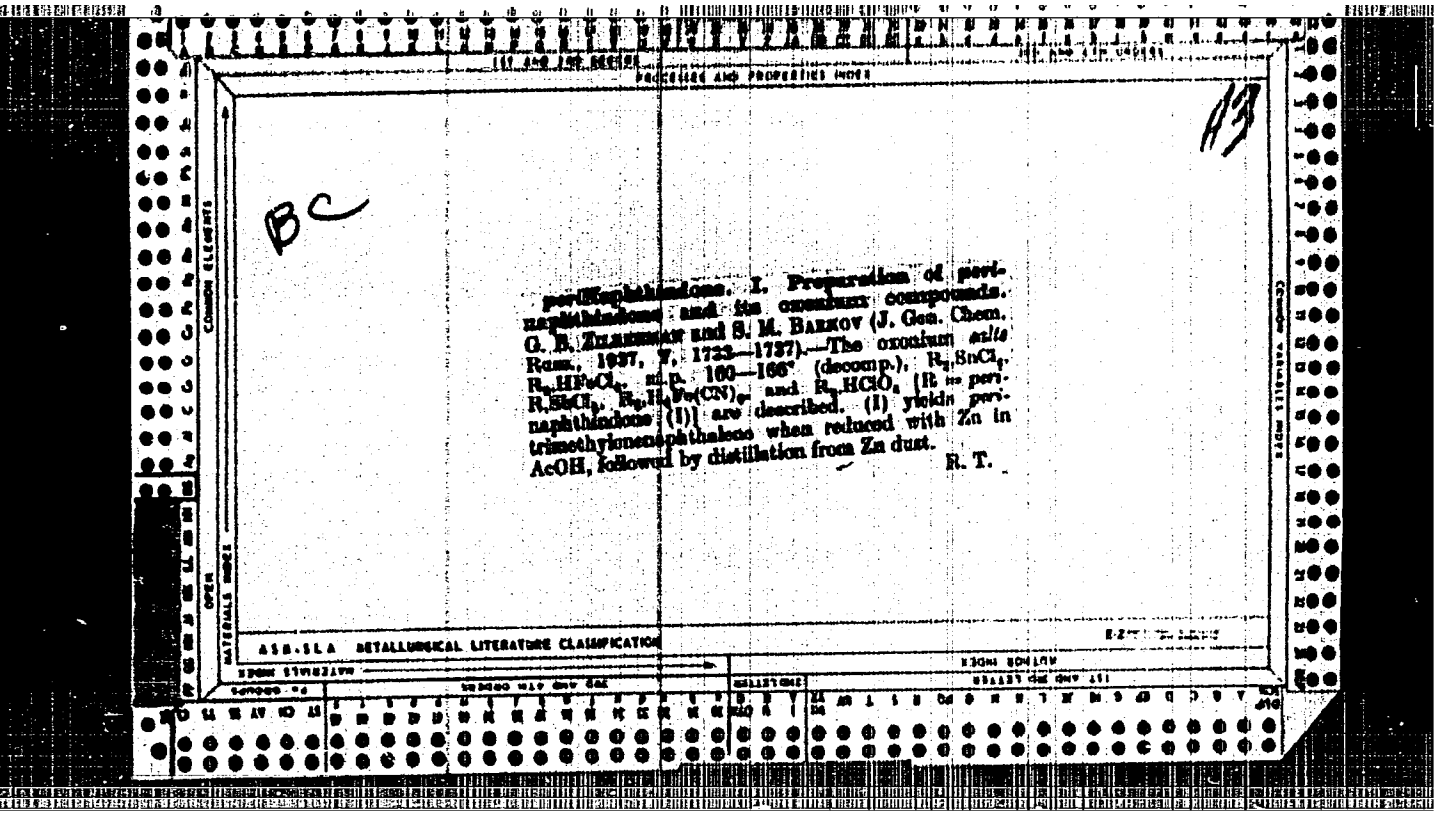
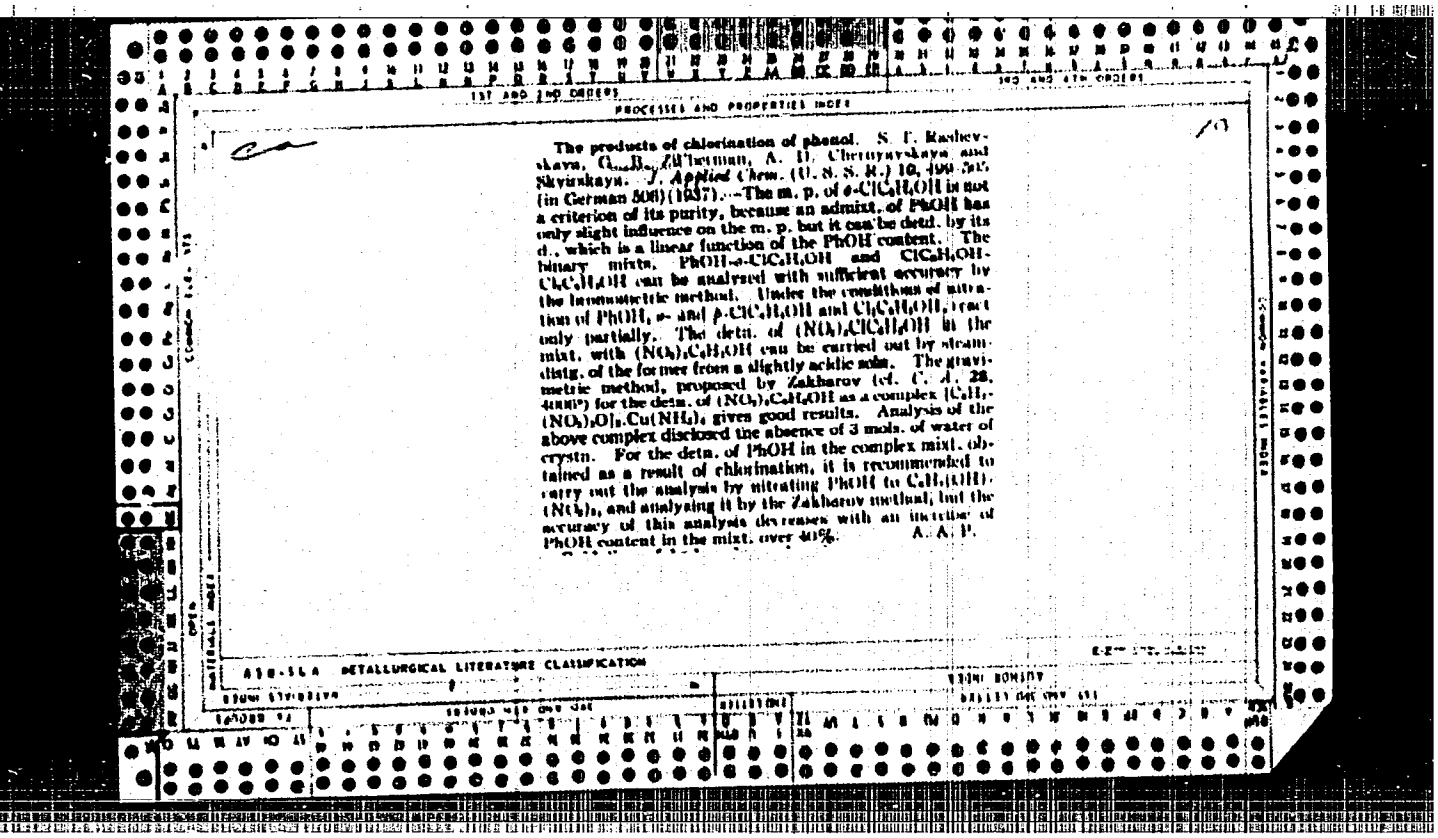


BC

A3

peri-Naphthindones. I. Preparation of peri-naphthindone and its oxonium compounds. G. B. Tsukerman and S. M. Barkov (J. Gen. Chem. Russ., 1937, 7, 1723—1737).—The oxonium salts R_2HFeCl_4, m.p. 160—166° (decomp.), R_2SnCl_6, R_2HSbCl_6, $R_4H_4Fe(CN)_6$ and R_2HClO_4 [R = peri-naphthindone (I)] are described. (I) yields peri-trimethylnaphthalene when reduced with Zn in AcOH, followed by distillation from Zn dust.

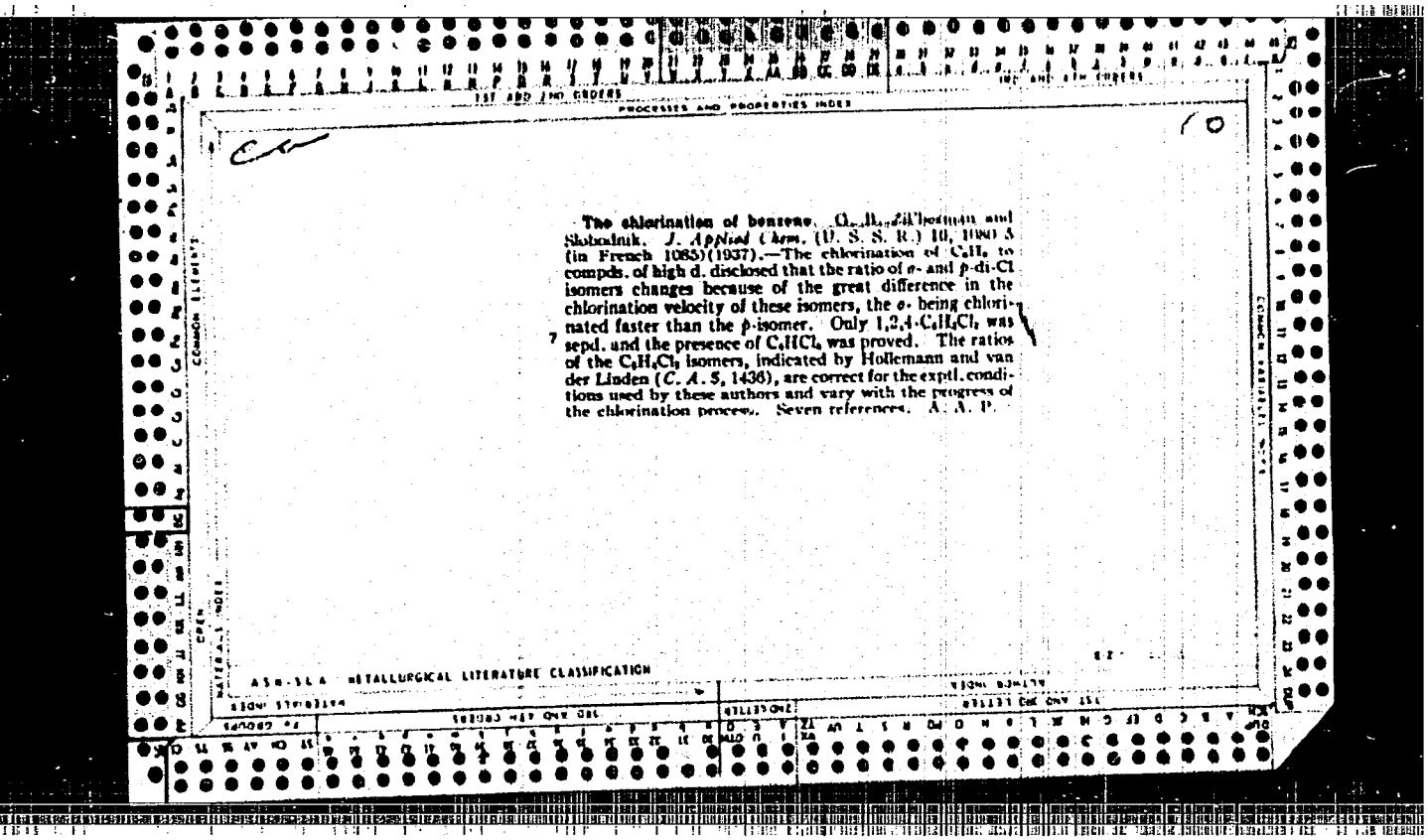
R. T.



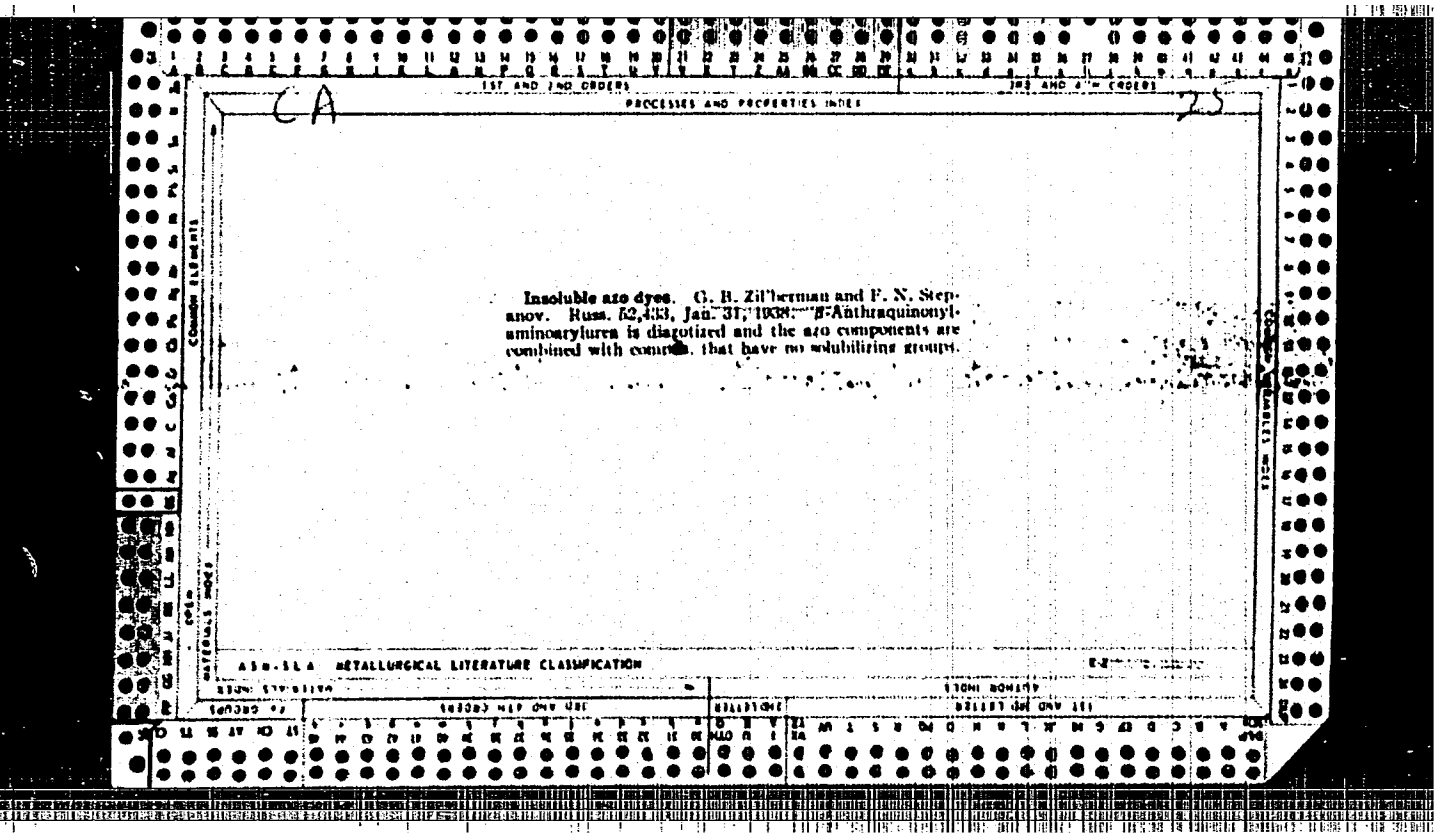
PROCESSES AND PROPERTIES INDEX

The products of chlorination of phenol. S. I. Rashevskaya, G. B. Zil'berman, A. D. Cheruyavskaya and Skvirskaya. *J. Applied Chem.* (U. S. S. R.) 10, 499-502 (in German 503) (1937).—The m. p. of *o*-ClC_6H_4OH is not a criterion of its purity, because an admixt. of PhOH has only slight influence on the m. p. but it can be detd. by its d., which is a linear function of the PhOH content. The binary mixts. PhOH-*o*-ClC_6H_4OH and ClC_6H_4OH-$Cl_2C_6H_3OH$ can be analysed with sufficient accuracy by the immunometric method. Under the conditions of nitration of PhOH, *o*- and *p*-ClC_6H_4OH and $Cl_2C_6H_3OH$ react only partially. The detn. of $(NO_2)_2ClC_6H_2OH$ in the mixt. with $(NO_2)_2C_6H_2OH$ can be carried out by steam-distg. of the former from a slightly acidic soln. The gravimetric method, proposed by Zakharov (cf. C. A. 28, 4888[9]) for the detn. of $(NO_2)_2C_6H_2OH$ as a complex $[C_6H_2(NO_2)_2O]_2Cu(NH_3)_4$ gives good results. Analysis of the above complex disclosed the absence of 3 mols. of water of crystn. For the detn. of PhOH in the complex mixt. obtained as a result of chlorination, it is recommended to carry out the analysis by nitrating PhOH to $C_6H_2(NO_2)_3OH$, and analysing it by the Zakharov method, but the accuracy of this analysis decreases with an increase of PhOH content in the mixt. over 40%. A. A. P.

A10-51A METALLURGICAL LITERATURE CLASSIFICATION



The chlorination of benzene. G. H. Zilberman and Slobodnik. *J. Applied Chem.* (U. S. S. R.) 10, 1080-5 (in French 1085)(1937).—The chlorination of C_6H_6 to compds. of high d. disclosed that the ratio of *o*- and *p*-di-Cl isomers changes because of the great difference in the chlorination velocity of these isomers, the *o*- being chlorinated faster than the *p*-isomer. Only 1,2,4-$C_6H_3Cl_3$ was sepd. and the presence of C_6HCl_5 was proved. The ratios of the $C_6H_4Cl_2$ isomers, indicated by Hollemann and van der Linden (*C. A.* 5, 1436), are correct for the exptl. conditions used by these authors and vary with the progress of the chlorination process. Seven references. A. A. P.

