KHALATNIKOV, I. M.

56-1-28/56

AUTHORS: Abrikosov, A. A., Khalatnikov, I. M.

TITLE: The Scattering of Light in a Fermi Fluid (Rasseyaniye sveta v Fermi-zhidkosti)

PERIODICAL: Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, 1958, Vol. 34, Nr 1, pp. 198-203 (USSR)

ABSTRACT: The present paper determines the distribution of the scattered light to the angles and to the frequencies. According to Landau (reference 1) oscillations of a certain type which are designated as "zero sound" can spread in a Fermi fluid at sufficiently low temperatures. Even at a temperature of $0{,}01^{0}$ a frequency of more than 10^{8} cycles is needed for the immediate observation of zero sound, which renders the performance of such an experiment very difficult. But an indirect method can also be suggested which consists of the observation of the Rayleigh scattering of light in liquid He^{3}. The observation of the frequency distribution of the scattered light principally makes possible the measurement of the speed of zero sound. Besides, the scattering of the light in a Fermi fluid has a number of specific features, wherefore the theoretical investigation

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of this phenomenon, especially of the distribution of the intensities to the frequencies, is of interest. Due to the very small polarizability of the helium-atoms it may be assumed that the dielectric constant changes due to the fluctuation of density. In the range of those temperatures and frequencies where $\hbar\Delta\omega \geqslant kT$ applies the quantum effects must be taken into account in the averaging of all possible fluctuations. But for this purpose only the knowledge of the purely classical case is needed and then a certain corrective factor has to be introduced. The fluctuation of the "random force" contained in the kinetic equation is determined by the method suggested by Rytov (reference 5), Landau and Lifshits (reference 6). After the solution of this equation the fluctuations of the distribution function can then also be determined. The kinetic equation used here for the case of the Fermi fluid is explicitly written down. The authors are furthermore only interested in the case that the collisions can be disregarded. In this connection the exact form of the shock integral does not have to be known. But the velocity of modification of the entropy has to be determined. The course of the calculation is followed step by step. In this manner formulae for the calculation

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is followed step by step. In this manner formulae for the calculation of the fluctuations of the distribution function are found. Finally the formula found for the distribution of the scattered light to the angles and frequencies is explicitly written down. The frequency spectrum consists of a central part and of two sharp lines. The central part corresponds to the Doppler broadening of the main line. There are 9 references, 7 of which are Slavic.

ASSOCIATION: Institute for Physical Problems AN USSR
(Institut fizicheskikh problem Akademii nauk SSSR)

SUBMITTED: July 30, 1957

AVAILABLE: Library of Congress

Card 3/3

AUTHOR: Abrikosov, A. A., Gorkov, L. P., SOV/56-35-1-37/53
Khalatnikov, I. M.

TITLE: A Superconductor in a High-Frequency Field (Sverkhprovodnik v vysokochastotnom pole)

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, 1958, Vol. 35, Nr 1, pp. 265-275 (USSR)

ABSTRACT: Bardeen, Cooper and Schrieffer (Bardin, Kuper, Shriffer) developed a microscopical theory of superconductivity (Ref 1). In the present paper the question is investigated as to how superconductors behave in variable weak fields, and a new (not local) equation is derived, which describes the connection between current and field instead of the equation of the phenomenological theory by F. and G. London. Also the question of the depth of penetration of a weak static field into massive superconductors and their dependence on temperature is dealt with. In the present paper the authors investigate the behavior of superconductors in high-frequency fields and derive an equation describing this behavior. The paper is subdivided into 4 sections. The first deals with the setting-up of an equation for the current in superconductors $j(\vec{k}, \omega)$

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A Superconductor in a High-Frequency Field SOV/56-35-1-37/59

in dependence on $\vec{A}(x)$; section two deals with Pippard's limiting case, and section three deals with London's domain ($vk \ll \Delta$). In section four the temperature- and frequency dependence of the impedance of a massive superconductor is determined by means of the equation derived as mentioned above. Finally, the authors thank L.D. Landau, Academician, for the interest he displayed in their work.
There are 5 references, 1 of which is Soviet.

ASSOCIATION: Institut fizicheskikh problem Akademii nauk SSSR (Institute of Physical Problems, AS USSR)

SUBMITTED: March 4, 1958

Card 2/2

AUTHORS: Abrikosov, A., Khalatnikov, I. M. SOV/53-65-4-2/13

TITLE: Modern Theory of Superconductivity (Sovremennaya teoriya sverkhprovodimosti)

PERIODICAL: Uspekhi fizicheskikh nauk, 1958, Vol 65, Nr 4, pp. 551 - 591 (USSR)

ABSTRACT: In this paper a survey is given on the present state of the theory of superconductivity; aside from a short historical review the paper is restricted to later publications. Landau and Kapitsa were the first ones in the USSR to take up these problems, further N.N.Bogolyubov, V.Tolmachev, D.Shirkov ("New Methods in the Theory of Superconductivity"; lithographed edition of the Ob"yedinennyy institut yadernykh issledovaniy (United Institute of Nuclear Research)), L. Gor'kov, S.Tyablikov, N.Zavaritskiy, D.Shenberg and B.Geylikman. The papers by Landau and Bogolyubov are considered in particular. The authors treat in detail: The theory of the Cooper (Kuper) phenomenon, the ground state of superconductors, (the role of the Coulomb (Kulon) interaction of the electrons), thermodynamics in superconductors, (the measurement of the energy gap with temperature, the specific heat, the critical

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magnetic field, the number of the "normal" electrons), furthermore the electrodynamic equations for superconductors ($T = 0$ and $T \neq 0$, the depth of penetration, the diffusion dispersion, the properties of superconductors of finite dimensions), the behavior of superconductors in a periodic (high-frequency) field, (the Pippard critical case, the London domain, the impedance), and in the last section the heat conductivity of superconductors. There are 4 figures and 22 references, 14 of which are Soviet.

AUTHORS: Abrikosov, A. A., Khalatnikov, I. M. SOV/53-66-2-3/9

TITLE: The Theory of the Fermi Liquid (the Properties of Liquid He^3 at Low Temperatures) (Teoriya Fermi-zhidkosti (svoystva zhidkogo He^3 pri nizkikh temperaturakh))

PERIODICAL: Uspekhi fizicheskikh nauk, 1958, Vol 66, Nr 2, pp 177-212 (USSR)

ABSTRACT: In 1956 L. D. Landau developed a systematic theory concerning the Fermi liquid (Ref 1). (It was also Landau who carried out the first quantum-theoretical investigation of the superfluidity of He II and who developed a theory of the Bose liquid). He also showed that, in contrast to what is the case in the Bose liquid, the interaction of excitation plays a very important part in the Fermi liquid. In the course of the present article the authors give a survey of the present stage of investigations of the properties of Fermi liquids on the basis of Landau's theory and by assuming the isotropy of the models investigated. Finally, the latest and final works by Landau are discussed (Refs 8, 12, 14, 21) in which it is shown in what way it is possible to

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derive the basic hypotheses of the theory of the Fermi liquid from a microscopical investigation of the interaction. Also the theory of the dissolved Fermi gas is taken into account. The following individual problems are dealt with in 10 paragraphs: 1) The excitation energy (ansatz for the energy of quasi-particles

$\delta L = \int \varepsilon \, \delta n \, d\tau$ with $d\tau = 2dp_x dp_y dp_z/(2\pi h)^3$ (Factor 2 takes into account that spin = 1/2) and for the energy ε:

$\varepsilon = \varepsilon_0(\vec{p},\vec{\sigma}) + \delta\,\varepsilon(\vec{p},\vec{\sigma}))$.

2) The effective mass ($\varepsilon_o - \mu(0) = v(p-p_o)$ $v = p_o/m^*$, where m^* denotes the effective mass). 3) Specific heat and entropy ($C = (\partial E/\partial T)_N$; $c = C/N = \gamma T$; $\gamma = (\pi/3N)^{2/3} \cdot \frac{m^*}{\hbar^2}$; $\gamma \sim 3$ cal/mol-degr.^{2}; $\varrho = 0{,}078$ g/cm^3; $m^* = 1{,}43\ m_{He^3}$; $\frac{p_o}{\hbar} = 0{,}76.10^8$ cm^{-1}). 4) Magnetic susceptibility; 5) The kinetic equation; 6) Viscosity ($\eta = \alpha/T^2$; $\alpha \sim 10^{-6}$ to 10^{-5} Poise,

The Theory of the Fermi Liquid (the Properties of Liquid He^3 at Low Temperatures) SOV/53-66-2-3/9

T in ^{o}K); 7) Thermal conductivity ($\kappa = \frac{\beta}{T}$; $\beta \sim 10^2$ to 10^3 erg/cm.sec.degr.); 8) Sound (laws of the propagation of sound for $\omega\tau \ll 1$ and $\omega\tau \gg 1$); 9) Dispersion and the absorption of sound; 10) The propagation of light, fluctuations of the distribution function. In an appendix the authors discuss the microscopical theory of the Fermi liquid: Paragraph 1 deals with the dissolved Fermi gas and paragraph 2 with the microscopical theory of the Fermi liquid at T = 0. There are 3 figures and 21 references, 14 of which are Soviet.

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24(0)

AUTHOR: Khalatnikov, I. M., Doctor of Physical and Mathematical Sciences SOV/30-59-2-42/60

TITLE: Investigations of Low-temperature Physics (Issledovaniya po fizike nizkikh temperatur)

PERIODICAL: Vestnik Akademii nauk SSSR, 1959, Nr 2, pp 98-100 (USSR)

ABSTRACT: The 5th All-Union Conference on this problem took place in Tbilisi from October 27 to November 1, 1958. It was attended by physicists from Moscow, Khar'kov, Leningrad, Tbilisi, Sverdlovsk, and Kiyev. 4 fields of low-temperature physics were discussed: superliquidity of liquid helium II, supraconductivity, antiferromagnetism, magneto-resistive effect. The following reports and communications were heard: A. A. Abrikosov, L. P. Gor'kov reported on the investigation of the properties of supraconductive alloys. A. A. Abrikosov, L. P. Gor'kov, I. M. Khalatnikov spoke of properties of supraconductors in the high-frequency magnetic field. D. V. Shirkov and Chen' Chun'-yan' and Chzhou Si-shin', two young Chinese scientists working at Moscow University, described investigations for determination of the influence exercised by the Coulomb (Kulon) interaction of charges on supraconductivity. V. V. Tolmachev explained the

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nature of the so-called collective excitations of the Bose type in supraconductors. D. N. Zubarev, Yu. A. Tserkovnikov spoke of the thermodynamics of supraconductors and B. T. Geylikman, V. Z. Kresin of the thermal conduction of supraconductors. Yu. V. Sharvin, V. F. Gantmakher reported on experimental work with supraconductors. N. V. Zavaritskiy spoke of the measurement of the anisotropy of thermal conductivity in the supraconductive state. In a series of reports problems of the superliquidity of helium were discussed, which was discovered in 1938 by P. L. Kapitsa and the theory of which was set up in 1941 by L. D. Landau. E. L. Andronikashvili and his collaborators investigated the properties of rotating helium. V. P. Peshkov spoke of the effect of the formation of the boundary between superliquid and non superliquid helium. Guan Vey-yan', collaborator of the Institut fizicheskikh problem (Institute of Physical Problems) investigated the properties of the so-called jump in temperature of Kapitsa. I. M. Lifshits, V. D. Peschanskiy investigated galvanomagnetic phenomena in strong magnetic fields for metals with open Fermi surfaces. N. Ye. Alekseyevskiy, Yu. P. Gaydukov experimentally investigated the resistance anisotropy of gold monocrystals in the

magnetic field. L. S. Kan, B. G. Lazarev combine the presence of a temperature minimum with the structural state of the metal. M. Ya. Azbel' reported on the quantum theory of metallic conductivity in the alternating electromagnetic and constant magnetic field. A. S. Borovik-Romanov reported on the weak ferromagnetism in antiferromagnetic samples of $MnCO_3$. N. M. Kreynes, Ye. A. Turov investigated the magnetic anisotropy of the antiferromagnetic monocrystals $CuSO_4$ and $CoSO_4$. R. A. Alikhanov reported on neutronographic investigations of antiferromagnetics. Ye. I. Kondorskiy and collaborators reported on the susceptibility of nickel and nickel-copper alloys at low temperatures. M. I. Kaganov, V. M. Tsukernik reported on kinetic phenomena in ferromagnetics at low temperatures. A. I. Akhiyezer, V. G. Bar'yakhtar, and S. P. Peletminskiy spoke of computations of the relaxation of the magnetic moment in ferromagnetic dielectrics at low temperatures. T. I. Sanadze spoke of observation results of paramagnetic resonance of terbium in the $TbNO_3 \cdot 6H_2O$ nitrate. G. R. Khutsishvili gave a theoretical analysis of the orientation of the nuclear spin in the Overhauser (Overkhauzer)

24(5),24(8)

AUTHOR: Khalatnikov, I. M.

