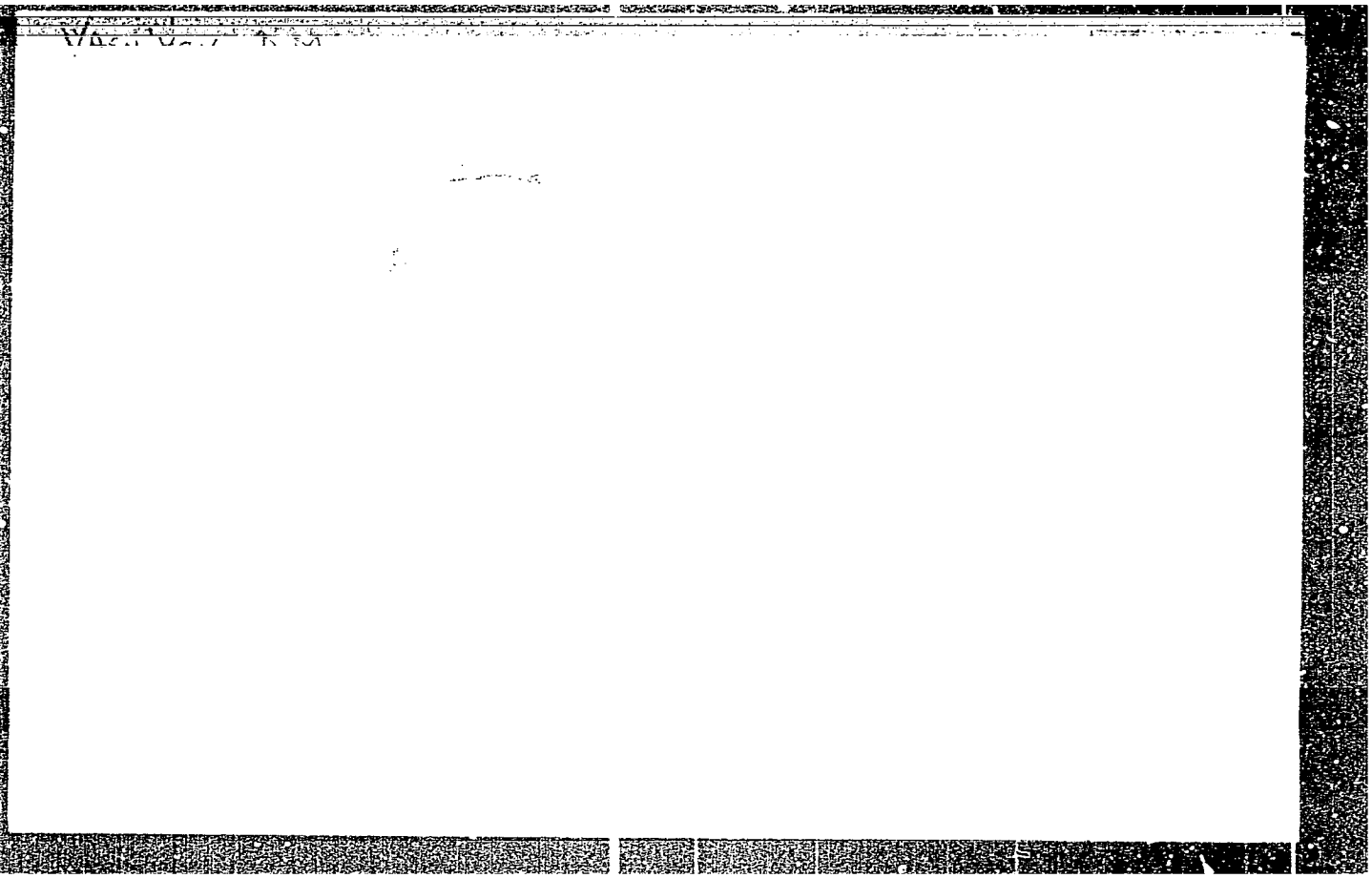
Orig Pub : Zh. tekhn. fiziki, 1956, 26, No6, 1357-1365

Abstract : It is proposed that the reversed elastic aftereffect and that plastic aftereffect have the same physical nature and are caused by relaxation of micro stresses produced by previous deformation. For a qualitative explanation of the nature of the aftereffect, a two-component rheological system consisting of parallel Maxwell elements with different relaxation times is proposed. It is shown that if after unloading the ratio of the relaxation time of the Maxwell elements is inverted, a positive aftereffect appears; if this ratio remains the same, a negative aftereffect is observed. The treatment of the phenomena of aftereffect in real polycrystalline bodies is based on a hypothesis of the existence of oriented micro stresses in the bodies upon their

Card : 1/2

formation. A phenomenological scheme is analyzed for the dependence of the relaxation time on the temperature and on the heating speed. This scheme explains the conditions under which positive or negative aftereffects appear. [illegible] ness, was confirmed experimentally in steels with different carbon contents.

Card : 2/2



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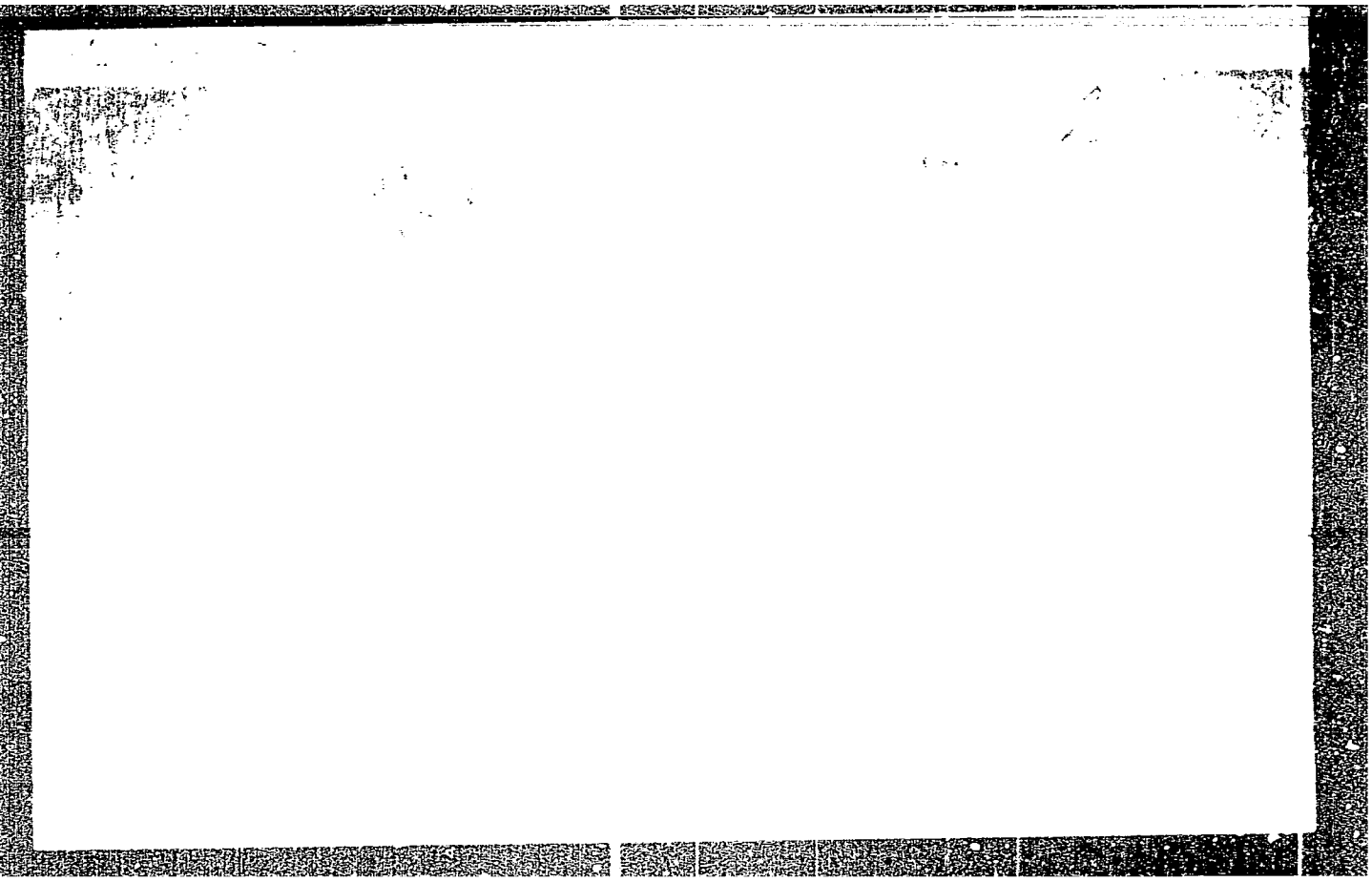