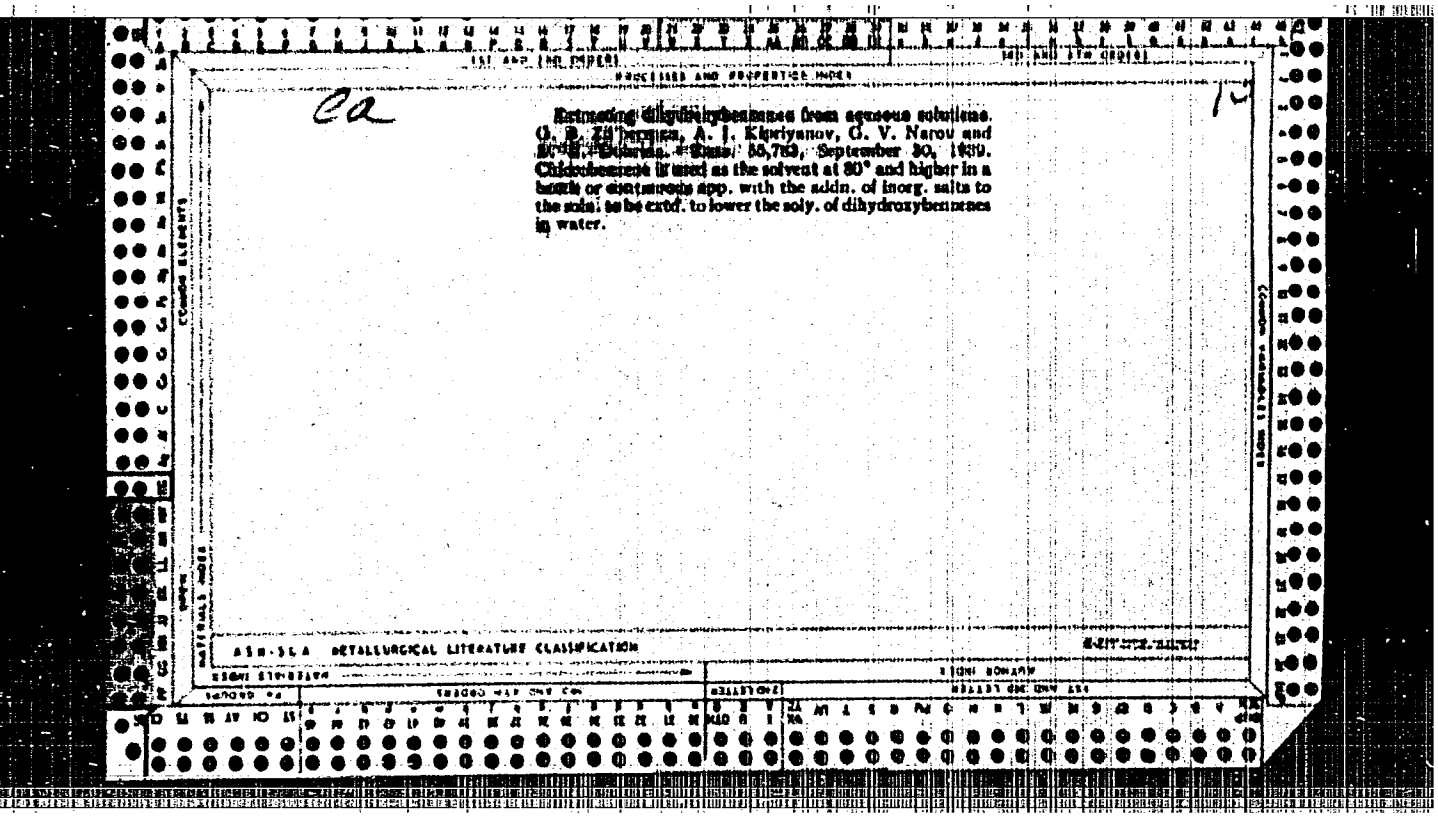

CA

PROCESSES AND PROPERTIES INDEX

25

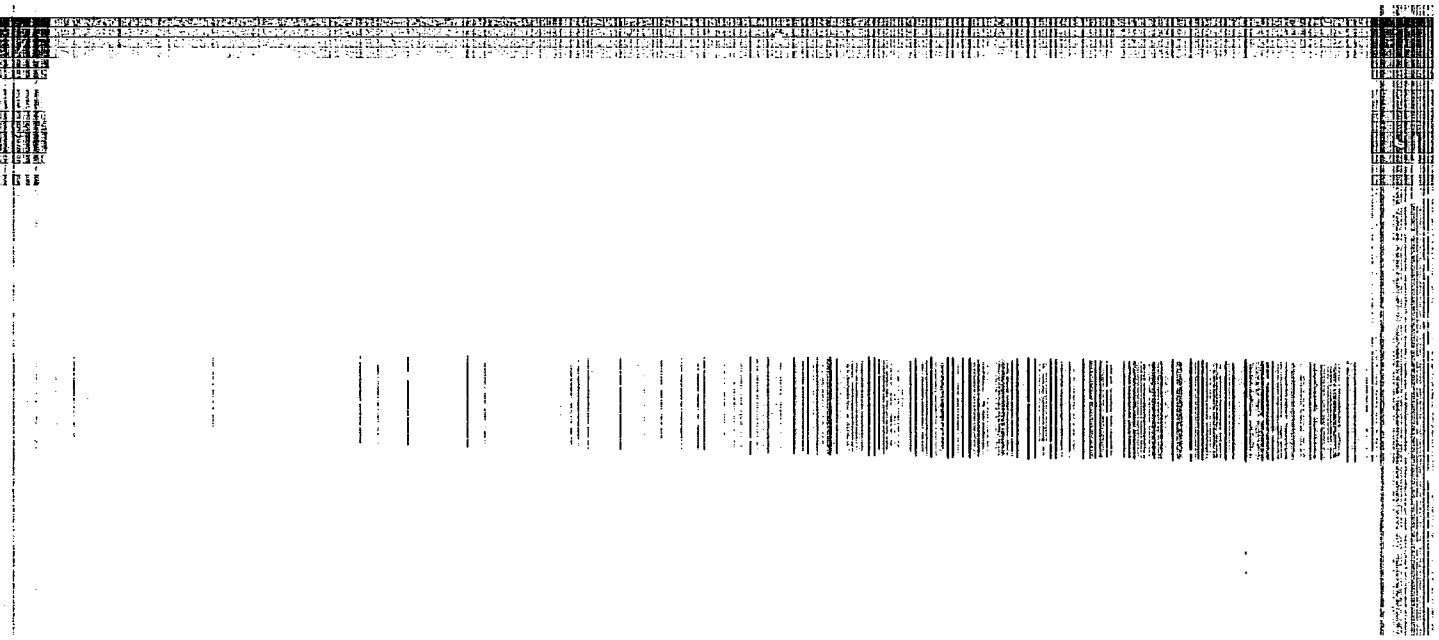
Insoluble azo dyes. G. B. Zil'berman and F. N. Stepanov. Russ. 52,433, Jan. 31, 1938. 1-Anthraquinonylaminoarylurea is diazotized and the azo components are combined with compds. that have no solubilizing groups.

ASM-SLA METALLURGICAL LITERATURE CLASSIFICATION

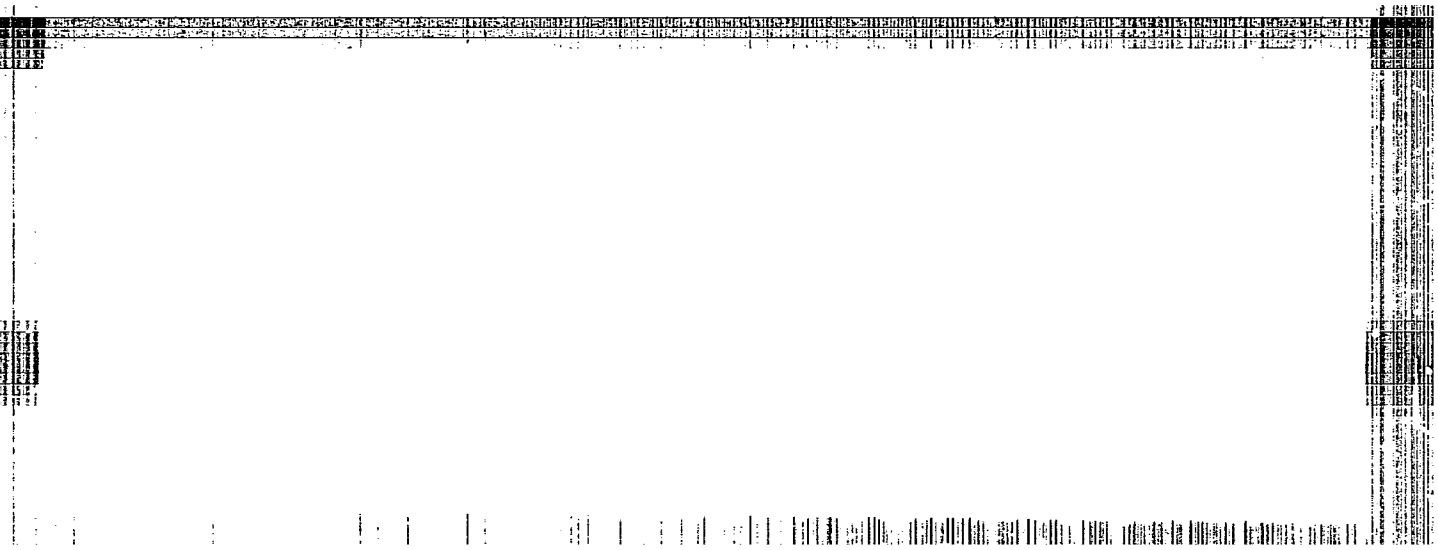


Ca

Estimating dihydroxybenzenes from aqueous solutions. G. P. Zil'bergleit, A. I. Kipriyanov, G. V. Narov and [illegible]. Russ. 55,763, September 30, 1939. Chlorobenzene is used as the solvent at 80° and higher in a batch or continuous app. with the addn. of inorg. salts to the soln. to be extd. to lower the soly. of dihydroxybenzenes in water.



APPROVED FOR RELEASE: 09/19/2001 CIA-RDP86-00513R002065120015-9"



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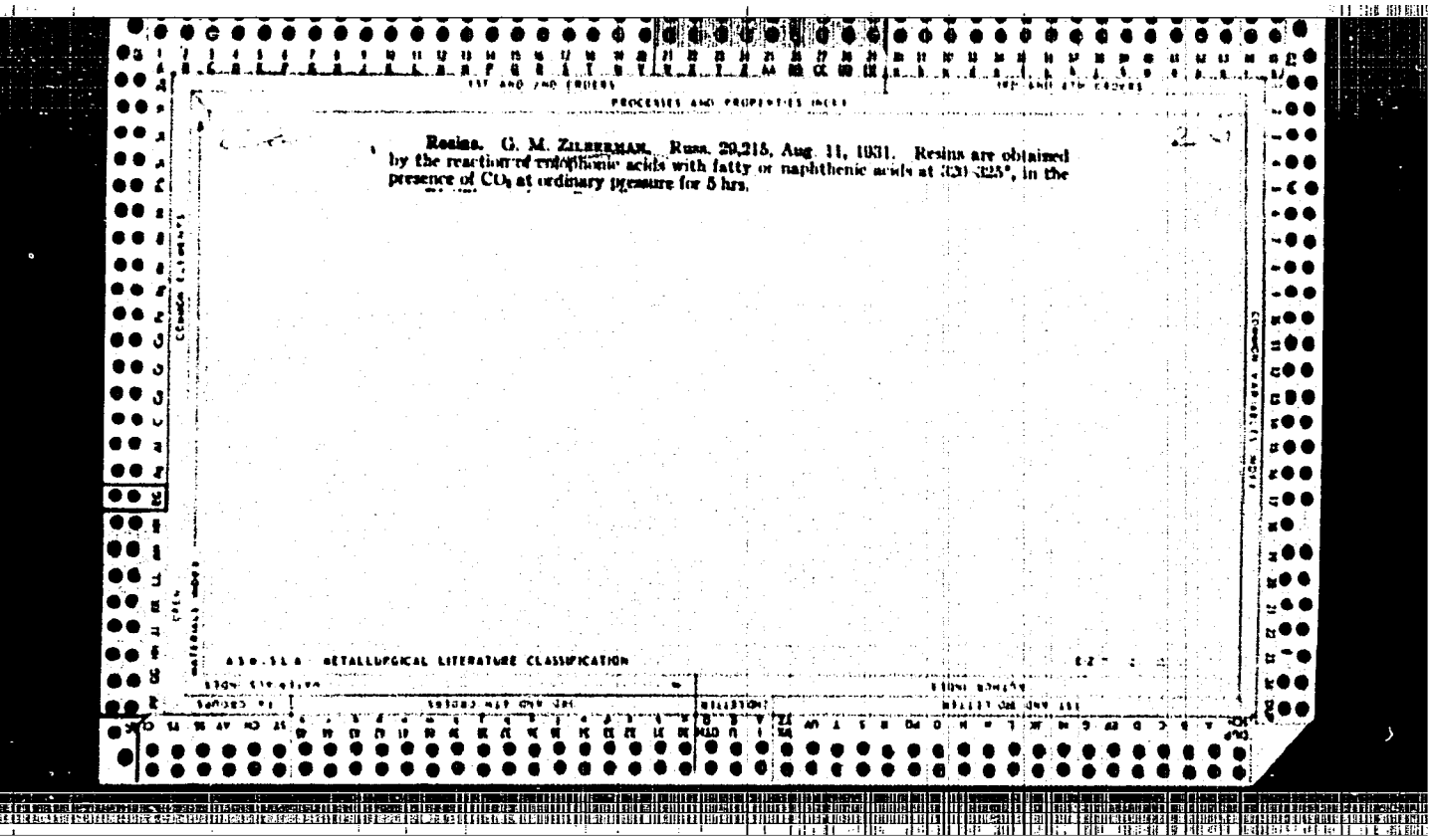
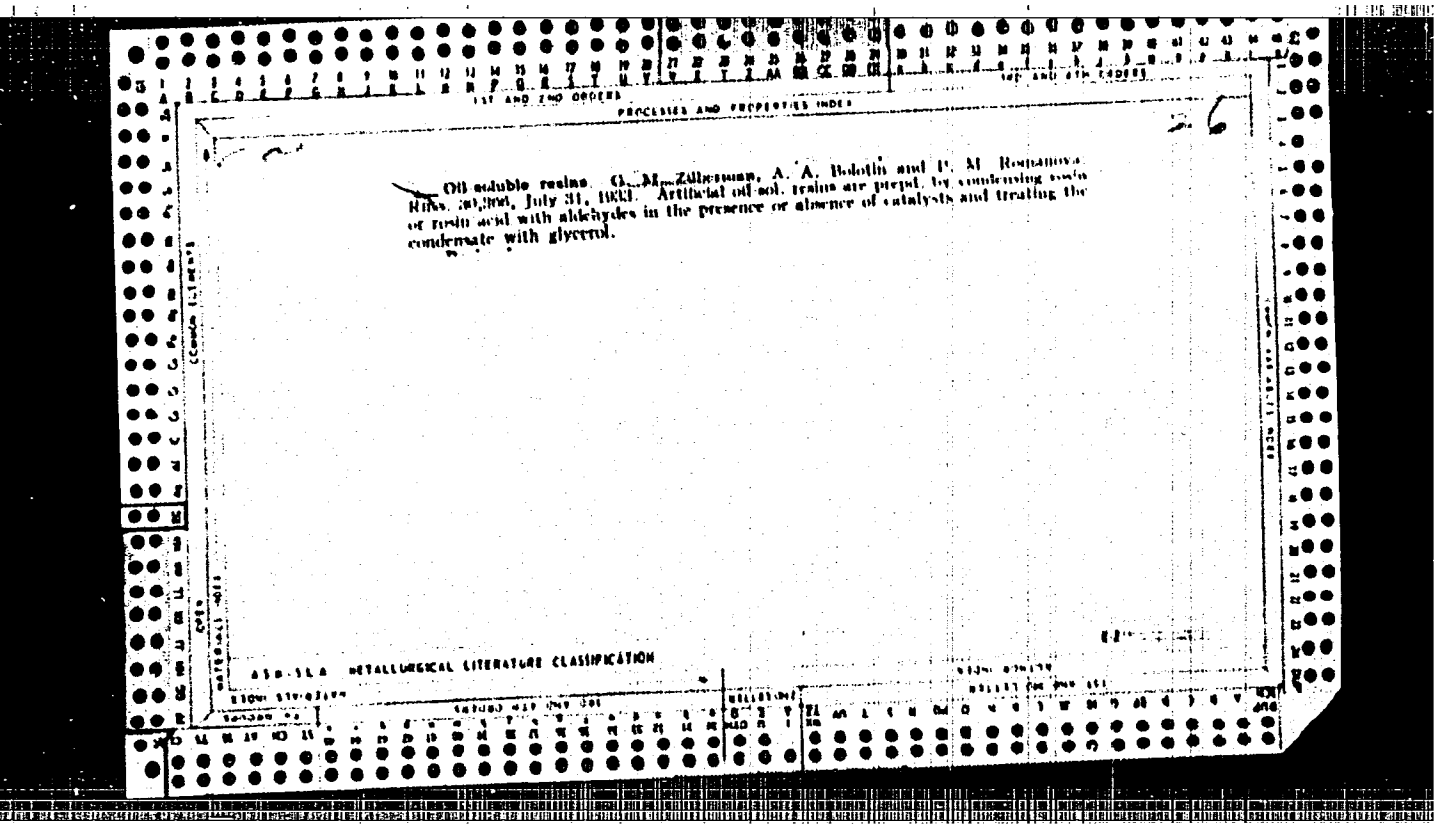


Resins. G. M. ZILBERMAN. Russ. 29,215, Aug. 11, 1931. Resins are obtained by the reaction of naphthenic acids with fatty or naphthenic acids at 320–325°, in the presence of CO_2 at ordinary pressure for 5 hrs.

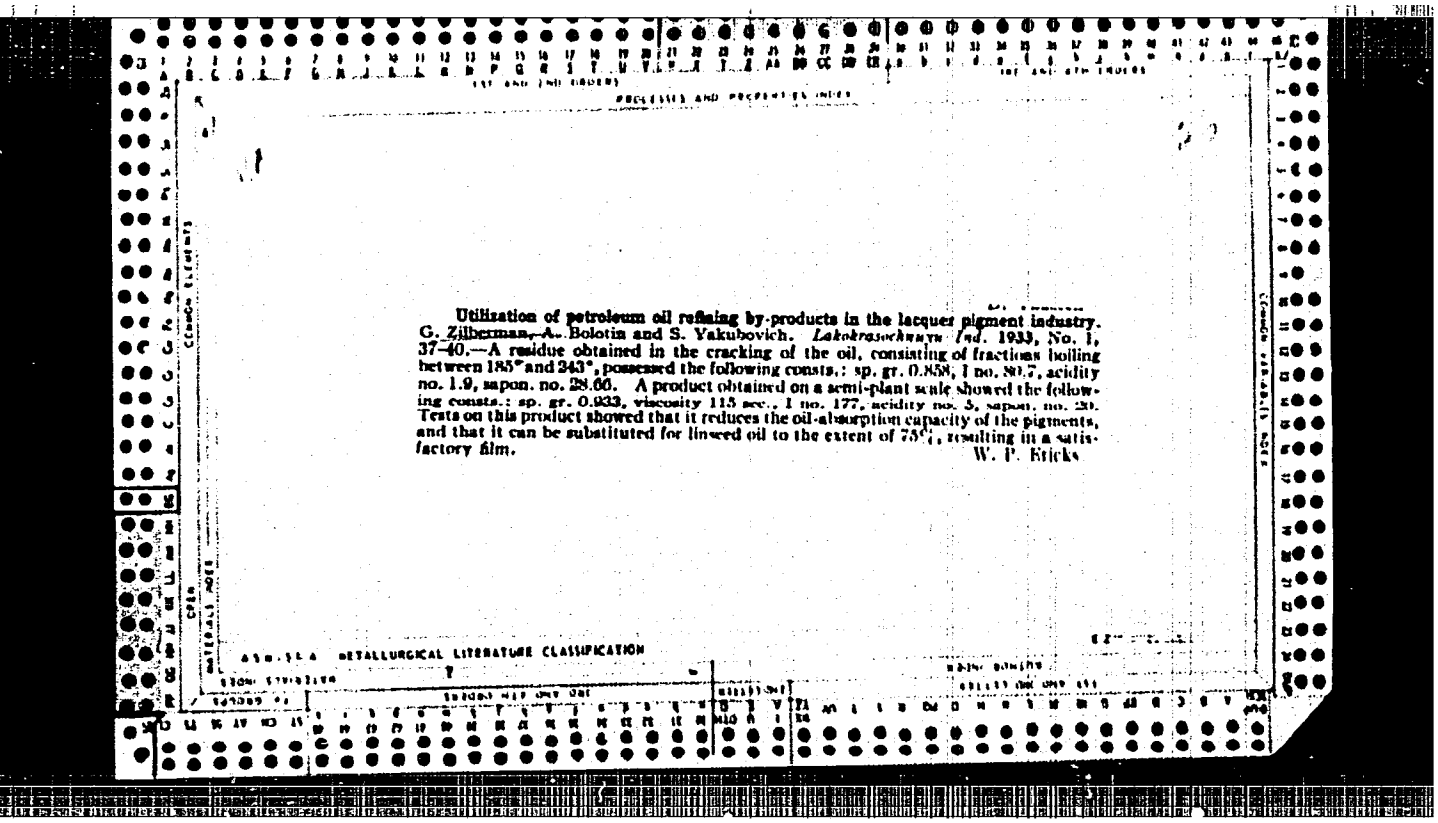
A50-51A METALLURGICAL LITERATURE CLASSIFICATION



