AVAILABLE: Library of Congress

Card 3/3

GO/aak
2-10-59

81499

SOV/137-59-5-10393

18.7200

Translation from: Referativnyy zhurnal, Metallurgiya, 1959, Nr 5, p 136 (USSR)

AUTHORS: Stepanov, V.V., Krokh, A.N., Kirillov, A.A.

TITLE: "SK-U" Electrodes for Electric Arc Welding

PERIODICAL: Sb. statey, Ural'skiy z-d tyazh. mashinostr. im. S. Ordzhonikidze, 1958, Nr 6, pp 28 - 40

ABSTRACT: Weld jointswith flaky surfaces are more prone to rusting under tropical conditions than weld joints with smooth surfaces. In this connection "K5A" electrodes were replaced by new "SK-U" electrodes ensuring the formation of angular and butt welds with minimum flaks formation on the surface (when welding in lower position). These electrodes correspond to the "E50A" type of GOST-2523-51 and are designed for welding medium-carbon steel. The composition of the coating (in %): fluorspar 18, chalk 23, Ti dioxide (electrode type) 7.5, Fe-Si (45%) 7.5, Fe-Mn 7.5, kaolin 6.5, Fe-powder, group A and B 30, water glass 25. Thicknesses of 1.25 - 1.35, 1.4 - 1.5 and 1.45 - 1.5 mm are recommended for the coating of electrodes of

Card 1/2

"SK-U" Electrodes for Electric Arc Welding SOV/137-59-5-10393

4 mm, 5 mm and 6 mm diamter, respectively. Wire of Sv08 and Sv08A grade is used. Welding is possible in all spatial positions of the seam and is carried out with a short d-c arc of reverse polarity. The mechanical properties of the seam metal are $\sigma_b \approx 50$ kg/mm^2, a_k 12 - 20 kgm/cm^2 at room temperature. At -40°C, a_k decreases down to 10 - 15 kgm/cm^2. The electrodes are not sensitive to rust. The seam metal did not show a considerable reduction of a_k after heating up to 650°C, water quenching and holding for ten days, and after mechanical aging. The following characteristics of electrode melting are given: α_r = 10.4 g/a.hour; α_n = 10.7 g/a . hour.

O.K.

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81198

SOV/137-59-5-10304

18.7200

Translation from: Referativnyy zhurnal, Metallurgiya, 1959, Nr 5, p 121 (USSR)

AUTHOR: Stepanov, V.V.

TITLE: Investigations Into the Weldability of Stainless Chrome Steel of the Martensite Class

PERIODICAL: Sb. statey. Ural'skiy z-d tyazh. mashinostr. im. S. Ordzhonikidze, 1958, Nr 6, pp 50 - 70

ABSTRACT: The author investigated weldability of 2Kh17, 2Kh13 and 3Kh13 steels. The author shows the erroneous classification of steels with a high Cr content on the basis of estimating the weldability by the equivalent of C. When welding these steels without preheating, H_B of the metal increases up to 512 in the zone adjacent to the seam, while the plastic properties diminish by a factor of 5 - 10, compared to the base metal in the initial state. Changes in the cooling rate at 650°C within a range of 4 to 38°C per second do not have a considerable effect on the hardness. Increased C in steel within the range of grade composition causes grain growth and a sharp reduction of plastic properties a_k

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Investigations Into the Weldability of Stainless Chrome Steel of the Martensite Class

(down to 0.5 kgm/cm^2). To prevent martensite formation, the cooling rate of the metal has to be reduced in the zone adjacent to the weld joint down to 0.01 - 0.015°C/sec. This can be achieved by welding with an energy of 10,000 - 12,000 cal/cm and using simulataneously preliminary preheating up to 600°C.

Yu.K.

Card 2/2

18.3200

SOV/133-59-10-18/39

AUTHORS: Stepanov, V. V. (Candidate of Technical Sciences, Docent), Batmanov, V. A., Sanok, N. A. (Engineers)

TITLE: Electric Arc Heating of Ingot Heads

PERIODICAL: Stal', 1959, Nr 10, pp 913-916 (USSR)

ABSTRACT: Industrial tests conducted at "Elektrostal'", "Dneprospetsstal'" and "Azovstal'" plants (zavody "Elektrostal'," "Dneprospetsstal'," "Azovstal'") as well as at Kuznetsk Combine (Kuznetskiy kombinat) corroborated the expediency of arc heating of the ingot head metal. The portable experimental installation for electric arc heating develop by Ural Heavy Machinery Plant (Uralmashzavod) proved reliable and economic. An arc of a carbon electrode 80 mm in diameter and 300-800 mm long and gripped by a water-cooled holder is used. The electrode holder can be displaced along the column of the installation by 0.5 to 3 m and turned around it by 180°. The circuit regulates the length of the arc with the help of an automatic head A-66.

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Table 1

Characteristics of electric arc heating of ingot heads.

Performance Figures	Arbitrary Ingot Designations*						
	A	B	C	D	E	F	G
Type of Steel	40	40	38KhGN	40	40	38KhGN	45
Ingot Weight, t	2	2	2	2	2	2	4
Time of ingot holding before heating, min . .	1	1	2	3	22	1	4
Period of arc application, min	55	15	10	20	21	51	62
Shrinkage of metal, mm .	70-90	70-90	100-120	80	80	100	——
Arc current, amp.** . . .	700-800	700-750	750-800	700-750	750-800	700-750	700-800

*Ingots "A," "B," "C" were heated with flux OSTs-45, others with FU-7 flux with magnesia additions.

**Arc voltage: 60 to 40 v.

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Electric Arc Heating of Ingot Heads

The authors conclude that (1) electric arc heating decreases the volume of pipe formation observed only in the top part of the head metal, so that the weight of the head metal can be reduced by 7 to 8% of the total ingot weight; (2) liquation of sulfur and phosphorus as well as carburization of the metal is absent. The authors recommend further studies to determine the effects of temperature parameters on ingot crystallization and optimal temperature rates. There are 5 figures; and 2 tables.

ASSOCIATION: Ural Polytechnic Institut (Ural'skiy politekhnicheskiy institut), Ural Heavy Machinery Plant (Ural'skiy zavod tyazhelogo mashinostroyeniya)

Card 3/3

GALAKTIONOV, A.T.; DENISOV, Yu.A.; KOPYTOV, G.T.; MASLOV, Yu.A.; NIKONOV, I.P.; PETUNIN, I.V.; KOCHEVA, G.N.; KUZNETSOV, A.P.; LELEKO, N.M.; RAZIKOV, M.I.; SPESHKOV, V.V.; STEPANOV, B.V., STEPANOV, V.V., kand. tekhn. nauk; SHELOMOV, B.Ye.; YUNYSHEV, G.P.; YES'KOV, K.A., dots., retsenzent; BAKSHI, O.A., dots., retsenzent; BEREZKIN, P.N., dots., retsenzent; PATSKEVICH, I.R.,dots., retsentzent; RUDAKOV, A.S., dots., retsenzent; FIZHBEYN, N.B., inzh., retsenzent; KHRUSTALEV, L.Ya., inzh., retsenzent; KRUTIKHOVSKIY, V.G., inzh., red. BOBROV, Ye.I., kand. tekhn. nauk, red. DUGINA, N.A., tekhn. red.