TITLE: The Influence of Anisotropy on the Thermal Conductivity of Superconductors (Vliyaniye anizotropii na teploprovodnost' sverkhprovodnikov)

SOV/56-36-6-27/66

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, 1959, Vol 36, Nr 6, pp 1818-1822 (USSR)

ABSTRACT: The electron part of the thermal conductivity of superconductors according to the theory of Bardeen, Cooper, and Schrieffer has already been investigated by several authors, but only on the assumption that the superconductor is isotropic. The author of the present paper carries out quite the same calculations, but on the assumption of anisotropy. Bogolyubov, Tolmachev, and Shirkov (Ref 4) already calculated the energy spectrum of anisotropic superconductors and showed that the same method may be employed as in the isotropic case. Either Fröhlich's or Bardeen's Hamiltonian serves as a basis. The author of the present paper uses the Hamiltonian:

$$H = \sum (E_k - \mu) a_k^+ a_k + \frac{1}{2} \sum g(\vec{k}_1', \vec{k}_2', \vec{k}_1, \vec{k}_2) a_{k_1'1/2}^+ a_{k_2'-1/2}^+ a_{k_1 1/2} a_{k_2 -1/2}$$

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(μis the chemical potential). It is shown that for uniaxial crystals the temperature dependence of the thermal conductivity may differ according to the various directions of the crystallographic axes. N. V. Zavaritskiy (Ref 5) already showed this for gallium in the superconductive state. The author finally thanks L. D. Landau for discussing the results of this investigation. There are 1 figure and 5 references, 3 of which are Soviet.

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

SUBMITTED: December 18, 1958

24 (3)

AUTHORS: Abrikosov, A. A., Gor'kov, L. P., Khalatnikov, I. M.

SOV/56-37-1-29/64

TITLE: The Analysis of Experimental Data on the Surface Impedance of Superconductors (Analiz eksperimental'nykh dannykh o poverkhnostnom impedanse sverkhprovodnikov)

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, 1959, Vol 37, Nr 1(7), pp 187 - 191 (USSR)

ABSTRACT: The authors compare the experimental data on the measurement of the surface impedance of superconductors for different frequencies with the conclusions drawn from the new theory of superconductivity. The properties of superconductors in a high-frequency field were investigated in a previous paper of the authors (Ref 1) and in a paper by D. C. Mattis and J. Bardeen (Ref 2). The present paper compares the theory with the experimental data on the surface impedance of superconductors. The authors give, above all, formulas for the surface impedance in various limiting cases which are suitable for a convenient comparison with the experiment. The amount usually measured by experiment, of the ratio between the impedance $Z(\omega)$ in supercon-

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The Analysis of Experimental Data on the Surface Impedance of Superconductors SOV/56-37-1-29/64

ductive state and the real part of the impedance in the normal state is given by the formula $Z(\omega)/R_n = -2i(\pi\omega/\Delta Q(\omega))^{1/2}$ in Pippard's limiting case. An expression for the complex function $Q(\omega)$ is then written down, and an expression for the frequency dependence of the impedance follows subsequently. Now the authors analyze the temperature dependence for various frequencies at temperatures different from zero. The following cases are investigated in detail (the quantity 2Δ denoting the gap, in the energy spectrum at a given temperature): (a) $\omega \ll \Delta(0)$, (b) $\omega \sim \Delta(0)$: This very case is the most difficult one for comparing theory with experiment, for the quantities Δ, ω and T are, over a large part of the temperature interval $0 < T < T_c$, of the same order of magnitude. The expression for $Q(\omega)$ can only be simplified in the range of low temperatures $T \ll \omega \sim \Delta$. (c) $\omega \gg \Delta(0)$. In this case, only the ratio between T and Δ changes, and ω is always large with respect to these two quantities. The formulas written down in the present paper permit a detailed comparison of theory with numerous experimental data.

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The Analysis of Experimental Data on the Surface Impedance of Superconductors SOV/56-37-1-29/64

In the range of very high frequencies $\omega \gg$, no experimental data have become known up to date. The causes of disagreement between the experimental data and the values of impedance calculated by the new theory of superconductivity have not yet been clarified. There are 3 figures and 6 references, 3 of which are Soviet.

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

SUBMITTED: February 3, 1959

Card 3/3

I. M. Khalatnikov

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-matemati-
cheskikh 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 uni-
versitet 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 deliver-
ed which were divided according to research fields. .
II. Supraconductivity. 13 lectures were delivered on this
field of which two were experimental and the others theoreti-
cal. Reports on experimental investigations of supraconductivity
were delivered by Yu. V. Sharvin and V. F. Gantmakher (IFP)
and N. V. Zavaritskiy (IFP). The former investigated the
structure of the intermediate state in monocrystals of pure
tin, the latter measured the thermal conductivity of different-
ly shaped orientated cylindrical gallium samples at
0.1 - 4.2°K. A. A. Abrikosov, L. P. Gor'kov and I. M. Khalat-
nikov (IFP) theoretically investigated the behavior of a
superconductor in the high-frequency field. V. L. Ginzburg
and G. F. Zharkov (FIAN) dealt with the microscopical theory,
and Ginzburg discussed among other things the part played
by fluctuations in phase transitions of the second kind.
I. M. Lifshits (KhFTI) showed that it follows from the modern
theory of supraconductivity in consideration of the aniso-
tropy of metals that, in principle, the existence of supra-
conductors is possible which are supra-conductive only with-
in a limited range of temperature (and not at all temperatures
below the critical ones). B. T. Geylikman and V. Z. Kresin
(IAE) investigated the electron- and phonon thermal conductivi-
ty of supraconductors by means of the microscopical theory at
temperatures that are not very near absolute zero. M. V. Buykov
and L. E. Gurevich (FTI AN SSSR) spoke about the surface
energy on the boundary between the supraconductive and normal
phases. D. N. Zubarev and Yu. A Tserkovnikov (Matematicheskiy
institut AN SSSR - Mathematics Institute AS USSR) dealt with
the thermodynamics of the supraconductive state (Froehlich-model),
V. V. Tolmachev (MIAN) investigated the problem of collective
excitations in a supraconductor. D. V. Shirkov (Ob"yedinennyy
institut yadernykh issledovaniy - Joint Institute of Nuclear
Research) spoke about consideration of Coulomb-interaction
of electrons in semiconductors. The problem of consideration
of the Coulomb interaction was discussed by Chen' Ch'un-hsien
and Chou, Hsi-hsin (PCU).

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S/030/60/000/011/005/026
B021/B059

AUTHOR: Khalatnikov, I. M., Professor

TITLE: Problems in Low-temperature Physics

PERIODICAL: Vestnik Akademii nauk SSSR, 1960, No. 11, pp. 28-35

TEXT: Low-temperature physics includes a large number of phenomena of which superfluidity, superconductivity, antiferromagnetism, and galvanomagnetic phenomena in metals are particularly emphasized. Superfluidity in helium was discovered by P. L. Kapitsa in 1938. Temperature dependence of the thermodynamic quantities of helium were explained by L. D. Landau by the existence of a minimum in the energy spectrum. Fluid helium, consisting of He^4 isotopic atoms and obeying Bose statistics, exhibits the property of superfluidity. At present, research of the properties of liquid helium is concentrated to the properties of the liquid He^3 isotope. This field is regarded presently as the most promising area of research. The phenomenon of superconductivity had been discovered by Kamerlingh-Onnes 50 years ago, but has been explained only in the last few years. Superconductivity of metals is distinguished not only by vanishing resistivity, but also by extraordinary magnetic properties. The energy spectrum of superconductive

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Problems in Low-temperature Physics

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metals has, among others, also been explained by the Soviet scientist N. N. Bogolyubov on the basis of a system of Fermi electrons. The young scientist L. P. Gor'kov, who investigated the excitation spectrum by means of field quantum theoretical methods is also mentioned. Galvanomagnetic properties of metals have been investigated during the last years at the Institut fizicheskikh Problem Akademii nauk SSSR (Institute for Physical Problems of the Academy of Sciences USSR) and at the Fiziko-tekhnicheskiy institut Akademii nauk USSR (Institute of Physics and Technology of the Academy of Sciences UkrSSR). The dependence of resistivity, heat conductivity and other electrical characteristics of metals on magnitude and direction of a magnetic field were the subject of investigations for the purpose of explaining the electron spectrum. The energy spectrum of the excitation of antiferromagnetics has not been obtained so far. Achievements may be attained by co-operation of experimental and theoretical physicists. There is 1 figure.

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KHALATNIKOV, I. M.

S/056/60/039/01/19/029
B006/B063

AUTHORS: Lifshits, Ye. M., Khalatnikov, I. M.

TITLE: On the Singularities of Cosmological Solutions of the Gravitational Equations. I

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, 1960, Vol. 39, No. 1(7), pp. 149-157

TEXT: The usualloy applied cosmological solution of the Einstein gravitational equation is based on the assumption of an entirely homogeneous and isotropic mass distribution in space though this assumption is at most approximately satisfied. In the present paper, the authors wanted to clarify as to how far the properties of the solution and, above all, the occurrence of time singularities are connected with this assumption. This problem can be tackled most successfully by studying the general properties of the solutions to gravitational equations in the neighborhood of singularities. The existence of such solutions is assumed. Two particular classes of these solutions are given. One of them is a generalization of

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S/056/60/039/003/032/045
B006/B063

AUTHORS: Lifshits, Ye. M., Khalatnikov, I. M.

TITLE: Singularities of the Cosmological Solutions of Gravitational Equations. II

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, 1960, Vol. 39, No. 3(9), pp. 800-808

TEXT: The sub-classes of cosmological solutions of gravitational equations derived in Ref. 1 (Part I of the present paper) usually have singularities. The question as to whether the existence of singularities is a general property of cosmological solutions, irrespective of the assumptions made for the distribution of matter and the field of gravity, has not been solved as yet. The solution of this problem is related to the existence or non-existence of a general solution of gravitational equations. Thus, the authors were confronted with the following problem: Within the region of a singularity that is assumed to exist, the form of the broadest class of solutions to gravitational equations is to be found, and conclusions are to be drawn as to the universal character of

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24.5300

AUTHORS: Bekarevich, I. L., Khalatnikov, I. M.

TITLE: Theory of the Kapitsa Thermal Discontinuity on the Interface Between Liquid He^3 and a Solid

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, 1960, Vol. 39, No. 6(12), pp. 1699 - 1712

TEXT: Heat transfer between liquid He II and the surrounding solid is accompanied by a temperature jump which is related to the complicated temperature exchange between He II and the phonons of the solid. A similar effect is displayed by He^3 where the surface of the solid performs small vibrations, and the moved liquid carries away a small amount of energy. Nonetheless, a temperature jump occurs on the boundary. A theoretical description of this effect is presented here. The authors used liquid He^3 which was in contact with the vibrating surface of a solid. At low temperatures, liquid He^3 can be regarded as a Fermi fluid, and its condition is characterized by an excitation distribution function which

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satisfies the equation of motion $\frac{\partial n}{\partial t} + \frac{\partial n}{\partial r}\frac{\partial \varepsilon}{\partial p} - \frac{\partial n}{\partial p}\frac{\partial \varepsilon}{\partial r} = I(n)$ (n - distribution function; ε - excitation energy which is a function of n; I(n) - collision integral; p - momentum). It may be assumed that all points of the body surface oscillate in phase. Therefore, the distribution function is only a function of the normal to the surface z. n is set equal to n_0+n_1, where n_0 is the equilibrium Fermi function at absolute zero; thus, $\varepsilon = \varepsilon_0 + \int f(p,p')n_1(p')dp'$ and $f(p,p') = \delta\varepsilon(p)/\delta n(p')$. Spherical coordinates, θ and χ, are introduced (θ is the angle between p and z; χ is the azimuthal angle), μ is substituted for cos θ, and the z-coordinates are measured in units of the mean free path ($l = v_0\tau$); with $\omega\tau \to \infty$ (ω - oscillation frequency) one obtains equation (8):

$$\mu\frac{\partial\varphi}{\partial z} + (1-i\omega\tau)\varphi = -\frac{i\omega\tau F_0}{1+F_0}\varphi_0 - \frac{3i\omega\tau F_1}{1+F_1}\mu\varphi_{1n} - \frac{3i\omega\tau F_1}{1+F_1}\cdot\sqrt{1-\mu^2}\cos\chi\,\varphi_{1t}$$

. Next, the suitable boundary conditions are determined. When substituting $\psi(\mu)$ for $\varphi(z,\mu)$ at z=0, one obtains equation (15): $\psi = -p_0u_z(\mu+\xi) - p_0u_t\cdot\sqrt{1-\mu^2}\cos\chi$,

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and the condition for ξ reads $\psi_{1n} = \frac{1}{2}\int_{-1}^{+1}\mu\psi(\mu)d\mu = -p_0u_z/3$. The solution to (8) is divided into two parts (proportional to u_z and u_t) accrding to the two terms of (15). The solution corresponding to perpendicular surface oscillations is called the longitudinal solution, while that corresponding to tangential surface oscillations is called the transverse solution. The two types of solutions are discussed, and several relations are derived for diffuse reflection in both cases. Thereupon, mirror reflection is studied, in which case a solution is obtained through a Fourier expansion. Finally, several formulas are presented for the thermal resistance of the boundary, which is proportional to T^{-3}. Academician L. D. Landau is thanked for discussions. V. A. Fok is mentioned. There are 1 figure and 5 references: 4 Soviet and 1 US.