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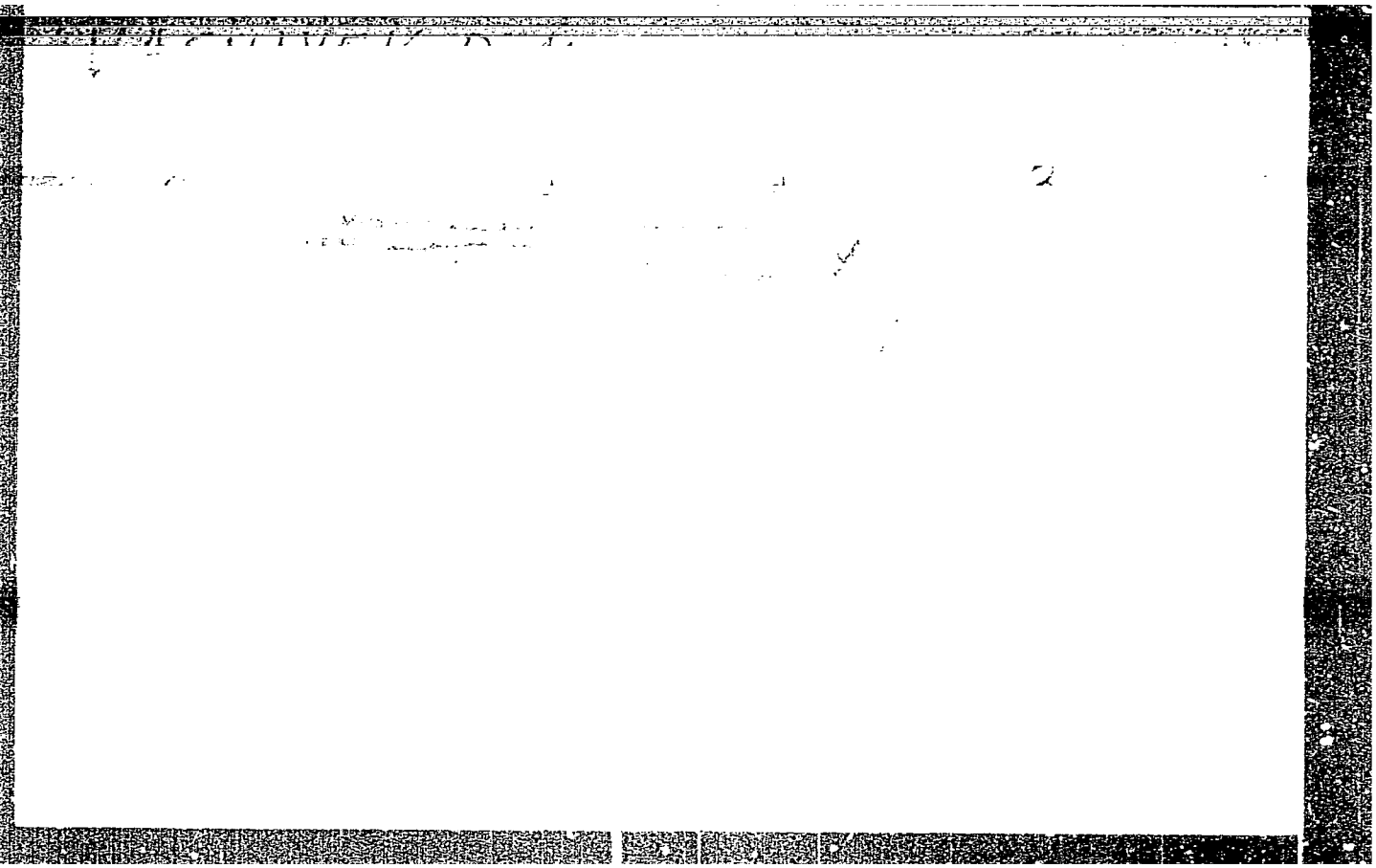

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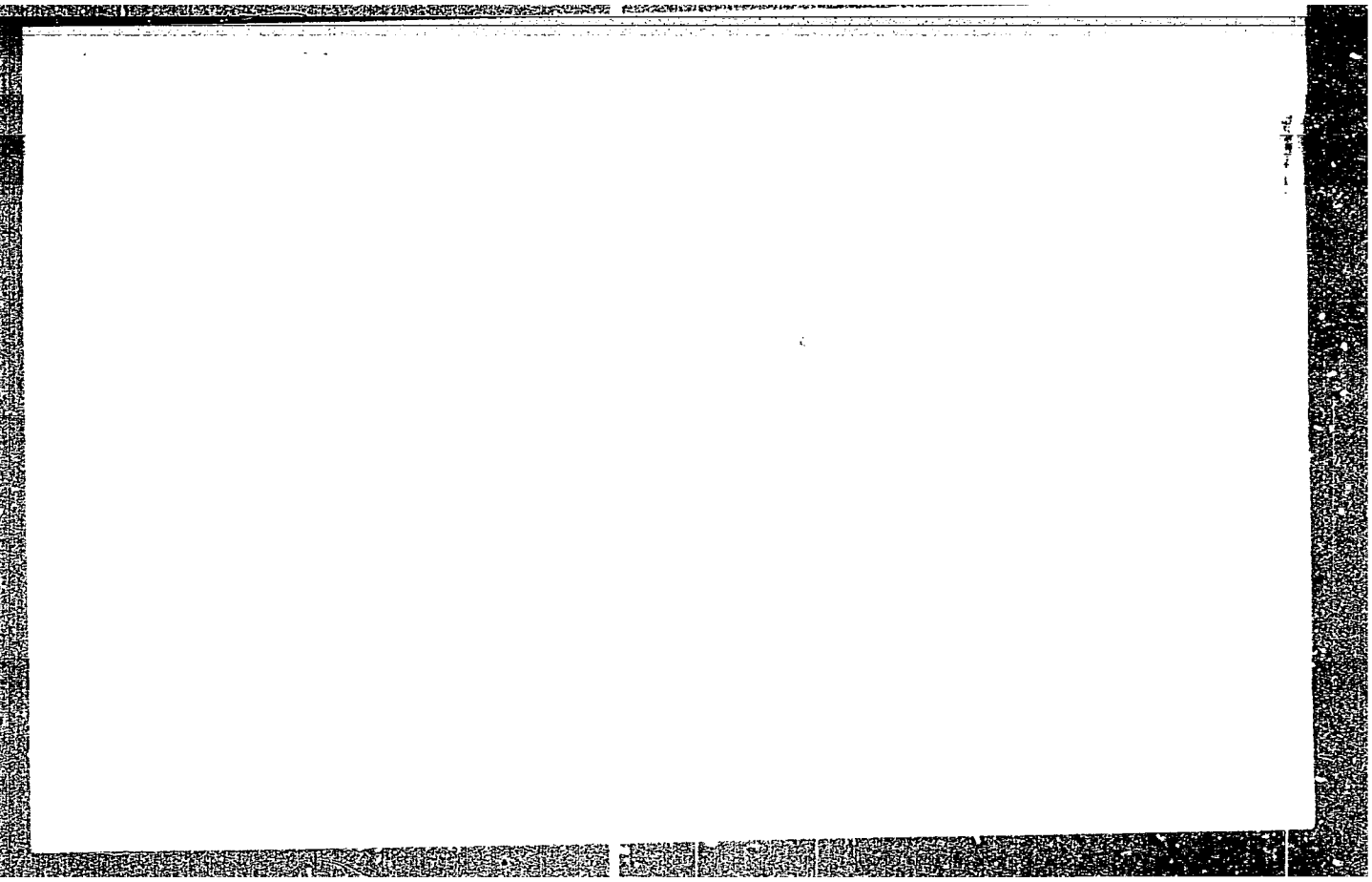