PROCESSES AND PROPERTIES INDEX

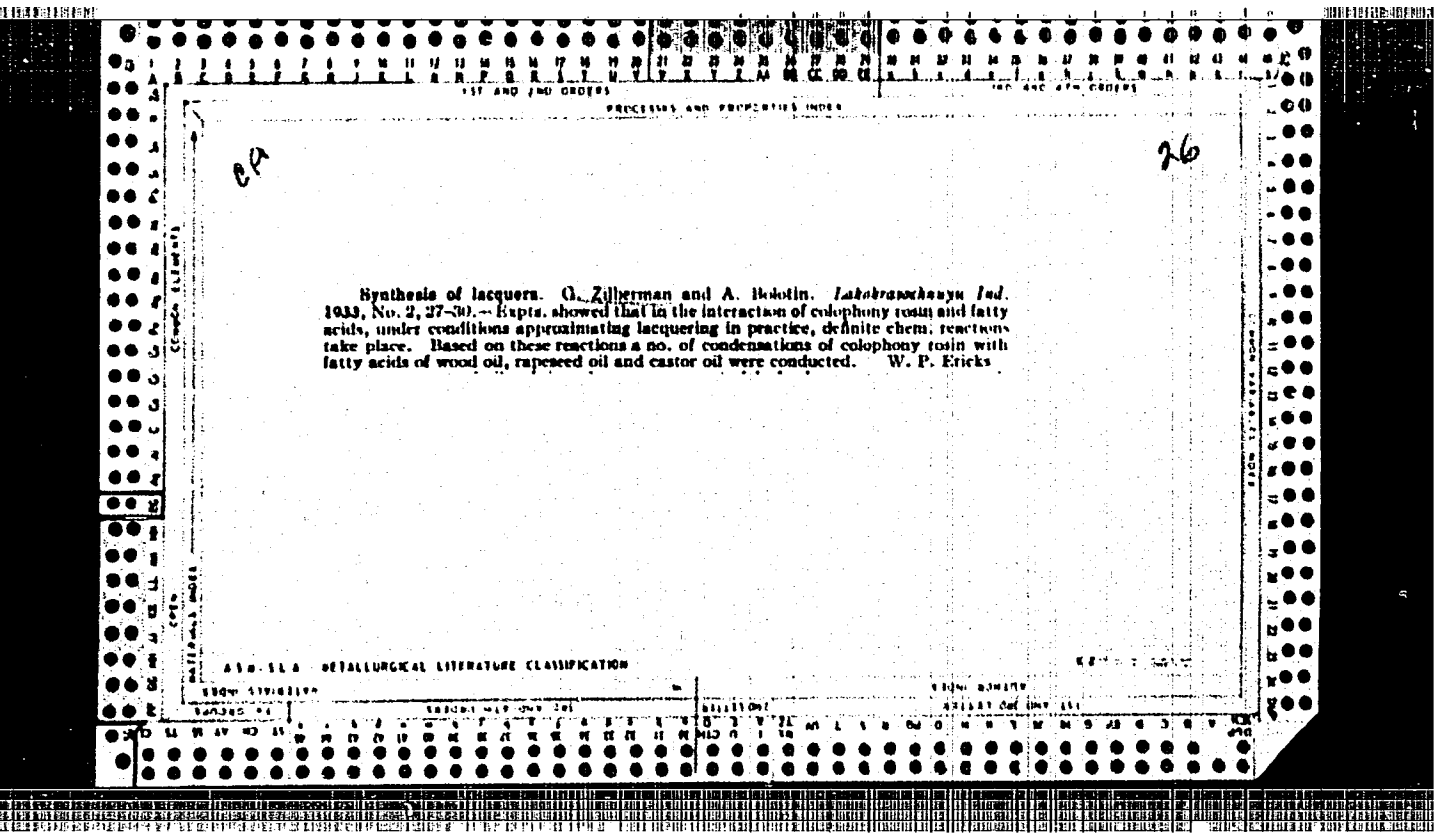
Oil soluble resins. G. M. Zillessen, A. A. Bolotin and P. M. Romanova. Russ. 30,901, July 31, 1933. Artificial oil-sol. resins are prepd. by condensing resin or resin acid with aldehydes in the presence or absence of catalysts and treating the condensate with glycerol.

ASM-SLA METALLURGICAL LITERATURE CLASSIFICATION

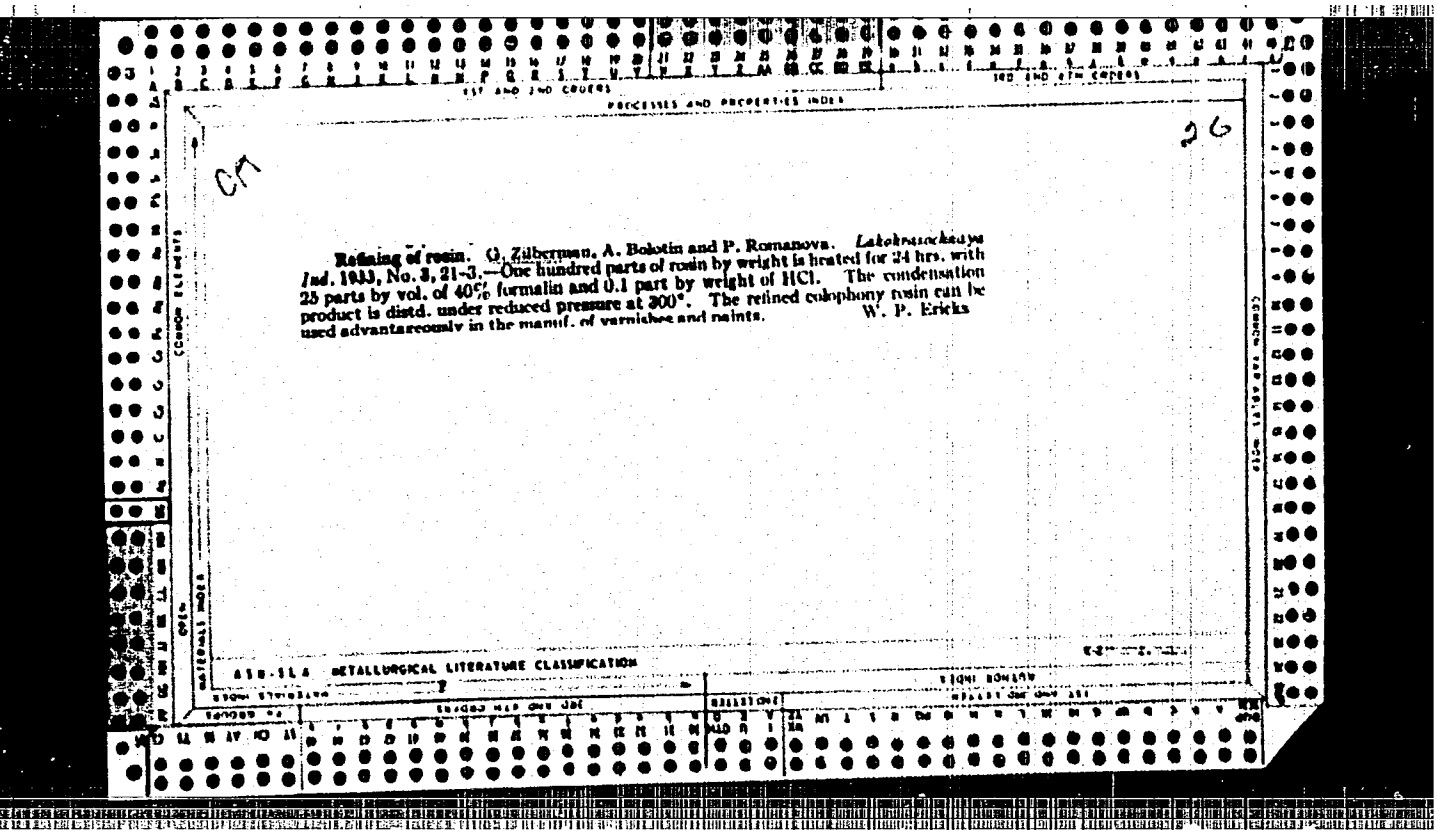


Utilization of petroleum oil refining by-products in the lacquer pigment industry. G. Zilberman, A. Bolotin and S. Yakubovich. *Lakokrasochnaya Ind.* 1933, No. 1, 37–40.—A residue obtained in the cracking of the oil, consisting of fractions boiling between 185° and 243°, possessed the following consts.: sp. gr. 0.858, I no. 80.7, acidity no. 1.9, sapon. no. 28.66. A product obtained on a semi-plant scale showed the following consts.: sp. gr. 0.933, viscosity 115 sec., I no. 177, acidity no. 3, sapon. no. 20. Tests on this product showed that it reduces the oil-absorption capacity of the pigments, and that it can be substituted for linseed oil to the extent of 75%, resulting in a satisfactory film.

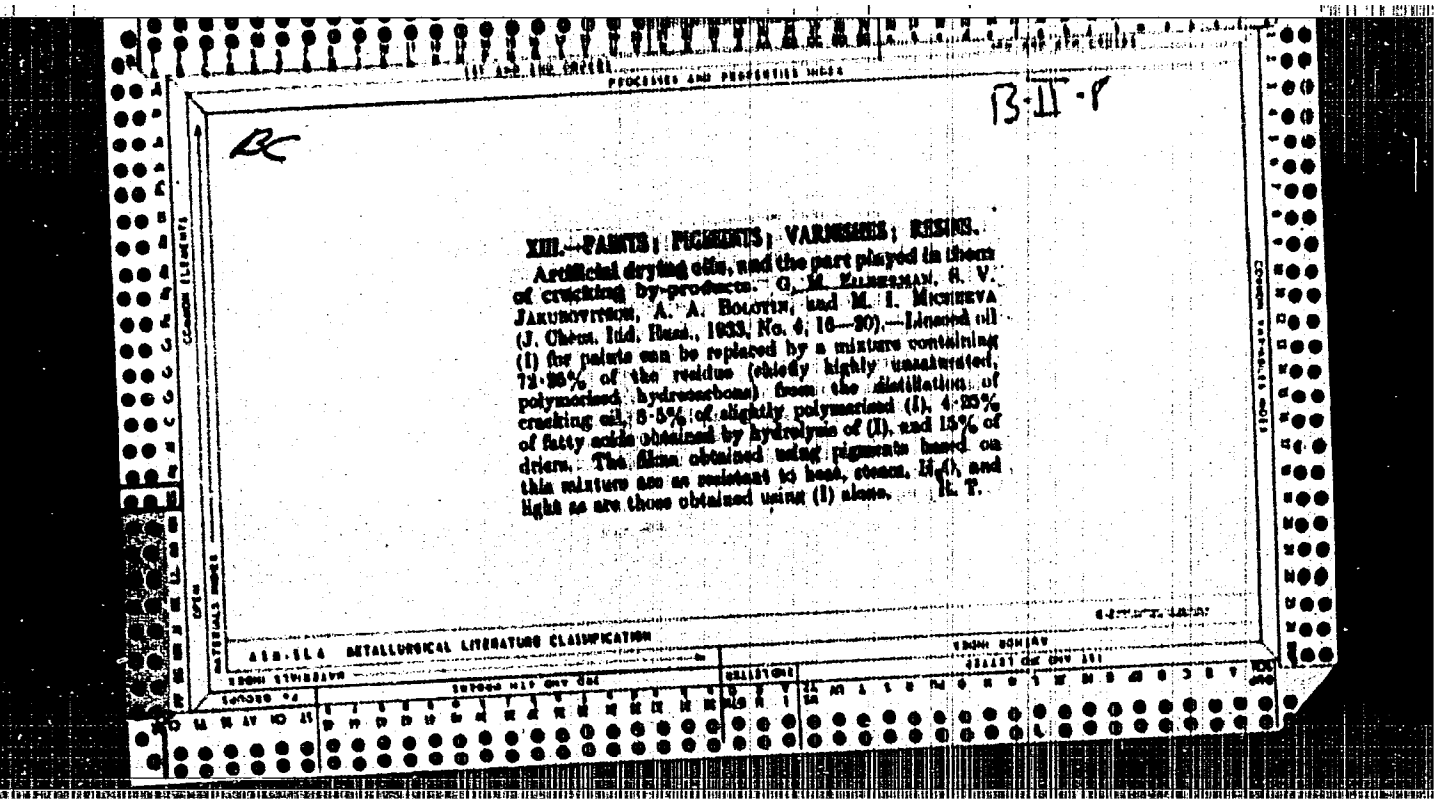
W. P. Sticks



Synthesis of lacquers. G. Zilberman and A. Bolotin. *Lakokrasochnaya Ind.* 1933, No. 2, 27–30.—Expts. showed that in the interaction of colophony rosin and fatty acids, under conditions approximating lacquering in practice, definite chem. reactions take place. Based on these reactions a no. of condensations of colophony rosin with fatty acids of wood oil, rapeseed oil and castor oil were conducted. W. P. Ericks

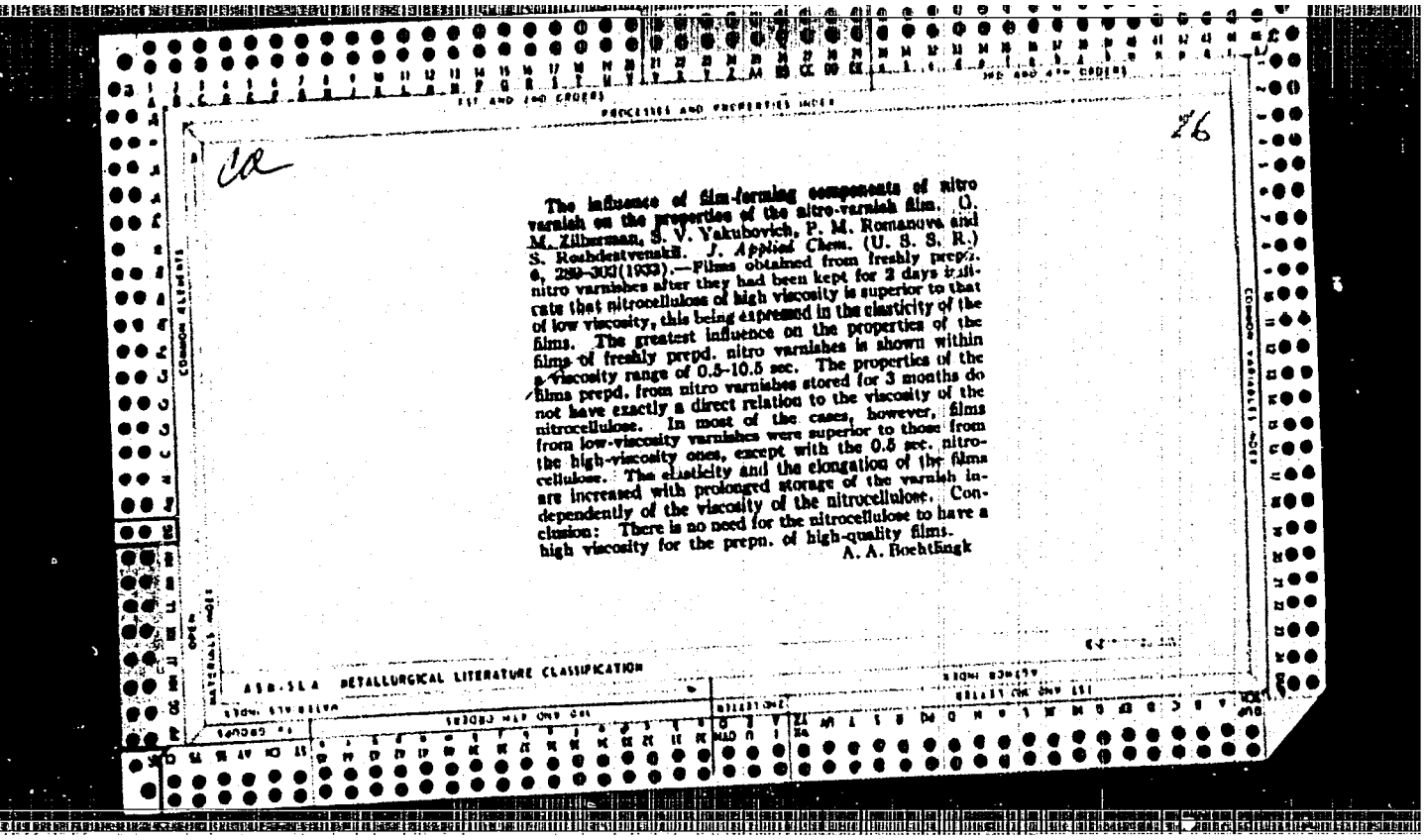


Refining of resin. G. Zilberman, A. Bokstin and P. Romanova. *Lakokrasochnaya Ind.* 1933, No. 3, 21–3.—One hundred parts of resin by weight is heated for 24 hrs. with 25 parts by vol. of 40% formalin and 0.1 part by weight of HCl. The condensation product is distd. under reduced pressure at 300°. The refined colophony resin can be used advantageously in the manuf. of varnishes and paints. W. P. Ericks



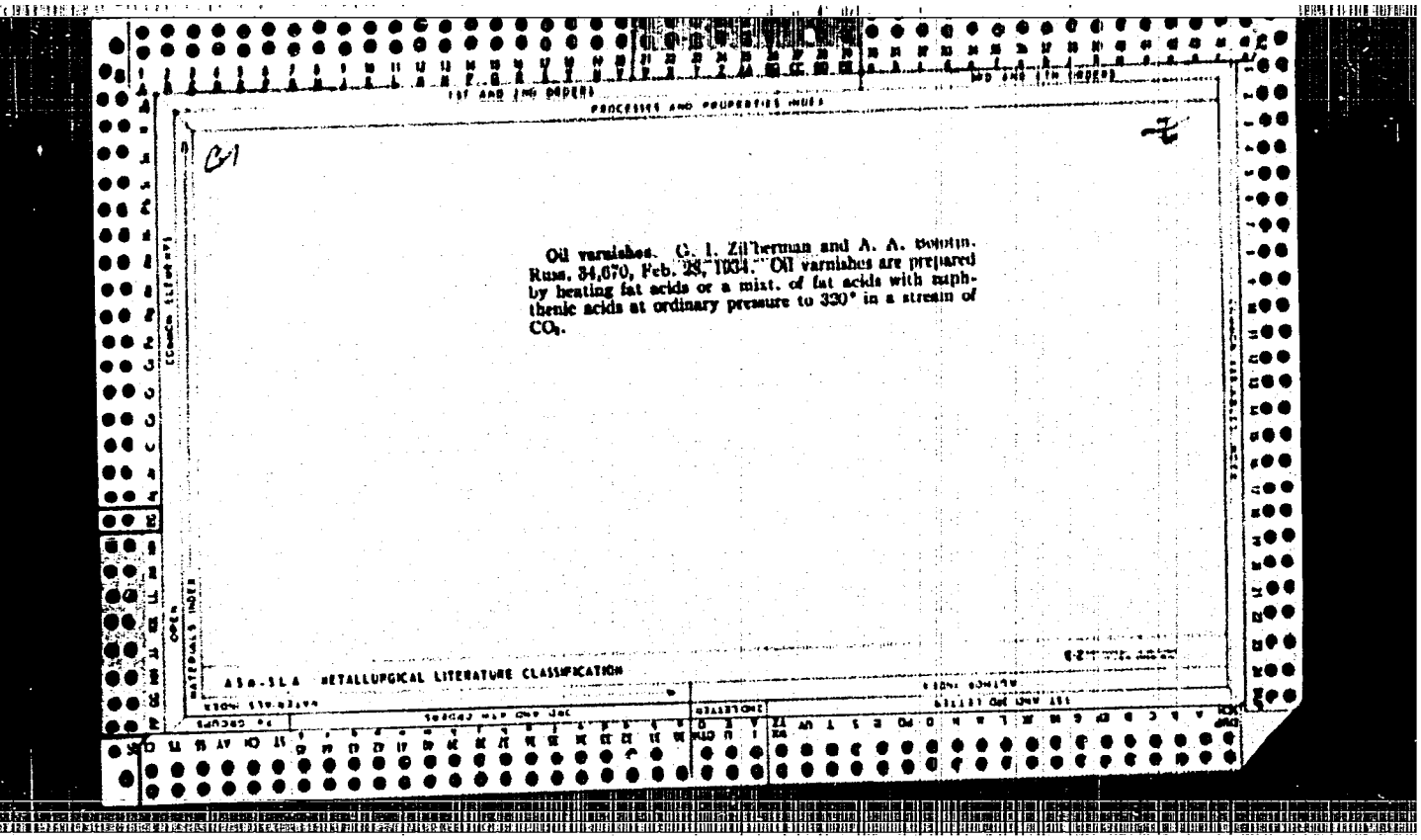
XIII.—PAINTS; PIGMENTS; VARNISHES; RESINS.