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

SUBMITTED: June 13, 1960

Card 3/3

BEKAREVICH, I.L.; KHALATNIKOV, I.M.

Phenomenological deduction of the equations of vortex motion for He II. Zhur.eksp.i teor.fiz. 40 no.3:920-925 Mr '61.
(MIRA 14:8)

1. Institut fizicheskikh problem Akademii nauk SSSR.
(Vortex motion) (Helium)

POKROVSKIY, V.L.; KHALATNIKOV, I.M.

Superbarrier reflection of high-energy particles. Zhur. eksp. i teor. fiz. 40 no.6:1713-1719 Je '61. (MIRA 14:8)

1. Institut fizicheskikh problem AN SSSR.
(Particles (Nuclear physics))

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S/056/61/040/006/025/031
B108/B209

3,1900(1538,1057)

AUTHORS: Lifshits, Ye. M., Sudakov, V. V., Khalatnikov, I. M.

TITLE: Singularities of cosmological solutions of gravitation equations. III

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, v. 40, no. 6, 1961, 1847-1855

TEXT: In earlier papers (Refs. 1,2: ZhETF, 39, 149, 1960; ZhETF, 39, 800, 1960), Ye. M. Lifshits and I. M. Khalatnikov studied the form of the cosmological solution of gravitation equations near a point with time singularity. The general solution of gravitation equations with a fictitious singularity may be represented (by a proper choice of a synchronous reference system) in a form in which the singularity is synchronous for the entire space. Such a solution must contain eight arbitrary solutions of the three spatial coordinates: 1) four "physically different" functions, necessary to establish the gravitational field at a certain initial moment, 2) one function determining the initial hyper-

Card 1/3

surface in the geometrical structure, 3) three functions related to the requirement that the conditions $g_{00} = -1$, $g_{0\alpha} = 0$ (1) for the metric tensor (Refs. 1,2) permit any transformation of the spatial coordinates without involving time. The arbitrary choice of the spatial coordinates may be used to bring the first terms of the expansion for the metrics near the singularity into a form in which the spatial differential length is given by the formula

$$dl^2 = g_{\alpha\beta}dx^\alpha dx^\beta = a_{ab}dx^a dx^b + (t-\varphi)^2 a_{33}dx_3^2 + 2(t-\varphi)^2 a_{a3}dx^a dx^3 \quad (5),$$

where the indices a,b assume the values 1,2; the quantities $a_{ab}, a_{3a}, a_{33}, \varphi$ are functions of all three coordinates. These statements, together with the results of Refs. 1 and 2 lead to the conclusion that the presence of a time singularity is not a necessary property of cosmological models in the general relativity theory, and that the general case of arbitrary distribution of matter and gravitational field does not lead to such a singularity. The authors thank Academician D. L. Landau and

25204
S/056/61/040/006/025/031
B108/B209

Singularities of cosmological...

L. P. Pitayevskiy for discussions. There are 3 Soviet-bloc references.

ASSOCIATION: Institut fizicheskikh problem Akademii nauk SSSR (Institute of Physical Problems of the Academy of Sciences USSR)

SUBMITTED: January 25, 1961

Card 3/3

S/030/62/000/002/007/008
B101/B110

AUTHOR: Khalatnikov, I. M., Doctor of Physics and Mathematics

TITLE: New studies in the field of low-temperature physics

PERIODICAL: Akademiya nauk SSSR. Vestnik, no. 2, 1962, 111 - 112

TEXT: This is a report on the VIII Congress on Low-temperature Physics held in Kiyev on October 13-20, 1961, by the Nauchnyy sovet po fizike nizkikh temperatur Otdeleniya fiziko-matematicheskikh nauk Akademii nauk SSSR (Scientific Council of Low-temperature Physics of the Department of Physics and Mathematics of the Academy of Sciences USSR). This Scientific Council has been working for eight years. The conference was attended by scientists of Moscow, Leningrad, Khar'kov, Kiyev, Sverdlovsk, Tbilisi, and other places. The following papers and results are mentioned: Tunnel passages of electrons through a dielectric lying between superconducting metal (Al, In, Sn, Pb) at 0.1°K. Superconducting modification of Bi, the superconductivity of Bi II being discovered with a transition temperature of 3.92°K at 25,000 kg/cm^2. Effect of electron scattering due to spin-orbit interaction on Night's shift in superconductors. Experimental investigation

New studies in the field of...

of superfluidity of demixed phases of He^3-He^4 solutions. Investigation of the scattering of gamma quanta and slow neutrons in Fermi fluid (He^3) to find the zero sound predicted by L. D. Landau. Piezomagnetic effect in siderite monocrystals, antiferromagnetic resonance in $MnCO_3$ and $CoCO_3$. The properties of Ni_3Mn alloy between room temperature and 1.3°K were studied to prove the coexistence of ferromagnetism and antiferromagnetism below 20.4°K. Measurements of the magnetic heat capacity of carbonates of transition metals between 80 and 1.5°K showed that the magnetic heat capacity (spin waves) in $MnCO_3$ exceeded that of the lattice by one order of magnitude. No spin waves were observed in $FeCO_3$. Theoretical study of quantum oscillations of complex electroconductivity in perpendicular magnetic and electric fields, and of the de Haas - van Alphen effect for electrons in the metal. Theoretical prediction of a new type of oscillation of the ultrasonic absorption coefficient of metals in a magnetic field, which had already been proved experimentally in Zn monocrystals. Development of the theory of cyclotron resonance in metals. Experiments concerning the galvanomagnetic properties of Pb showed that the Fermi

level in Pb consisted of two equal parts with opposite signs. Thermomagnetic and galvanomagnetic effects in InAs, InSb, and galvanomagnetic effects in Al and In at low temperatures were investigated. Anisotropy of the effective masses in Al was found by cyclotron resonance, and the Fermi velocities and the effective electron masses in Sn were measured. Analysis of the dimension effect of the electric resistance in metals to ascertain the free path of electrons. Prediction for semiconductors of a new resonance type on band carriers caused by the electric vector of a high-frequency field at low temperatures. Spectroscopic study of the resonance effect in wurtzite-type semiconductors at helium temperature led to the determination of the tensor of the effective masses. Hall effect and magnetic resistance of Ge in strong magnetic fields at low temperatures. Determination of the spin-spin and spin-lattice relaxation times in metal by "spin echo". Nuclear magnetic resonance in Tl with natural and enriched isotope content. Moessbauer effect of 23.8 kev gamma quanta on Sn^{119} nuclei. Further reports dealt with low-temperature research, structure of strength, and polymorphous conversions at low temperatures.

Card 3/3

ABRIKOSOV, A.A., doktor fiziko-matematicheskikh nauk; KHALATNIKOV, I.M., doktor fiziko-matematicheskikh nauk, prof. (Moskva)

Academician Lev Davidovich Landau. Fiz.v shkole 22 no.1:21-27 Ja-F '62. (MIRA 15:3)

(Landau, Lev Davidovich, 1908-)

ABRIKOSOV, A.A., doktor fiziko-matematicheskikh nauk, prof.; KHALATNIKOV, I.M., doktor fiziko-matematicheskikh nauk, prof. (Moskva)

Symmetry of the world. Fiz.v shkole 22 no.5:4-13 S-O '62. (MIRA 15:12)

(Particles (Nuclear physics)) (Symmetry)

TAMM, I.Ye., akademik; ABRIKOSOV, A.A., doktor fiz.-matem.nauk;
KHALATNIKOV, I.M., doktor fiz.-matem.nauk

Nobel prize winner for 1962. Vest.AN SSSR 32 no.12:63-67 D '62.
(MIRA 15:12)

(Landau, Lev Davidovich, 1908-)

S/056/62/043/003/059/063
B104/B102

AUTHORS: Patashinskiy, A. Z., Pokrovskiy, V. L., Khalatnikov, I. M.

TITLE: Regge poles in nonrelativistic quantum mechanics

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, v. 43, no. 3(9), 1962, 1117-1119

TEXT: A method of examining the position of the poles in the complex momentum plane for a large class of potentials was worked out. This method is closely related to that previously established by V. L. Pokrovskiy and I. M. Khalatnikov (ZhETF, 40, 1713, 1961). The nonanalytical potential $U = U_0 < 0$ for $r < a$ and $U = 0$ for $r > a$ is studied on the basis of a semi-classical approximation to Schrödinger's radial equation. From the equations

$$x_1 J'_\nu(x_1)/J_\nu(x_1) = xH^{(1)\prime}_\nu(x)/H^{(1)}_\nu(x), \quad x^2/a^2 = 2mE,$$
$$x_1^2/a^2 = 2m(E - U_0). \qquad (3)$$

Card 1/3

Regge poles in nonrelativistic...

it is concluded that three series of poles exist. The first series is to the left of $\nu = x_1$ (Fig. 1), the second in the upper semiplane above the point x asymptotically approaching the line $\mathrm{Im}\,\nu = -1$ at $U_0 < E < 0$. The third series is missing when $U_0 < E < 0$, but approximately symmetric with the second series when $E > 0$. An analytical potential $U(r)$ having singularities in the complex momentum plane is examined. When $E \gg U_0$ the poles are near to those values of ν at which the level line has two points of inversion, $r_1 \approx \nu/k$ and r_2 (Fig. 2). There are two series of poles in the upper semiplane. The first series extends to the left and downward of the point $\nu = kr_0$, $k^2 = 2mE$, approaching the real axis asymptotically. The second series is situated right and left of the point $\nu = kr_0$ where the asymptotes $\mathrm{Im}(\nu - kr_0) \sim n/\ln(n)$, $\mathrm{Re}(\nu - kr_0) \sim \mathrm{Im}(\nu - kr_0)/\ln(n)$. The position of the poles in the case of $\min U(r) < E < 0$ is the same as in the case of a potential well with negative energies. There are 2 figures.

Card 2/3

Card 3/3 Fig. 1

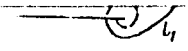

Fig. 2

KELDYSH, M.V., akademik; FEDOROV, Ye.K., akademik; ARTSIMOVICH, L.A., akademik; SISAKYAN, N.M., akademik; GORSKIY, I.I.; KAPITSA, P.L.; FOK, V.A.; LANDAU, L.D.; LIFSHITS, Ye.M.; SHAL'NIKOV, A.I.; KHALATNIKOV, I.M.; ALEKSEYEVSKIY, N.Ye.; VAYNSHTEYN, L.A.; PALLADIN, A.V., akademik; SATPAYEV, K.I., akademik; AMBARTSUMYAN, V.A., akademik; KUPREVICH, V.F.; MUSKHELISHVILI, N.I., akademik; KARAPETYEV, K.K.; MUSTEL', E.R.; MASEVICH, A.G., doktor fiz.-matem.nauk; EFRON, A.M.; MARTYNOV, D.Ya., prof.; GRIGOR'YEV, A.A., akademik; MARKOV, K.K., prof.; COLOVKOVA, A.G., prof.; PILATOVA, L.G., prof.; PEYVE, Ya.V.; SEMIKHATOV, B.N., prof.; TITOV, A.G.; RYCHAGOV, G.I.; BARSKAYA, V.F.; VLASOVA, A.A.; BARANOVA, Ye.P.; KIBARDINA, L.A.; ISACHENKO, A.F.; IL'INA, Yu.P.; DANILOV, A.I., prof.; PLAUDE, K.K.; NECHAYEVA, T.N., prof.; CHEPEK, L., doktor; SZANTO, Ladislav, akademik; BELACHIK, Yozef; FAN KLOK V'YEN; EYGENSON, M.S., prof. (L'vov); STARKOV, N.; ABRAMOVICH, Yu.; VOSKRESHENSKIY, V.; KROPACHEV, A.; REZVOY, D., prof., (L'vov); KONDRAT'YEV, V.N., akademik; LEBEDINSKIY, V.I., kand.geol.-mineral.-nauk; YANSHIN, A.L., akademik

"Priroda" is 50 years old. Priroda 51 no.1:3-16 Ja '62. (MIRA 15:1)

1. Prezident AN SSSR (for Keldysh). 2. Glavnyy uchenyy sekretar' Prezidiuma AN SSSR (for Fedorov). 3. Akademik-sekretar' Otdeleniya fiziko-matem.nauk AN SSSR (for Artsimovich). 4. Akademik-sekretar' Otdeleniya biologicheskikh nauk AN SSSR (for Sisakyan). 5. Chlen-korrespondent AN SSSR, zamestitel' akademika-sekretarya Otdeleniya

(Continued on next card)

S/056/63/044/002/061/065
B188/B102

AUTHOR: Khalatnikov, I. M.