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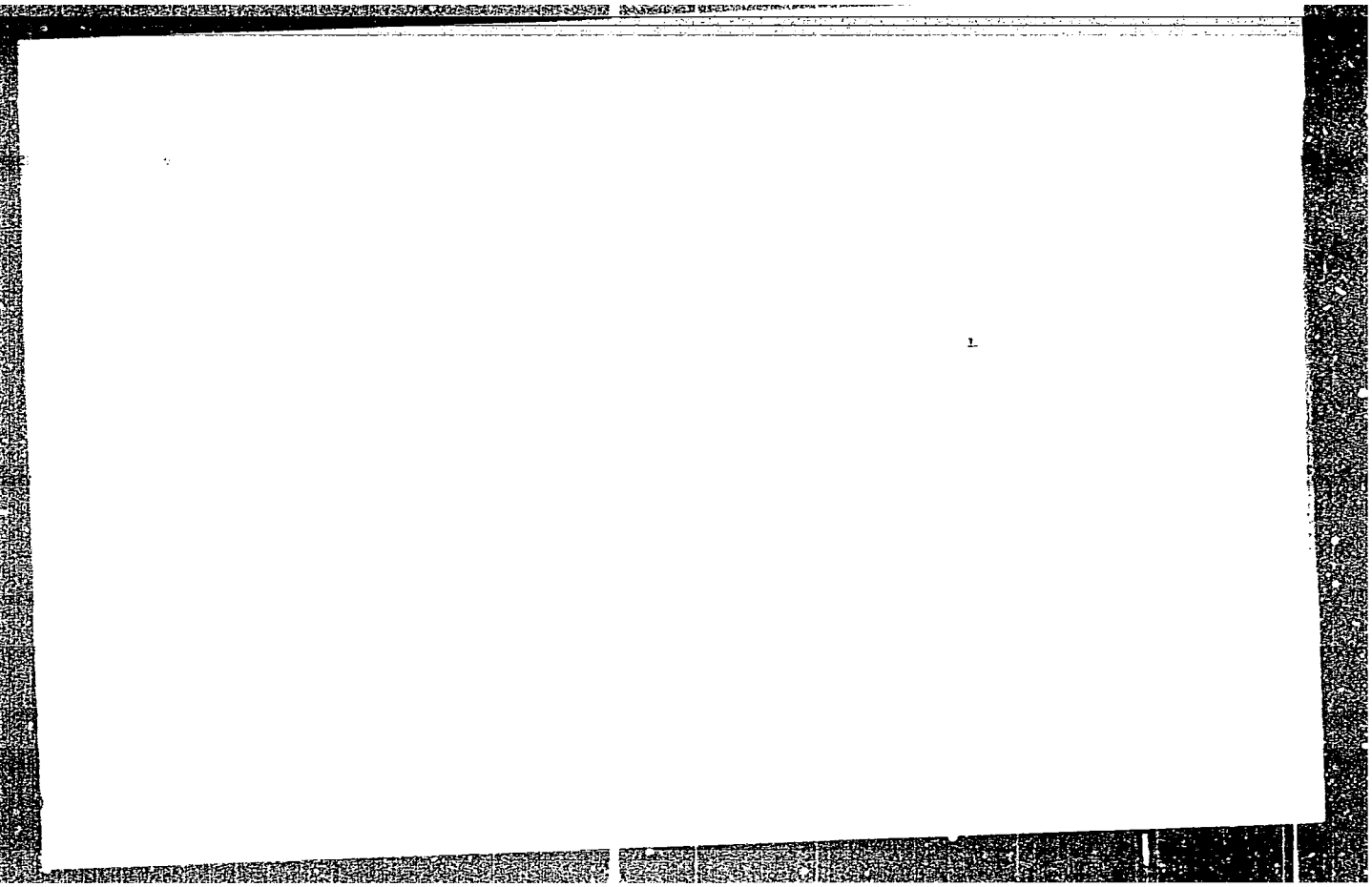

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VASIL'YEV, D. M.

VASIL'YEV, D. M.
Polytechnical Institute, Leningrad.

"Microstresses in Plastically Deformed Polycrystalline Samples."

Paper submitted at
Program of the Conference on the Non-Metallic Solids of Mechanical Properties. Leningrad
May 19 - 26, 1958.

SOV/57-58-8-37/37

AUTHOR: Vasil'yev, D. M.

TITLE: Letters to the Editor(Pis'ma v redaktsiyu):Answer to the Letter From Ye.G.Nesterenko Concerning the Article by D.M. Vasil'yev "On the Method of Separating the Kα-Doublet in X-Ray Lines" (Otvet na pis'mo Ye.G.Nesterenko po povodu stat'i D.M.Vasil'yeva "K metodike razdeleniya Kα-dubletta rentgenovskikh liniy")

PERIODICAL: Zhurnal tekhnicheskoy fiziki, 1958, Nr 8, pp 1849 - 1849 (USSR)

ABSTRACT: In order to throw light on the problem under review the author states that only recently he examined the results of a separation of the Kα-doublet, using

$\frac{B_o}{B} = f(\frac{\delta}{B})$. This formula is taken from reference 1. It was computed under the assumption that the contour of the x-ray line is specified by the

$e^{-k^2x^2}$ law. The examination exhibited that in this case exactly the same results were obtained as when the formula $\Delta\beta = f(\beta_o)$ had been used. As concerns the remark made by Ye. G. Nesterenko stating that the "replacement of many

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Letters to the Editor. Answer to the Letter From Ye.G.Nesterenko Concerning the Article by D.M.Vasil'yev "On the Method of Separating the Kα-Doublet in X-Ray Lines" SOV/57-58-8-37/37

supplementary diagrams by only one diagram is always desirable" there is no reason to agree with such an assertion. After all the formula $\triangle\beta = f(\beta_0)$ was specified from a universal curve which was obtained from several δ -values in order to be able to use the diagram plotting $\triangle\beta = f(\beta_0)$ without additional computations. There is 1 reference.