Artificial drying oils, and the part played in them of cracking by-products. G. M. Kuznetsov, S. V. Jakubovitsch, A. A. Bolotin, and M. I. Michéeva (J. Chem. Ind. Russ., 1933, No. 4, 16—20).—Linseed oil (I) for paints can be replaced by a mixture containing 72·26% of the residue (chiefly highly unsaturated, polymerised hydrocarbons) from the distillation of cracking oil, 5·5% of slightly polymerised (I), 4·25% of fatty acids obtained by hydrolysis of (I), and 13% of driers. The films obtained using pigments based on this mixture are as resistant to heat, steam, H$_2$O, and light as are those obtained using (I) alone. H. T.

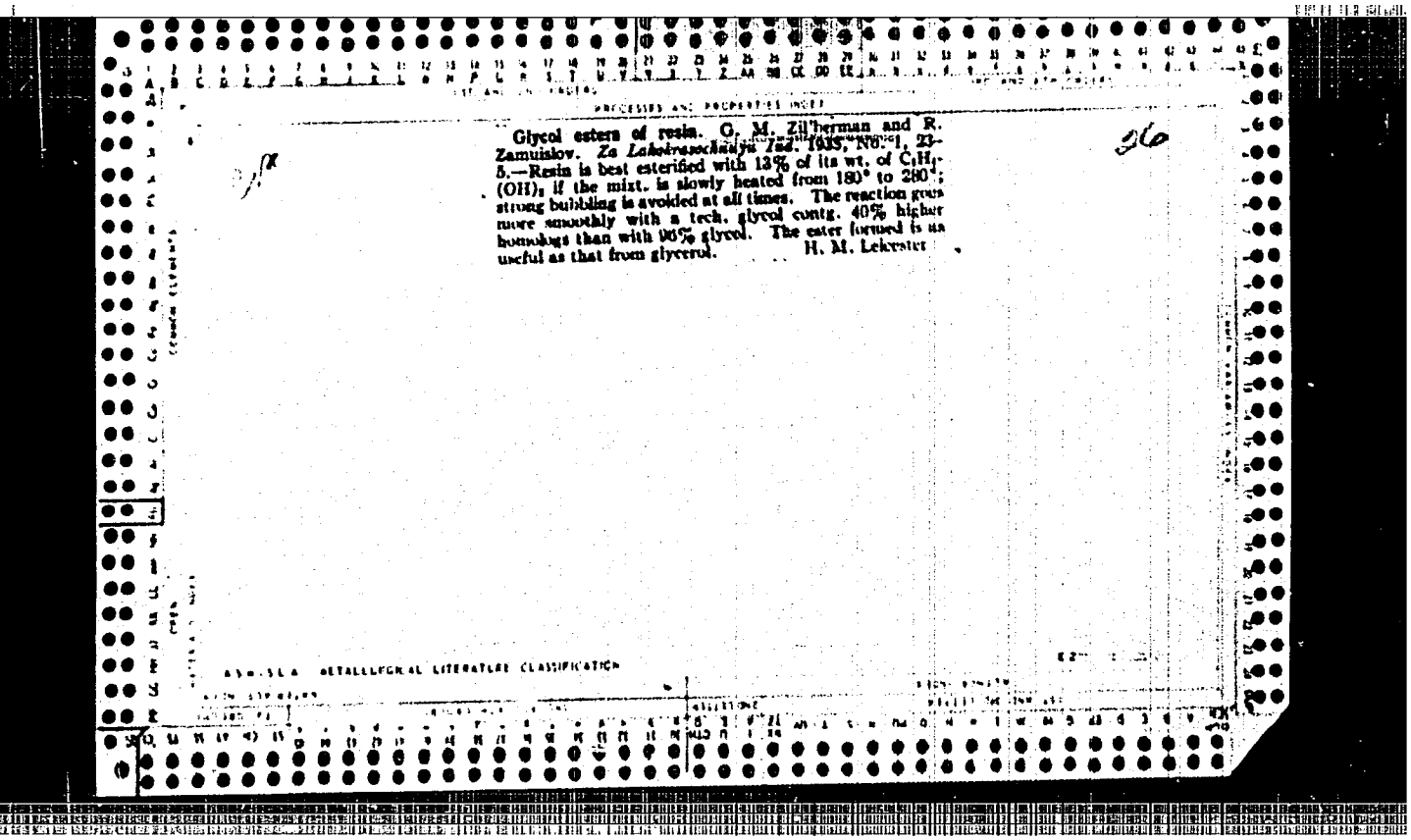


The influence of film-forming components of nitro varnish on the properties of the nitro-varnish film. O. M. Zilberman, S. V. Yakubovich, P. M. Romanova and S. Rozhdestvenskii. *J. Applied Chem.* (U. S. S. R.) 6, 289-303(1933).—Films obtained from freshly prepd. nitro varnishes after they had been kept for 3 days indicate that nitrocellulose of high viscosity is superior to that of low viscosity, this being expressed in the elasticity of the films. The greatest influence on the properties of the films of freshly prepd. nitro varnishes is shown within a viscosity range of 0.5–10.5 sec. The properties of the films prepd. from nitro varnishes stored for 3 months do not have exactly a direct relation to the viscosity of the nitrocellulose. In most of the cases, however, films from low-viscosity varnishes were superior to those from the high-viscosity ones, except with the 0.5 sec. nitrocellulose. The elasticity and the elongation of the films are increased with prolonged storage of the varnish independently of the viscosity of the nitrocellulose. Conclusion: There is no need for the nitrocellulose to have a high viscosity for the prepn. of high-quality films.

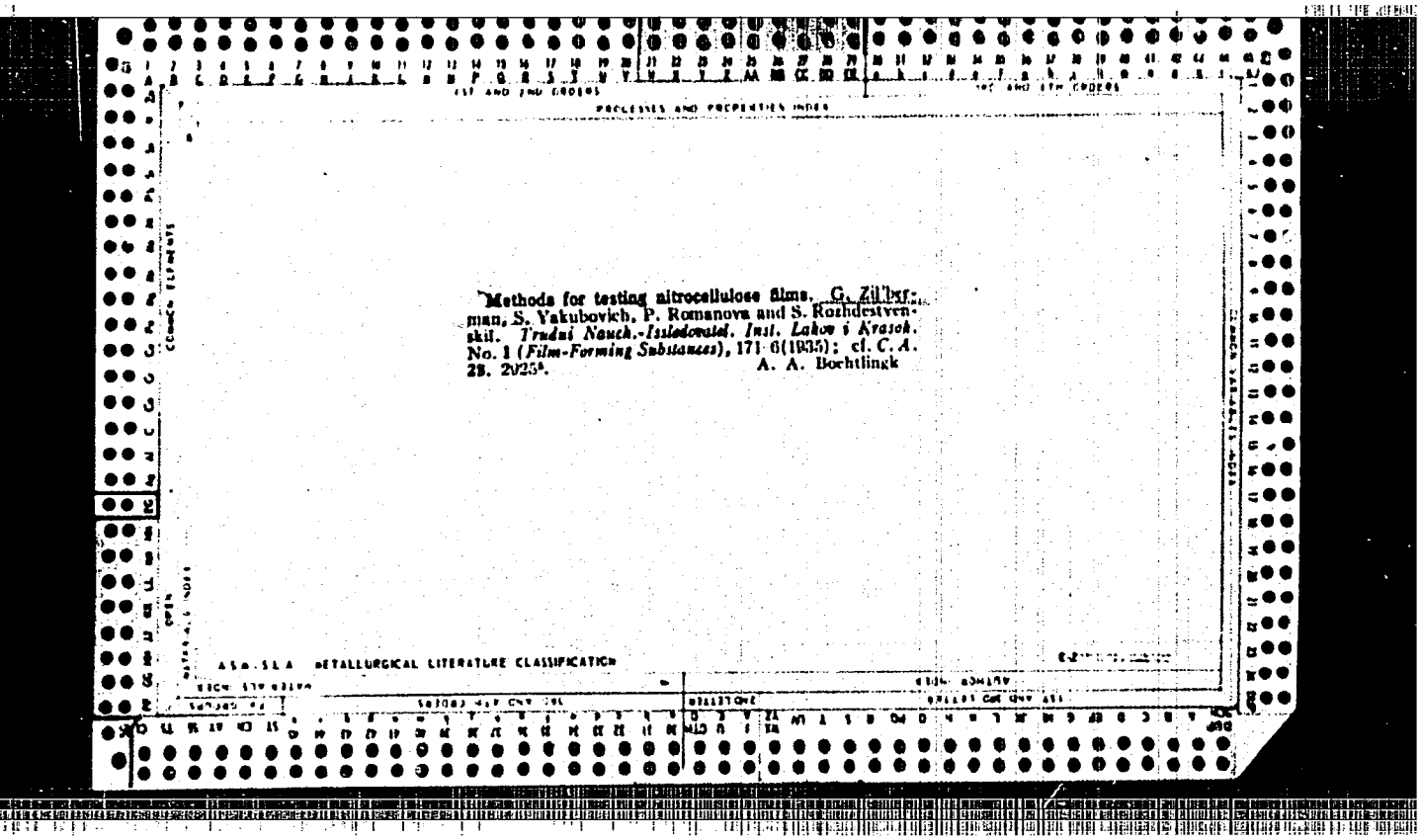
A. A. Boehtlingk



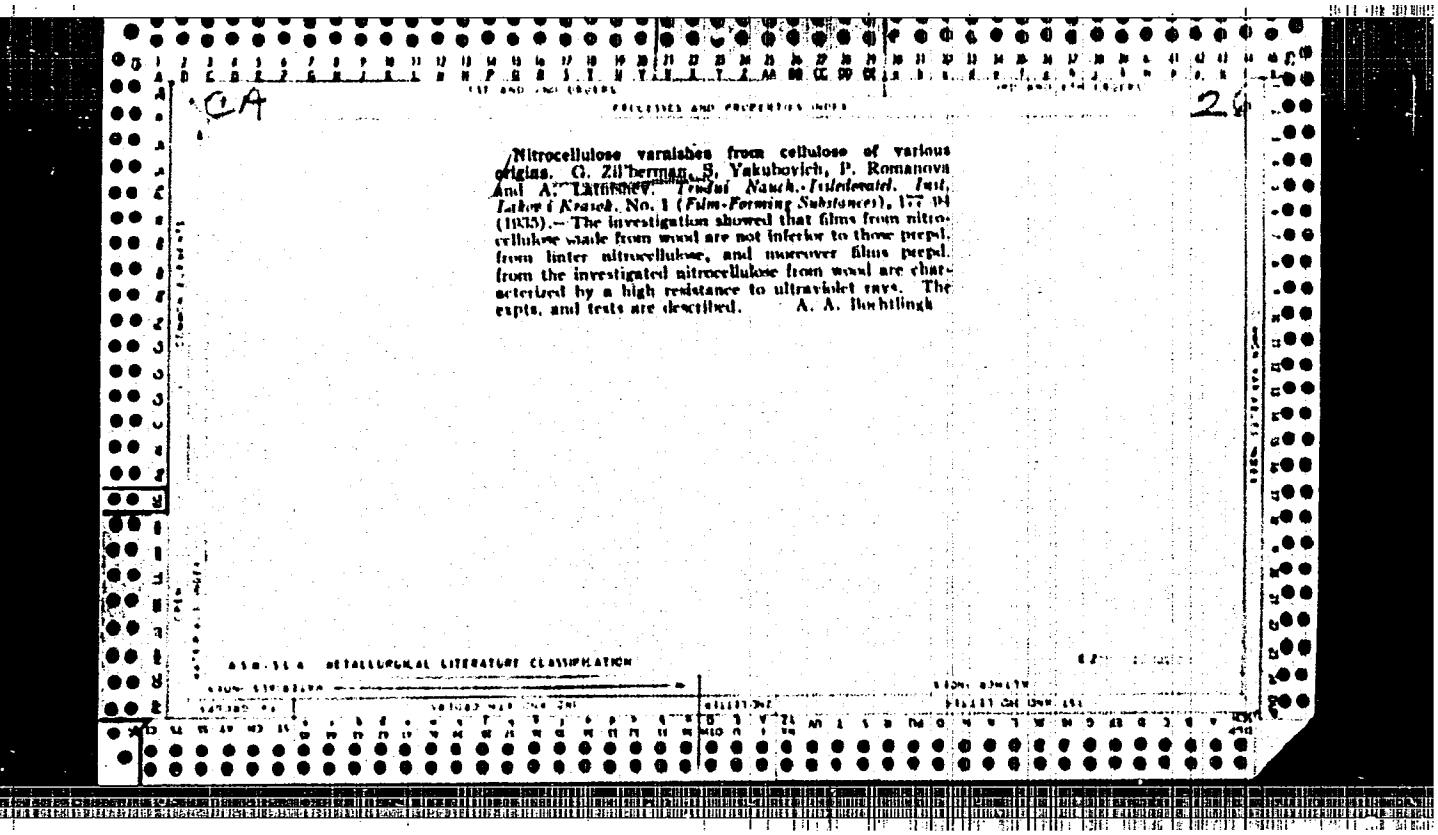
Oil varnishes. G. I. Zil'berman and A. A. Dobrin. Russ. 34,070, Feb. 28, 1934. Oil varnishes are prepared by heating fat acids or a mixt. of fat acids with naphthenic acids at ordinary pressure to 330° in a stream of CO_2.



Glycol esters of resin. G. M. Zilberman and R. Zamuiskov. *Za Lakokrasochnaya Ind.* 1935, No. 1, 23-5.—Resin is best esterified with 13% of its wt. of $C_2H_4(OH)_2$ if the mixt. is slowly heated from 180° to 280°; strong bubbling is avoided at all times. The reaction goes more smoothly with a tech. glycol contg. 40% higher homologs than with 96% glycol. The ester formed is as useful as that from glycerol. H. M. Leicester



Methods for testing nitrocellulose films. G. Zil'berman, S. Yakubovich, P. Romanova and S. Rozhdestvenskii. *Trudui Nauch.-Issledovatel. Inst. Laków i Krasok.* No. 1 (*Film-Forming Substances*), 171-6(1935); cf. *C. A.* **29**, 2025⁸. A. A. Boehtlingk



CA

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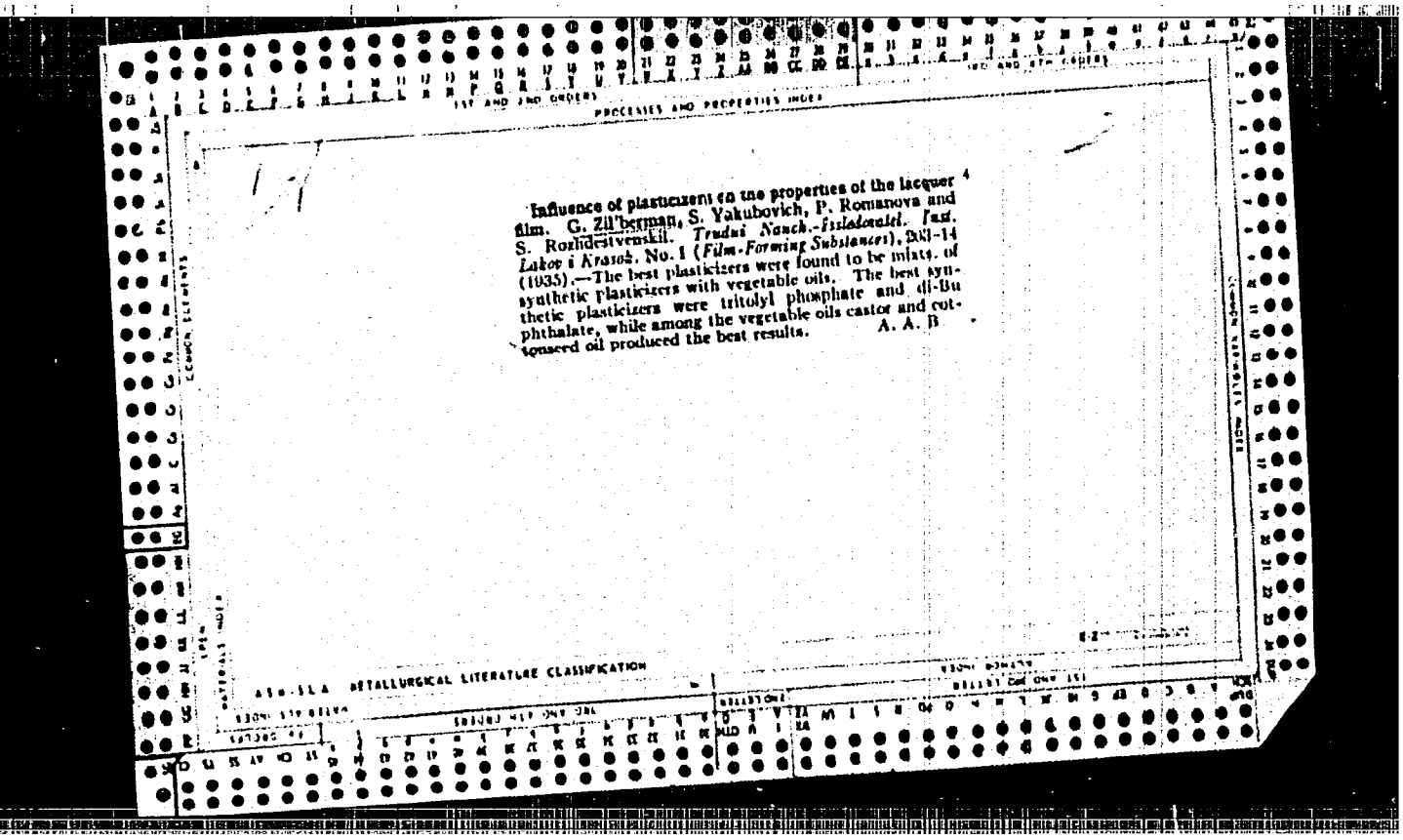
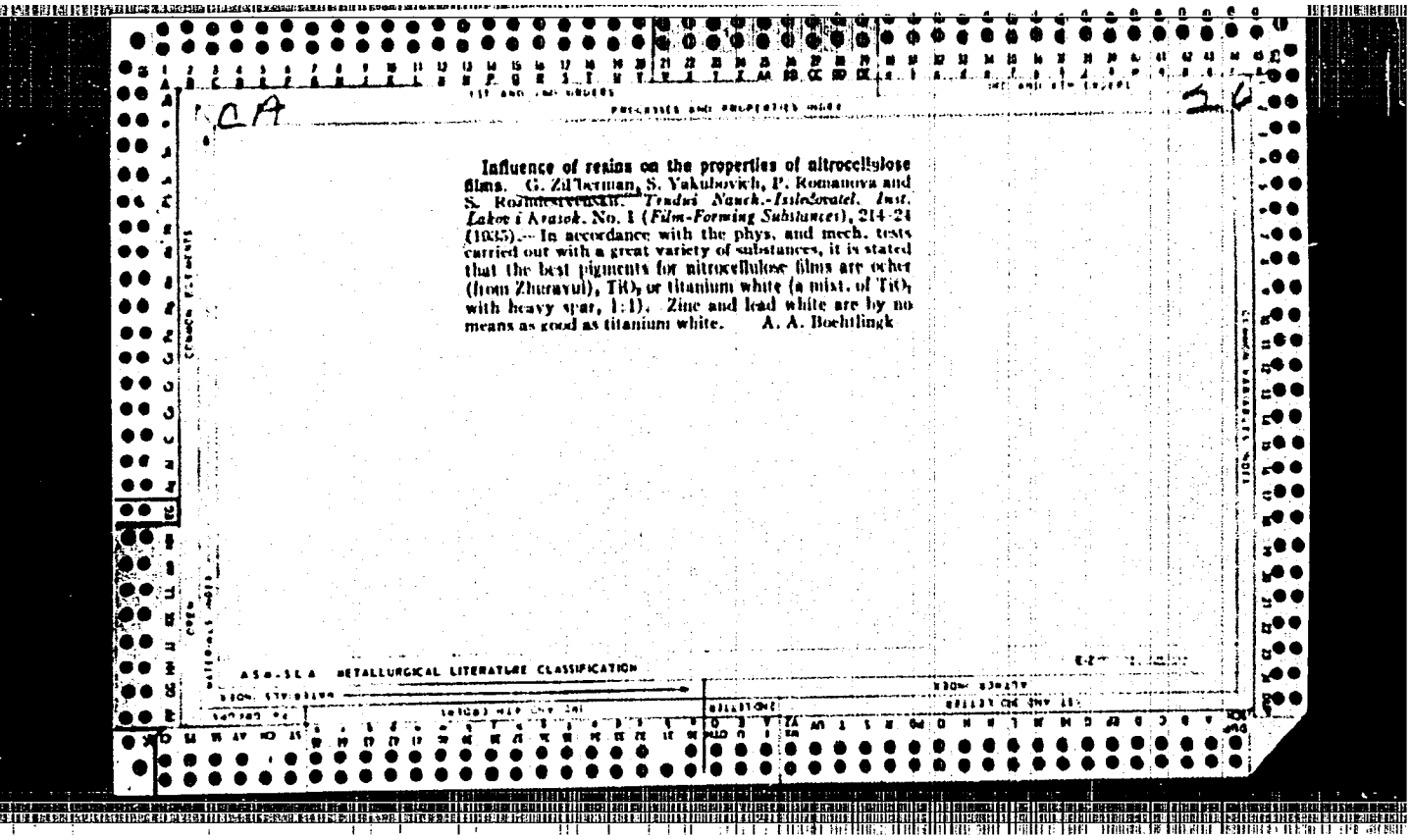
Nitrocellulose varnishes from cellulose of various origins. G. Zil'berman, S. Yakubovich, P. Romanova and A. Lavrov. *Trudui Nauch.-Issledovatel. Inst. Lakov i Krasok*, No. 1 (*Film-Forming Substances*), 177-94 (1935).—The investigation showed that films from nitrocellulose made from wood are not inferior to those prepd. from linter nitrocellulose, and moreover films prepd. from the investigated nitrocellulose from wood are characterized by a high resistance to ultraviolet rays. The expts. and tests are described. A. A. Boehtlingk