TITLE: Sound absorption in liquid He II below 0.6°K

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, v. 44, no.2, 1963, 769 - 771

TEXT: Both T. Woodruff (Phys. Rev., 127, 682, 1962) and K. Dransfeld (Phys. Rev. 127, 17, 1962) have assumed that sound absorption in He II occurs via three phonon processes. These processes are, however, forbidden at such low temperatures - not only because of energy and momentum conservation but also since the phononspectrum is stable against phonon decay. Therefore the author ascribes sound absorption to four-phonon processes (cf. ZhETF, 19, 637, 709, 1949). As a consequence, the absorption coefficient is obtained as $\varkappa = \frac{1}{\tau c} = \frac{5(u+1)^4}{8\pi^3(\varrho c)^2\gamma}\left(\frac{kT}{\hbar c}\right)^6 \frac{\omega}{c}$, i.e. $\alpha \sim T^6$, and not, as obtained by Woodruff and Dransfeld, $\sim T^4$. $u = (\partial c/\partial \varrho)(\varrho/c) \simeq 3$, ϱ is the He-II density, c the sonic velocity, τ the phonon lifetime, and γ is a constant determined

Card 1/2

Sound absorption in ...

from the phonon energy at small momenta p: $\varepsilon(p) = cp(1+\beta p^2)$. From the experimental $\alpha(T)$ curve obtained by Chase and Herlin (Phys. Rev. 97, 1447, 1953) it is obvious that below $\sim 0.3^{\circ}K$ the slope of the curve corresponds to the T^6-law. Quantitative agreement with the above relation for α is obtained when β is assumed to be equal to $1.5 \cdot 10^{35}$ $(g \cdot cm/sec)^{-2}$. Therefore $\alpha \sim T^6$ can be considered as an asymptotic law for $T \to 0$. Above $\sim 0.3^{\circ}K$ three-phonon processes will contribute to sound absorption. There are 2 figures.

ASSOCIATION: Institut fizicheskikh problem Akademii nauk SSSR (Institute of Physical Problems of the Academy of Sciences USSR)

SUBMITTED: November 28, 1962

Card 2/2

L 13566-63 EWT(1)/FCC(w)/BDS AFFTC/ASD

ACCESSION NR: AP3003138 S/0056/63/044/006/2058/2061

53

AUTHOR: Andreyev, A.; Khalatnikov, I.

TITLE: Sound in liquid helium II near absolute zero

SOURCE: Zhurnal eksper. i teor. fiziki, v. 44, no. 6, 1963, 2058-2061

TOPIC TAGS: liquid helium, sound velocity, sound absorption, low temperature, three-phonon porcesses, four-phonon processes, temperature dependence, frequency dependence

ABSTRACT: Oscillations in helium-II are considered for the low-temperature regions in which collisions between excitations are insignificant. Sound vibrations in liquid He sup 3 at low temperatures were considered by L. D. Landau (ZhETF 32, 59, 1957), and this paper considers sound in He sup 4 close to zero temperature. It is shown that the velocity of sound increases in this case with temperature, in proportion to the quantity T sup 4 ln(const/T), where T is the temperature, while the absorption is proportional to T sup 6 and to the frequency of the sound. Orig. art. has: 1 figure and 18 formulas.

ASSOCIATION: Institut fizicheskikh problem Akademii nauk SSSR (Institute of Physics Problems, Academy of Sciences SSSR)

SUBMITTED: 17 Jan 63 DATE ACQ: 23 Jul 63 ENCL: 00
SUB CODE: 00 NO REF SOV: 004 OTHER: 001

Card 1/1

Barashinskiy, A. Z.; Pokrovskiy, V. L.; Khalatnikov, I. M.

TITLE: Regge poles in problems concerning a quasi-classical potential well

SOURCE: Zhurnal eksper. i teor. fiziki, v. 44, no. 6, 1963, 2062-2078

TOPIC TAGS: Regge poles, rectangular spherical potential well, physical and unphysical poles, levels and resonances

ABSTRACT: A method recently proposed by the authors for finding the poles of the scattering phase shift (Regge poles) for the quasi-classical potentials (ZhETF v. 43, 1117, 1962) is used to analyze the simplest problem of Regge poles for the case of rectangular spherically-symetric potential well. In this case the scattering phase-shift can be explicitly expressed in terms of Bessel functions. In looking for the Regge poles, the previously developed method is used to follow the properties of the phase shift along level lines. Two series of poles are found, "physical" and "unphysical." The character of the motion of the poles with variation of the energy is then clarified and finally some general relations are established between the number of levels and

the number of resonances. Although the simplest potential well was chosen in order not to complicate the calculations, the results remain valid essentially for potentials that have singularities outside the point r = 0. Original article has 5 figures and 97 formulas.

ASSOCIATION: Institut fizicheskikh problem Akademii nauk SSSR; Institut teplofiziki Sibirskogo otdeleniya Akademii nauk SSSR (Institute of Physics problems, Acad. Sci. SSSR; Institute of Thermophysics, Siberian Department, Acad. Sci. SSSR)

SUBMITTED: 17Jan63 DATE ACQ: 23Jul63 ENCL: 00

SUB CODE: 00 NO REF SOV: 005 OTHER: 005

PATASHINSKIY, A.Z.; POKROVSKIY, V.L.; KHALATNIKOV, I.M.

Studying of an S-matrix in a complex space of angular momenta in the quasi-classical case. Zhur. eksp. i teor. fiz. 45 no.3:760-771 S '63. (MIRA 16:10)

1. Institut teplofiziki Sibirskogo otdeleniya AN SSSR, Institut radiofiziki i elektroniki Sibirskogo otdeleniya AN SSSR i Institut fizicheskikh problem AN SSSR.
(Matrices) (Quantum theory)

PATATINSKIY, A.Z.; POKROVSKIY, V.L.; KHALATNIKOV, I.M.

Quasi-classical scattering in a centrally symmetric field.
Zhur. eksp. i teor. fiz. 45 no.4:989-1002 O '63. (MIRA 16:11)

1. Institut fizicheskikh problem AN SSSR.

LIFSHITS, Ye.M.; KHALATNIKOV, I.M.

Problems in relativistic cosmology. Usp. fiz. nauk 80 no.3: 391-438 Jl '63. (MIRA 16:9)
(Cosmology) (Relativity (Physics))

KHALATNIKOV, I. M.

"Theory of fermi liquids and possibilities of ^3He"

report submitted for 9th Intl Conf on Low Temperature Physics, Columbus, Ohio, 31 Aug-4 Sep 64.

Inst for Physical Problems, AS USSR, Moscow.

ACCESSION NR: AP4037581 S/0056/64/046/005/1677/1679

AUTHOR: Kemoklidze, M. P.; Khalatnikov, I. M.

TITLE: Hydrodynamics of rotating helium II in an annular channel

SOURCE: Zh. eksper. i teor. fiz., v. 46, no. 5, 1964, 1677-1679

TOPIC TAGS: helium II, rotating helium II, annular channel, Feynman vortex, irrotational region, Feynman vortex region

ABSTRACT: Following the original work by Bendt and Oliphant (Phys. Rev. Lett. v. 6, 213, 1961 and Phys. Rev. v. 127, 1441, 1962), a variational method is used to derive an equation for the general description of the velocity fields in rotating helium II with annular configuration. It is shown that the Feynman vortices have an uneven distribution in an annular channel, and the liquid helium breaks up into two regions, one inside, without Feynman vortices in which the superfluid liquid rotates in irrotational fashion with a circulation much larger than the circulation quantum h/m, and an outside region, containing a uniform system of Feynman vortices and rotating like a rigid body. The radius of the boundary between the two regions

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ACCESSION NR: AP4037581

is estimated. The shape of the meniscus is also investigated and is found to differ little from plane, approaching parabolic with increasing speed of rotation. "We are grateful to Yu. G. Mamaladze for a discussion of the results." Orig. art. has: 7 formulas.

ASSOCIATION: Institut fizicheskikh problem AN SSSR (Institute of Physics Problems, AN SSSR)

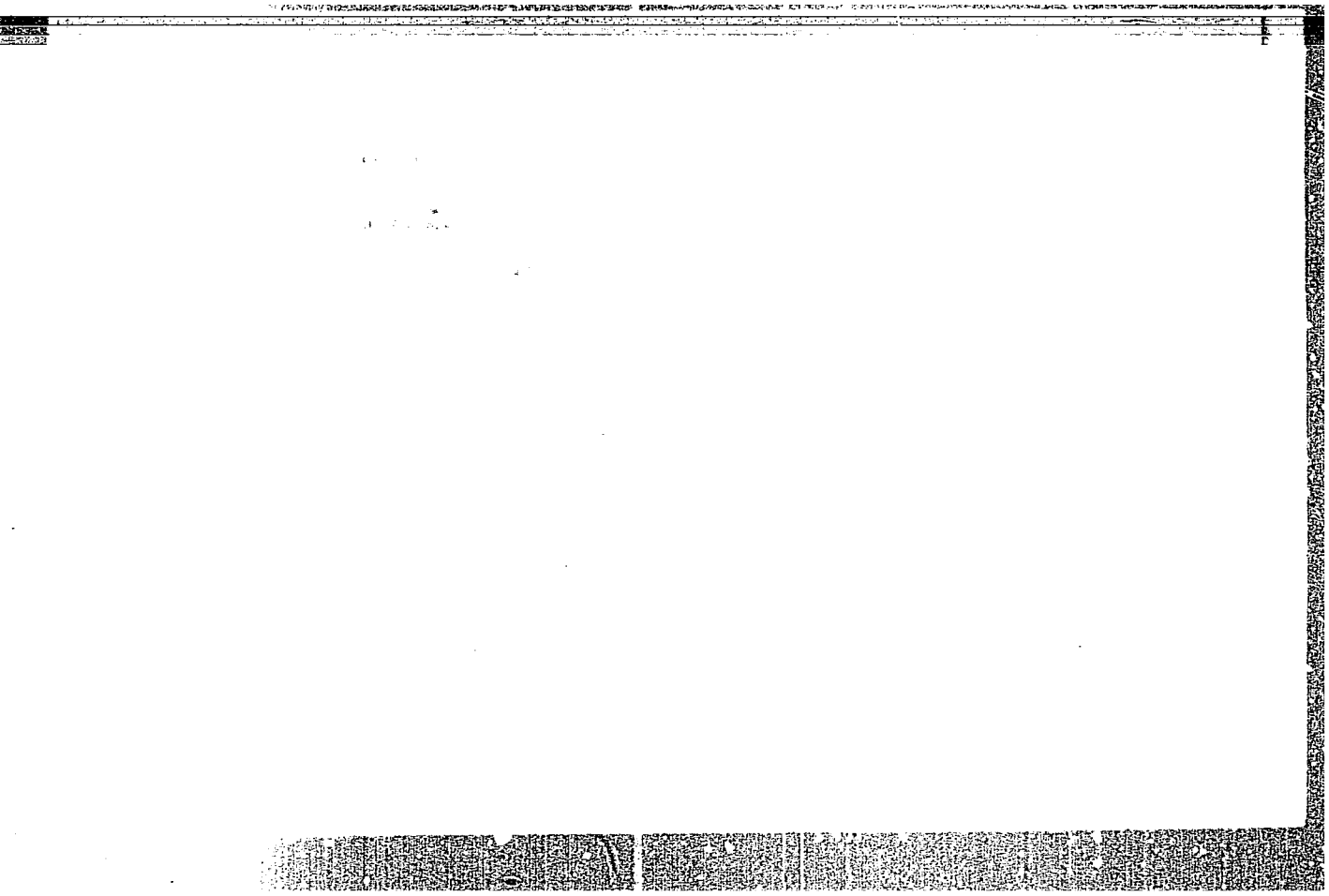
SUBMITTED: 25Jul63 ATD PRESS: 3078 ENCL: 00

SUB CODE: IC, ME NO REF SOV: 000 OTHER: 002

Card 2/2

KHALATNIKOV, Isaak Markovich; KOZLOV, V.D., red.