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USCOMM-DC-60471

VASIL'YEV, D.M.

Microstresses arising in polycrystalline plasticly deformed test pieces. Zhur. tekh. fiz. 28 no.11:2527-2542 N '58.
(MIRA 12:1)

(Strains and stresses) (X rays--Scientific applications)

VASIL'YEV, D.M.

PHASE I BOOK EXPLOITATION SOV/3559

Akademiya nauk SSSR. Institut metallurgii. Nauchnyy sovet po probleme zharoprochnykh splavov

Issledovaniya po zharoprochnym splavam, t. 5 (Investigations of Heat-Resistant Alloys, Vol 5) Moscow, Izd-vo AN SSSR, 1959. 423 p. Errata slip inserted. 2,000 copies printed.

Ed. of Publishing House: V.A. Klimov; Tech. Ed.: I.F. Kuz'min; Editorial Board: I.P. Bardin, Academician, G.V. Kurdyumov, Academician, N.V. Ageyev, Corresponding Member, USSR Academy of Sciences (Resp. Ed.), I.A. Oding, I.M. Pavlov, and I.F. Zudin, Candidate of Technical Sciences.

PURPOSE: This book is intended for metallurgical engineers, research workers in metallurgy, and may also be of interest to students of advanced courses in metallurgy.

COVERAGE: This book, consisting of a number of papers, deals with the properties of heat-resisting metals and alloys. Each of the papers is devoted to the study of the factors which affect the properties and behavior of metals. The effects of various elements such as Cr, Mo, and W on the heat-resisting properties of various alloys are studied. Deformability and workability of certain metals as related to the thermal conditions are the object of another study described. The problems of hydrogen embrittlement, diffusion and the deposition of ceramic coatings on metal surfaces by means of electrophoresis are examined. One paper describes the apparatus and methods used for growing monocrystals of metals. Boron-base metals are critically examined and evaluated. Results are given of studies of interatomic bonds and the behavior of atoms in metal. Tests of turbine and compressor blades are described. No personalities are mentioned. References accompany most of the articles.

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Vasil'yev, D. M.
24(6) PHASE I BOOK EXPLOITATION SOV/2385

Akademiya nauk SSSR

Nekotoryye problemy prochnosti tverdogo tela; sbornik statey (Some Problems in the Strength of Solids; Collection of Articles) Moscow, Izd-vo AN SSSR, 1959. 386 p. Errata slip inserted. 2,000 copies printed.

Ed. of Publishing House: V. I. Aver'yanov; Tech. Ed.: R. S. Pevzner; Editorial Board: A.F. Ioffe, Academician; G. V. Kurdyumov, Academician; S. N. Zhurkov, Corresponding Member, USSR Academy of Sciences; B. P. Konstantinov, Corresponding Member, USSR Academy of Sciences; F. F. Vitman, Doctor of Physical and Mathematical Sciences, Professor (Resp. Ed.); L. A. Glikman, Doctor of Technical Sciences, Professor; N. A. Zlatin, Doctor of Physical and Mathematical Sciences; V. A. Stepanov, Doctor of Technical Sciences; Ya.B. Fridman, Doctor of Technical Sciences, Professor; B. S. Ioffe, Candidate of Technical Sciences (Deputy Resp. Ed.).

PURPOSE: This book is intended for construction engineers, technologists, physicists and other persons interested in the strength of materials.

COVERAGE: This collection of articles was compiled by the Otdeleniye fiziko-matematicheskikh nauk AN SSSR(Department of Physical and Mathematical Sciences) and the Fiziko-tekhnicheskiy institut AN SSSR (Institute of Applied Physics,

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Academy of Sciences, USSR) in commemoration of the 80th birthday of Nikolay Nikolayevich Davidenkov, Member of the Ukranian Academy of Sciences, founder and head of the Otdel prochnosti materialov (Department of the Strength of Materials) at the Institute of Applied Physics, Academy of Sciences, USSR, founder of the Fakul'tet fizicheskogo metallovedeniya (Department of Physical Metallurgy) at the Leningradskiy politekhnicheskiy institut (Leningrad Polytechnic Institute), recipient of the Stalin Prize (1943), the Order of the Red Banner of Labor (1945) and the Order of Lenin (1953). The articles deal with the strength of materials, phenomena of imperfect elasticity, temper brittleness, hydrogen embrittlement, cold brittleness, influence of deformation speed on the mechanical properties of materials, fatigue of metals, and general problems of the strength, plasticity, and mechanical properties of nonmetals. Numerous personalities are mentioned in the introductory profile of Professor Davidenkov. References are given at the end of each article.

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67325

AUTHORS: Vasil'yev, D.M., Kozhevnikova, L.V. SOV/181-1-8-30/32

TITLE: On the Nature of the Fluidity Area of Pure Iron and Carbon Steels

PERIODICAL: Fizika tverdogo tela, 1959, Vol 1, Nr 8, pp 1316-1319 (USSR)

ABSTRACT: By a method described by D.M. Vasil'yev it is possible to follow directly the behavior of the matrix regions and of the brittle skeleton in plastic deformation, and also to determine the structural stresses acting upon the A-region (of the matrix) and the B-region (grain boundaries and mosaic blocks, hard phases). Between the residual microstresses σ_i, the microstresses σ_m, and the "structural stresses", the relation $\sigma_{st} = \sigma_m + \sigma_i$ holds. The microstresses σ_i in turn are composed of the microstresses $\overline{\sigma}_i$. The stresses acting upon the ferrite of the carbon steel were experimentally measured for steel with 0.22%C in normalized steel and in steel tempered at 680°. The results illustrated in a diagram show the following: As soon as the fluidity area is found, the structural stresses acting upon the ferrite become smaller than the macroscopic

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On the Nature of the Fluidity Area of Pure Iron and Carbon Steels

stresses, and this difference is conserved up to very high degrees of plastic deformation. When considering the dispersion $\Delta\sigma_{st} = \Delta\sigma_i$, the sample exhibits regions in which the stress almost vanishes, in addition to the ferrite regions in which the stress is somewhat larger than σ_m. For the direct determination of the "structural stresses" acting upon cementite the authors used U-8 steel annealed at 760°. On a sample stretched by 10% it was possible to determine the average structural stresses $\bar{\sigma}_{st}$ of the ferrite and cementite. Immediately after the passage through the fluidity area, underloading of the ferrite begins with a considerable overload of the cementite, which fact sharply contradicts the Koster hypothesis. Apart from cementite apparently also the grain boundaries and the mosaic blocks play an important part by taking up part of the overload. In a metal containing either no impurities or which is subject to such conditions as prevent the formation of "atmospheres" around the dislocations, the curves of average structural stresses correspond to the macroscopic

On the Nature of the Fluidity Area of Pure Iron and Carbon Steels

deformation curve. The X-ray curves of deformation are smooth. If there are "atmospheres", the macroscopic curve of deformation is a straight line in the initial stage of the process, and the structural stresses are not necessarily equal to the macroscopic stresses. The plastic deformation leads to a skeleton fracture. This, however, is no obstacle for the particles scattered into the material of the boundary-near regions in the way of taking up also the structural overload stresses, and to compensate in this manner for the underload of the weak A-regions of the matrix. A direct experimental hypothesis thus contradicts the Koster hypothesis where it holds that the cementite skeleton in the fluidity area of steel is unloaded. There are 3 figures, 3 tables, and 4 references, 3 of which is Soviet.