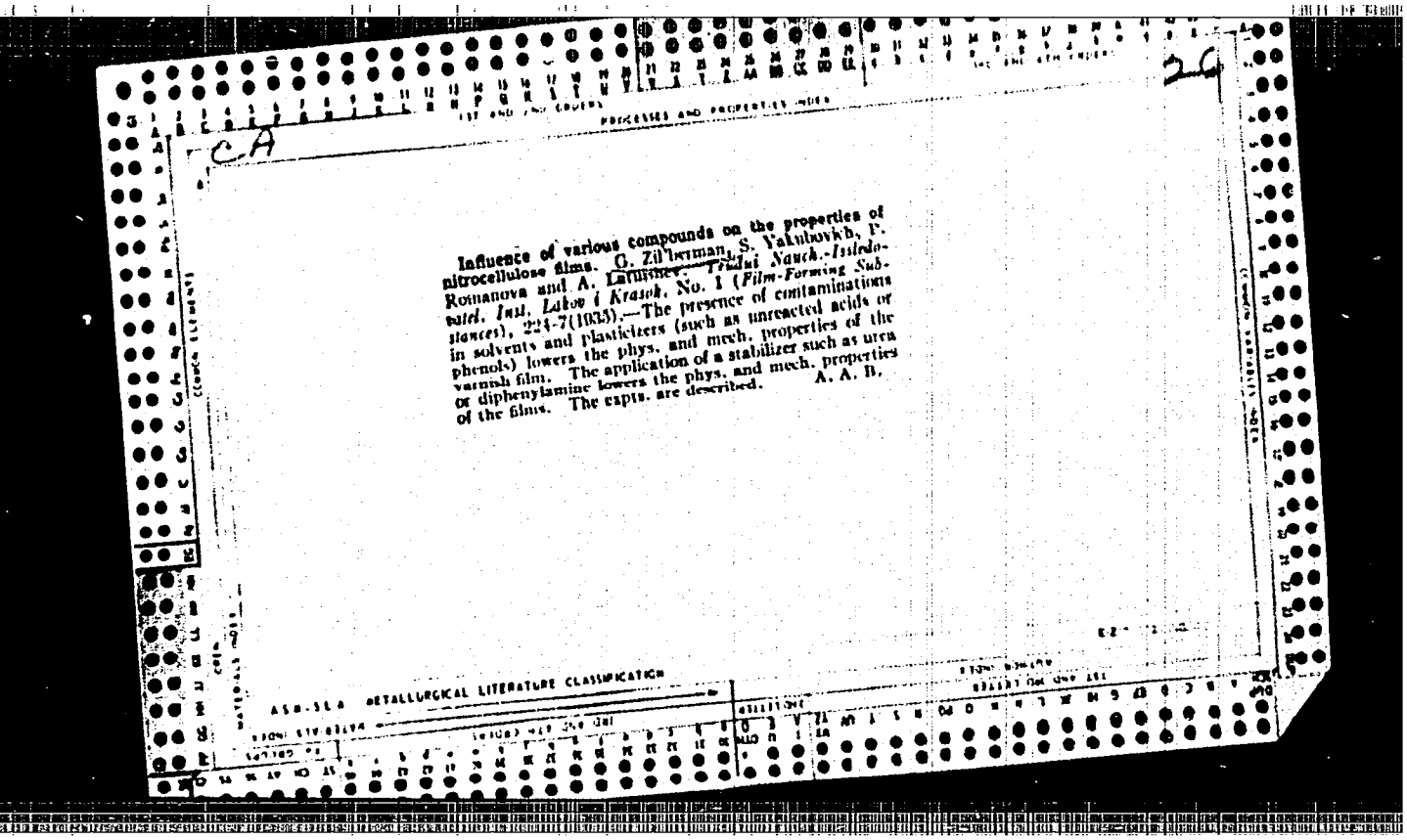
The influence of the nitrogen content in the nitrocellulose on the properties of the lacquer film. A. G. Zhdanov, S. Yakubovich, P. Romanova and A. Latuishev. *Trudui Nauch.-Issledovatel. Inst. Lakov i Krasok.* No. 1 (*Film-Forming Substances*), 194–203(1935).—Films prepd. from nitrocellulose high in N have the same mech. and chem. properties as those prepd. from nitrocellulose low in N. Therefore lacquers can be prepd. from nitrocellulose low in N. A. A. Boehtlingk



Influence of plasticizers on the properties of the lacquer film. G. Zil'berman, S. Yakubovich, P. Romanova and S. Rozhdestvenskii. *Trudui Nauch.-Issledovatel. Inst. Lakov i Krasok*. No. 1 (*Film-Forming Substances*), 203–14 (1935).—The best plasticizers were found to be mixts. of synthetic plasticizers with vegetable oils. The best synthetic plasticizers were tritolyl phosphate and di-Bu phthalate, while among the vegetable oils castor and cottonseed oil produced the best results. A. A. B



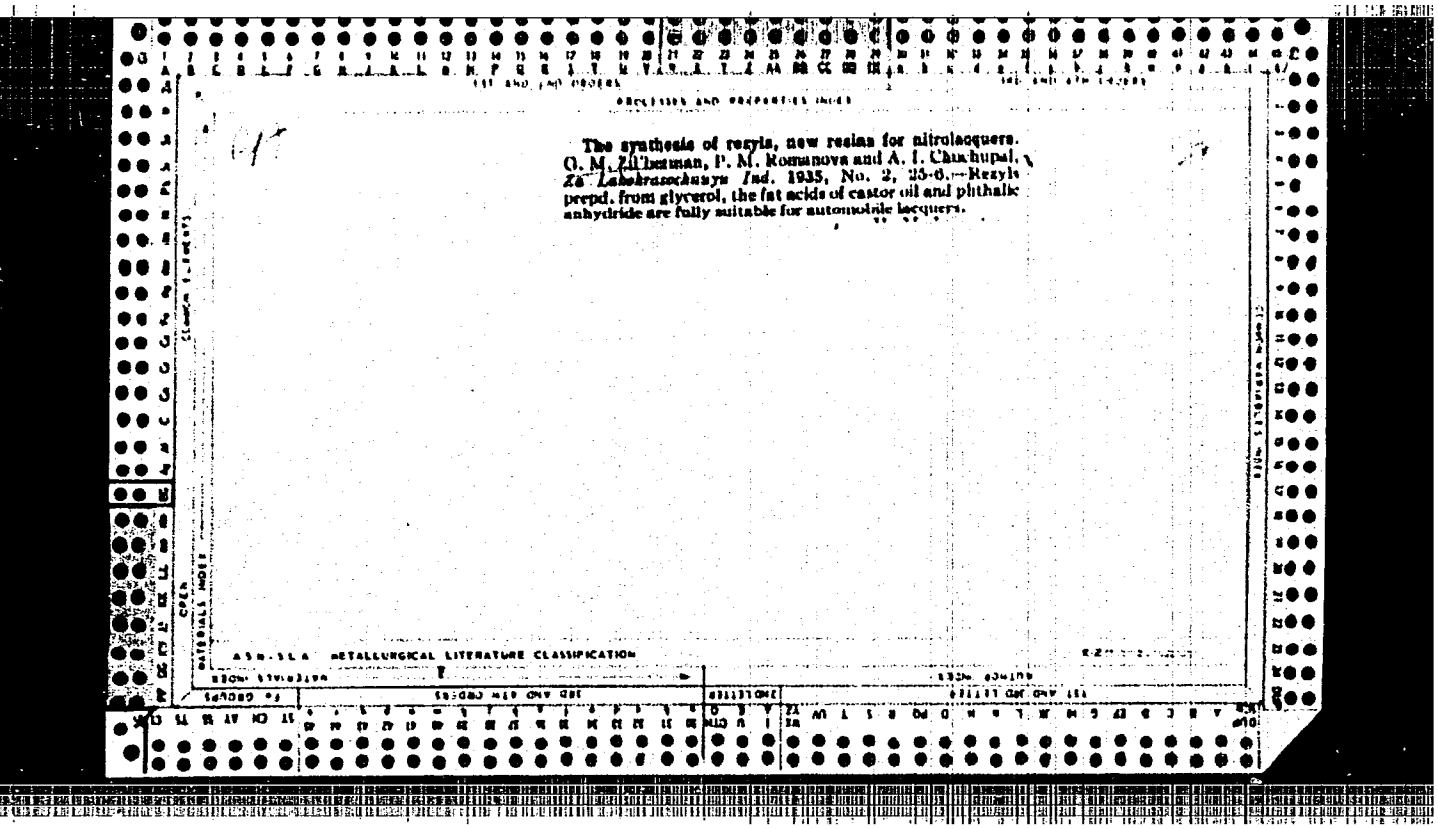
Influence of resins on the properties of nitrocellulose films. G. Zil'berman, S. Yakubovich, P. Romanova and S. Rozhdestvenskii. *Trudui Nauch.-Issledovatel. Inst. Lakov i Krasok*. No. 1 (*Film-Forming Substances*), 214-24 (1935).— In accordance with the phys. and mech. tests carried out with a great variety of substances, it is stated that the best pigments for nitrocellulose films are ocher (from Zhuravul), TiO_2 or titanium white (a mixt. of TiO_2 with heavy spar, 1:1). Zinc and lead white are by no means as good as titanium white. A. A. Boehtlingk



CA

Influence of various compounds on the properties of nitrocellulose films. G. Zil'berman, S. Yakubovich, F. Romanova and A. Lapushner. *Trudui Nauch.-Issledovatel. Inst. Lakov i Krasok*, No. 1 (*Film-Forming Substances*), 224-7(1933).—The presence of contaminations in solvents and plasticizers (such as unreacted acids or phenols) lowers the phys. and mech. properties of the varnish film. The application of a stabilizer such as urea or diphenylamine lowers the phys. and mech. properties of the films. The capts. are described. A. A. B.

ASM-SLA METALLURGICAL LITERATURE CLASSIFICATION



The synthesis of rezyls, new resins for nitrolacquers. O. M. Zil'berman, P. M. Romanova and A. I. Chukhupal. *Za Lakokrasochnuyu Ind.* 1935, No. 2, 35-6.—Rezyls prepd. from glycerol, the fat acids of castor oil and phthalic anhydride are fully suitable for automobile lacquers.

YERMICHEV, V.A.; ZIL'BERMAN, G.M., dots., red.

[Methodological manual for calculating mechanical transmissions for machinery; for correspondence students] Metodicheskoe posobie po raschetu mekhanicheskikh perodach v mashinakh dlia studentov-zaochnikov. Perm', Permskii sel'khoz. in-t im. D.N.Prianishnikova, 1963. 109 p. (MIRA 17:8)

ZIL'BERMAN, G. M.

Skorostnaia obrabotka detalei na mnogoshpindel'nykh avtomatakh. (Vestn. Mash., 1950, no. 12, p. 28-39)

High-speed machining of parts on multispindle automatic machines.

DLC: TN4.V4

SO: Manufacturing and Mechanical Engineering in the Soviet Union, Library of Congress, 1953.

ZIL'BERMAN, G. M.

ZIL'BERMAN, G. M. -- "Investigation of the Wear of High-Melting Shaped Cutters with Radial Feed." Min Higher Education USSR. Ural Polytechnic Inst imeni S. M. Kirov. Sverdlovsk, 1955. (Dissertation for the Degree of Candidate of Technical Sciences.)

SO: Knizhnaya letopis', No. 4, Moscow, 1956

ZIL'BERMAN, G. M., Cand Tech Sci (diss) -- "Investigation of the wearing of hard-alloy shaped cutters when working with radial feed". Moscow, 1959. 15 pp (Min Higher and Inter Spec Educ RSFSR, Moscow Automotive Mech Inst), 150 copies (KL, No 15, 1960, 134)

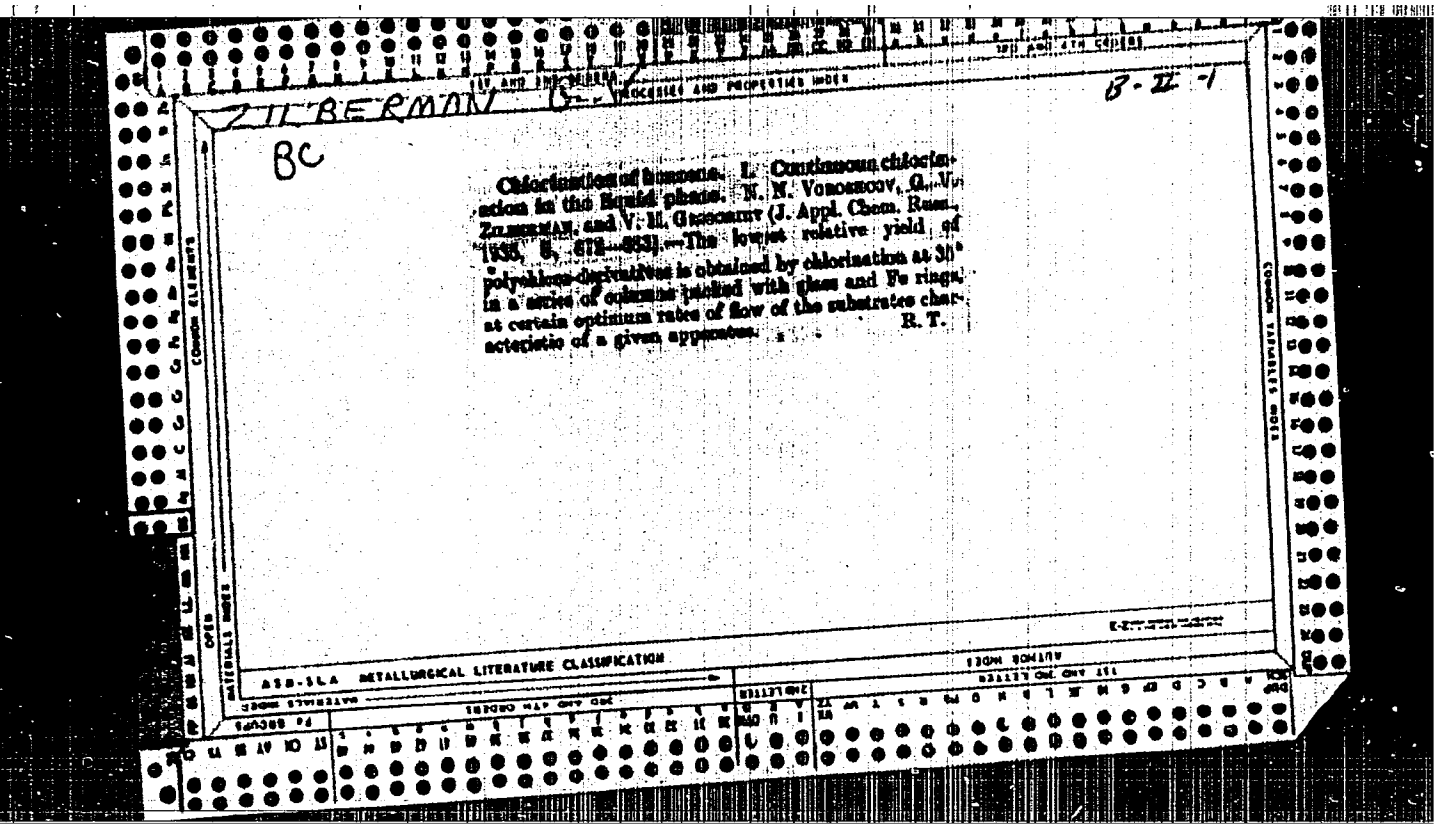
ZIL'BERMAN, G.N.

More consideration must be given to the processing of plastics.
Plast.massy no.10:1 '60. (MIRA 13:12)
(Plastics)

GUREVICH, M.B., arkhitektor; YEL'KIN, G.A., arkhitektor; FILENKOV, Yu.P., arkhitektor; ZIL'BERMAN, G.P., arkhitektor; KRYUKOV, G.V., arkhitektor; PANCHENKO, N.D., arkhitektor; VOLOSHINOV, G.I., arkhitektor

Regardless of passengers convenience and economics of constructions. Transp. stroi. 15 no.3:57 Mr '65. (MIRA 18:11)

1. Vsesoyuznyy nauchno-issledovatel'skiy institut tekhnicheskoy estetiki (for Gurevich, Yel'kin, Filenkov). 2. Novosibirskproyekt (for Zil'berman). 3. MVKhTU (for Kryukov). 4. Moskovskiy gosudarstvennyy proyektnoizyskatel'skiy i nauchno-issledovatel'skiy institut transporta Ministerstva transportnogo stroitel'stva SSSR (for Panchenko, Voloshinov).



G.V. ZIL'BERMAN

C.A.

PROCESSES AND PROPERTIES INDEX

Chlorine derivatives of naphthalene. G. V. Zil'berman, S. I. Rashevskaya and N. N. Matyushina. *J. Applied Chem. (U. S. S. R.)* 9, 1832-40 (in German 1841) (1936).—α-$C_{10}H_7Cl$ was prepd. by the Sandmeyer method (diazotization at 10-15° and decompn. of the diazo compd. at not lower than 60°). The yield was 70-75% and the product m. −2.3°, b_{760} 255.6° (cor.). β-$C_{10}H_7Cl$ was prepd. according to the Scheid method, and m. 57.4-7.8°, b_{760} 255 (cor.). 1,4-$C_{10}H_6Cl_2$ was obtained by the Beattie-Whitmore method with the following modifications: (1) the diazo compd. was sepd. from the mother liquor in a solid form, before it was decompd.; (2) Cu salts were filtered after decompn., as $Cu(OH)_2$; and (3) 1,4-$C_{10}H_6Cl_2$ was prepd. directly from $C_{10}H_6Cl$-SO_3Na by treating with an excess of PCl_5, yielding 65-70% of a product m. 88.6-7°. 1,6-$C_{10}H_6Cl_2$ was synthesized from 1,6-$C_{10}H_6(SO_3H)_2$ by heating with PCl_5. The tech. α-$C_{10}H_7Cl$ can be analyzed by the Bourion method. The middle fraction, obtained in the vacuum distn. of mono-Cl derivs. prepd. by direct chlorination in the presence of $SbCl_3$, consisted mainly of mono-derivs. with a very small admixt. of $C_{10}H_8$ and di-Cl derivs. (total less than 1%); therefore, the detn. of the f. p. of this fraction permitted the evaluation of the ratio of α- and β-isomers in the sample under consideration. The admixt. of β-$C_{10}H_7Cl$ to the α-isomer in the amt. of 10% had no influence upon the d. of the latter. 1,4- and 1,6-$C_{10}H_6Cl_2$ lowered the m. p. of α-$C_{10}H_7Cl$. Six references.

A. A. Podgorny

ASM-SLA METALLURGICAL LITERATURE CLASSIFICATION

SOV/70-4-4-25/34

AUTHORS: Kulik, I.O. and Zil'berman, G.Ye.