[Introduction to superfluidity theory] Vvedenie v teoriiu sverkhtekuchesti. Moskva, Nauka, 1965. 157 p.
(MIRA 18:9)



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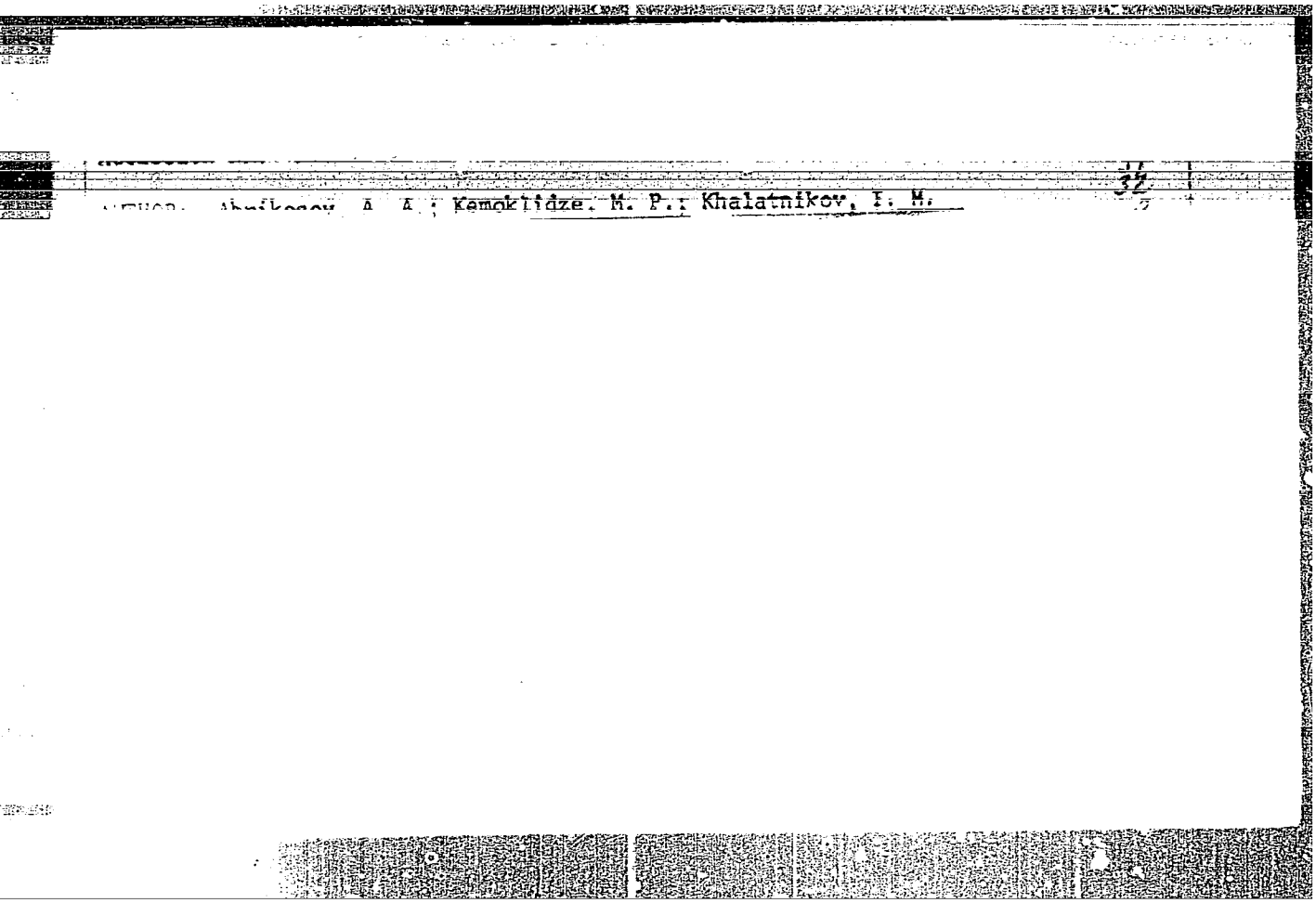
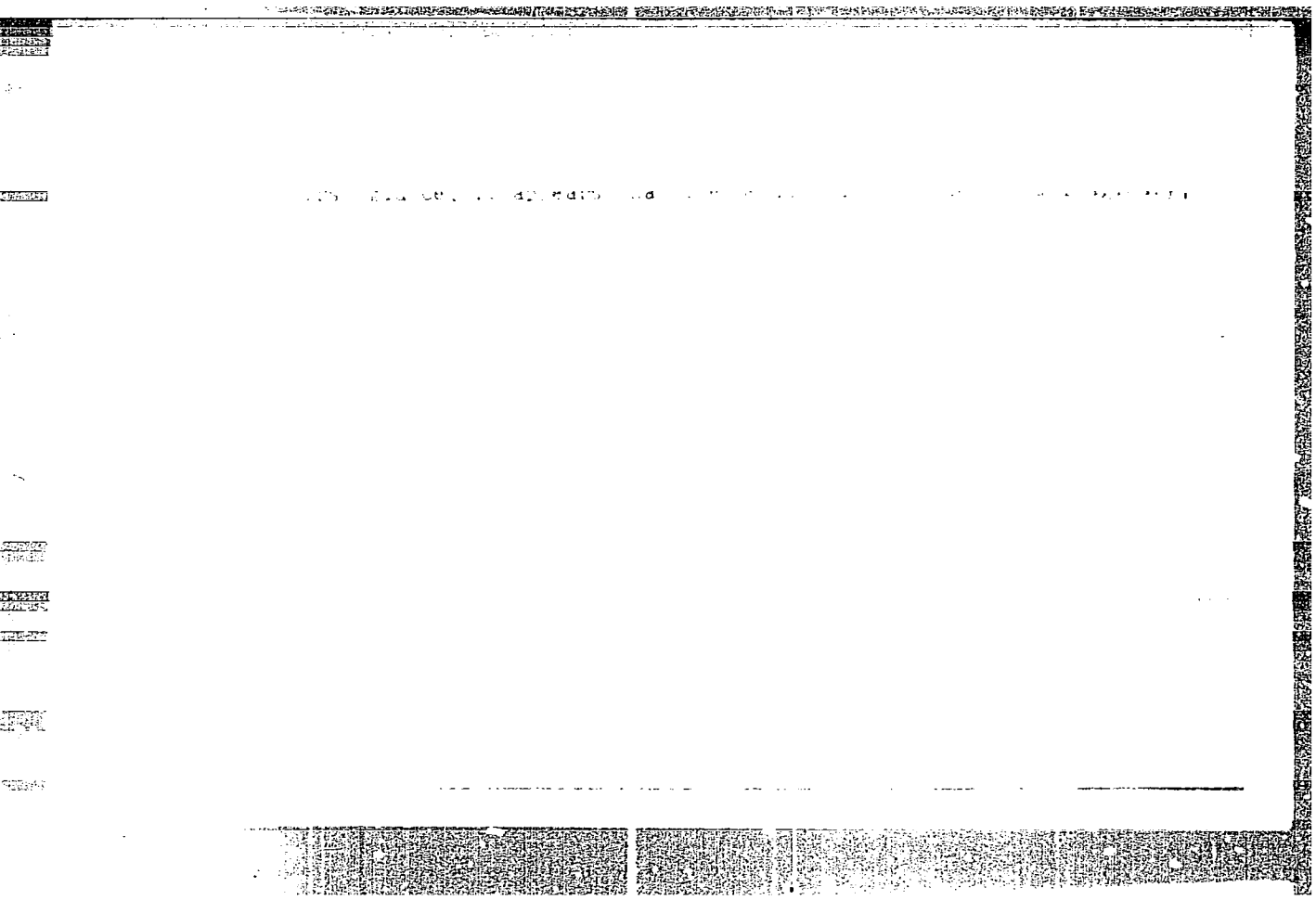
[redacted] singularities with respect to time are present, are also analyzed. The [redacted]





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KHALATNIKOV, Isaak Markovich, doktor fiz.-matem. nauk, prof.;
FAYNBOYM, I.B., red.

[Quantum liquids] Kvantovye zhidkosti. Moskva, Izd-vo "Znanie," 1965. 15 p. (Novoe v zhizni, nauke, tekhnike. IX Seriia: Fizika, matematika, astronomiia, no.4)
(MIRA 18:3)

L 13134-66 EWT(1)/EWT(m)/EPF(n)-2/EWP(t)/EWP(b)/ETC(m) IJP(c) JD/WW/GG

ACC NR: AP6002663 SOURCE CODE: UR/0386/65/002/012/0566/0572

AUTHOR: Khalatnikov, I. M.; Chernikova, D. M.

ORG: Institute of Theoretical Physics, Academy of Sciences SSSR (Institute theoreticheskoy fiziki Akademii nauk SSSR)

TITLE: Dispersion of sound in superfluid helium

SOURCE: Zhurnal eksperimental'noy i teoreticheskoy fiziki. Pis'ma v redaktsiyu. Prilozheniye, v. 2, no. 12, 1965, 566-572

TOPIC TAGS: helium, superfluidity, sound propagation, cryogenics

ABSTRACT: After showing that it is possible to separate from the system of equations describing the propagation of sound oscillations in helium II, and described by them earlier (ZhETF v. 49, No. 12, 1957, 1965 and v. 50, No. 2, 1966, in press), two pairs of equations describing propagation of first and second sound respectively, they proceed to compare their earlier results with the latest measurements of the absorption coeffecient of second sound by W. A. Jeffers and W. M. Whitney (Phys. Rev. v. 139, 1082, 1965) and C. E. Chase (Ph.D. Thesis, Cambridge University, 1954, unpublished). They show that the temperature dependences of the first-sound absorption coefficient calculated with their formulas for 1, 2.02, 3.91, and

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Card 2/2

L 12176-66 EWT(d) IJP(c)

ACC NR: AP5024722 SOURCE CODE: UR/0056/65/049/003/1000/1008

AUTHORS: Belinskiy, V. A.; Khalatnikov, I. M.

ORG: Institute of Physics Problems, Academy of Sciences SSSR (Institut fizicheskikh problem Akademii nauk SSSR)

TITLE: General solution of the gravitational equations with a simultaneous fictitious singularity

SOURCE: Zhurnal eksperimental'noy i teoreticheskoy fiziki, v. 49, no. 3, 1965, 1000-1008

TOPIC TAGS: cosmology, gravitation field, singular integral

ABSTRACT: A general solution of the gravitational equations in vacuum is derived in a synchronous coordinate system, which possesses a simultaneous fictitious singularity reached by all points in space at the same time t = 0. The vacuum gravitational equations solved are those of E. M. Lifshits and I. M. Khalatnikov (UFN v. 80, 391, 1963 and earlier), but in the present paper the solution is constructed analytically in a manner in which transformations containing two-dimensional or three-dimensional functions are eliminated. The only arbitrariness left in the metric of the solution is physical. It is shown further

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L 12176-66

ACC NR: AP5024722

that the solution obtained is general and consequently describes an arbitrary gravitational field in the vacuum. The criterion for this generality is discussed in some detail. Authors thank Professor E. M. Lifshits for a discussion. Orig. art. has: 37 formulas

SUB CODE: 20/ 03/ SUBM DATE: 29Apr65/ NR REF SOV: 002

Card 2/2

KHALATNIKOV, I.M.; CHERNIKOVA, D.M.

Sound dispersion in superfluid helium. Pis'. v red. Zhur. eksper. i teoret. fiz. 2 no.12:566-572 D '65. (MIRA 19:1)

1. Institut teoreticheskoy fiziki AN SSSR. Submitted Nov. 9, 1965.

L 25706-66 EWT(l)/EWT(m)/EEC(k)-2/EPF(n)-2/T/EWP(k)/ETC(m)-6 IJP(c) WG/JD/WH/GG

ACC NR: AP6002742 SOURCE CODE: UR/0056/65/049/006/1957/1972

AUTHOR: Khalatnikov, I. M.; Chernikova, D. M.

ORG: Institute of Theoretical Physics, Academy of Sciences SSSR (Institut teoreticheskoy fiziki Akademii nauk SSSR) 72 B

TITLE: Relaxation phenomena in superfluid helium 21 27

SOURCE: Zhurnal eksperimental'noy i teoreticheskoy fiziki, v. 49, no. 6, 1965, 1957-1972

TOPIC TAGS: liquid helium, superfluidity, phonon interaction, phonon scattering, kinetic equation, acoustic propagation, relaxation process

ABSTRACT: Since the propagation of sound in a superfluid cannot be considered in the hydrodynamic approximation at high frequencies and the kinetic equation must be used, the authors solve the problem by analyzing the various interactions between the different excitations (phonons and rotons) in the superfluid. The cross sections for the scattering of phonons by phonons, phonons by rotons, and rotons by rotons are determined and the corresponding kinetic equations analyzed. It is shown that the longest relaxation time is possessed by the interaction between the phonon and roton gases. A system of equations, valid for both high and low frequencies, is derived, describing the propagation of sound oscillations with allowance for the relaxation processes. Orig. art. has: 1 figure and 43 formulas.