[Welding handbook] Spravochnik rabochego-svarshchika. Pod red. V.V.Stepanova. Moskva, gos. nauchno-tekhnizd-vo mashinostroit. lit-ry, 1960. 640 p. (MIRA 14:6)
(Welding)

S/135/60/000/007/012/014
A006/A002

AUTHOR: Stepanov, V.V., Candidate of Technical Sciences

TITLE: New Achievements in Welding Engineering in the German Democratic Republic

PERIODICAL: Svarochnoye proizvodstvo, 1960, No. 7, pp. 40-41

TEXT: A conference on the technology of welding was convened in Halle (German Democratic Republic) in October 1959. The Conference was organized by the Chamber of Engineering and the Central Institute of Welding (TsIS). The Conference participants came from the USSR, the German Federal Republic, the German Democratic Republic, Czechoslovakia, Poland, Bulgaria and other European countries. The author of this report was a delegate of TsP NTO MAShPROM. During the stay in the German Democratic Republic, the Soviet delegation visited TsIS, the Heavy Machinebuilding Plant imeni E. Thaelmann in Magdeburg, and the Chemical Machinebuilding Plant in Leine. TsIS is developing the coating of metal surfaces with plastics by spraying or dipping. The "Polyamid-V" plastics on a Nylon or Perlon base is used for this purpose. The wear resistance of steel surfaces coated with this material is higher than without the coating. "Polyamid-V" with graphite is used for coating shafts. Its electric conductivity is low and a layer of 0.1-0.2 mm is sufficient to insure a reliable insulation. TsIS is also

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A006/A002

New Achievements in Welding Engineering in the German Democratic Republic

working on method of welding plastic articles by high-frequency currents or air heated to 350°C. Semi-automatic welding of polyvinyl chlorides is widely used in construction engineering. Welding is performed by lap joints using the "TP" (TP) burner. Sheets of any thickness can be lap-welded at a speed of 14 m/min. The weight of the burner manufactured by Paul Reinhardt in Halle, is 170 g. The "ΦC" (FS) burner, manufactured by Berthold in Goerlitz, is used for butt-welding without beveling of edges and filler wire. The weight of the burner is 310 g, the welding speed is 20 m/h. Gluing metals with epoxide resins is of great interest. It may be performed in cold or hot state and will result in high strength joints. TsIS developed also a plasma jet for welding conductors, semi-conductors, insulators with high melting points, for gas cutting and applying plastic coatings. For welding heat resistant steel the Berlin Branch of TsIS developed electrodes whose coating contains 50% TiO_2. This coating has a good electric conductivity, ensuring easy ignition of the arc and stable burning. It can be used for vertical and overhead welding; the crack sensitivity of the weld metal is reduced. The electrodes are 6 mm in diameter and can be used for

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A006/A002

New Achievements in Welding Engineering in the German Democratic Republic

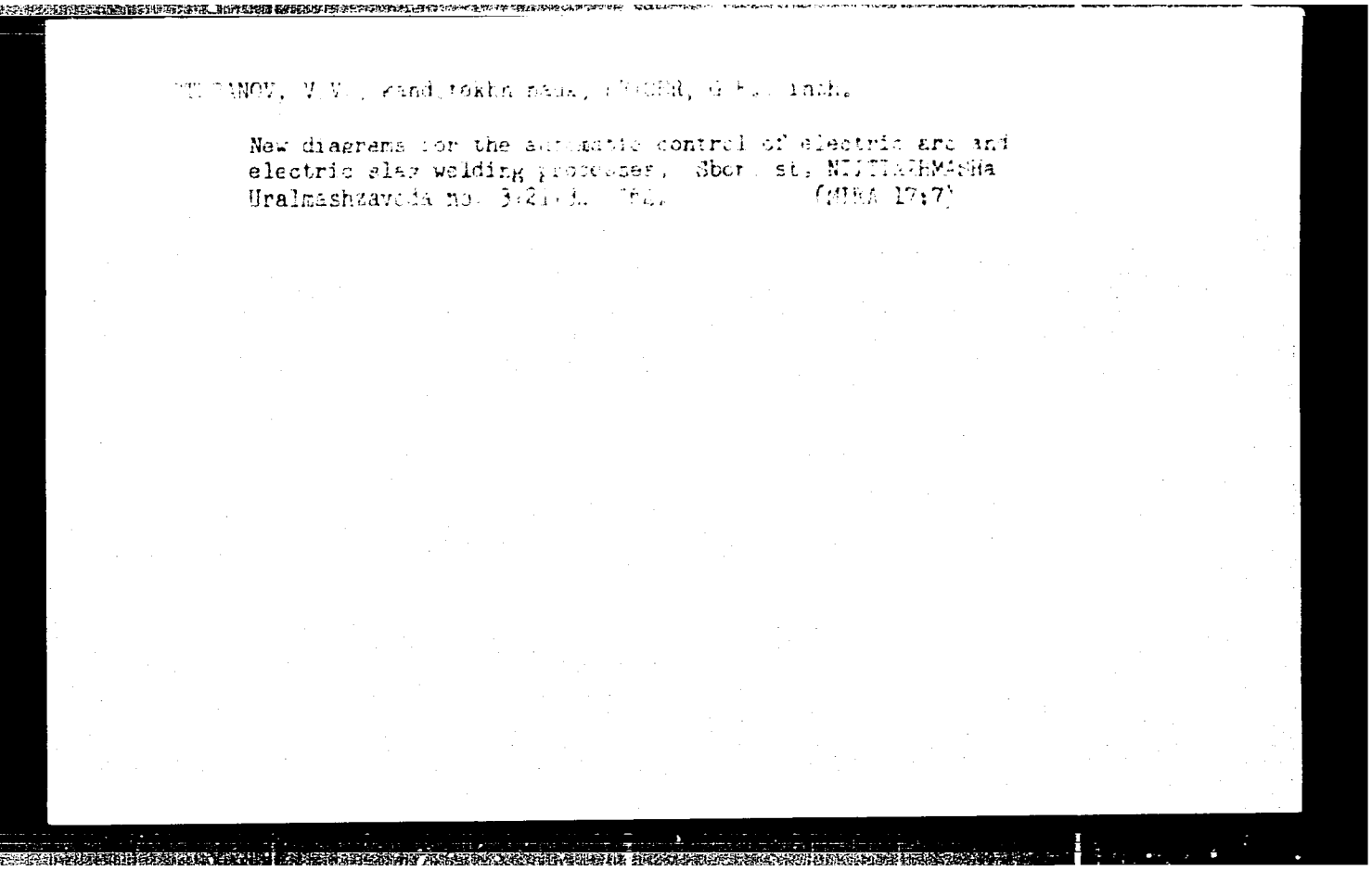
building-up 5-8 kg metal per hour. The Kjelberg plant designed a pistol for arc welding of 6-16 mm pins to steel surfaces at a welding current of 250-1,250 amps. There are 4 figures.

ASSOCIATION: Ural'skiy politekhnicheskiy institut imeni Kirova (Ural Polytechnic Institute imeni Kirov)

Card 3/3

KOZLOV, N.A., inzh.; STEPANOV, V.V., kand. tekhn. nauk

Regional scientific technological seminar of Ural Mountain region welders. Svar. proizv. no.6:47-48 Je '63. (MIRA 16:12)



[illegible]NOV, V. V., Candidate of Technical Sciences, [illegible] Branch.