TITLE: Investigation of Directed Crystallisation in Melts Containing Impurities. I.

PERIODICAL: Kristallografiya, 1959, Vol 4, Nr 4, pp 613-617 (USSR)

ABSTRACT: The study is theoretical but is directed towards the problems of growing crystals for scintillators by the Obreimov-Shubnikov or Stockbarger methods. It is also important for zone refining and other situations where there are impurities in a growing crystal. The diffusion equations are set up and lead to an integral equation which is soluble by iteration. The solution depends on two dimensionless parameters. These are g , the distribution coefficient, or coefficient of purification, and $\lambda = (vH/4D)^{1/2}$ where D is the diffusion coefficient, H the height of the crystalline phase and the melt above it and vt the depth which has solidified. Curves are drawn for $\lambda \gg 1$ and $\lambda \ll 1$. Both are experimentally observed under various conditions.

Cardl/2

Investigation of Directed Crystallisation in Melts Containing Impurities SOV/70-4-4-25/34

Acknowledgments are made to L.G. Eydel'man, A.M. Ratner and Yu.V. Naboykin.

There are 3 figures and 7 references, of which 5 are Soviet and 2 English.

ASSOCIATION: Khar'kovskiy filial Vsesoyuznogo nauchno-issledovatel'skogo instituta khimicheskikh reaktivov (All-Union Scientific Research Institute for Chemical Reagents)

SUBMITTED: December 10, 1958

Card 2/2

SOV/126-7-4-4/26

AUTHOR: Zil'berman, G.Ye.

TITLE: Some Problems in the Theory of the de Haas-van Alphen Effect

PERIODICAL: Fizika metallov i metallovedeniye, 1959, Vol 7, Nr 4, pp 504-512 (USSR)

ABSTRACT: Using the results obtained by the present author in Ref 2 and 3, a study is made of certain properties of electrons with an arbitrary dispersion law in a magnetic field. It is shown that there is a quasi-classical shift of the energy levels which is proportional to H^2. In the derivation of Eq (1) in Ref 2 the nondiagonal terms were neglected. It was shown in Ref 2, that they are of the order of ε^3 provided the curves $\chi_1 = \chi_1(k_2)$, which correspond to the same values of the quantum numbers n and k_3 in different energy bands, intersect. In the present paper the nondiagonal terms of the order of ε^3 are taken into account. The calculation is carried out for the case where the above curves are in the form of concentric ellipses. These ellipses have equal areas and hence they intersect. A discussion is given of the effect of the influence of this correction on the

Card 1/3

Some Problems in the Theory of the de Haas-van Alphen Effect

de Haas-van Alphen effect. The electron energy with a nearly quadratic dispersion law is given by Eq (12) and (13) of the present paper. In Eq (13) C_1 and C_2 can be both positive and negative. The presence in this formula of a constant shift independent of n, which is proportional to H^2, leads to a change in the usual (Ref 1-3) formulae for the oscillating part of the magnetic moment. In these formulae the replacement given by Eq (24) should be carried out. It then follows that the "intersection number" is given by Eq (25). In strong magnetic fields, this function deviates from a straight line either upwards or downwards, depending on the sign of C_2. Eq (25) differs from the formula obtained by taking into account the dependence of E_o on H in which the term proportional to H is always positive. The nondiagonal terms in the Hamiltonian lead to analogous results. Using Eq (16) for the energy instead of Eq (24) one obtains Eq (26). Thus, the "intersection number" is now given by Eq (27). If the value γ is close to unity, then Eq (27) approaches Eq (25) except that the deviation from a straight line will be

Some Problems in the Theory of the de Haas-van Alphen Effect

proportional to $H^{1/2}$ and not to H. The additional term in this formula is greater than in Eq (25) (in absolute magnitude), since in this case the effect is of the order of ε^3, while in Eq (25) it is of the order of ε^4. When γ is very different from unity, Eq (27) gives weak oscillations with increasing amplitude about a straight line (H increases). This effect has not been detected experimentally. It is shown that the broadening of the electron energy levels in a magnetic field is described by two continuous parameters. The broadening is calculated for closed trajectories. The broadening is of the order of ε^4 where

$$\varepsilon = a\sqrt{eH/hc}$$

I.M.Lifshits is thanked for discussing the present work. There are 1 figure and 6 Soviet references.

SUBMITTED: November 23, 1957

Card 3/3

ZILBERMAN, G.E.

Zilberman, G. E., The investigation of excited states of the center of color. P. 135.

The investigation of excited states of the center of color (F-center) is done with the help of the method of the excitation theory (in a limiting case a medium polarizable almost without inertia), and the Ritz method. The first method makes it possible to find the possible self-coordinated states, and the second-to calculate their energy. It is shown that there exists a series of second (in the potential pit coordinated with them) self-coordinated states and a series of third self-coordinated states. The radii of these states and the duration of their life are calculated. The latter is of the order 10^{-6} sec. and the radii of the states are sufficiently large to warrant a macroscopic examination of polarization. These results will be used in the following article for the examination of the temperature and time relation of the photo-conductivity of colored alkali-halide crystals.

Institute of Physics
Aca. of Sci. Ukrainian SSR
Kiev State University
June 26, 1948

SO: Journal of Experimental and Theoretical Physics (USSR) 19, No. 2 (1949)

ZILBERMAN, G. E.

Zilberman, G. E., Time and temperature relation of the photo-conductivity of colored alkali-halide crystals. P. 146.

The investigation of the excited states of the F-center conducted in (1) makes it possible to examine the kinetics of the processes of excitation, dissociation and recombination of electrons in colored alkali-halide crystals. This makes it possible to explain, in full qualitative agreement with experiment, the time relation of the photo-conductivity in such crystals. In the second part of the article the temperature relation is examined, qualitative and quantitative (in the question concerning the value of the dissociation energy) agreement with experiment is reached.

Institute of Physics
Aca. of Sci. Ukr. SSR
Kiev State University
June 26, 1948

SO: Journal of Experimental and Theoretical Physics (USSR) 19, No. 2 (1949)

USSR/Physics - Magnestism Nov 51

"Magnetic Properties of Metals at Low Temperatures," G. Ye. Zilberman

"Zhur Eksper i Teoret Fiz" Vol XXI, No 11, pp 1209-1217

Discusses main exptl results of fluctuations in magnetic permeability of metals at low temp during variation of magnitude and direction of magnetic field. Paramagnetic spin in a form admitting transition to anisotropic state is taken into account within theoretical framework of the model of free electron gas in cases of slightly degenerate and nondegenerate state. Finds

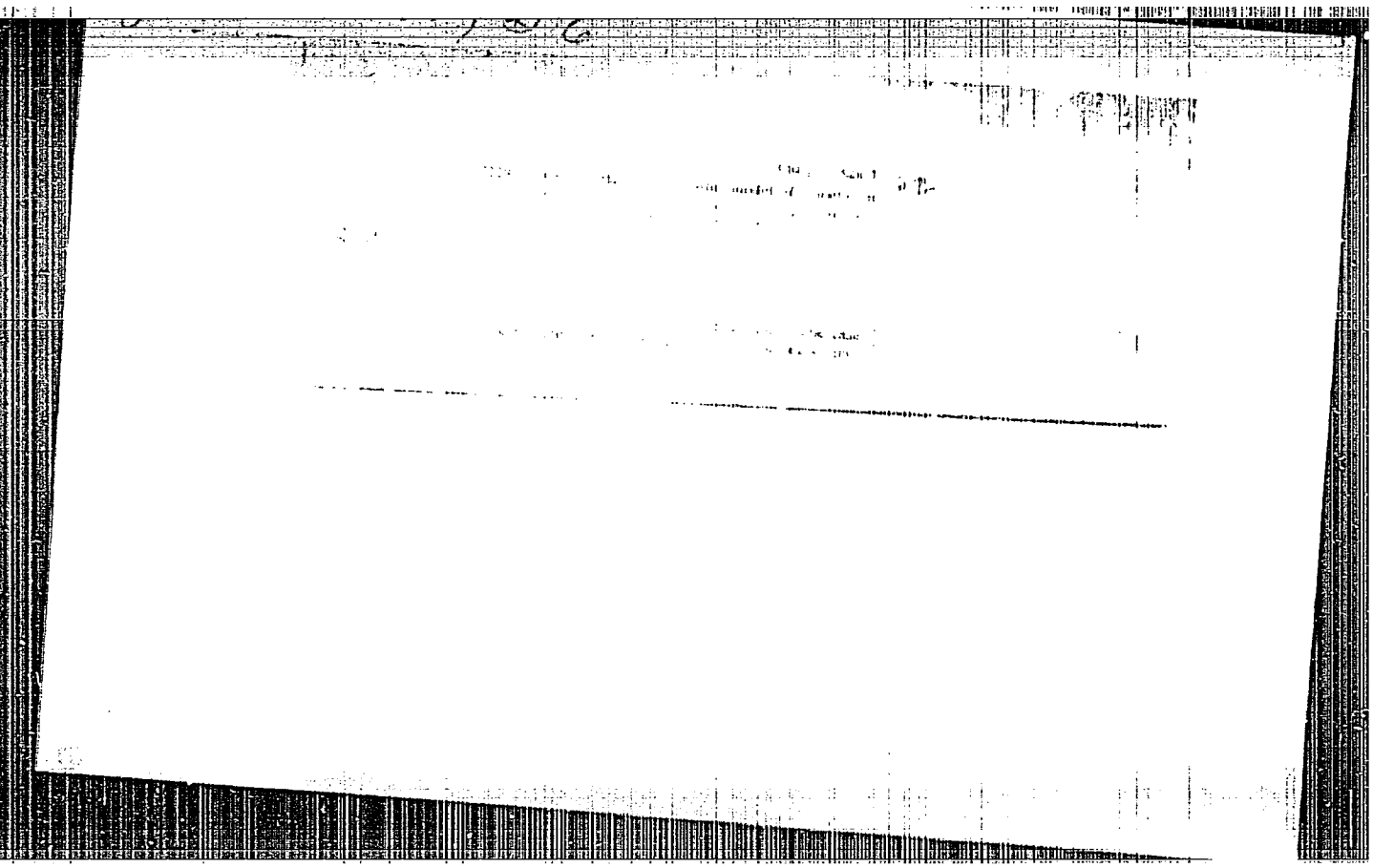
204T90

USSR/Physics - Magnetism (Contd) Nov 51

theoretical results compared with exptl correspond in main features, but diverge in details. Acknowledges assistance of A. I. Akhiyezer, B. I. Verkin and I. M. Lifshits. Submitted 3 Jan 51.

204T90

ZILBERMAN, G. YE.



APPROVED FOR RELEASE: 09/19/2001 CIA-RDP86-00513R002065120015-9"

USSR/Physics - Electron gas FD-979

Card 1/1 Pub. 146 - 3/20

Author : Zil'berman, G. Ye.

Title : Certain properties of weakly nonideal electron gas

Periodical : Zhur. eksp. i teor. fiz., 27, No 5 (11), 549-556, Nov 1954

Abstract : The author considers the conditions for which the interaction of electrons can be considered a perturbation and also the problem of the selection of the perturbation operator. For T=0 he finds the free energy of a weakly nonideal electron gas and calculates its magnetic susceptibility. He shows that the period of oscillation depends upon the chemical potential which is not so for non-interacting electrons. The concrete form of this dependence as obtained in this work permits one to determine the law of dispersion of quasiparticles for T=0 close to the boundary of the Fermi distribution and to extend the theory to the case close to zero temperature. Thanks professor I. M. Lifshits for acquainting the author with the results of his work before their publication (I. M. Lifshits and A. M. Kosevich, DAN SSSR, 96, 963, 1954). Nine references, 8 USSR.

Submitted : January 23, 1954

ZIL'BERMAN, G.Ye.

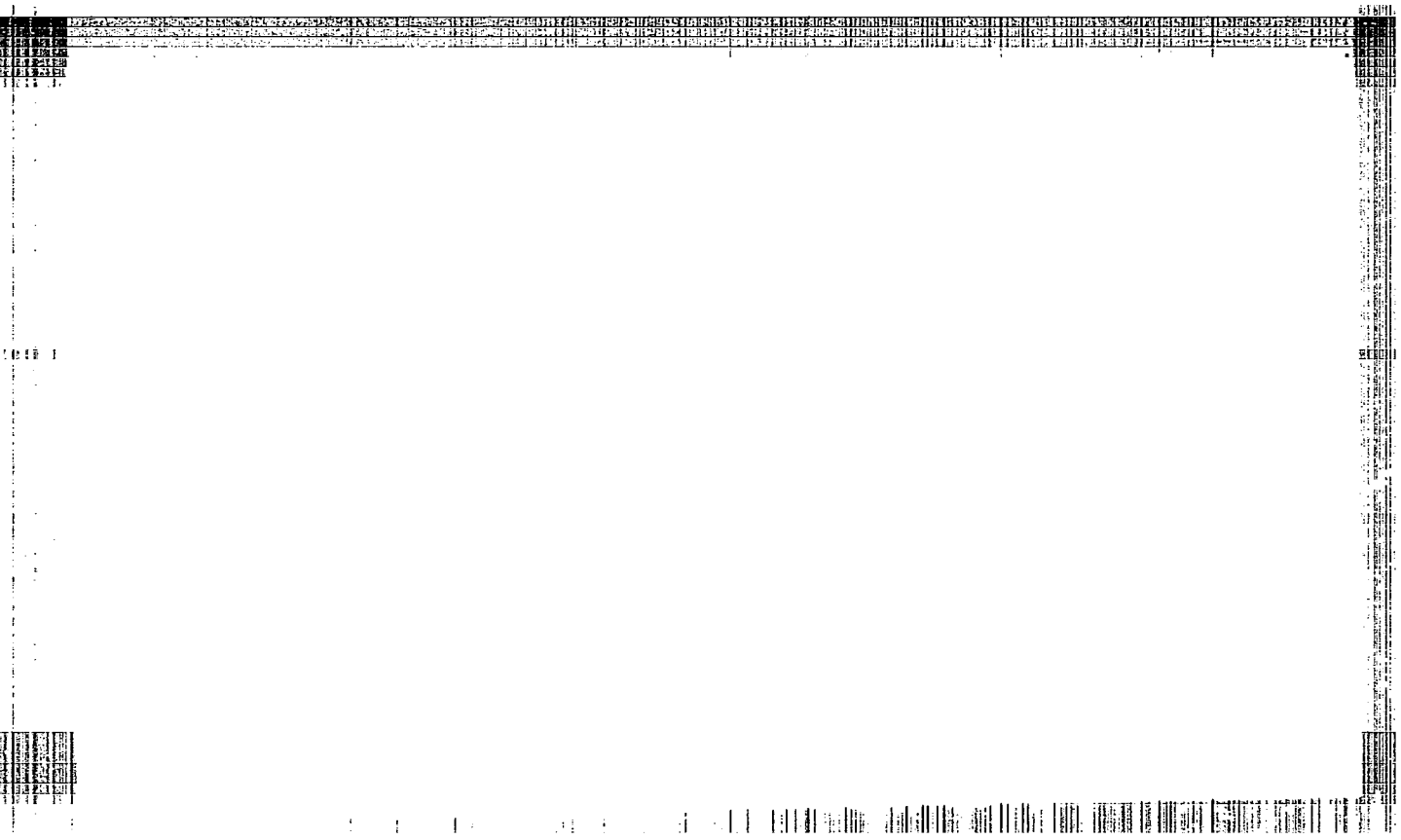
Oscillation effects in a magnetic field. Izv.AN SSSR.Ser.fiz.19 no.4:404-408 Jl-Ag '55. (MLRA 9:1)
(Magnetic fields)

Category : USSR/Electricity - Semiconductors G-3

Abs Jour : Ref Zhur - Fizika, No 2, 1957, No 4173

$N_1 \neq N_2$, the resistance increases to a saturation value, and the Hall field is proportional to H; if $N_1 = N_2$, then $\rho \sim H^2$, and the Hall field is very small. The osicllations of ρ and of the Hall field should differ in phase by π, and ρ should decrease and the Hall field should increase with increasing pressure. This is observed experimentally. $1/\underline{\ell}$ (ℓ is the length of the mean free path) also turns out to be an oscillating function of H and, as always, is proportional to the impurity concentration and is independent of the electron concentration.

Card : 2/2



APPROVED FOR RELEASE: 09/19/2001 CIA-RDP86-00513R002065120015-9"

ZIL' BERMAN, G. Ye.

USSR / Magnetism. Diamagnetism. Paramagnetism. F-3

Abs Jour : Ref Zhur - Fizika, No 3, 1957, 6838

Author : Zil'berman, G. Ye.
Title : Energy Spectrum of an Electron in a Crystal in a Magnetic Field

Orig Pub : Zh. eksperim. i teor. fiziki, 1956, 30, No 6, 1092 - 1097

Abstract : It is shown that in a strong field the discrete energy levels of an electron in a crystal broaden into narrow bands. The structure of the energy band in a crystal in a magnetic field was investigated. The possible effect of the broadening on the de Haas-Alfen effect is discussed.

Card : 1/1

On a possible surface of constant energy of electrons in the periodic field of a lattice. (Cont.) 126-2-5/30

β	γ	δ
-0.25	0	0.9
0	0	0.7
0	0	-0.5

There are 10 figures and 3 references, all of which are Slavic.

SUBMITTED: May 24, 1956.

AVAILABLE:

Card 2/2

AUTHOR: ZIL'BERMAN, G.E., ICKOVIČ, F.I.

TITLE: Temperature Dependence of the Magnetic Susceptibility of Electrons in Metals. (Temperaturnaja zavisimost' magnitnoge vospriimčivosti elektronov v metalle, Russian).

PA - 2078

PERIODICAL: Zhurnal Eksperimental'noi i Teoret.Fiziki, 1957, Vol 32, Nr 1, pp 158-160 (U.S.S.R.)

Received: 3 / 1957 Reviewed: 4 / 1957

ABSTRACT: The authors investigated the temperature dependence of the magnetic susceptibility χ of electrons within a wide temperature interval in weak magnetic fields, when χ practically does not depend on H. Here the following cases are investigated:
1) Only small electron groups exist.
2) Furthermore, also great electron groups exist.
3) In addition, great hole groups exist.
Computations are carried out here on the assumption of a quadratic dispersion law, taking into account the spin-paramagnetism and the anisotropy of effective masses.
Hexagonal bismuth crystals are investigated (results in the case of other symmetry types remain qualitatively unchanged). Furthermore, as usual, the existence of three homogeneous small ellipsoid-like groups is assumed. The axes of these ellipsoids form angles of 120° in the plane of the binary axis.

Card 1/3

Temperature Dependence of the Magnetic Susceptibility of Electrons in Metals.

Case I: For the components χ_i (the index 3 here denotes the principal axis) of the 3 aforementioned groups computations furnish the expression:

$$\chi_i = -(1/2)\, AB_i\, (kT)^{1/2}\, F_{-1/2}(\zeta/kT) = -AB_i \sqrt{\zeta_0}\, X.$$

Also the quantities occurring in this formula are given explicitly. For the dependence of the chemical potential ζ on temperature the following formula is obtained from the condition of constancy of the concentration n of electrons:

$\theta = \left[(3/2)F_{1/2}(u)\right]^{-2/3}$. After computation of the function $F_{+1/2}$, $X(\theta)$ is determined, i.e. the required dependence $\chi(T)$ in universal coordinates, and, furthermore, $\zeta(\theta)/\zeta_0$. For limiting cases (extensive degeneration as well as validity of BOLTZMANN'S statistics) the following relations are found:

$T \ll T_0$: $X = 1 - \pi^2\theta^2/12$, $\zeta/\zeta_0 = 1 - \pi^2\theta^2/12$;

$T \gg T_0$: $X = 2/3\ \theta$ $\zeta/\zeta_0 = (3/2)\theta \ln\left[(16/9\pi)^{1/3}\ \theta^{-1}\right]$.

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PA - 2078

Temperature Dependence of the Magnetic Susceptibility of Electrons in Metals.

The curves for $X(\Theta)$ and $\zeta(\Theta)/\zeta_0$ as well as for their asymptotic expressions are demonstrated in a diagram. Such a temperature dependence of γ applies in the very case of the series of metals.
Case 2) and 3) are dealt with in a similar manner and the equations obtained are given explicitly as under 1).