SUB CODE: 20/ SUBM DATE: 26Jul65/ ORIG REF: 012/ OTH REF: 014

Card 1/1 lo

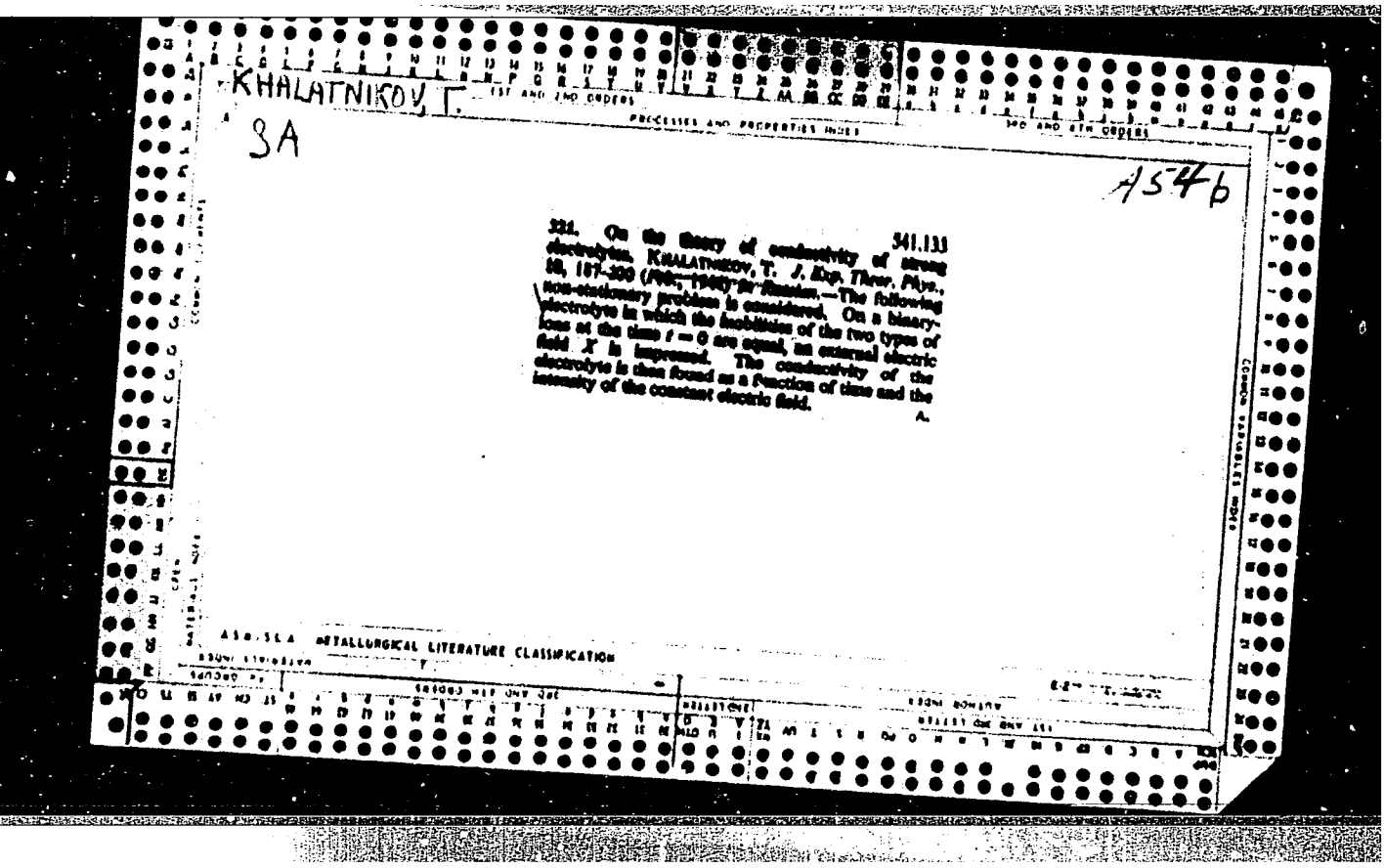
Card 2

UDC: 530.14

ACC NR: AM6001739

SUB CODE: 20

Card 3/3


KHALATNIKOV T
3A
454b
331. On the theory of conductivity of strong electrolytes. KHALATNIKOV, T. *J. Exp. Theor. Phys.*, 18, 187-200 (Feb., 1948) In Russian.—The following non-stationary problem is considered. On a binary-electrolyte in which the mobilities of the two types of ions at the time $t = 0$ are equal, an external electric field X is impressed. The conductivity of the electrolyte is then found as a function of time and the intensity of the constant electric field. A. 541.133
ASM/SLA METALLURGICAL LITERATURE CLASSIFICATION

KHALATOV, I.Ya.

Merited glory of work. Elek.i tepl.tiaga 5 no.9:26 S '61.
(Locomotive engineers) (MIRA 14:10)

KHALATYAN, A. A.

Stanki i instrument, no. 10, 1962, p. 44

Dissertations

S/121/62/000/010/005/005
D040/D112

The following dissertations for the degree of Cand. of Technical Sci. were presented: A.A. Khalatyan, at the Kiyev "Order of Lenin" Polytechnic Institute, "On the Chip Formation Process and the Plastic Deformation of Metals"; V.A. Chudutov, at the Odesskiy politekhnicheskiy institut (Odessa Polytechnic Institute), "Investigation of Error Sources in the Method of Measuring Torque by Means of a Tensometric Clutch".

Card 5/3

KHALATYAN, E.S.

Distribution of boron in the rocks and underground waters of the Erivan region. Izv. AN Arm. SSR. Nauki o zem. 18 no.1:31-39 '65.
(MIRA 18:5)

1. Institut geologicheskikh nauk AN Armyanskoy SSR.

KHALATYAN, G.G.

Mulberry propagation using summer cuttings [in Armenian with summary in Russian]. Izv.AN Arm.SSR.Est.nauki no.7:93-101 '47.

(Mulberry) (MLRA 9:8)

KHALATYAN, G.G.

Mulberry trees in mountainous regions of the Armenian S.S.R.
Biul.Bot.sada [Eriv.] no.11:65-78 '51.
(Armenia--Mulberry) (MLRA 9:8)

KHALATYAN, G.G.

Results of planting mulberry trees in mountainous regions of the Armenian S.S.R. (preliminary report). Biul.Bot.sada [Erlv.] no.12: 51-58 '51.

(Armenia--Mulberry) (MLRA 9:8)

KHALATYAN, G.G.

The mulberry as a monoecious tree. Izv.AN Arm.SSR.Biol.i sel'khoz. nauki 6 no.9:15-32 '53. (MLRA 9:8)

1. Botanicheskiy institut AN Armyanskoy SSR.
(Mulberry)

TUMANYAN, S.A.; KHALATYAN, G.G.

Desiccation of young mulberry plants under the influence of frost. Biul.Bot.Sada [Eriv.] no.13:5-14 '53. (MLRA 9:8)
(Mulberry) (Plants, Effect of temperature on)

KHALATYAN, G.

6854. Khalatyan, G. Peredoviki tutovodstva na Vsesoyuzndy sel'skokhozyaystvennoy vystavke. Yerevan, 1954. 43 s. s. ill. 17 sm. (Glav. upr. s.-kh. propagandy i nauki M-va sel'skogo khozyaystva Arm. SSR). 1.000 ekz. Bespl. ✱ Na arm. yaz. - (55-2890)
638.2 st (47.925)

SO: Knizhnaya Letopis' No. 6, 1955

KHALATYAN, G.G.

An unusual staminate flower in the mulberry. Izv.AN Arm.SSR. Biol. i sel'khoz.nauki 19 no.8:101-102 Ag '57. (MIRA 10:10)

1. Botanicheskiy institut Akademii nauk ArmSSR.
(Mulberry) (Inflorescence)

KHALATYAN, G.G.

Experiments on photoperiodism in the mulberry. Izv. AN Arm.SSR. Biol. i sel'khoz.nauki 11 no.8:87-95 Ag '58. (MIRA 11:10)

1. Botanicheskiy institut AN Arm.SSR.
(Photoperiodism) (Mulberry)

KHALATYAN, G.G.

Tissues of various quality in mulberries. Izv. AN Arm. SSR. Biol. nauki 14 no.10:91-96 O'61. (MIRA 16:7)

1. Nauchno-issledovatel'skaya stantsiya shelkovodstva Armyanskogo nauchno-issledovatel'skogo instituta semledeliya.
(MULBERRY) (PLANT CELLS AND TISSUES)

KHALATYAN, O. I. and AFANAS'YEV, A. N.

Reported on the water balance of the Lake Baykal and the Khrami water reservoir.

report presented at the 3rd All-Union Hydrological Congress, 7-17 Oct 1957, Leningrad

Izv. Ak Nauk SSSR, ser geograf., 3, pp3-9, '58.

KHALATYAN, O. I.

PA 15/49T53

USSR/Engineering Jun 48
Hydraulics
Filtration

"Studying the Losses Due to Filtration at the Reservoir of the Khram' Hydroelectric Power Station," O. I. Khalatyan, Engr, 2 3/4 pp

"Gidrotekh Stroi" No 6

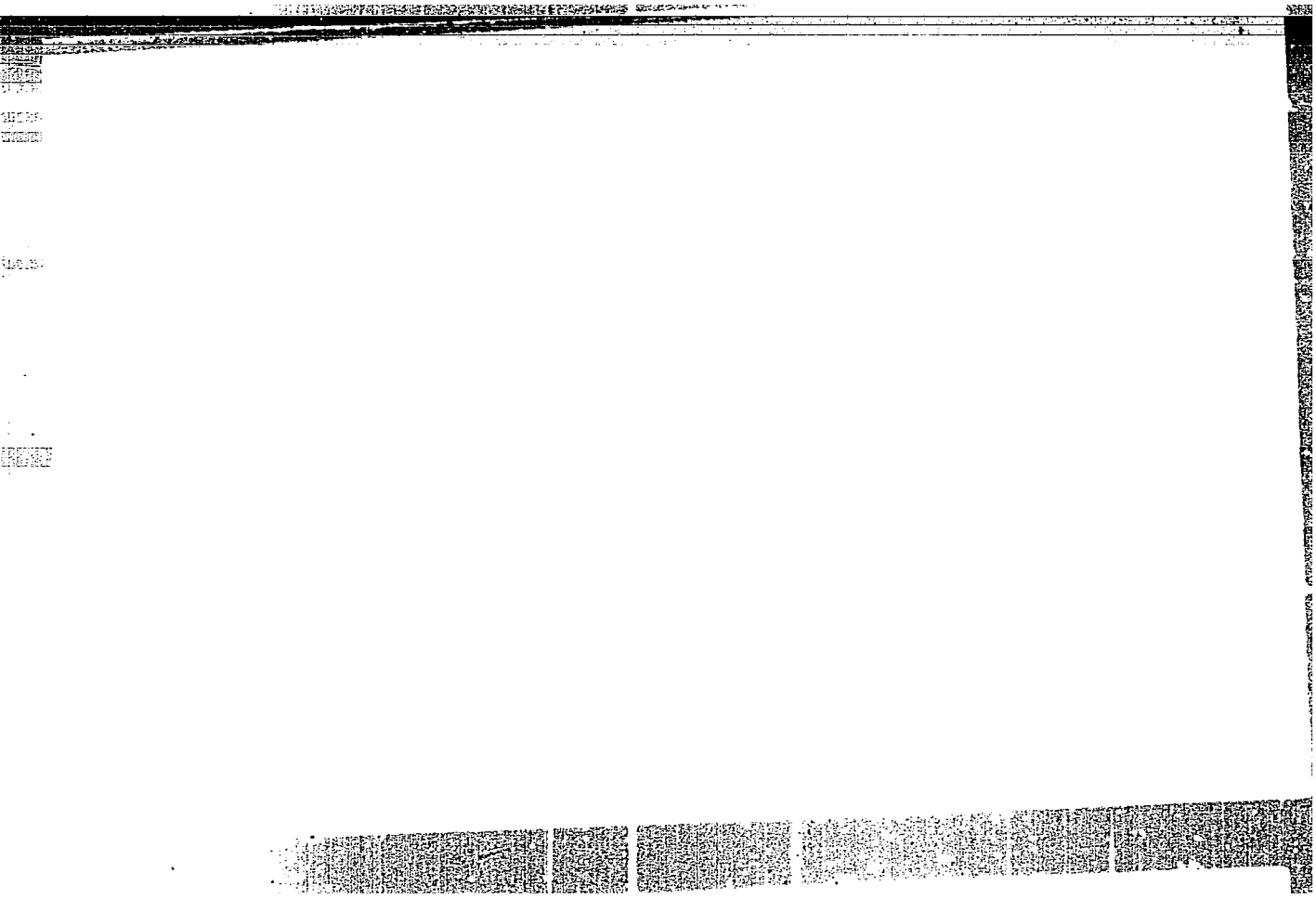
Station put into service 31 Dec 1947. Feeds Georgia network. Describes method and plots results of study made to determine filtration losses. Calculated figures, prior to study, varied widely.

15/49T53

KHALAVITSKIY, Z. Z.