New diagrams for the automatic control of electric arc and electric slag welding processes. Sbor. st. NII[illegible]Uralmashzavoda no. 3:21-[illegible] (MIRA 17:7)

STEPANOV, V.V., kand.tekhn.nauk; LELEKO, N.M., inzh.

Automatic portable-type equipment for the electric heating of ingots and castings. Sbor. st. NIITIAZHMASHa Uralmashzavoda no. 3:117-131 '64. (MIRA 17:7)

SHULYAK, V.S.; STEPANOV, V.V.

Overall mechanization and automation of the section for casting in shell molds. Lit. proizv. no.12:23-24 D '64. (MIRA 18:3)

SYNCROV, V.F.; BUGAROV, S.S.; STEPANOV, V.V.

Effect of low-energy nitrogen ions on a germanium surface. Fiz. tver. tela 7 no.5:1375-1377 My '65. (MIRA 18:5)

1. Voronezhskiy gosudarstvennyy universitet.

STEPANOV, V.V.; LOPAYEV, B.Ye.; SHTENGEL'MEYYER, S.V.

Viscosity of fluxes used in electric slag remelting and heating. Avtom.svar. 18 no.11:28-30 N '65. (MIRA 18:12)

1. Ural'skiy politekhnicheskiy institut im. S.M.Kirova (for Stepanov, Lopayev). 2. Institut metallurgii im. A.A.Baykova (for Shtengel'meyyer). Submitted October 13, 1964.

L 5188-66 EWT(1)/EWA(h) GW SOURCE CODE: UR/2619/64/000/035/0030/0035

ACC NR: AT6000080

42

B+1

AUTHOR: Borisovich, Ye. S; Preobrazhenskiy, V. B.; Stepanov, V. V.

ORG: Institute of Physics of the Earth im. O.Yu. Shmidt, AN SSSR (Institut fiziki zemli AN SSSR)

TITLE: N-002 three-channel seismic pen-recorder

SOURCE: AN SSSR. Institut fiziki zemli. Trudy, no. 35, 1964, 30-35

TOPIC TAGS: seismograph, seismologic instrument, seismography, electronic circuit

ABSTRACT: This is a hot-pen recorder which was developed and tested at the "Vibropribor" Plant and which assures clear records of seismic vibrations in the range from 0 to 3 cps at a double amplitude of up to 20 mm. This instrument was designed for use as the recorder for capacitance or magnetoelectric seismographs using UPN amplifiers (schematics for principal circuit, kinematic circuit, electrical circuit, photograph of instrument, and diagram of hot pen are given). Orig. art. has: 5 figures, 1 table. [FSB: v. 1, no. 5]

SUB CODE: ES, EC / SUBM DATE: none / ORIG REF: 002

Card 1/1 0901045?

L 24440-66 EWT(m)/EWP(t)/EWA(h) LIP(c) JD
ACC NR: AP6012280 (N) SOURCE CODE: UR/0125/65/000/011/0028/0030

AUTHOR: Stepanov, V. V.; Lopayev, B. Ye.; Shtengel'meyer, S. V.

ORG: [Stepanov, Lopayev] Ural Polytechnical Institute im. S. M. Kirov (Ural'skiy politekhnicheskiy institut); [Shtengel'meyer] IMET im. A. A. Baykov

TITLE: Viscosity of fluxes used for electroslag melting and preheating

SOURCE: Avtomaticheskaya svarka, no. 11, 1965, 28-30

TOPIC TAGS: electroslag melting, calcium fluoride, calcium oxide, magnesium oxide, fluid viscosity

ABSTRACT: The authors study viscosity as a function of temperature in 11 calcium fluoride fluxes recommended for electroslag melting and preheating. It is found that the viscosity of the calcium fluoride melt is low (0.2-0.3 poise) when heated above the liquidus curve (Δt = 40°C). Components which lower the crystallization temperature of the melt also reduce the viscosity due to an increase in superheating above the liquidus curve. Additives which raise the crystallization temperature increase the viscosity. Examples of impurities which reduce the viscosity are sodium fluoride and cryolite, while calcium oxide and magnesium oxide increase the viscosity by raising the crystallization temperature. Calcium fluoride fluxes containing magnesium

UDC: 621.791.92.04

Card 1/2

L 17993-66 EWT(m)/EWA(d)/EWP(v)/T/EWP(t)/EWP(k) JD/HM

ACC NR: AP6006190 SOURCE CODE: UR/0135/66/000/002/0044/0045

AUTHOR: Stepanov, V. V. (Doctor of technical sciences); Kozlov, N. A. (Engineer) 62 42

ORG: none

TITLE: All-Union Welding Conference in Sverdlovsk

SOURCE: Svarochnoye proizvodstvo, no. 2, 1966, 44-45

TOPIC TAGS: welding, friction welding, explosive welding, ultrasonic welding, vacuum diffusion bonding, electron beam welding, pressure welding, plasma welding, cold welding, electroslag welding, submerged arc welding, resistance welding, pulsed arc welding, surfacing, pulsed arc surfacing, brazing, welding machinery

ABSTRACT: The All-Union Scientific Conference on Welding was held in Sverdlovsk 18—20 November 1965. The conference was attended by representatives of 252 organizations from 112 towns. Problems of new welding techniques and improvement of weld quality were discussed. A. S. Gel'man and K. V. Lynbavskiy, Doctors of Technical Sciences (TsNIITMASh), read a report on new welding methods and prospects of their application in machine building. Friction-explosive, ultrasonic, vacuum-diffusion, radio-frequency, resistance-arc, electron-beam, and other welding methods developed during the last 5—10 years were discussed. S. M. Taz'ba, Candidate of Technical Sciences (VNIIESO), speaking about new welding equipment, pointed out that the elec-

Card 1/3 UDC: 621.791:006.3

2

trical equipment industry turns out at present about 180 different types of welders and special welding machines. The 1964 output of this equipment was 4 times that of 1958. New equipment includes silicon and selenium rectifiers for 120, 300, and 500 amp current and multistation rectifiers for 1500 and 3000 amp, semiautomatic lightweight welders for carbon dioxide-shielded arc welding, automatic plasma welders, and three-phase welders for gas-shielded arc welding. It is expected that lot production of the UGER-300 type units for gas-shielded arc cutting of ferrous and nonferrous metals will begin soon. Among new equipment an important allotment is set for pressure-welding machines (resistance, contact arc, friction and cold welding, ultrasonic welding, diffusion welding, etc.). B. S. Bril', Chief Welder, outlined the introduction and development of new welding techniques in the Central Ural economic region and stated that during the last seven years the number of welded structures in general machine building increased two times and that in metallurgical machinery, three times. A number of Ural plants have large specialized welding shops. The share of mechanized welding rose from 31% in 1958 to 52% in 1965. The use of resistance welding increased 4.4 times, that of electroslag welding 3.2 times, and that of submerged-arc welding 1.3 times. I. F. Kobzev, Chief Welder of the Chelyabinsk Tractor Plant, stated that modern mechanized welding methods are applied in making tractor subassemblies. Submerged-arc welding, resistance welding, friction welding, electroslag welding, pulsed-arc welding and hf brazing are among the methods used. V. A. Es'kov, Candidate of Technical Sciences, reviewed scientific research on welding carried out at the Chelyabinsk Polytechnical Institute. The weld strength of new improved types