ASSOCIATION: Not given
PRESENTED BY:
SUBMITTED:
AVAILABLE: Library of Congress

Card 3/3

An Electron in a Periodic Electric and in a Homogeneous Magnetic Field.

is practically satisfied up to field strengths of $H \sim 10^5 - 10^6$ Ørsted. (at $H = 10^4$ Ørsted and $a = 2{,}5.10^8$ cm it holds that $\varepsilon = 10^{-2}$.) The terms of the order of magnitude ε^4 are neglected here. The equation of motion of an electron in a magnetic field is obtained by replacing the quantum number k_1 by the operator $k_1 - (1/i\alpha_0^2)\partial/\partial k_2$ in the formula given for the energy of the electron in the case of a lacking magnetic field.

The third chapter deals with the solution of the equation of motion of the electron. This solution is set up here in the form

$g(k_1,k_2,k_3) = \exp\{i\alpha_0^2 k_1 k_2 - i\psi(k_1,k_2,k_3)\}$ It applies that

$\psi = \varphi + i\varphi_1$, where the imaginary part is small in comparison to the real part.

The entire eigenfunction $g(k_1,k_2,k_3)$ can be written down in form of the linear combination

$$g(k_1,k_2,k_2) = |\partial E^0/\partial \chi_1|^{-(1/2)} e^{i\alpha_0^2 k_1 k_2} (A\exp\{i\alpha_0^2 \int \chi_1 dk_2\} + B\exp\{$$

CARD 2/3

$$-i\alpha_0^2 \int \chi_1 dk_2 + \gamma\})$$

An Electron in a Periodic Electric and in a Homogeneous Magnetic Field.

or also in the form

$$g(k_1,k_2,k_3) = |\partial E^0/\partial \mathcal{X}_1|^{-1/2} e^{id_0^2 k_1 k_2} \sin(a_0^2 \int \mathcal{X}_1 dk_2 + \gamma)$$

The last chapter deals with the broadening of the discrete energy levels of the electron into small bands in a magnetic field under the influence of the periodic field of the lattice.
A mathematical appendix is added at the end of this paper. (No illustrations.)

ASSOCIATION: not given.
PRESENTED BY: -
SUBMITTED: 27. 11. 1955.
AVAILABLE: Library of Congress.

CARD 3/3

ZIL'BERMAN, G. Ye.

56-2-11/47

AUTHOR: Zil'berman, G. Ye.

TITLE: On the Energy States of an Electron in a Periodic Electric Field and a Homogeneous Magnetic Field. II. (Elektron v periodicheskom elektricheskom i odnorodnom magnitnom polyakh. II)

PERIODICAL: Zhurnal Eksperim. i Teoret. Fiziki, 1957, Vol. 33, Nr 2(8), pp. 387-396 (USSR)

ABSTRACT The first part of this paper is given to the determination of the energy levels of an electron in a crystal situated in a magnetic field in a semiclassical approximation in the case that the path is closed in $\vec{k}$ - space and is completely contained within a cell of the inverse lattice. The present paper discusses the energy spectrum of the electron in a magnetic field in the case, that its path in the k space is not closed and periodic. Such paths are obtained, when the isoenergetic surfaces of the type of a cylinder interseot with the planes passing through the axis of the cylinder. In this case narrow interruptions occur in the energy spectrum and the continuous spectrum is divided up into zones, wich represent strongly widened levels. With the approximation considered here the interruptions in the energy spectrum are quasi-equidistant and are of the order of magnitude ε^2, $\varepsilon = a/a_0$, $a_0 = \sqrt{\hbar c/eH}$. Such considerable interruptions occur only under certain assumptions. In all cases considered here the interruptions in the spectrum occur at three energy values. The following sections deal with such cases, where

Card 1/2

On the Energy States of an Electron in a Periodic Electric Field and a Homogeneous Magnetic Field II. 56-2-11/47

the interruptions in the energy spectrum are sufficiently large to cause a noticeable DE HAAS-Van ALFV'EN effect. These sections deal with the following points: 1) the solution of the problem of motion in a periodic field, which is suited for small values of momentum at the boundaries of the cell. 2) The case, that the momentum or its derivative shows jumps, the application on the theory of DE HAAS and Van ALFV'EN. In the last chapter the "jumping" is again investigated, but without the assumption of strongly or weakly bound electrones. There is possible a complete as well as an incomplete "jumping" of the oscillating physical quantities; There are 6 figures and 8 Slavic references.

SUBMITTED: January 7, 1957 after revision May 9, 1957

AVAILABLE Library of Congress.

Card 2/2

ZIL'BERMAN, G. Ye. Doc Phys-Math Sci -- (diss) "On the theory of oscillatory effects in metals in a magnetic field." Khar'kov, 1958. 12 pp (Min of Higher Education UkSSR. Khar'kov Order of Labor Red Banner State Univ im A. M. Gor'kiy), 100 copies. Bibliography at end of text (26 titles). (KL, 11-58, 111)

24.2120

68193

SOV/58-59-5-10999

Translation from: Referativnyy Zhurnal Fizika, 1959, Nr 5, p 156 (USSR)

AUTHORS: Zil'berman, G.Ye., Itskovich, F.I.

TITLE: On the Thermodynamics of an Electron Gas Under an Arbitrary Dispersion Law

PERIODICAL: Tr. Khar'kovsk. politekhn. in-ta, 1958, Vol 14, pp 133 - 140

ABSTRACT: The authors calculate some thermodynamic functions for the case of an arbitrary law of dispersion of the electrons in a metal. The crossover method adopted to calculate the statistical sums requires the fulfilment of conditions coinciding with the criteria of the quasi-classical description. For the square law of dispersion these conditions are strictly satisfied, but not, generally speaking, in the case of the arbitrary dispersion law; as a result the expressions obtained in this study bear an approximate character. The authors calculate the heat capacity of the electron gas in the presence of a magnetic field. That part of the heat capacity which depends on the magnetic field is connected with the concrete form of the dispersion law, while the part not dependent on the field is obtained for the arbitrary dispersion law. The heat

Card 1/2

ZIL'BERMAN G. YE

AUTHOR: Zil'berman, G. Ye.

TITLE: On the Theory of the De Haas-van Alfven Effect for Not Closed Isoenergetic Surfaces (K teorii effekta de Gaaza -van Al'fena dlya otkrytykh izoenergeticheskikh poverkhnostey)

56-1-45/56

PERIODICAL: Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, 1958, Vol. 34, Nr 1, pp. 243-245 (USSR)

ABSTRACT: The theory of the motion of an electron with any dispersion law $E(k)$ in a crystal being in a homogeneous magnetic field was developed in 3 earlier papers (references 1, 2, 3). The magnetic susceptibility χ of a collective of such electrons oscillates at a modification of the magnetic field strength (effect of de Haas-van Alfven (de Gaaz -van Al'fen)). When the isoenergetic surface defined by the equation $E(\vec{k})$=const is closed in the $\vec{k}$ -space, the period of the oscillations is determined by the amount of the extremum cross section S_m of the isoenergetic surface with the plane vertical to $\vec{H}$. But when the surface $E(\vec{k})$=const represents an open surface of the type of a crimped cylinder and when the magnetic field stands vertical to the cylinder axis, the oscillations are generally not determined by the extrema but by the limit

Card 1/3

56-1-45/56

On the Theory of the De Haas-van Alfven Effect for Not Closed Isoenergetic Surfaces

cross sections. These limit cross sections are now introduced here. Near the points of discontinuity the width of the points of discontinuity is of the same order of magnitude as the widths of the permitted bands. The extremum cross section due to the exponential littleness of the points of sudden irregularity only furnishes a very small contribution to the oscillating portion of the sum of states. The contribution of the limit cross section is considerable. After some steps of calculation the author goes over from the sum of states to the thermodynamic potential. The differences between this thermodynamic potential and the ordinary thermodynamic potential are shortly given. Other oscillation effects, e. g. the oscillations of the resistance, the oscillations of the thermo-electromotive force or of the Hall effect are also determined by the limit cross sections and not by the extremum cross sections. There are 1 figure and 3 references, all of which are Slavic.

Card 2/3

On the Theory of the De Haas-van Alfven Effect for not Closed Isoenergetic Surfaces 56-1-45/56

SUBMITTED: October 18, 1957

AVAILABLE: Library of Congress

Card 3/3

56-2-38/51

AUTHOR: Zil'berman, G. Ye.

TITLE: On the Problem of the Energy Spectrum of an Electron on Open Periodical Trajectories (K voprosu ob energeticheskom spektre elektrona na otkrytykh periodicheskikh trayektoriyakh)

PERIODICAL: Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, 1958, Vol. 34, Nr 2, pp. 515 - 516 (USSR)

ABSTRACT: First the author shortly refers to earlier works dealing with the same subject. Then he puts down an equation for the quasiclassical approximation. The solution of this equation is technically by far more complicated than is the case with Schroedinger's equation since it is not a differential equation but a difference equation. The solutions, however, have the same general properties. The expressions for the first 4 approximations are put down explicitly and are discussed in detail. The course of calculation is given step by step. The average of the tolerable discontinuities is found by means of the same relation as are the discreet discontinuities with closed trajectories. The width of the dis-

Card 1/2

56-2-38/51

On the Problem of the Energy Spectrum of an Electron on Open Periodical Trajectories

continuities (razryv) can be determined by means of an ordinary dispersion equation. This equation is put down here and is always solvable. There are 2 references, all of which are Slavic.

SUBMITTED: November 14, 1957

AVAILABLE: Library of Congress

1. Electrons-Energy spectrum-Theory

Card 2/2

AUTHOR: Zil'berman, G. Ye. SOV/56-34-3-34/55

TITLE: The Motion of an Electron in Tracks Intersecting Themselves (Dvizheniye elektrona po trayektoriyam, imeyushchim samoperesecheniya)

PERIODICAL: Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, 1958, Vol. 34, Nr 3, pp. 748-749 (USSR)

ABSTRACT: The present work investigates the case where a track has the shape of a closed curve intersecting itself (a figure eight shape). This investigation also applies when the figure "eight" has a narrow "neck" and just as well when it is divided into two separate closed parts. Near the intersecting point the quasi-classical approximation can not be used and the exact solution must be put down. A similar problem had already been solved in a previous work by the author (Ref. 3). Near the intersecting point the exact solution is expressed by degenerate hypergeometrical functions. Uniting the quasiclassical and the exact solution supplies a condition for the quantization which has the form $S = 4\pi\alpha_0^{-2}(n + (1/2) + \gamma_{1,2}(\lambda))$. S denoting the total surface content of the curve and $\gamma_{1,2}(\lambda)$ denoting certain here

Card 1/2

defined functions of the quantity $\lambda = (\varkappa_0/\varepsilon)^2 \sqrt{R/\varkappa_0}$. In order to obtain an idea on the splitting up of the energy level with a gradual deformation of the figure eight the investigation of the following cases is sufficient: 1.-With $\lambda < 0$ holds $|\lambda| \gg 1$, which corresponds to two separate domains. 2.- With $\lambda = 0$ holds $\gamma_1 = -\gamma_2 = 1/8$. In this case the two levels corresponding to a given n have a distance which is one fourth of those levels corresponding to the neighbouring n. Thus the levels are pairwise equidistant. 3.- With $\lambda \gg 1$ holds $\gamma_1 = -\gamma_2 = 1/4$. Also here the levels are equidistant but they have half the distance as in the case with two single domains. The equivalence of the samples is eliminated when the curve is approximating a curve intersecting itself and when the condition for the applicability of the quasiclassical approximation can be applied no longer. Finally the author discusses briefly the effect by de Haas -van Alfvén (de Gaaz-van Al'fen) for tracks intersecting themselves. There are 3 references, 3 of which are Soviet.

SUBMITTED: November 14, 1957

66275

~~24(7)~~ 24,3500 SOV/181-1-11-10/27

AUTHORS: Ratner, A. M., Zil'berman, G. Ye.

TITLE: Luminescence of Impurity Centers. I

PERIODICAL: Fizika tverdogo tela, 1959, Vol 1, Nr 11, pp 1697-1706 (USSR)

ABSTRACT: The present paper begins with an introductory discussion of the respective publications by Pekar and Krivoglaz (Refs 1-4), which are based on the assumption that the "law of mirror symmetry" is applicable. The papers by Williams (Refs 5-7) are then reviewed, and mention is made of the various restricting assumptions made by other authors. In the present paper the authors attempt to give a mathematical representation of the absorption- and luminescence spectra, without applying any of the restrictions mentioned to the theoretical representation. The only fundamental restriction consists in the calculation being made in adiabatic approximation, i.e. the assumption that the nuclei (ions) in the "crystal" (these considerations, however, are valid also for amorphous or liquid luminophors) move slowly with respect to the electrons, and that every nuclear configuration corresponds to a certain steady electron state. Agreement with these assumptions is satisfactory, since the bond energy of the electrons exceeds the quantity $\hbar\omega_1$ (where

Card 1/3

Luminescence of Impurity Centers. I SOV/181-1-11-10/27

ω_1 = frequency of lattice vibrations) by two orders of magnitude. Ion movement is studied classically. It is further assumed that the shifts of nuclei from the position of equilibrium are so small that anharmonic vibrations can be neglected. The impurity concentration should be sufficiently low to enable the mutual interaction of impurity centers to be neglected. This condition replaces the demand for low concentrations of the excitation centers of luminescence if the additional widening of spectra, caused by inhomogeneous surroundings of the impurity centers, is small in comparison to the half-width of the spectra. It was shown experimentally that the concentration may change within a comparatively large interval without affecting the shape of the spectra. For these concentrations the second condition is fulfilled. Formulas describing the spectral dependence of the absorption coefficient and the intensity of the light emitted are derived. Both changes in the equilibrium position of ions during electron transitions and changes in the moduli of elasticity of the lattice are accounted for. A relationship is set up between the changes in the modulus of elasticity and the deviations of the absorption- and luminescence spectra from mirror symmetry and the Gauss distribution curve.

Card 2/3

ZIL'BERMAN, G.Ye.

Movement of electrons with random dispersion in shortened electric and magnetic fields. Izv. vys. uchab. zav.; fiz. no.4:106-110 '59. (MIRA 13:3)

1.Khar'kovskoye VAIVU.
(Electrons) (Electromagnetic waves)

24.7000

77114
SOV/70-4-6-15/31

AUTHORS: Kulik, I. O., Zil'berman, G. Ye.

TITLE: Study of Oriented Crystallization of Impure Melts. II

PERIODICAL: Kristallografiya, 1959, Vol 4, Nr 6, pp 898-903 (USSR)

ABSTRACT: Continuing the subject of their previous article (Abstract 74889), the authors analyze the effects of curved interfaces and of thermal diffusion on the impurity distribution in growing crystals. A curved crystal interface depending on ambient temperature gives rise to a radial impurity distribution which contributes essentially to the nonuniform composition of the grown crystal. Thermal diffusion is a function of the transverse temperature gradient in both the crystal and the melt. The rate at which a crystal interface moves transverse to itself is lower than the rate at which a constant ambient temperature becomes established. Consequently, assuming steady-state temperature, the coefficients of thermal conductivities χ_1 and χ_2 of the crystal and the melt can

Card 1/5

be determined according to Laplace equations

$$\frac{\partial T}{\partial z} = 0\Big|_{z=0};\ \frac{\partial T}{\partial z} = 0\Big|_{z=H};\ \frac{\partial T}{\partial r} + \sigma(T - T^{\circ}(z)) = 0\Big|_{r=R}; \qquad (1)$$

$$\varkappa_1 \frac{\partial T}{\partial z}\Big|_{z=h-0} - \varkappa_2 \frac{\partial T}{\partial z}\Big|_{z=h+0} = \rho q v. \qquad (2)$$

of which the second must be replaced by

$$\varkappa_1 \frac{\partial T_1}{\partial z} - \varkappa_2 \frac{\partial T_2}{\partial z} = \rho q v (1 + \zeta'(r)^2)^{-1/2}\Big|_{z=\zeta(r)}. \qquad (5)$$

where $z = \zeta(r)$ describes a curved interface in terms of the radius of curvature r and the height z of the crystalline layer in the container; $\frac{\partial T}{\partial n}$ is derivative from the temperature variable in direction normal to the interface; σ is the heat transfer coefficient of the container; ρ is density; q is latent heat of melting; ρqv is the heat flow produced by crystal growth; $T^{\circ}(z)$ is a given temperature such as in a furnace;

H is the height of the container. The change in impurity content because of curved interface is defined by

$$c_R = \sum_{n=0}^{\infty} u_n(z, t) \cdot I_0(\mu_n r / a), \qquad (10)$$

where μ_n is the root of $I_1(\mu_n) = 0$; coefficient u_n at a given time t and height z is defined by

$$[D(\partial^2/\partial z^2 - \mu_n^2/a^2) - \partial/\partial t]\, u_n(z, t) = 0. \qquad (11)$$

D is the coefficient of diffusion. The Green equation in the case of a curved interface is written

$$G_n(z, t; \xi, \tau) = -\frac{1}{2\sqrt{\pi D(t-\tau)}} e^{-\frac{\mu_n^2 D}{a^2}(t-\tau)} \cdot e^{-\frac{(z-\xi)^2}{4D(t-\tau)}} v(t-\tau). \qquad (12)$$

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where T and a are the same as in original Green functions. The change in impurity content because of thermal diffusion in a melt is defined in the case of a plane interface by

$$c_T^0 = -\gamma e^{-\frac{v}{D}\xi} \int_0^\xi e^{\frac{v}{D}s} c^{(0)}(s) \frac{\partial}{\partial s} \ln T \, ds. \qquad (25)$$

and in the case of curved interface by

$$c_T(\xi, r) = c_T^{(0)}(\xi) - \eta \cdot \frac{nH}{2T_n} \left(\frac{r^2}{a^2} - \frac{1}{2}\right) c^{(0)}(\xi), \qquad (29)$$

where η denotes thermal diffusion, $B = \left(\frac{\partial T}{\partial r}\right)_{r=a}$; $c^{(0)}$ is impurity content before corrections for thermal diffusion and curved interface. The two corrections generally have opposite signs. The former correction is usually smaller and can frequently be disregarded.

L. G. Eydel'man and A. M. Patner are acknowledged for discussions. There are 5 figures; and 4 Soviet references.

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Study of Oriented Crystallization of Impure Melts. II

77114
SOV/70-4-6-15/31

ASSOCIATION: Khar'kov Branch of the All-Union Scientific Research Institute of Chemical Reagents (Khar'kovskiy filial Vsesoyuznogo nauchno-issledovatel'skogo instituta khimicheskikh reaktivov)

SUBMITTED: December 10, 1958

Card 5/5

24(5),24(2)

AUTHOR: Zil'berman, G. Ye.

SOV/56-36-5-25/76

TITLE: On the Problem of the Motion of an Electron in a Crystal in External Fields (K voprosu o dvizhenii elektrona v kristalle vo vneshnikh polyakh)

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, 1959, Vol 36, Nr 5, pp 1465-1471 (USSR)

ABSTRACT: Already in an earlier paper (Ref 1) the author set up and solved the equation of motion of an electron in the case of any dispersion law in a magnetic field. In the present paper the problem is extended to the case in which, besides the homogeneous magnetic filed $H = H_z$, yet another arbitrary electric field V exists in the crystal. In the earlier paper only terms up to ε^2 were considered in the expansion in series, and in the present paper only terms from $\sim\varepsilon^6$ onwards and exponentially from $\exp(-1/\varepsilon^2)$ are neglected. ($\varepsilon^2 = a^2/\alpha_0^2$, a - lattice constant, $\alpha_0^2 = \hbar c/eH$). Various forms for equations of motion of the electron with an arbitrary

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On the Problem of the Motion of an Electron in a Crystal in External Fields

SOV/56-36-5-25/76

dispersion law are investigated, i.e. the equations of motion are set up for various V-ansätzes. Among others, simple cases, if V = Fy, are investigated with and without magnetic field and the necessary neglects are estimated. In conclusion, the electron motion in the field V = Fy is investigated especially with respect to nondiagonal terms (which are due to neighboring energy zones). The motion of the electron in the $\vec{k}$-space is described in a general manner by formula (I). For this rather complicated equation the terms of the order $1/\alpha_0^4$ are explicitly written down in an appendix. There are 6 references, 4 of which are Soviet.

SUBMITTED: November 17, 1958

Card 2/2

24(0)

AUTHOR: Chentsov, R.