"Unutilized Possibilities for Determining the Spatial Distribution of Overcast," Meteor. i Gidrol., No.1, pp 32-33, 1955

Translation M-737, 29 Aug 55



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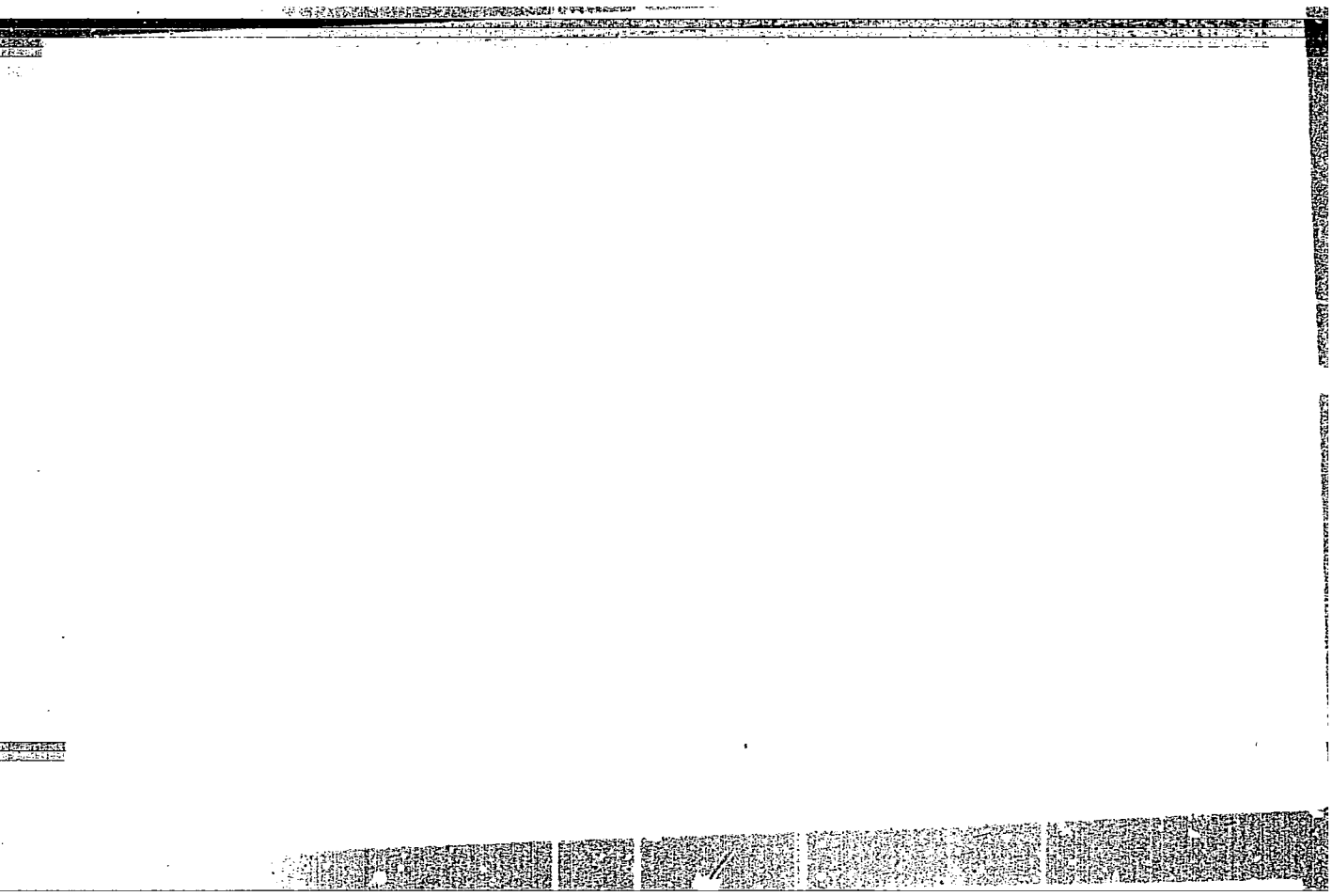

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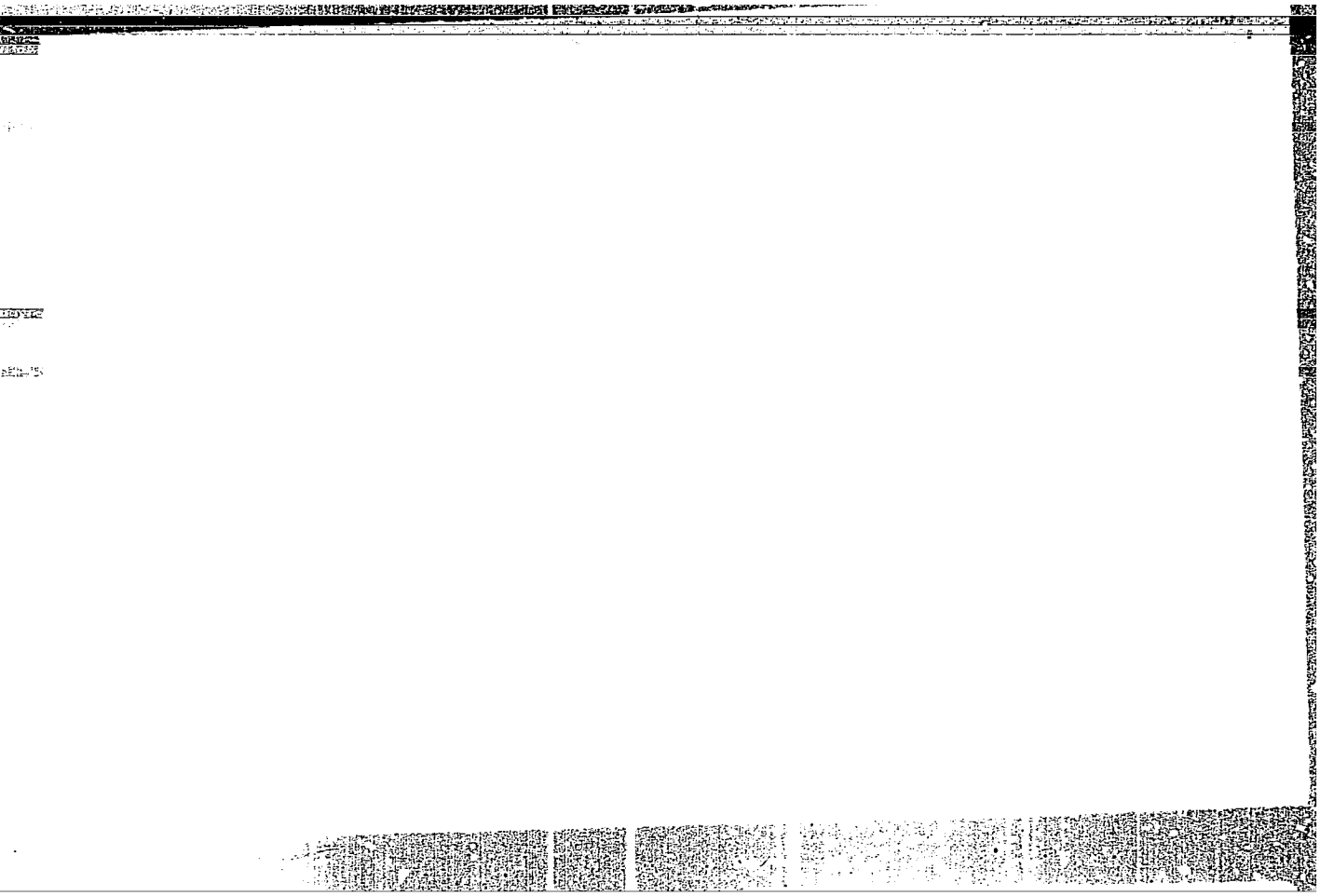
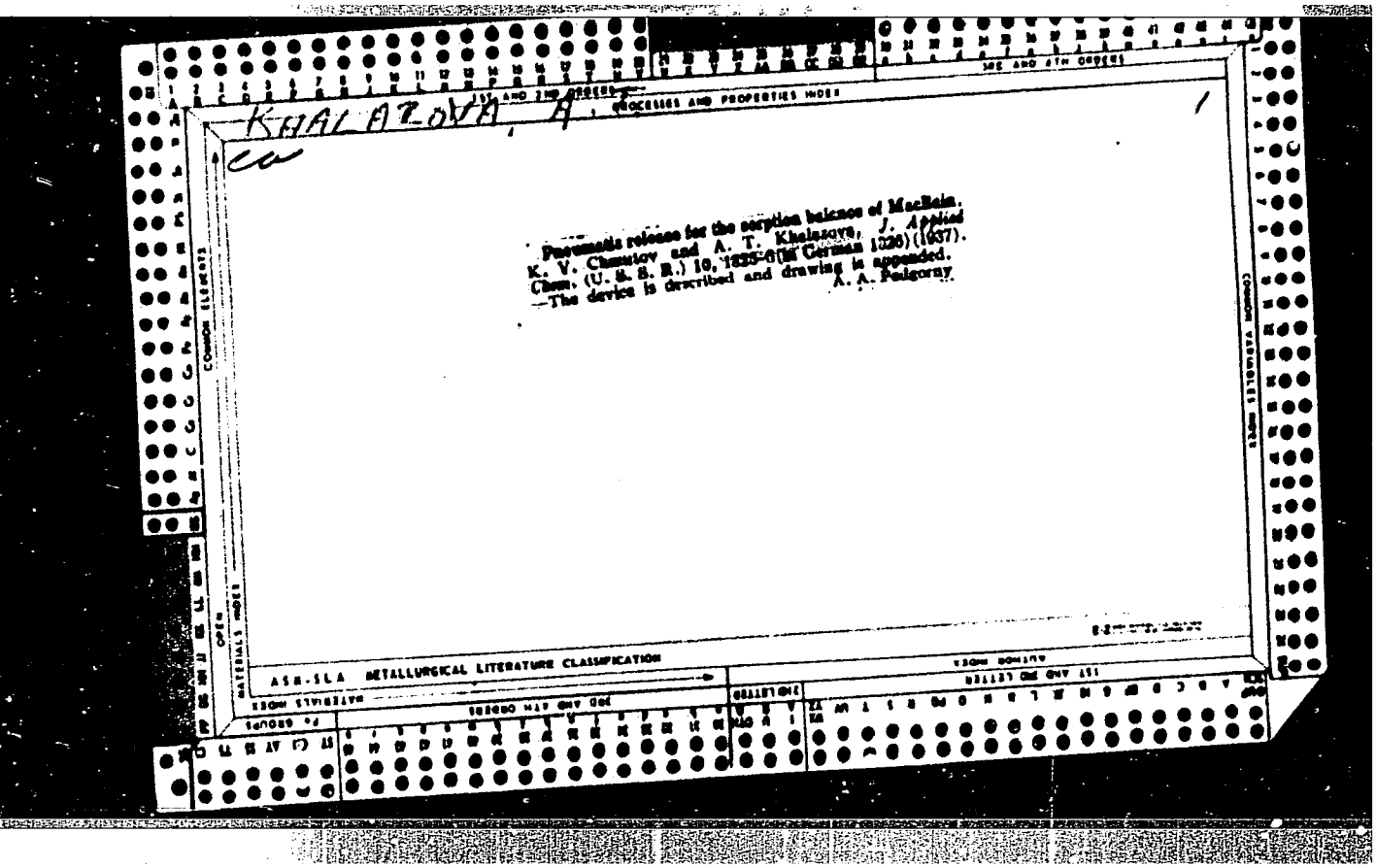
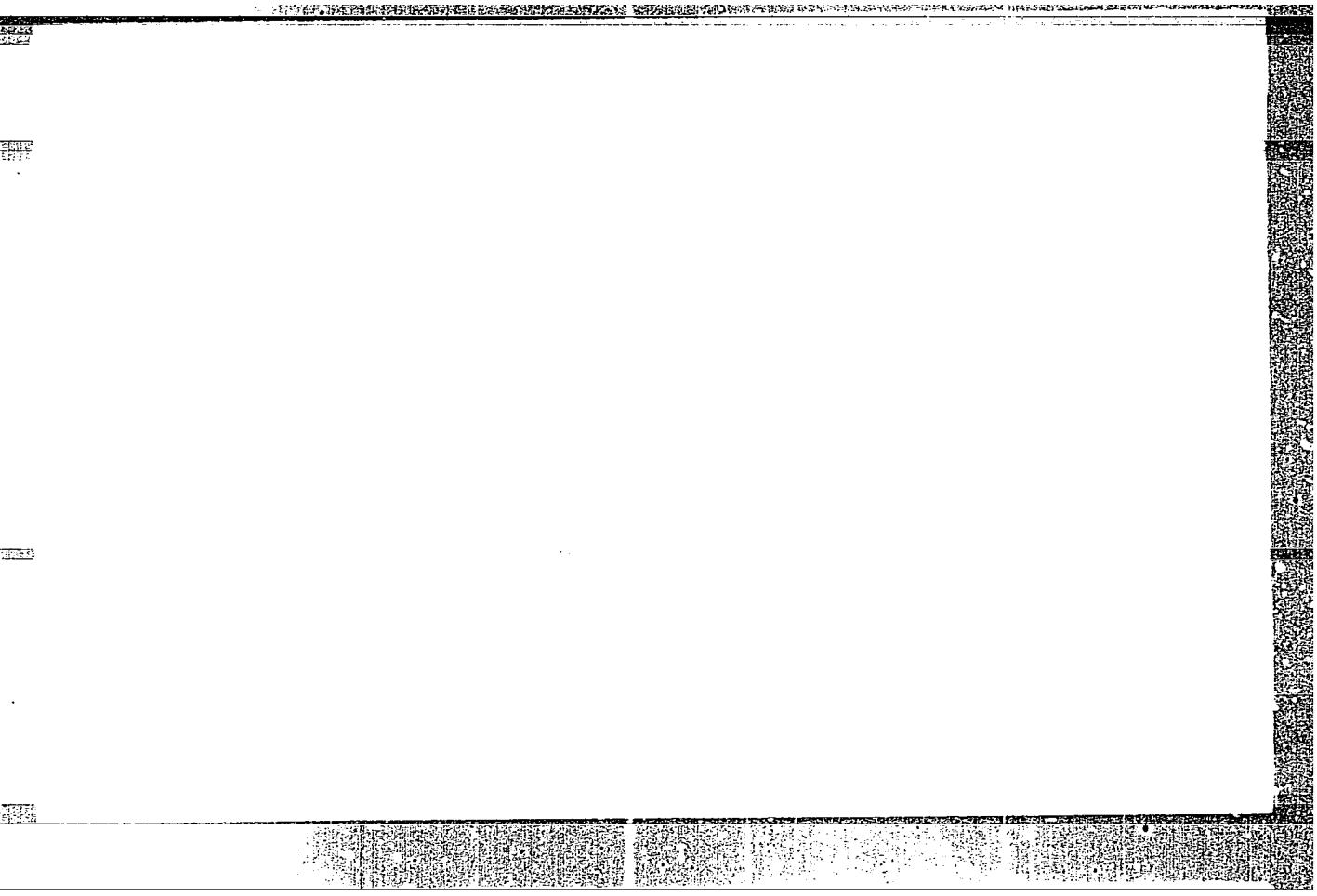