L 17993-66
ACC NR: AP6006190

of weld designs, new welding materials, joining and repair welding of heavy castings, and surfacing with a vibrating electrode were discussed. M. K. Lushpey, Ye. R. Khismatulin, and A. G. Kolmakov, Engineers (NIIKhIMMASha), reported on welding of heat-treated medium-alloy steels in making high-pressure vessels. [ND]

SUB CODE: 13, 11/ SUBM DATE: none/ ATD PRESS: 4913

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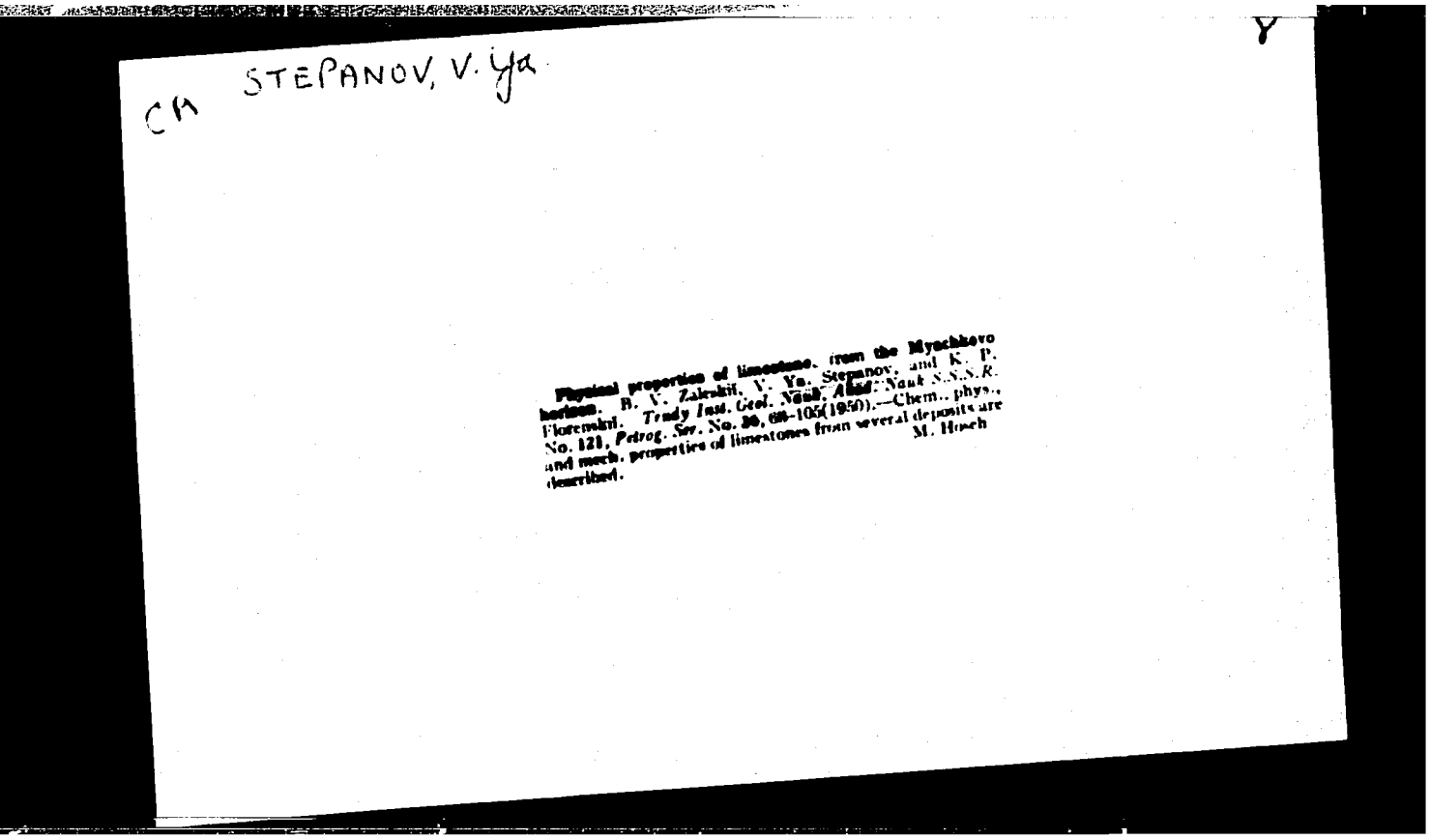
Card 3/3



CA STEPANOV, V. Ya

Physical properties of limestone, from the Myachkovo horizon. B. V. Zalesskii, V. Ya. Stepanov, and K. P. Florenskii. *Trudy Inst. Geol. Nauk, Akad. Nauk S.S.S.R.* No. 121, *Petrog. Ser.* No. 36, 68–105(1950).—Chem., phys., and mech. properties of limestones from several deposits are described. M. Hoch

STEPANOV, V. YA.

STEPANOV, V.Ya.; MASLOV, V.P.

Vasalemma facing stone; its origin and its durability in structures. (In: Akademiia nauk SSSR. Voprosy petrografii i mineralogii. Moskva, 1953. Vol. 1, p.460-473) (MLRA 7:4)
(Building stones)

STEPANOV, V.Ye., inzh.; CHEBOTAREV, Yu.P., inzh.

Dispatcher communication apparatus with harmonic selective signaling. Avtom., telem.i sviaz 2 4:16-20 Ap '58. (MIRA 12:12)

(Railroads--Signaling) (Oscillators, Electron)

STEPANOV, V.Ye., inzh.

Method of calculating call frequencies in dial-type communication systems. Vest. TSNII MPS no. 5:18-23 Jl '58. (MIRA 11:8)
(Railroads—Communication systems)

CHEBOTAREV, Yu.P., insh.; STEPANOV, V.Ye., insh.

Duplex amplifiers without differentiating systems. Avtom., telem. i sviaz 3 no.9:7-11 S '59. (MIRA 13:2)

1. Vsesoyuznyy nauchno-issledovatel'skiy institut zheleznodorozhnogo transporta.
(Transistor amplifiers)

CHEBOTAREV, Yu.P., kand. tekhn. nauk; STEPANOV, V.Ye., inzh.

Amplifiers without differentiating systems operating in dispatcher networks. Avtom. telem. i sviaz' 3 no.11:10-13 N '59 (MIRA 13:3)
(Transistor amplifiers) (Railroads--Electronic equipment)

STEPANOV, V.Ye., inzh.

Effect of interferences on the receiver of harmonic selective signaling. Vest. TSNII MPS 19 no.3:46-50 '60. (MIRA 13:10)
(Electric railroads--Signaling)
(Radio frequency modulation--Receivers and reception)

STEPANOV, V. Ye.