ASSOCIATION: Leningradskiy politekhnicheskiy institut (Leningrad Polytechnic Institute)

SUBMITTED: April 4, 1959

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66282

AUTHOR: Vasil'yev, D.M. SOV/181-1-11-17/27

TITLE: On the Microstrains Arising in Metals by Plastic Deformation.II

PERIODICAL: Fizika tverdogo tela, 1959, Vol 1, Nr 11, pp 1736-1746 (USSR)

ABSTRACT: In the present paper the author treats the underlying principles of the hypothesis of oriented microstrains occurring in metals after macroscopically homogeneous and plastic deformations. In the first part of the paper it is shown that a shift of X-ray diffraction lines occurs in the range of "rearward" angles of diffraction. In the second part of the paper the nature of equilibration of the residual microstrains occurring in metals after macroscopically homogeneous and plastic deformations is investigated. Tests made with the following pure metals: α-Fe, Al, Cu, Mo, and Ni show that in all cases contracting residual strains which are independent of the sign of the preceding plastic deformation act on the matrix range. An equilibrium is reached in this system of microstrains owing to the existence of grain boundaries and mosaic blocks which are under the influence of stressing microstrains. The ferrite and cementite in high-carbon steels were also found to be subject to microstrains having

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On the Microstrains Arising in Metals by Plastic Deformation. II

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SOV/181-1-11-17/27

reverse signs. In the last part of the paper the author discusses some possible applications of the concept of "oriented" microstrains for the solution of problems in the field of physics of metals. N.N. Davidenkov discussed the paper. There are 8 figures, 1 table, and 25 references, 12 of which are Soviet.

ASSOCIATION: Leningradskiy Politekhnicheskiy institut (Leningrad Polytechnic Institute)

SUBMITTED: March 3, 1959

Card 2/2

7(6)
AUTHOR: Vasil'yev, D. V.

SOV/32-25-1-30/51

TITLE: On the Method of Radiographic Measurements of Macro- and Microstresses According to the Method of Angle Plotting (K metodike rentgenovskogo izmereniya makro- i mikronapryazheniy metodom uglovykh snimkov)

PERIODICAL: Zavodskaya Laboratoriya, 1959, Vol 25, Nr 1, pp 70 - 75 (USSR)

ABSTRACT: It had already been pointed out (Ref 1) that in the determination of residual macrostresses by radiography the displacement of radiographic lines can be influenced by aligned microstresses thus causing variations in the measuring results obtained. The present paper describes a method of determining aligned microstresses, based on a macro-uniform and plastic deformation of polycrystalline samples. A method for the discriminating determination of macro- and micro-residual stresses is also given. For the angle plotting of small-dimensioned samples a camera was employed, based on the design of the OK type, but featuring a shorter distance "camera

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aperture - film" (30 mm), as compared to the well known Kros camera (55 mm). A linear stress or compression of cylindrical samples leads to the formation of a homogeneous field of aligned microstresses. The experimental X-ray analysis of this field calls for the sample to be cut to the shape of a rectangular parallelepipedon (Fig 2a). In the calculations the dependence of the relative change of the interface distance

$\frac{\Delta d}{d}$ on the square of the sinus of angle ψ between the reflecting plane and the deformation axis is of essential importance. In the case of angle plotting in which the angle $\psi^* \neq 90^\circ$, two different values can be obtained for ψ (Fig 3). A diagram is given, showing the function of the roentgen line displacement in dependence of $\sin^2\psi$, with respect to a steel St 20 sample, which was submitted to a compression of 3.6%. Detailed calculations and explanations are followed by equations for the determination of macro-and microstresses. By employing Glikman's method (Ref 9) and data by Tsobkallo and Vasil'yev (Ref 10) the value of these stresses can be

estimated by causing a perturbation in the macrostress equilibrium. Microstresses are determined according to the present methods. There are 4 figures and 11 Soviet references.

ASSOCIATION: Leningradskiy politekhnicheskiy institut (Leningrad Polytechnic Institute)

SOV/32-25-3-51/62

8(2)
AUTHORS: Vasil'yev, D. M., Tumanov, A. K.

TITLE: A Precision Quartz Dilatometer (Pretsizionnyy kvartsevyy dilatometr)

PERIODICAL: Zavodskaya Laboratoriya, 1959, Vol 25, Nr 3, pp 374-375 (USSR)

ABSTRACT: The article is a description of a dilatometer using the pattern of a "roller" with an expansion coefficient of appr. 5.10^4. The apparatus (Fig 1) consists of a base plate with two supports for the two working rods which are connected through quartz extension pieces and which hold the sample. The samples with the quartz extension pieces are contained in two quartz tubes attached to a clamping device. A third quartz tube contains a thermoelement. During the experiment the three quartz tubes are in a stove with a maximum temperature of 1200^0. The sample deformation is measured with the help of a mirror mounted on an axis. The latter is attached to a clamp (Fig 2). With a sample length of 10 mm a relative length change can be determined by means of the apparatus described with an accuracy of 2.10^{-6}; the accuracy of determining an absolute extension is 2.10^{-5} mm. There are 2 figures.

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A Precision Quartz Dilatometer SOV/32-25-3-51/62

ASSOCIATION: Leningradskiy politekhnicheskiy institut
(Leningrad Polytechnical Institute)

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24 (2)
AUTHORS: Vasil'yev, D. M., Likhachev, V. A. SOV/32-25-6-38/53

TITLE: X-Ray Ionization System for the Investigation of Deformations of the Structure of Polycrystalline Samples (Rentgenovskaya ionizatsionnaya ustanovka dlya issledovaniya iskazheniy struktury polikristallicheskikh obraztsov)

PERIODICAL: Zavodskaya Laboratoriya, 1959, Vol 25, Nr 6, pp 747-748 (USSR)

ABSTRACT: An ionization system is described which permits operating in the broad range of diffraction angles, up to values of θ near 90°. From the scheme (Fig 1) it may be seen that the X-ray tube BSV-1 with the anode directed to the top, is arranged in such a manner that the X-ray beam runs in horizontal direction. A selective filter absorbs the Kβ-rays. The sample is deformed by means of a lever with a weight. It is possible to heat the sample during the investigation. The diffraction maximum is recorded by means of an electron potentiometer EPPV-51. The radiotechnical part of the system is connected according to the scheme of the system URS-50 I. The X-ray diagram of a deformation of a flat sample of Armco iron is mentioned as example (Fig 2). The diagram of

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the function between the width of the diffraction line β and time - obtained on a sample of electrolyte nickel under constant voltage (σ = 15 and 20 kg/mm^2) - is given as the second example (Fig 3). There are 3 figures.