SOV/53-67-4-7/7

TITLE: The Fifth All-Union Conference on the Physics of Low Temperatures (5-ye Vsesoyuznoye soveshchaniye po fizike nizkikh temperatur)

PERIODICAL: Uspekhi fizicheskikh nauk, 1959, Vol 67, Nr 4, pp 743-750 (USSR)

ABSTRACT: This Conference took place from October 27 to November 1 at Tbilisi; it was organized by the Otdeleniye fiziko-matematicheskikh nauk Akademii nauk SSSR (Department of Physico-mathematical Sciences of the Academy of Sciences, USSR), the Akademiya nauk Gruzinskoy SSR (Academy of Sciences, Gruzinskaya SSR), and the Tbilisskiy gosudarstvennyy universitet im. Stalina (Tbilisi State University imeni Stalin). The Conference was attended by about 300 specialists from Tbilisi, Moscow, Khar'kov, Kiyev, Leningrad, Sverdlovsk, and other cities as well as by a number of young Chinese scientists at present working in the USSR. About 50 lectures were delivered which were divided according to research fields.

III. Galvanomagnetic Phenomena. (10 lectures). I. M. Lifshits and V. D. Peschanskiy (KhFTI, Khar'kov Physico-technical Institute, Khar'kov University) showed that the most important part in connection with the galvanomagnetic properties of metals is played by the concrete form of the Fermi surface of conductivity electrons. N. Ye. Alekseyevskiy (IFP) spoke about experiments he carried out together with Yu. P. Gaydukov. He investigated the variation of the resistance in the transversal magnetic field at helium temperatures of Au, Cu, Pb, Ta, Ga, Zn and (together with T. I. Kostina) of Bi. Ye. S. Borovik and V. G. Volotskaya (KhFTI) investigated the galvanomagnetic properties at low temperatures of chromium and zirconium and found that the resistance of chromium grows with field strength without attaining a saturation value. L. S. Kan and B. G. Lazarev (KhFTI) investigated the resistance minimum in gold at low temperatures and found that if the sample is heated, the minimum disappears. Yu. P. Gaydukov (IFP) said in this connection in the course of the discussion that the minimum effect does not occur in gold in the case of very pure samples; the disappearance of the minimum is explained by the plastic deformation of the sample at helium temperatures. M. Ya. Azbel' (KhFTI) gave a report of his work in connection with the quantum theory of the high-frequency resistance of metal in a constant magnetic field at low temperatures. M. I. Kaganov and V. M. Tsukernik (KhFTI) spoke about a theoretical investigation of the influence exercised by thermoelectric forces upon the skin effect in various conductors. B. I. Verkin and B. N. Aleksandrov (KhFTI) spoke about measurements of the electric resistance of thin wires made from highly-pure tin, indium and cadmium, and computed the free length of path at 4.2°K in these metals as amounting to 1/3 to 2/3 mm. N. B. Brandt (MGU) and B. I. Verkin and I. M. Dmitrenko (KhFTI) investigated the influence exercised by the hydrostatic pressure (of 1000 atmospheres absolute pressure) upon the behavior of metals at low temperatures and investigated the quantum oscillations of the magnetic susceptibility of bismuth at 1.6 - 4.2°K. G. Ye. Zil'berman and A. M. Kosevich (KhFTI) gave a theoretical explanation of the fact that already relatively small deformations exercise considerable influence upon oscillation effects in metals. IV. Magnetism. A. S. Borovik-Romanov (IFP) delivered a report on investigations he carried out of the anisotropy of the weak ferromagnetism in monocrystal samples of the antiferromagnetic $MnCO_3$ (the effect of anisotropy was predicted by the thermodynamical theory developed by Dzyaloshinskiy). In the course of the discussion R. A. Alikhanov (IFP) spoke about neutronographical investigations he carried out of the magnetic structure of $MnCO_3$ and $FeCO_3$ at low temperatures. P. L. Kapitsa stressed the importance of the method based upon Dzyaloshinskiy's theory. N. M. Kreynes (VNIIFTRI), whose lecture was read by A. S. Borovik-Romanov, reported on measurements carried out by him (in the IFP) of the magnetic anisotropy of the antiferromagnetic $CuSO_4$- and $CoSO_4$-monocrystals. Ye. A. Turov (IFM AN SSSR, Sverdlovsk) spoke about his theore-

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APPROVED FOR RELEASE: 09/19/2001 CIA-RDP86-00513R002065120015-9"

87209

S/126/60/010/001/021/027/XX
E032/E314

9.4220 (also 1071)

AUTHORS: Zil'berman, G.Ye. and Kulik, I.O.

TITLE: On the Relaxation Time of Fast Electrons in a Metal

PERIODICAL: Fizika metallov i metallovedeniye, 1960, Vol. 10, No. 1, pp. 9 - 13

TEXT: The authors consider an electron in a band lying above the conduction band in the case where the energy of the electron is insufficient to excite plasma oscillations and the finite range is due only to collisions with the conduction electrons. The following cases are considered: sr; rs; ss and rr , where rs denotes the case where the scattering electron lies in the conduction band and the scattered electron in the band above the conduction, and prior to the collision, and similarly for the other combinations. Explicit expressions are derived for the relaxation times for collisions in the above types of interactions. It is shown that the limitations imposed by the band structure on the collisions can increase the relaxation time by a large factor.

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S/126/60/010/001/021/027/XX
E032/E314

On the Relaxation Time of Fast Electrons in a Metal

There are 1 figure and 9 references: 4 Soviet and 5 non-Soviet.

ASSOCIATION: Khar'kovskiy filial Vsesoyuznogo NII khimicheskikh reaktivov (Khar'kov Branch of the All-Union NII of Chemical Reagents)

SUBMITTED: January 14, 1960

Card 2/2

83728

S/056/60/038/004/021/048
B006/B056

24.2600

AUTHORS: Zil'berman, G. Ye., Kulik, I. O.

TITLE: Quantum Oscillations of the Photoelectric Yield of Metals in a Magnetic Field

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, 1960, Vol. 38, No. 4, pp. 1188 - 1200

TEXT: I. M. Lifshits, A. M. Kosevich, and A. V. Pogorelov already pointed out the importance of investigations of the quantum oscillation effects for the problem of the conservation of the dispersion law of conduction electrons in certain metals. The best-known of such effects are the de Haas - van Alphen effect and the Shubnikov - de Haas effect; the former was experimentally investigated in the USSR by B. I. Verkhin, B. G. Lazarev et al. (Ref. 3). The present paper describes the theoretical investigation of the external photoelectric effect on metals in a magnetic field in the ultraviolet spectral range. Let the magnetic field be assumed to be perpendicular to the surface, so that the electrons are free to reach the anode. Under these conditions oscillating compounds

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Quantum Oscillations of the Photoelectric Yield of Metals in a Magnetic Field

occur in the photoelectric current besides the compounds changing monotonically with H. One of them is due to those oscillations of the electron state number in the magnetic field, which cause the de Haas - Van Alphen effect. A second one is due to periodic dependence of the transition matrix element on the magnetic field, and is not interrelated with the state number; it is a new oscillation effect, which is common to all optical phenomena and is connected with transitions between the bands. An investigation of this effect in principle permits determination of the position of the individual regions of the Fermi surface in the reciprocal lattice. The third component represents an interference effect. A further new quantity, which may be obtained from photoelectric experiments (of the energy distribution of the departing electrons), is the shape of the isoenergetic surfaces which are lower than the Fermi surface. The investigation of the quantum oscillations of the volume (external) photoelectric effect carried out in the ultraviolet for electrons possessing an arbitrary dispersion law, thus furnishes not only theoretically interesting results, but also gives indications for experiments. Thus, it is also pointed out that by means of photoelectric experiments, the possibility is, in principle, given with comparatively weak fields to

Quantum Oscillations of the Photoelectric Yield of Metals in a Magnetic Field

S/056/60/038/004/021/048
B006/B056

investigate large groups of electrons whose oscillations are blurred under usual experimental conditions due to the block structure. In photo-effect experiments a narrow light ray can be produced which covers just one block. The effect investigated in this case depends, as also the de Haas - van Alphen effect, actually only on the dispersion law and not on its genesis (the wave functions). The authors thank I. M. Lifshits and M. I. Kaganov for discussing this paper. M. Ya. Azbel' and E. A. Kaner (Ref. 2) are mentioned. There are 5 figures and 21 references: 7 Soviet, 6 US, 3 British, 1 Swiss, and 4 German.

ASSOCIATION: Khar'kovskoye vyssheye aviatsionno-inzhenernoye voyennoye uchilishche (Khar'kov School of Higher Learning for Airforce Engineers). Khar'kovskiy gosudarstvennyy universitet (Khar'kov State University)

SUBMITTED: October 9, 1959

Card 3/3

ZIL'BERMAN, G.Ye.

Meaning of the mean $\langle a_q^+ a_q \rangle$. Izv. vys. uchsb. zav.; fiz. no.4: 136-141 '63. (MIRA 16:9)

1. Khar'kovskiy politekhnicheskiy institut imeni Lenina.
(Electrons) (Operators (Mathematics))

18.9500

41342
S/081/62/000/017/006/102
B166/B180

AUTHORS: Kulik, I. O., Zil'berman, G. Ye.

TITLE: Problem of impurity distribution when crystals are grown from the melt

PERIODICAL: Referativnyy zhurnal. Khimiya, no. 17, 1962, 33, abstract 17B195 (In collection: Rost kristallov. v. 3. M., AN SSSR, 1961, 85 - 89. Discuss., 214 - 218)

TEXT: This is a theoretical study of the impurity distribution throughout a single crystal grown by directed crystallization from the melt (the methods of Stokbarger, Obreimov and Shubnikov, and others). It was assumed that the redistribution of an impurity between the melt and the solid phase at the interface can be described by means of the equilibrium distribution coefficient g, which can be found from the constitution diagram $C_s(z,r) = g \cdot C(z,r,t)_t = z/v$, where C_s is the impurity concentration in the solidified specimen, $C(z,r,t)$ is the impurity concentration in the melt. An equation is derived for the overall concentration, taking into account corrections for the temperature field, thermal diffusion and

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Problem of impurity distribution ... S/081/62/000/017/006/102
B166/B180

distortion of the crystallization front. [Abstracter's note: Complete translation.]

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38378
S/058/62/000/005/073/119
A061/A101

24.7000

AUTHORS: Kulik, I. O., Zil'berman, G. Ye.

TITLE: Impurity distribution in crystal growth from a melt

PERIODICAL: Referativnyy zhurnal, Fizika, no. 5, 1962, 11, abstract 5E90 (V sb. "Rost kristallov. T. 3", Moscow, AN SSSR, 1961, 85 - 89. Discuss., 214 - 218)

TEXT: The distribution of an impurity over the volume of a single crystal grown from a melt has been determined. In this problem, the decisive factors are two concurrent processes: impurity and heat flows. The former flow is determined by diffusion and thermal diffusion, and the latter by thermal conductivity and heat transfer by diffusion. In addition, the presence of a temperature field in the melt - crystal system leads to the distortion of the crystallization front and makes the impurity distribution more complex. The problem is solved by the method of successive approximations. The effect of heat transfer by diffusion is neglected altogether, and the temperature field is found from one closed equation with given boundary conditions. In the problem of diffusion in zeroth ap-

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Impurity distribution in crystal growth from a melt

S/058/62/000/005/073/119
A061/A101

proximation, pure diffusion with a plane crystallization front is considered. Corrections for the impurity distribution due to the thermal diffusion effect and to the distortion of the crystallization front are obtained in first and second approximations, respectively.

K. Gurov

[Abstracter's note: Complete translation.]

Card 2/2

BELOZOROV, D.P.; KULIK, I.O.; ZIL'BERMAN, G.Ye.

Distribution of impurities in crystals grown from melts. Kristallografiia 6 no.2:279-282 Mr-Ap '61. (MIRA 14:9)

1. Khar'kovskiy filial Instituta khimicheskikh reaktivov.
(Crystals--Growth)

RATNER, A.M.; ZIL'BERMAN, G.Ye.

Luminescence of impurity centers. Part 3. Fiz. tver. tela 3 no.3:687-697 Mr '61. (MIRA 14:5)
(Luminescence) (Crystals)

KULIK, I.O.; ZIL'BERMAN, G. Ye.

Directed crystallization of melts with impurities. Part 2.
Kristallografiia 4 no.6:898-903 N-D '59. (MIRA 14:5)

1. Khar'kovskiy filial Vsesoyuznogo nauchno-issledovatel'skogo instituta khimicheskikh reaktivov.
(Crystallization)

RATNER, A.M.; ZIL'BERMAN, G.Ya.

Theory of luminescence of activated phosphors. Izv. AN SSSR fiz. 25 no.4:537-538 Ap '61. (MIRA 14:4)
(Phosphors)

ZIL'BERMAN, G.Ye.

De Haas- Van Alphen's effect for strongly coupled electrons in lattices. Fiz.met.i metalloved. 3 no.1:18-21 '56. (MLRA 9:11)
(Metals--Magnetic properties) (Electrons) (Lattice theory)

9.4300 (1138, 1143, 1395)

20777

S/181/61/003/003/002/030
B102/B214

AUTHORS: Ratner, A. M. and Zil'berman, G. Ye.

TITLE: Luminescence of impurity centers. III.

PERIODICAL: Fizika tverdogo tela, v. 3, no. 3, 1961, 687-697

TEXT: The band shapes of impurity absorption and luminescence and the probability of thermal (nonradiative) transitions between the discreet levels O and S due to the existence of impurities in the crystal were calculated in the first two parts of the paper (FTT, I, 1697, 1959; FTT, I, 1707, 1959) where the motion of ions was considered classically. The present third part of the paper gives analogous calculations; but the motion of ions is considered quantum-mechanically, and the changes in the elastic constants of the lattice on electron transitions are taken into account. For this purpose, a study is first made of the relationship between the elastic constants of the lattice distorted by the introduction of impurity atoms and the parameters characteristic of the form of absorption and luminescence bands in the classical case. It can be shown that in the case of strong coupling, the classical theory has only a small number of parameters determined by the

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Luminescence of ...

interaction of the impurity atom with its nearest neighbors. As in the classical case, at temperatures above one-fifth of the Debye temperature of the crystal, the results can be expressed by the elastic constants of the interaction of the impurity atom with its nearest neighbors. At lower temperatures, the expressions for the form of the absorption and luminescence spectra are influenced also by the law of dispersion of normal vibrations of a perfect lattice. [Abstracter's note: The important formulas are not quoted here as they contain an extraordinarily large number of quantities whose exact definition alone would exceed the normal size of an abstract.] I. M. Lifshits is thanked for his interest in the work and for discussions. There are 2 figures and 4 Soviet-bloc references.

SUBMITTED: April 4, 1960 (initially) and October 10, 1960 (after revision)

24,3500

S/048/61/025/004/039/048
B117/B209

AUTHORS: Ratner, A. M. and Zil'berman, G. Ye.

TITLE: Theory of the luminescence of activated phosphors

PERIODICAL: Izvestiya Akademii nauk SSSR. Seriya fizicheskaya, v. 25, no. 4, 1961, 537-539

TEXT: The present paper has been read at the 9th Conference on Luminescence (Crystal Phosphors) and is devoted to the theory of luminescence of crystal phosphors. S. I. Pekar and M. A. Krivoglaz (Refs. 1 to 3: Zh. eksperim. i teor. fiz., v. 22, 641 (1952); Tr. In-t fiz. AN USSR, no. 4, 37 (1953); Zh. eksperim. i teor. fiz., v. 25, 191 (1953)) have calculated the optical characteristics of impurity luminescence centers as well as the probability of thermal transitions, basing on the assumption that the elastic moduli of the lattice are conserved during an electron transition. However, this assumption is usually not fulfilled when the electrons of the impurity atom are strongly bound. This fact follows from the deviation from the law of mirror symmetry. The authors of the present paper have previously calculated the shape of absorption

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Theory of the luminescence ...

and luminescence bands of impurity centers as well as the probability of thermal transitions, taking into account the change in the elastic moduli of the lattice during an electron transition. In the classical case ($kT \gg \hbar\omega_D$; ω_D - Debye crystal frequency) the variables q_i are introduced in the calculation of the optical characteristics. The formulas for the potential energy of the lattice in the ground and in the excited state are rendered into the diagonal form simultaneously:

$$U_o = \frac{1}{2}\sum_{i=1}^{N} K_i q_i^2, \qquad U_s = E^{(0)} + \frac{1}{2}\sum_{i=1}^{N} K_i'(q_i - q_{oi})^2$$

(N denotes the number of degrees of freedom of the crystal lattice; the variables q_i are no normal lattice coordinates). It can be shown that in the case of a strong bond only the first M of the q_{oi} differ from zero, and that $\delta_i = (K_i - K_i')/K_i$, where M is of the order of several units. The quantities K_α, K_α', and $q_{o\alpha}$ ($\alpha = 1, \ldots, M$) are determined immediately by the interaction of an impurity atom with its nearest neighbors; they

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Theory of the luminescence ... S/048/61/025/004/039/048
B117/B209

express optical characteristics of impurity luminescence centers and the probability of thermal transitions. The change in the elastic moduli during an electron transition leads to a violation of mirror symmetry and to a deviation of the absorption and luminescence bands from Gaussian shape. This change has a considerable effect on the probability of thermal transitions. In a quantum-mechanical treatment of ion motion, the calculation of the optical characteristics requires the use of normal lattice constants that do not coincide for the individual electron states of the impurity atom. The results are simplified in the classical case, as they are then expressed by the variables K_α, K'_α, and $q_{0\alpha}$ used in the classical case. The authors have found that at temperatures $kT > 1/5\ \hbar\omega_D$, just like in the classical case, the optical characteristics are expressed by the elastic moduli of the interaction of an impurity atom with its nearest neighbors, and that these characteristics are not directly related to the lattice vibrations. In particular, local vibrations do not have any effect upon the shape of absorption and luminescence bands. At low temperatures, the dispersion law of normal vibrations (corresponding to a perfect lattice) is predominant. In the discussion about this paper,

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B117/B209

K. K. Rebane among other things points out the fact that in his papers he has given formulas obtained on the basis of quantum-mechanical calculations taking the superimposition of normal vibrations into account and which are valid for any temperature. He also suggested to subject the conclusions, drawn by the authors as to the insignificant role of local vibrations, to a test by means of these formulas. There should be cases in which local vibrations do play an essential part. [Abstracter's note: Essentially complete translation.] There are 7 Soviet-bloc references.

Card 4/4

ZIL'BERMAN, G.Ye.

Graphic representation of perturbation theory in the discrete spectrum. Izv. vys. ucheb. zav.; fiz. 8 no.4: 124-128 '65. (MIRA 18:12)

1. Khar'kovskiy politekhnicheskiy institut. Submitted July 11, 1964.

ZIL'BERMAN, I.D.

The MK70-type automatic lathe. Biul.tekh.-ekon.inform. no.5:11-13 '58. (MIRA 11:7)

(Lathes)

ZIL'BERMAN, I. I. 15044

USSR/Sugar 4304.0300 Oct 1947

"Analytical Account of 24-hour Production of a Sugar Refinery," I. I. Zil'berman, Candidate in Econ Sci, 5 pp

"Sakhar Prom" Vol XX, No 10

Fairly detailed statistics on 24-hour productivity of group of refineries, most of which are not named. Tables show percentages of expenditure of fuel, loss of sugar, fulfillment of 24-hour plan, etc. Production of Gorodishche-Pustovarov and Chupakhov refineries cited: Former produced 4,481 hundredweight in average 24-hour period, while latter produced 4,565 hundredweight. Tables and other statistics show how these figures were obtained.

LC 15044

LOMOV, F. O., ZIL'BERMAN, I. I., VINOGRADOV, N. V.

Sugar - Transportation

Practical sugar transportation. Sakh. prom., 26, no. 1, 1952.

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

ZIL'BERMAN, I.I.

Increasing production rates of new and of reestablished sugar mills. Sakh.prom. 27 no.11:29-31 '53. (MLRA 7:1)

1. Tsentral'nyy nauchno-issledovatel'skiy institut sakharnoy promyshlennosti.

(Sugar industry)

ZIL'BERMAN, I.V.

Reduction of railroad shipments of beets. Sakh.prom. 28 no.5:32-33 '54. (MLRA 7:9)

(Sugar beets--Transportation)