Cand Tech Sci - (diss) "System of tonal selective call for train dispatcher communications." Moscow, 1961. 16 pp; (Ministry of Railways USSR, Leningrad Order of Lenin Inst of Railroad Transport Engineers imeni Academician V. N. Obraztsov); 200 copies; free; (KL, 6-61 sup, 226)

USTINSKIY, A.A.; STEPANOV, V.Ye., starshiy inzh.; LYUBIMOV, A.V., inzh.; SHATOKHINA, A.A., inzh.; KOVGANKO, E.I., starshiy laborant

Measures for improving railroad radio communications with selective ringing. Avtom., telem. i sviaz' 6 no.3:21-25 Mr '62. (MIRA 15:3)

1. Rukovoditel' laboratorii provodnykh i radioreleynykh svyazey Vsesoyuznogo nauchno-issledovatel'skogo instituta zheleznodorozhnogo transporta Ministerstva putey soobshcheniya (for Ustinskiy).
2. Laboratoriya provodnykh i radioreleynykh svyazey Vsesoyuznogo nauchno-issledovatel'skogo instituta zheleznodorozhnogo transporta Ministerstva putey soobshcheniya (for Stepanov, Lyubimov, Shatokhina, Kovganko).

(Railroads--Communication systems)

STEPANOV, V.Ye., kand.tekhn.nauk; CHEBOTAREV, Yu.P., kand.tekhn.nauk

Railroad communication equipment with selective audio ringing.
Avtom., telem.i sviaz' 6 no.4:9-10 Ap '62. (MIRA 15:4)
(Railroads--Communication systems)

CHEBOTAREV, Yuriy Pavlovich; STEPANOV, Vladimir Yevgen'yevich; TUMARKINA, I.I., red.

[Station selective communication system with voice-frequency ringing] Postantsionnaia izbiratel'naia sviaz' s tonal'nym vyzovom. Moskva, Transport, 1965. 79 p. (MIRA 18:7)

USSR/Physics Jul/Aug 48
Solar Phenomena
Sunspots

"Regularities in the Formation of Sunspots," V. Ye. Stepanov, Astronomical Observatory, L'vov State U imeni I. Frank, 6½ pp

"Astron Zhur" Vol XXV, No 4

Investigates relation between occurrence of sunspots and position of sun's magnetic axis, using data from Greenwich and USSR observatories.

14/49T103

STEPANOV, V. YE.

Sun-Prominences

Observations of chromospheric ejections.
Uch.zap.L'vov.un. 15, No. 4, 1949.

9. Monthly List of Russian Accessions, Library of Congress, August 1952 [redacted], Uncl.

STEPANOV, V. YE.

Sun Spots

Electromagnetic nature of sun spots.
Uch.zap.L'vov.un 15, No. 4, 1949.

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

STEPANOV, V.Ye., dotsent.

Methods for determining temperatures of sunspots. Dop.ta pov.L'viv.un. no.4, pt.2:73 '53. (MLRA 9:11)

(Sunspots)

STEPANOV, V.Ye., dotsent; KOPYSTYANSKIY, A.A., starshiy nauchnyy sotrudnik.

Diffraction spectrograph with double image and great resolving power. Dop.ta pov.L'viv.un. no.4, pt.2:74 '53. (MLRA 9:11)

(Spectrograph)

SEVERNYY, A.B.; STEPANOV, V.Ye.

First observations of magnetic fields of sunspots at the Crimean Astrophysical Observatory. Izv.Krym.astrofiz.obser. 16:3-11 '56. (MIRA 13:4)
(Sunspots) (Magnetic fields)

STEPANOV, V.Ye.; KLYAKOTKO, M.A.

Large-scale motions in subphotospheric layers of the sun.
Izv.Krym.astrofiz.obser. 16:80-99 '56. (MIRA 13:4)
(Sun)

STEPANOV, V.Ye.

Problems in determining the temperature of sunspots. Soob. GAISH no.100:3-36 '57. (MIRA 12:1)
(Sunspots)

STEPANOV, V.Ye.

Distribution of the intensity for λ 3400, 3670, 4370, 4825, 5310, and 6055 A. at the border of the sun's disk. Soob. GAISH no.100:36-50 '57. (MIRA 12:1)
(Spectrum, Solar)

STEPANOV, V.Ye.

Stepped structure of sunspot penumbra. Soob.GAISH no.100:51-56 '57. (MIRA 12:1)
(Sunspots)

STEPANOV V. Ye.

NIKULIN, N.S.; SEVERNYY, A.B.; STEPANOV, V.Ye.

Measuring weak magnetic fields and radial velocity on the solar surface. Astron. tsir. no.183:9-13 Jl '57. (MIRA 11:3)

1. Krymskaya astrofizicheskaya observatoriya.
(Photoelectric measurements) (Magnetic fields) (Sun)

STEPANOV, V.Ye.; PETROVA, N.N.

Polarities and maximum strength of magnetic fields of sunspots in 1956. Izv.Krym.astrofiz.obser. 18:66-95 '58. (MIRA 13:4)

(Sunspots) (Magnetic fields)

STEPANOV, V.Ye.

Local magnetic fields, fine chromospheric structure, and filaments in the line H_α. Izv. Krym. astrofiz. obser. 20:52-66 '58.
(MIRA 13:3)

(Spectrum, Solar) (Magnetic fields)

67215
SOV/58-59-7-16531

24.6210

Translation from: Referativnyy Zhurnal Fizika, 1959, Nr 7, p 267 (USSR)

AUTHOR: Stepanov, V.Ye.

TITLE: The Absorption Coefficient of Atoms in the Reverse Zeeman Effect in the Case of an Arbitrary Direction of the Magnetic Field

PERIODICAL: Izv. Krymsk. astrofiz. observ., 1958, Vol 18, pp 136 - 150 (English résumé)

ABSTRACT: The author carries out a classical calculation of the complex refractive index and absorption coefficient of atoms in a magnetic field of arbitrary direction in the simplest case of triple Zeeman splitting. In the general case when a blending of the Zeeman components is present, the absorption decomposes into two independent parts with the coefficients s_+ and s_-, corresponding to the mutually orthogonal polarization of the absorbed radiation. The character of the polarization of each component depends on the direction of the magnetic field and, in addition, varies with the frequency within the line limits. In the general case elliptical polarization takes place, which changes into linear polarization in the line center and into circular polarization at the two symmetrical points.

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SOV/58-59-7-16531

The Absorption Coefficient of Atoms in the Reverse Zeeman Effect in the Case of an Arbitrary Direction of the Magnetic Field

In longitudinal and transverse fields, as well as in the case of the complete separation of the Zeeman components, the polarization of the s_+ and s_- components becomes independent of the frequency. The mutual orthogonality of the two absorption coefficients enables one to make allowance for them independently of one another and to set up two independent transfer equations when solving astrophysical problems. The bibliography contains 12 titles.

L.A. Vaynshteyn

Card 2/2

81463

SOV/35-59-8-6359

3.1210

Translation from: Referativnyy zhurnal, Astronomiya i Geodeziya, 1959, Nr 8, p 38

AUTHORS: Nikulin, N.S., Severnyy, A.B., Stepanov, V.Ye.