SHCHAPOV, N.P., prof.; VASIL'YEV, D.M., kand.fiz.-matem.nauk; ROVINSKIY, B.M., prof., doktor fiz.-matem.nauk; SHAROV, B.V, starshiy inzhener

Classification and exposure of residual stresses. Zav.lab. 25 no.10:1224-1231 '59. (MIRA 13:1)

1. Vsesoyuznyy nauchno-issledovatel'skiy institut zheleznodorozh-nogo transporta (for Shchapov).
(Strains and stresses)

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SOV/32-25-10-27/63

28(5)
AUTHOR: Vasil'yev, D. M., Candidate of Physical and Mathematical Sciences

TITLE: The Problem of the Classification and Manifestation of Residual Stresses. (Answers to the Article by Academician N. N. Davidenkov Published in Nr 3 of the Periodical for 1959 Have Arrived at the Editorial Office of the Periodical "Zavodskaya Laboratoriya". These Answers Are Given Below in the Form of a Discussion). II.

PERIODICAL: Zavodskaya laboratoriya, 1959, Vol 25, Nr 10, pp 1226-1228 (USSR)

ABSTRACT:

II

The author points out that the question raised by N. N. Davidenkov is very interesting. It was found (Ref 1) that the effect of shifting of the X-ray lines does not disappear after the removal of the surface layer (from the sample), i.e. the macrohomogeneous plastic deformation also occurs inside the sample. Smith and Wood (Ref 2) explained this shifting by microstresses. B. M. Rovinskiy (Ref 3) assumed that oriented microstresses were present in the sample after plastic deformation. The author of the present article arrived at the same statement (Refs 4, 5),

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The Problem of the Classification and Manifestation of Residual Stresses. (Answers to the Article by Academician N. N. Davidenkov Published in Nr 3 of the Periodical for 1959 Have Arrived at the Editorial Office of the Periodical "Zavodskaya Laboratoriya". These Answers Are Given Below in the Form of a Discussion). II.

and showed (Ref 6) that in a plastically deformed sample there were no "disoriented" microstresses according to Hein. The nature of microstresses can be explained by the hypothesis of "strong" and " weak" ranges offering a varying resistance to plastic deformation. If the various ranges of structure (grain) are regarded as such ranges, Greenough's (Ref 7) hypothesis is arrived at, which is, however, not confirmed experimentally (Ref 8). The stresses acting upon the range of structure in plastic deformation can, however, be determined experimentally (Refs 6, 10)(Fig: Deformation diagram for steel 20 after hardening and tempering at 680°). In steel rich in carbon of type U8, the stresses acting upon ferrite and cementite (Refs 9, 11, 12) can be directly determined; thus, a natural explanation of Baushinger's effect is obtained, and the hypothesis on the decisive importance of microstresses is quantitatively confirmed (Refs 11, 13). It is found that the method of "angular recording" according to Gloker is not

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The Problem of the Classification and Manifestation of Residual Stresses. Answers to the Article by Academician N. N. Davidenkov Published in Nr 3 of the Periodical for 1959 Have Arrived at the Editorial Office of the Periodical "Zavodskaya Laboratoriya". These Answers Are Given Below in the Form of a Discussion). II.

suitable for the determination of residual macrostresses after plastic deformation (Refs 1, 8, 10) since also the microstresses are determined. The author agrees with N. N. Davidenkov that at present a classification of residual stresses can only be carried out according to the extension of the range in which these stresses are localized (i.e. in the state of equilibrium). There are 1 figure and 13 references, 11 of which are Soviet.

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AUTHORS: Vasil'yev, D. M., Arkovenko, G. I.

TITLE: On the Part Played by Microstrains in the Process of Plastic Deformation of Metals

PERIODICAL: Fizika tverdogo tela, 1960, Vol. 2, No. 3, pp. 543-546

TEXT: The authors reported on investigations of microstrains occurring in plastic deformation of samples of Л-70 (L-70) brass and aluminum. Brass was homogenized for 30 hours at 400°C, aluminum (purity of 99.7 per cent) for two hours at 250°. The microstrains were measured according to shifts and widenings of the K_αNi line 331 in the case of brass and according to the K_αCu line 333/511 in the case of aluminum. The elasticity limit $\sigma_{0.05}$ determines the resistance to deformation. Fig. 1 shows various characteristic curves drawn on brass samples. For aluminum (no diagrams are shown of these experiments) the greatest change in the properties investigated was observed in the range 100 - 250°C; $\sigma_{0.05}$ had its maximum at 100°C. The course of the individual curves is discussed. It is

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shown that the changes of various parameters occurring in the course of deformation can be divided into a "weak" A-range and a "strong" B-range (Fig. 2). The shift and the widening of the X-ray diffraction lines occurring in deformation are caused by mean structural strains $\sigma_{st} \neq \sigma_m$ and a dispersion of the structure $\Delta\sigma_{st} \neq 0$, and they are a result of a varying resistance to deformation of the ranges A and B (which causes the line shift) and of the varying resistance to deformation of the individual A-ranges (line widening). After the macrostress has ceased, a field of microtensions is formed in the sample, which essentially influences the first part of the re-deformation curve. This effect becomes especially manifest in a sign change of load. There are 2 figures and 6 references: 4 Soviet and 2 German.

ASSOCIATION: Leningradskiy politekhnicheskiy institut im. M. I. Kalinina (Leningrad Polytechnic Institute imeni M. I. Kalinin)

SUBMITTED: July 5, 1959

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AUTHORS: Davidenkov, N.N., Braynin, E.I. and Vasil'yev, D.M.

TITLE: On the Problem of the Mechanism of the Formation of the Lüder's Lines and the Geometry of Plastic Deformation of Steel Specimens in the Yield Ledge Region

PERIODICAL: Fizika metallov i metallovedeniye, 1961, Vol.11, No.3, pp.451-460

TEXT: The stress-strain diagram of some metals, of which steel is one example, is characterized by the presence of the yield ledge, i.e. a region within which strain continues to increase at a constant stress. This effect is associated with non-uniform deformation of the specimen in the initial stages of the plastic deformation process. On reaching the yield point, only a small portion of the specimen deforms plastically, this process continuing until the plastically deformed region attains elongation corresponding to the end of the yield ledge. When this stage has been reached, a region of plastically deformed material exists side by side with a region of undeformed metal, and the boundary between these two regions constitutes also a

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boundary between two parts of the specimen which, now, have different diameters. These sudden changes of the diameter of the specimen not only cause stress concentration which promotes spreading of the plastic deformation to the yet undeformed regions but also give rise to surface marks, known under the name of Lüder's lines, which do not disappear even when the mean diameters of the adjacent parts of the specimen become identical as a result of further deformation. A study of the process of deformation of the surface of a steel test piece, carried out by the present authors with the aid of high speed cine-photography, showed that the formation of Lüder's lines is associated with the arrests of the front of the deformation region and with the appearance of new deformation nuclei, the arrests being probably caused by localized variation of the mechanical properties of the metal along the specimen. It is pointed out here that the formation of Lüder's lines is independent of the nature of localized plastic deformation; irrespective of the physical causes of the latter effect, the very presence of boundaries between the deformed and undeformed regions and the periodic arrests of the deformation front are sufficient to cause the appearance of the Lüder's lines. Consequently, in