APPROVED FOR RELEASE: 09/17/2001 CIA-RDP86-00513R000721710013-9"

GOKHSHTEYN, D.P., doktor tekhn. nauk; DEKHTYAREV, V.L., kend. tekhn. nauk; OLESEVICH, Ye.K., inzh.; TISHCHENKO, B.S., inzh.; KHALAYDZHI, V.N., inzh.; RYABOVA, A.S., inzh.; BYKOV, V.N.; KOZOREZ, A.I., inzh.

Carbon dioxide system with medium power output. Energomashinostroenie 10 no.11:20-22 N '64 (MIRA 18:2)





ACC NR: AP7002162 SOURCE CODE: UR/0089/66/021/006/0439/0445

AUTHOR: Anatskiy, A. I.; Bogdanov, O. S.; Bukayev, P. V.; Vakhrushin, Yu. P.; Malyshev, I. F.; Malivayko, G. A.; Pavlov, A. I.; Suslov, V. A.; Khal'chitskiy, Ye. F.

ORG: none

TITLE: Linear induction accelerator

SOURCE: Atomnaya energiya, v. 21, no. 6, 1966, 439-445

TOPIC TAGS: linear accelerator, electron accelerator, mev accelerator

ABSTRACT:

A description is given of the LIU-3000 linear induction accelerator, which was designed at the Scientific-Research Institute for Electro-Physical Devices (NIIEFA) in 1962. The LIU-3000 was designed for an energy of 3 Mev and a pulse current of up to 200 amp. Its operation for electron acceleration is based on the utilization of a rotational electric field, created in a system consisting of several circular transformers. The maximum possible current of the accelerated electrons in such an accelerator with focusing sufficient to compensate for the repelling force of the space charge, is determined basically by the power of the commuting element in the primary circuit of the inductor. The LIU-3000's power can be brought to 1000 amp/pulse, what is impossible in other types of accelerators. The

Card 1/2 UDC: none

ACC NR: AP7002162

LIU-3000 consists of a series of accelerating sections (the first of which was adjusted in 1963). Each section consists of 12 inductors which are vacuum sealed to permit a vacuum of 5×10^{-6} torr inside. The sections are connected in pairs into units with the aid of special pipes. Pumping and observation devices are situated between the units. The following data were obtained from tests: maximum current of accelerated electrons, 180 amp; maximum energy of injected electrons, 300 kev; energy of accelerated electrons, 485 kev; duration of the current pulse of the gun, 2.2 μsec; pulse duration of the accelerating voltage, 0.35 μsec; duration of the pulse front of accelerating voltage, 0.18 μsec; average gradient of accelerating field, 310 kv/m; and diameter of the accelerated beam (at the exit), 2 cm. In addition to the authors, other staff member of NIIEFA who participated in designing and testing the LIU-3000 were R. A. Alekseyev, L. M. Andrezen, A. V. Belyayeva, O. D. Volodin, M. A. Gashev, V. K. Gagun-Torn, N. K. D'yachenko, N. V. Tolokonov, Yu. V. Lebedev, A. A. Markhel', P. G. Moreyev, A. V. Popkovich, A. N. Popov, S. V. Promyshlyayev, G. L. Sakaganskiy, Ya. L. Yakhelis, and A. T. Chesnokov. The authors thank V. I. Veksler and V. P. Saratsev for their help with the work. Orig. art. has: 4 formulas and 11 figures.

SUB CODE: 20/ SUBM DATE: 14Apr66/ ORIG REF: 003/ OTH REF: 001/
ATD PRESS: 5112

Card 2/2

AVAZOV, T.N.; KREMMER, A.M.; KHALDAROV, S.

Phenols in the formation waters of the Gazli gas and oil field and adjacent areas. Dokl. AN Uz. SSR 21 no. 11:46-49 '64. (MIRA 18:12)

1. Institut geologii i razrabotki neftyanykh i gazovykh mestorozhdeniy Gosudarstvennogo geologicheskogo komiteta SSSR. Submitted June 21, 1963.

KHALDEY, L.M.

Hydrostatic experiments. Fiz. v shkole 14 no.4:63-65 Jl-Ag '54.
(MLRA 7:7)

1. 45-ya srednyaya shkola, Chkalov.
(Hydrostatics--Experiments)

KHALDEY, L.M.

Instrument demonstrating the concept "Pressure". Fiz. v shkole 15 no.3:63-64 My-Je '55. (MLRA 8:6)

1. 45-ya shrednyaya shkola (g. Chkalov)
(Pressure (Physics))

L 00734-66 EWT(m)/T/EWP(t)/EWP(b)/EWA(c) JD

ACCESSION NR: AP5022700 UR/0181/65/007/009/2655/2659

AUTHOR: Garber, R. I.; Soloshenko, I. I.; Khaldey, O. A.

TITLE: Relaxation of critical stresses of motion and critical stresses of multiplication of dislocations with repeated bending

SOURCE: Fizika tverdogo tela, v. 7, no. 9, 1965, 2655-2659

TOPIC TAGS: lithium fluoride, sodium chloride, plastic deformation, bend test, bending stress, stress relaxation

ABSTRACT: Critical stresses of multiplication and motion of dislocations are studied in lithium fluoride and sodium chloride specimens as functions of the number of loading cycles, the temperature and the loading method. It is found that there is a reduction in the critical stress with an increase in the number of cycles. For LiF, one-time loading is associated with a stress of 600, ten times loading with 250, and 100 times with 70 $g \cdot mm^{-2}$. The corresponding values for NaCl are 300, 150 and 50 $g \cdot mm^{-2}$. Mechanical strength increases with the number of cycles. This is shown by a gradual reduction in the number of regenerated dislocations and by a decrease in the damping constant of elastoplastic vibrations. Holding in the unloaded state at room temperature for 150 seconds after each loading cycle complete-

Card 1/2

L 00734-66

ACCESSION NR: AP5022700

ly nullifies the effect of repeated bending. The effect is also cancelled by a frequency of 1 cps at a high temperature (300°C). It is assumed that the multiple loading effect is caused by separation of the dislocations from barriers. The energy of activation for effecting this separation is ~0.4 ev. The results show that the repeated action of small stresses can cause plastic deformations if the pauses are short enough to prevent reversal of the process. Orig. art. has: 10 figures, 1 table.

ASSOCIATION: Khar'kovskiy gosudarstvennyy pedagogicheskiy institut im. G. S. Skovorody (Kharkov State Pedagogical Institute)

SUBMITTED: 09Mar65 ENCL: 00 SUB CODE: AS

NO REF SOV: 003 OTHER: 002

Card 2/2

KHALDEY, S.

Creative people. Neftianik 7 no.12:18-19 D '62.
(MIRA 16:6)

1. Zaveduyushchiy otdelom Azerbaydzhanskogo Soveta professional'nykh soyuzov.
(Karadag region--Oil well drilling)

ABDULLAYEV, A.A.; KOPYSITSKIY, T.I.; LEYTMAN, Yu.S.; MAMED-ZADE, A.G.; KHALDEY, Z.V.

Temperature-control system for a catalytic-cracking reactor with a finely divided catalyst. Neftepер. i neftekhim. no.8:19-22 '63. (MIRA 17:8)

1. Nauchno-issledovatel'skiy i proyektnyy institut po kompleksnoy avtomatizatsii proizvodstvennykh protsessov v neftyanoy i khimicheskoy promyshlennosti, g. Baku.

KYAZIMOV, A.A.; KHALDEY, Z.V.; KHAR'KOVSKIY, Yu.I.; YURIN, M.I.

Determination of the quality of raffinate at the output from an extraction column on oil selective purification units using furfural. Khim.i tekh.topl. i masel 10 no.1:24-26 Ja '65. (MIRA 18:4)

1. Bakinskiy zavod im. XXII s"yezda Kommunisticheskoy partii Sovetskogo Soyuza i Nauchno-issledovatel'skiy i proyektnyy institut po kompleksnoy avtomatizatsii proizvodstvennykh protsessov v neftyanoy i khimicheskoy promyshlennosti.

KYAZIMOV, A.A.; KHALDEY, Z.V.; KHAR'KOVSKIY, Yu.I.

Colorimetric method for determining furfurole in the products and waste water of the selective purification of oils. Khim.i tekh. topl.i masel 8 no.11:61-64 N '63. (MIRA 16:12)

SHEVCHENKO, A. (UB5CLX) (Chernovtsy); BASOV, V. (Moskva); PRILUTSKIY, G. (Pyatigorsk); ARKHIPOV, Ye. (Bugul'ma); VYSOCHIN, V. (Moskovskaya obl.); PRIKHUNOV, I. (Moskovskaya obl.); OBLASOV, G. (Kiyev); SMIRNOV, Yu. (UA4YB) (Kanash); KHOKHLOV, B. (Moskva); KHALDEYEV, A. (Przheval'sk); SKOBELEV, I. (Primorskiy kray); PROSKUROV, V. (Irkutsk); DOBRYNIN, Yu. (g.Ivanovo /obl./)

Exchange of experience. Radio no.10:22,26,29,32,37,40,44,46,58 O '64. (MIRA 18:2)

KHALDEYEV, I. M.

Dissertation: "Certain Methods of Solving Axonometric Problems." Cand Tech Sci, Moscow Order of Lenin Aviation Inst imeni Sergo Ordzhonikidze, 26 Apr 54. (Vechernyaya Moskva, Moscow, 16 Apr 54)

SO: SUM 243, 19 Oct 1954

KHALDEYEV, M.I.

Timiriazev District in the capital. Gor.khoz.Mosk. 36 no.6:28-30 Je '62. (MIRA 15:8)

1. Pervyy sekretar' Timiryazevskogo rayonnogo komiteta Kommunisticheskoy partii Sovetskogo Soyuza.
(Moscow—City planning)

5(1,3,4) SOV/153-2-1-22/25

AUTHORS: Fasman, A. B., Khaldeyev, O. D., Sokol'skiy, D. V.

TITLE: Generation of Triboelectricity During the Catalytic Hydrogenation in Non-conductive Media (O vozniknovenii triboelektrichestva pri kataliticheskoy gidrogenizatsii v neprovodyashchikh sredakh)

PERIODICAL: Izvestiya vysshikh uchebnykh zavedeniy. Khimiya i khimicheskaya tekhnologiya, 1959, Vol 2, Nr 1, pp 123-125 (USSR)

ABSTRACT: Static electricity with a potential of several kilovolts is produced by the friction of dielectric liquids at the container- or the tube walls of any shape (Refs 1-3). If conductive substances are added to hydrocarbon, the electric charge first increases and is then reduced and ceases completely at specific resistances of below 10^{10} ohms.cm. Since during the catalytic hydrogenation dielectric liquids (hydrocarbons, ether) are employed by intensely stirring the reaction mass, it was interesting to determine whether friction electricity is herein produced and how it affects the process of hydrogenation. Figure 1 shows an apparatus designed for measuring the electrification potential. Figure 2 gives the charge curves for n-heptane and

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