TITLE: Solar Magnetograph of the Crimean Astrophysical Observatory

PERIODICAL: Izv. Krymsk. astrofiz. observ, 1958, Vol 19, pp 3 - 19 (Engl. summary)

ABSTRACT: A device of the Crimean Astrophysical Observatory of AS USSR, designed for measuring weak magnetic fields is described. The device is based on the design of Babcock magnetograph (RZhAstr, 1955, Nr 3, 1072). The measurement method is based on the alternate suppression of the components of magnetically split absorption lines. It is shown, on the example of the line 5250.218, that the fluctuation of the flux amounts to 0.3% when this line is split in a field of ~10 gauss. A theoretical analysis of the capacities of FEU VEI photomultipliers, employed jointly with the tower telescope of the Crimean Astrophysical Observatory, yields ~0.2 gauss as a limiting magnitude of

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SOV/35-59-8-6359

Solar Magnetograph of the Crimean Astrophysical Observatory

measurable fields. A 10-m spectrograph with a grid producing the light concentration of the 5th order in the green region (dispersion is 0.2 A/mm) is used in the design of the magnetograph. Two slits, 0.04 A wide each, separated from each other by 0.06 A are located in the spectrograph focal plane. In front of the entrance slit of the spectrograph, there is an electronic optical modulator, a plate of ammonium hydrophosphate cut out perpendicular to the crystal axis. When the voltage ($\sim$ 4.6 kv) is fed to the plate, it becomes double-refracting; if the voltage is varied, one can modulate by the circularly polarized signal. In this way, a constant flux Φ with the modulated addition $\delta\Phi$ hits the FEU photocathode through each of the exit slits. Signals from two FEU are fed into a differential amplifier employing a 6N2P tube; the constant components of the anode voltage are mutually compensated in the amplifier, and the modulated (at a frequency of 124 cps) signal is doubled. Then the signal is amplified in narrow-band amplifier (of the 28-IM type) and, after demodulation, is recorded by an EPP-09[28] self-recorder. The modulation is performed by an electromagnetic relay which is fed through a phase-inverter from a frequency modulation pickup and which is connected, through an RC filter, to the

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Solar Magnetograph of the Crimean Astrophysical Observatory

control grids of a differential cathode follower. In distinction from the Babcock magnetograph, the compensator of radial velocities functions automatically. When the lines in the exit slits are displaced, a difference in voltage arises between the FEU anodes. This difference is amplified by the amplifier and gives rise to the rotation of a line-shifter which brings the line back into a symmetric position relative to the slits. The method of adjustment of the device is described. The authors show the reproducibility of recording, the recording at different time constants and different slit heights. The operational slit height is 10 to 30''. An example is presented of the chart of magnetic intensity isolines for a portion of the solar surface.

G.M. Nikol'skiy

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SOV/169-59-3-2997

Translation from: Referativnyy zhurnal, Geofizika, 1959, Nr 3, p 139 (USSR)

AUTHOR: Stepanov, V.Ye.

TITLE: On the Theory of the Formation of Absorption Lines in a Magnetic Field and of Fe λ 6173 Å Line Contours in a Sunspot Spectrum

PERIODICAL: Izv. Krymsk. astrofiz. observ., 1958, Vol 19, pp 20 - 45 (Engl. Res.)

ABSTRACT: The article has not been abstracted.

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87357

S/035/60/000/012/015/019
A001/A001

3,1540 (1062,1128,1168)

Translation from: Referativnyy zhurnal, Astronomiya i Geodeziya, 1960, No. 12, pp. 52-53, # 12292

AUTHORS: Stepanov, V. Ye., Petrova, N. N.

TITLE: Brightness of Flocculi, Magnetic Fields and Heating Mechanisms

PERIODICAL: Izv. Krymsk. astrofiz. observ., 1959, Vol. 21, pp. 152-179 (English summary)

TEXT: In fields with $H < 70$ gauss the brightness of flocculi increases on an average with increasing field intensity. This correlation is very exact in individual formations. Magnetic field determines the shape of flocculi. The lines of equal brightness are closely similar to isogausses. In fields with $H > 70$ gauss, the brightness of flocculi decreases with increasing field intensity. As a result, formations acquire the annular structure, sometimes of irregular shape, but centers of the rings, i. e., their darkest parts, coincide with the strongest intensity of the field. Flocculi surrounding sunspots are also of the annular shape. A study of flocculi appearance variations and magnetic fields with time

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87357

S/035/60/000/012/015/019
A001/A001

Brightness of Flocculi, Magnetic Fields and Heating Mechanisms

has shown that magnetic fields affect the formation of flocculi. Convergence and divergence of magnetic force lines renders flocculi more compact or diffuse respectively. The origination of a weak field leads to flocculi appearance. In regions where flares occur, the brightness of chromospheric formations does not follow the above mentioned regularities on the day of a flare. There exist two mechanisms of flocculi origination. The first mechanism is connected with development of fast processes: flares and, possibly, "whiskers". In these cases the floccula appears as a result of the flare afterglow and the propagation of a shock-wave. The second mechanism is also of electromagnetic nature and apparently connected with the absorption of magnetohydrodynamic waves and dissipation of disturbances in regions where the intensity of a field, carried by the wave, is higher than the intensity of the external field. The magnitude of intensity in magnetohydrodynamic waves is estimated. The absorption of the energy of these waves gives rise to the heating of flocculi region at frequencies $\omega > 0.1$ sec^{-1}. In the region of sunspots the energy of the waves is higher, by two orders of magnitude, than the energy of waves in other regions of the active zone. The regions of maximum field may appear as those regions through which tremendous

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87357

S/035/60/000/012/015/019
A001/A001

Brightness of Flocculi, Magnetic Fields and Heating Mechanisms

amounts of energy are transferred by waves from subphotospheric and photospheric layers into the corona, without a noticeable absorption in the chromosphere. The difficulties are listed which arise in explaining the heating of flocculi by the absorption of magnetohydordynamic waves. There are 29 references.

Authors' summary

Translator's note: This is the full translation of the original Russian abstract.

Card 3/3

SMIRNOV, V. Ye., Dr. Phys- Math Sci -- (diss) "Formation of Absorption lines in a Magnetic Field and the magneto-hydrodynamic phenomena in the Suns atmosphere," Leningrad, 1960, 12 pp, 250 cop. (Main Astronomical Observatory, AS USSR) (KL, 43-60, 116)

89789

S/169/61/000/003/006/022
A005/A005

3,1540 (1062, 1128, 1184)

Translation from: Referativnyy zhurnal, Geofizika, 1961, No. 3, pp. 5-6, # 3042

AUTHOR: Stepanov, V Ye.

TITLE: The Motion of Ca^+ in the Chromosphere and the Connection of the Motion With Magnetic Fields

PERIODICAL: "Izv. Krymsk. astrofiz. observ.", 1960, No. 23, pp. 184-211 (English summary)

TEXT: The Krymskaya astrofizicheskaya observatoriya (Crimean Astrophysical Observatory) carried out measurements of the longitudinal magnetic field from the line Fe λ 5,250 Å, the ray speeds, and the brightness in the line H_2Ca^+ by the aid of a magnetograph and a recorder of ray speeds. The ray speed field above the active sun regions in the flocculi and the undisturbed regions of the chromosphere was investigated. The ray speeds were compared with the distribution of the magnetic field on the photosphere level. The existence of wide regions with liftings and sinkings of gas in the chromosphere was established, the extension of which attains to 200,000 km. The motion in these regions has the character of a large-scale turbulence. The characteristical scale of the elements is 5,000 - 20,000