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studies of the mechanism of the initial stages of plastic deformation, the analysis of the geometry of the process and of the physical causes of the localization of deformation is of fundamental importance, the nature of Lüder's lines (which are merely an external manifestation of localized deformation) being a relatively simple problem. In this connection, the present authors discuss a hypothesis due to L.B.Erlikh (Ref.1) who has postulated that the surface layer of a plastically deformed specimen constitutes a "weak" region which deforms plastically under stresses, constituting 1/2 to 2/3 of the yield point of the material tested; as a result, at the moment in which localized plastic deformation begins and the load, consequently, decreases, compressive stresses are set up in the surface layer of the tensile test piece, the surface layer loses its stability and "crumples", the resultant "creases" representing the Lüder's lines. However, apart from the fact that Lüder's lines are a volume and not a surface phenomenon (Ref.2) and that Erlikh's hypothesis does not explain the formation of Luder's lines on compressed specimens, the theory of redistribution of macro-stresses (during macroscopically uniform deformation) under the influence of the hypothetical

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"weakened" surface layer has not been supported by experimental evidence. Since, in addition, the very existence of the "weak" surface layer has not been experimentally proved, Erlikh's hypothesis cannot be regarded as having been sufficiently substantiated. The basis of the theory, postulated by the present authors, is provided by consideration of a tensile test piece which is being deformed by the mechanism of slip. If slip takes place in one direction only, and if the process of plastic deformation (taking place within the yield ledge region) is localized, deflection of the specimen axis must occur at the boundary between the plastically and elastically deformed regions. This is illustrated in Fig.1 which shows a specimen deforming by slip on planes at 45° to the specimen axis, the diagram showing the initial (I) and deformed (II) state of the specimen in a plane passing through the specimen axis and parallel to the direction of slip. In this case, elongation of the specimen takes place by parallel slip of the adjacent crystallographic planes under the action of the maximum tangential stress. Since the interplanar distance during slip must remain constant, it follows from Fig.1

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that the relative deformation ε is given by

$$\varepsilon = \frac{l_2 - l_1}{l_1} = \frac{\cos 45° - \cos(45° + \gamma)}{\cos(45° + \gamma)}, \quad (1)$$

where l_1 and l_2 denote the length of the deformed part of the specimen before and after deformation, and γ is the angle through which the specimen axis has been bent as a result of deformation. For small γ (measured in radians) Eq.(1) becomes

$$\varepsilon = \frac{\gamma}{1 - \gamma} \approx \gamma \quad (2)$$

Similar relationship

$$\varepsilon = \frac{d_1 - d_2}{d_1} \approx \gamma \quad (3)$$

is obtained from the consideration of the change in the diameter of the specimen, measured in the direction of slip. It can also be seen from Fig.1 that in the case of a cylindrical specimen, deformed

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locally by slip taking place in one direction only, the boundary between the elastically and plastically deformed regions (i.e. a Lüder's line) represents an ellipse, inclined to the specimen axis at an angle of approximately 45°. This has been confirmed by the examination of a comparatively rare example of a cylindrical tensile test piece, a part of which (approx. 10 mm long) deformed by slip in one direction only. An expanded graph of a Lüder's line, formed on this specimen, is shown in Fig.2 (curve 1) together with a graph of a line (ellipse) formed on the surface of this specimen by a plane, intersecting it at an angle of 47°30'. Measurements carried out on this specimen showed that $d_1 = 9.55$ mm, $d_2 = 9.40$ mm and $\gamma = 1°03' = 0.018$; hence $\varepsilon = 0.016 \simeq \gamma$ which confirms the validity of Eq.(1) and (2) for the case under consideration. The geometry of deformation of cylindrical specimens in which slip occurs in more than one direction is analysed in a similar manner, and it is shown that in this case the slip planes do not intersect the entire cross-section of the specimen. A nucleus of a deformed region "spreads" into the surrounding material in a direction which does not correspond to

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the direction of any particular slip, but which is determined by the "interference" of all slips taking place at a given moment. As a result of this slip "interference", the material flows in consecutive layers on a complex, saddle-like surface whose intersection with the specimen surface produces a Lüder's line. Whereas in the case of "compact" test pieces (i.e. specimens of round or square cross-section) the Lüder's lines appear as distinct, equidistant bands, the plastically deformed region of a thin, flat test piece is characterized by a uniformly roughened surface. Although the cause of this difference is still somewhat obscure, the present authors show that the formation of Lüder's lines within a plastically deformed region (as distinct from those which are an external evidence of the boundaries between the elastically and plastically deformed regions) are most likely associated with the arrests of the deformation front. Finally, experiments are described whose object was to ascertain whether slip takes place along the grain boundaries or within the grains. To this end, the number of grains per unit length was measured in two directions (parallel and normal to the specimen axis) before and after deformation that had taken place within the yield ledge region.
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Comparison of the deformation of grains in different parts of the specimen with the macroscopic deformation of these parts proved conclusively that in the initial stages of plastic deformation (i.e. within the yield ledge region) steel deforms plastically by slip within the grains. There are 8 figures and 31 references: 20 Soviet and 11 non-Soviet.

ASSOCIATION: Leningradskiy politekhnicheskiy institut
(Leningrad Polytechnical Institute)

SUBMITTED: July 13, 1960

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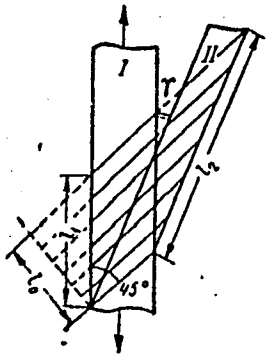

Fig.1.

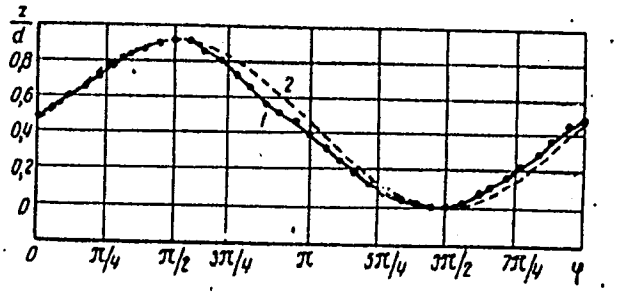

Fig.2.

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AUTHORS: Vasil'yev, D. M., and Smirnov, B. I.

TITLE: X-ray methods of studying plastically deformed metals

PERIODICAL: Uspekhi fizicheskikh nauk, v. 73, no. 3, 1961, 503-558

TEXT: The present survey deals chiefly with structural distortions of plastically deformed metals, as become manifest by a change of position, shape, width, and the integral intensity of the lines. The methods first developed for the study of macrostrains under macroelastic stress are also discussed briefly. The present paper does not, however, deal with studies concerning the various methods of studying the mosaic structure and its effect upon metal properties, as this problem had already been studied by P. Hirsch (Progr. Metal. Phys. 6, 236 (1956). The present report is the first systematic description of the principal results available in the literature. In fact, the well-known survey by G. Greenough (Progr. Metal. Phys. 3, 176 (1952)) is concerned with publications until 1951 only. The lectures by Barrett and Green at the congress in Detroit (International

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Stresses and Fatique in Metals, Proceedings of the Symposium, Ed. by G. M. Rassweiler and W. L. Grube, N. Y. Elsevier, 1959) contain only brief reports on some of the problems. The article by B. Warren, Progr. Metal. Phys. 8, 147 (1959) is an accurate survey of the totality of methods of harmonic analysis of the diffraction line profile. The present article is divided into the following chapters: 1) Shift of X-ray diffraction lines under macroelastic deformations: A. F. Ioffe and M. V. Kirpicheva suggested that the elasticity constants of single crystals be determined by measuring the lattice constants of a specimen under stress. Reference is made to papers by G. I. Aksenov. M. Ya. Fuks used nomograms for investigating steel specimens. This problem has been first studied by G. V. Kurdyumov and co-workers. V. Romberg supplied the formulas for the triaxial state of stress. D. M. Vasil'yev and S. O. Tsobkallo analyzed the "end effect" of the plane problem. The formula for a triaxial state of stress reads:

$$\sigma_\varphi - k\sigma_\perp = \frac{E}{1+\mu} \quad \frac{\varepsilon_{\psi_2,\varphi} - \varepsilon_{\psi_1,\varphi}}{\sin^2\psi_2 - \sin^2\psi_1} \qquad (1.8)$$

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where $\sigma_\perp$ denotes the stress in perpendicular to the surface. The coefficient k takes account of the effect of $\sigma_\perp$ on the position of the X-ray lines. According to H. Möller and H. Barbers, the use of elastic constants E_m and μ_m for the calculation of σ_r leads to a difference between σ_r and σ_m. Vasil'yev and Yerashev confirmed the hypothesis advanced by G. Greenough, Nature, 160, 258 (1947); Proc. Roy. Soc. A197, 556 (1949). According to B. M. Rovinskiy, the hypothesis of the boundary-near zones and of the inner parts of the grains explains the phenomena observed. The following conclusions can be drawn from the papers discussed in the second chapter: The hypothesis of the "weakened" layer does not explain all of the phenomena observed. The hypothesis by Greenough yields values of $\Delta d/d$ (relative change of distances between the layers) that are by one order of magnitude smaller than the observed ones. The hypothesis of the weak zones of the matrix and of the strong boundary-near zones gives a satisfactory explanation of the phenomena observed. 3. Study of X-ray line expansion: The possible causes of the blurredness of the lines, the

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correction rendered necessary by the geometrical conditions of the recording, the separate determination of expansion effects, separation of these effects with the method of the harmonic analysis of the form of lines, modification of the shape of blocks, and microdistortions in the deformation of metals. According to G. I. Aksenov, V. A. Moshchanskiy, and several non-Soviet authors, the macroelastic deformation of a polycrystalline specimen is bound to cause an insignificant reversible expansion of the X-ray lines if the elastic properties of crystallites are anisotropic. According to N. Ya. Selyakov and Scherrer $\beta_r = \lambda/D\cos\vartheta$ holds for this expansion, where D denotes the size of the particle in perpendicular to the reflection plane. L. I. Lysak and other authors have supplied formulas for the abovementioned correction for the geometrical conditions of recording. A. G. Khachaturyan has written on the separation of effects. Also O. N. Shivrin's method is mentioned, along with papers by B. I. Smirnov, N. N. Davidenkov, O. V. Klyavin, L. Rybakova, O. N. Shivrin, N. I. Sandler and V. I. Khotkevich. 4. Effect of the packing error upon the diffraction of the X-ray lines: Lattices of face-centered and volume-centered cubes, 5. Change of intensity of X-ray lines:

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Origin of conceptions regarding the distortions of the third kind, first studies, further development of these studies, study of deformed metals in the form of powders, change of the intensity of lines in the deformation of complicated polycrystalline specimens, static and dynamic distortions, problems of classification of structural distortions of deformed metals and corresponding inner distortions. The results of studies by V. K. Kritskaya, G. Gertsriken, Ya. S. Umanskiy, V. A. Il'ina, and several non-Soviet authors diverge considerably. A paper by A. Kochanovska and a formula by Vil'khinskiy are mentioned. D. Batrus', V. I. Iveronova, G. P. Revkevich studied the nature of extinction in deformed metals. In deformed powders, the intensity of X-ray lines may vary due to the following causes: fragmentation of crystals, whereby extinction is altered; appearance of distortions in the lattice, associated with displacements of the atoms from their position of equilibrium (distortions of third kind), appearance of errors in the layer packing. M. A. Krivoglaz made critical remarks on a separation procedure. N. N. Davidenkov gave a definition of remanent distortions. 6. Data on dislocations resulting from the diffraction of X-ray lines. Determination of density of dis-

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locations from roentgenograms by Debye-Scherrer and from the expansion of the curve of rotation on a double crystal spectrometer, direct observation of dislocations. There are 20 figures, 9 tables, and 335 references: 130 Soviet-bloc and 205 non-Sovietbloc. The three most recent references to English language publications read as follows: S. Chandrasekhar, Extinction in X-ray Crystallography. - Advances Phys. 9, 363 (1960). S. Chandrasekhar, An Experimental Method of Correcting for Extinction in Crystals. - Acta Crystallogr. 13, 588 (1960), W. Webb, J. Appl. Phys. 31, 194 (1960).

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B108/B104

18.8200

AUTHORS: Vasil'yev, D. M., and Dobrodeyeva, N. M.

TITLE: X-ray study of the initial stage of plastic deformation of polycrystalline metals

PERIODICAL: Fizika tverdogo tela, v. 4, no. 1, 1962, 140 - 147

TEXT: The authors used an x-ray method to find out whether plastic deformation of Al, Ni, Cu, and steel with 1% Cr proceeds inside or along the crystal grains. The small specimens were deformed at room temperature on an ИМ-4Р(IM-4R) tensile testing machine after heat treatment. The microscopic stresses can be found from the behavior of x-ray diffraction lines; with the aid of these microstresses and the macroscopic stress one can determine the structural strain acting on the grains. The microstresses in Al were determined by an investigation of the 333/511 diffraction line obtained in a K_αCu emission while those in copper, nickel, and steel samples were determined from the 400(K_αCo), 420(K_αCu) and 211(K_αCr) lines. It was established for all specimens that in the case of small deformations, the stresses upon the grains are smaller than the mean macroscopic stresses.

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Plastic deformation is due to displacements inside the grains. The deformation of steel in the yield area is due to displacements inside the grains too. N. N. Davidenkov is thanked for a discussion. B. I. Smirnov (Sb. "Issledovaniya po zharoprochnym splavam", 4, Izd. AN SSSR, 147, 1959) is mentioned. There are 9 figures and 23 references: 17 Soviet and 6 non-Soviet. The four most recent references to English-language publications read as follows: D. McLean. J. Inst. Metals, 80, 507, 1952 and 81, 293, 1952; D. McLean, M. Farmer. J. Inst. Metals, 83, 1, 1954; W. Rachinger. J. Inst. Metals, 81, 33, 1952.

ASSOCIATION: Leningradskiy politekhnicheskiy institut im. M. I. Kalinina (Leningrad Polytechnic Institute imeni M. I. Kalinin)

SUBMITTED: July 14, 1961

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VASIL'YEV, D.M.

Nature of the initial stage of plastic deformation of polycrystalline metals. Fiz. met. i metalloved. 14 no.1:106-113 Jl '62. (MIRA 15:7)

1. Leningradskiy politekhnicheskiy institut.
(Deformations (Mechanics))

VASIL'YEV, D.M.

X-ray study of the surface weekened layer effect. Fiz.met.i metalloved. 14 no.5:737-744 N '62. (MIRA 15:12)

1. Leningradskiy politekhnicheskiy institut im. M.I.Kalinina.
(Metals--Testing)
(Strains and stresses)