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A005/A005

The Motion of Ca^+ in the Chromosphere and the Connection of the Motion With Magnetic Fields

km, and the life-time is about 7 hours. The total average speed of the turbulent elements is equal to 3.6 km/sec. In the undisturbed chromosphere, the average speed of lifting of gas is equal to -0.96 km/sec, and that of sinking is +1.25 km/sec. The area, in which the liftings proceed, is 56% of the total area of the undisturbed chromosphere. The total stream of the lifted mass is equal to the sinking stream. In the flocculi, the average gas lifting speed is equal to -0.97 km/sec, and that of sinking is +1.7 km/sec. The sinking of gas proceeds in an area which is more than thrice as much as the lifting area. The mass stream of sinking gas is four times greater than that of the lifting mass. Apparently, the excess in sinking mass is compensated by ejections of matter in instationary processes (flares, "whiskers", ejections). The speeds of lifting and sinking increase with increasing brightness of the flocculi. In particularly bright flocculi, the lifting speed is on an average equal to -1.3 km/sec, and the sinking speed is +2.3 km/sec. If the flocculus exists above a section with a magnetic field with one polarity, the gas is sinking in the flocculus in the line H_3, and lifting motions take place around the flocculus. If the flocculus is located

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above magnetic fields of different polarities, the variation in the polarity is accompanied by a variation in sign of the ray speed. Hereat, gas sinking proceeds over sections with an intense magnetic field. In the vicinity of regions with intense magnetic fields and high values of $\partial H_{\parallel}/\partial r$, the zero line of speed passes through near the zero line of the magnetic field or coincides with this. Between two considerably remote sections with intense magnetic fields, two lines of zero speed pass through. The existence of a magnetic field considerably varies the shape of the speed distribution curve. Speeds of $v_{\parallel} \geqslant 1.2$ km/sec occur twice as much and higher more often than in the absence of a magnetic field. The general character of motion above magnetic fields corroborates the conception on a gas motion along the tubes of force of a magnetic field.

Author's summary

Translator's note: This is the full translation of the original Russian abstract.

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BOYARCHUK, A.A.; YEFIMOV, Yu.S.; STEPANOV, V.Ye.

Magnetic intensification of absorption lines. Izv.Krym.astrofiz. obser. 24:52-77 '60. (MIRA 13:12)
(Magnetic fields (Cosmic physics)) (Absorption spectra)

22105

S/030/61/000/003/032/048
A001/A101

3,1540

AUTHOR: Stepanov, V.Ye.

TITLE: The determination of magnetic field gradient in the Sun's photosphere

PERIODICAL: Referativnyy zhurnal. Astronomiya i Geodeziya, no. 3, 1961, 53, abstract 3A453 ("Izv. Krymsk. astrofiz. observ.", 1960, v. 22, 42-48, Engl. summary)

TEXT: Magnetic fields at two photospheric levels, differing in altitude, are determined from the records of the longitudinal component of magnetic field intensity in the active zone of the Sun's surface, made with the magnetograph of the Crimean Astrophysical Observatory AS USSR, on the basis of near and far wings of the NaD_1 line. It has been established that magnetic field in the photosphere increases with the depth, and its change is equal on an average to 0.026-0.035 gauss/km. There are 6 references.

Author's summary

[Abstracter's note: Complete translation]

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29498
S/035/61/000/009/030/036
A001/A101

3.1540 (1559)

AUTHOR: Stepanov, V.Ye.

TITLE: Dependence of solar magnetograph readings on the strength and orientation of the field

PERIODICAL: Referativnyy zhurnal. Astronomiya i Geodeziya, no. 9, 1961, 58, abstract 9A519 ("Izv. Krymsk. astrofiz. observ.", 1960, v. 23, 291-298, Engl. summary)

TEXT: The author considers the problem of the range of strength variation of a magnetic field, measured with a solar magnetograph, for which the signal in the magnetograph still remains to be proportional to Hcos γ, where γ is angle between vector H and the line-of-sight. The signal in the magnetograph, while measuring the Zeeman effect in a corresponding absorption line, is proportional to function $\Phi(H,\gamma)$ determined by the profile of the line. The author uses the theory of origination of absorption lines at the Zeeman triplet effect and a certain model of the photosphere; he calculates the profile for the FeI line λ 5250 and the magnitude of signal deviation in the magnetograph from the proportionality to the Hcos γ-value. The calculation is carried out for both in-

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A001/A101

Dependence of solar magnetograph readings ...

finitesimal narrow and finite widths of the magnetograph output slit. At a finite slit width (0.035 A), the signal in the magnetograph is proportional to Hcos φ for H $\leq$ 200 gauss. For higher values of magnetic field, underestimated field strengths are obtained. In large sunspots, where π - and σ -components can be observed simultaneously after the analyzer (depolarization effect), these estimates of accuracy are inapplicable. In the case of a longitudinal effect in the D_1 Na-line, at symmetrical position (in relation to the core of the line) of the magnetograph slits, the signal is proportional to field H at H $\leq$ 500 gauss. In this case it is still possible to determine the gradient of the magnetic field by singling out, by the slit, of different sections in the line wing. For large field magnitudes, even at a purely longitudinal case, underestimated values of field vector are obtained. There are 8 references.

E. Mogilevskiy

[Abstracter's note: Complete translation]

Card 2/2

S/058/61/000/007/014/086
A001/A101

34.3600

AUTHOR: Stepanov, V.Ye.

TITLE: Coefficient of absorption of atoms in the reverse Zeeman effect at arbitrary multiplicity

PERIODICAL: Referativnyy zhurnal, Fizika, no. 7, 1961, 105, abstract 7V14("Izv. Krymsk. astrofiz. observ.", 1960, v.24, 293-300, Engl. summary)

TEXT: The author proves coincidence of coefficient of emission and coefficient of absorption with respect to the form of their dependence on the wavelength and the angle between the direction of magnetic field and propagation of light. In his proof, the author made use of the method of decomposition of polarized triplet radiation in the Zeeman effect into two beams with mutually orthogonal polarization. The expression for coefficient of absorption presented in beams with mutually orthogonal polarization is generalized to the case of arbitrary splitting at dipole radiation for such fields in which the effect of Paschen-Back does not appear.

[Abstracter's note: Complete translation]

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85107

9,5320
24,3600 (1106,1114)

S/033/60/037/004/013/015/XX
E032/E314

AUTHOR: Stepanov, V.Ye.

TITLE: The Absorption Coefficient in the Inverse Zeeman Effect for an Arbitrary Multiplet Splitting and the Transfer Equation for Light with Mutually Perpendicular Polarisations

PERIODICAL: Astronomicheskiy zhurnal, 1960, Vol. 37, No. 4, pp. 631 - 641

TEXT: A magnetic field gives rise to the splitting of energy levels and thus removes the degeneracy. The contours and the equivalent widths of absorption lines alter when the magnetic field is introduced. An increase in the equivalent width leads to an effective increase in the turbulent velocity, when the latter is determined from the growth curve, and thus introduces an error into the estimation of the chemical composition. The form of the contour and the distribution of polarisation within an absorption line can be used to obtain information about the magnitude, the direction and also the variation of the magnetic-field strength with altitude. These spectroscopic data can only be interpreted if the mechanism of

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The Absorption Coefficient in the Inverse Zeeman Effect for an Arbitrary Multiplet Splitting and the Transfer Equation for Light with Mutually Perpendicular Polarisations

formation of the absorption lines is known. Thus, Unno (Ref. 1) and Warwick (Ref. 2) have discussed the theory of formation of absorption lines in the case of triplets. The transfer equations derived by Unno are, however, not very useful in practice. On the other hand, the theory developed by Warwick is said to be incorrect. The expression for the absorption coefficient in the inverse Zeeman effect for a longitudinal and transverse magnetic field has been widely used in astrophysics (Refs. 3-7). The approximate expression for the absorption coefficient in the case of an inclined field was given by Lorentz (Ref. 8) for some special cases ($\Delta\nu = 0$ and $\gamma = 45^{\circ}$). However, in general, one has to deal with magnetic fields having an arbitrary orientation. In previous papers (Refs. 3-7) the present author has given a derivation of the absorption coefficient for the case of

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triplet splitting in an inclined field. Derivations were also given of the radiation transfer equations and these were solved for a number of special cases. It was shown (Ref. 9) that the effective absorption coefficient can be expressed in terms of the following two coefficients:

$$S_{\pm} = \frac{1}{2}\left[(S_1 + S_2) + \frac{1}{2}(2S_o - S_1 - S_2)\sin^2\gamma \pm \right.$$
$$\left. \pm \sqrt{\frac{1}{4}(2S_o - S_1 - S_2)^2\sin^4\gamma + (S_1 - S_2)^2\cos^2\gamma}\right] \qquad (1)$$

where γ is the angle between the direction of the magnetic field and the line of sight, and S_o, S_1 and S_2

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E032/E314

The Absorption Coefficient in the Inverse Zeeman Effect for an Arbitrary Multiplet Splitting and the Transfer Equation for Light with Mutually Perpendicular Polarisation

are the absorption coefficients in the case of the transverse and longitudinal Zeeman effects. $S_{\pm}$ corresponds to two mutually perpendicular polarisation states:

$$\left(\frac{D_{\parallel}}{D_{\perp}}\right)_{\pm} = i\frac{\frac{1}{2}(2S_o - S_1 - S_2)\sin^2\gamma \pm \sqrt{\frac{1}{4}(2S_o - S_1 - S_2)^2\sin^4\gamma + (S_1 - S_2)^2\cos^2\gamma}}{(S_1 - S_2)\cos\gamma} \qquad (2)$$

where $D_{\parallel}$ and $D_{\perp}$ are the components of the displacement vector in the light wave absorbed by the atoms (Fig. 1). In the present paper, this theory is generalised and an expression is obtained for the absorption coefficient in the inverse Zeeman effect in the general case of multiplet splitting.

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85107

S/033/60/037/004/013/015/XX
E032/E314

The Absorption Coefficient in the Inverse Zeeman Effect for an Arbitrary Multiplet Splitting and the Transfer Equation for Light with Mutually Perpendicular Polarisation

A general transfer equation is also obtained for all the mechanisms of interaction between the medium and the radiation for rays with mutually perpendicular polarisations. The intensity distribution in the sub-components is taken into account. Various theories of formation of absorption lines in an inclined magnetic field are discussed and it is shown that Unno's transfer equations (Ref. 1) are equivalent to the transfer equations for rays with mutually perpendicular polarisations in the case of pure absorption. The formalism developed in the present paper is shown to have advantages over the represnetation of the transfer equations in terms of the Stokes parameters.

Card 5/5

Crimean Astrophysical Observatory
AS USSR

S/033/60/037/005/004/024
E032/E514

AUTHORS: Boyarchuk, A.A., Yefimov, Yu. S. and Stepanov, V.Ye.

TITLE: The Increase in Equivalent Widths of Absorption Lines in a Magnetic Field

PERIODICAL: Astronomicheskiy zhurnal, 1960, Vol.37, No.5, pp. 812-823

TEXT: The theory of the inverse Zeeman effect developed in Refs. 1-3 is used to determine the magnetic broadening of equivalent widths as a function of the nature of the splitting, the strength and direction of the magnetic field and the physical state of the atmospheres. The magnetic broadening of an absorption line is defined by

$$q = \ln \frac{W^{*}}{W_{o}} \qquad (1)$$

where W^{*} is the broadened line width and W_{o} is the line width in the absence of a magnetic field. The calculations are carried out for the following lines: FeI, FeII, NdII, EuII and LaII. It is found that the magnetic broadening in a longitudinal field

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increases linearly with $n\delta$, where n is the number of components and δ is the distance between neighbouring sub-components. It is assumed that LS-coupling is operative. When the magnetic field is at an angle to the line of sight, there is an additional broadening due to blending of sub-component groups with different polarizations. In this case the broadening depends on the intensity distributions in the sub-components of the splitting and increases with this angle. This increase is most rapid between 0 and 50° and then tends to level off. The magnetic broadening is proportional to the intensity of the magnetic field for all fields observed in the atmospheres of magnetic stars. The broadening decreases with increasing turbulent velocity and damping constant. The dependence of the magnetic broadening on the number x_o of absorbing atoms is more complicated. At first, the broadening increases with x_o, it then reaches a maximum at $x_o = 160$ and slowly tends to zero thereafter. General expressions are derived for calculating the magnetic

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E032/E514

The Increase in Equivalent Widths of Absorption Lines in a Magnetic Field

broadening as functions of the magnetic field, the angle between the magnetic field and the line of sight, the number of absorbing atoms and the damping constant. It is shown that the formula given by Warwick (Ref.9) is incorrect and cannot be used in the calculation of the equivalent widths of lines in a magnetic field. An estimate is given of the role played by the magnetic field in determining the abundances of elements in the atmospheres of magnetic stars. It is shown that the magnetic field cannot give rise to the observed broadening of rare-earth lines and that their excess abundance in peculiar A stars is real. A study is also made of the effect of the magnetic field on the growth curve for sunspots. The magnetic field tends to produce a rise of the curve as a whole. In the linear part of the curve the broadening is very small and tends to zero for large x_o. In order to determine the effect of the magnetic broadening in sunspots, it is necessary to plot growth curves separately for spots in the neighbourhood of the centre of the solar disc and those near its

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S/033/60/037/005/004/024
E032/E514

The Increase in Equivalent Widths of Absorption Lines in a Magnetic Field

limb. In order to determine the physical conditions in sunspots, the growth curve must be corrected for the effect of the magnetic field. Acknowledgment is made to T. S. Galkina for assistance in the numerical calculations. There are 8 figures, 4 tables and 15 references: 6 Soviet, 2 German and 7 English.

ASSOCIATION: Krymskaya astrofizicheskaya observatoriya Akademii nauk SSSR (Crimean Astrophysical Observatory, Academy of Sciences USSR)

SUBMITTED: April 19, 1960

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S/035/62/000/005/044/098
A055/A101

AUTHOR: Stepanov, V. Ye.

TITLE: On the problem concerning the movement at various levels of the Sun's atmosphere

PERIODICAL: Referativnyy zhurnal, Astronomiya i Geodeziya, no. 5,1962, 48, abstract 5A368 ("Izv. Krymsk. astrofiz. observ.", 1961, 25, 154 - 173, English summary)

TEXT: On the basis of photoelectric recordings, the author investigates the tangential movements in the chromosphere in the region of the flocculi fields, and the movements at the photosphere level. He shows that, in the case of 70% of all flocculi, gas flows in through their outer boundaries. The flow-in rate is, on the average, 0.6 km/sec for all flocculi. At the photosphere level, the field of velocities has a very complicated structure. The regions of upward and downward movements of the gas have an extent that reaches often $1.5 \cdot 10^5$ km. In certain parts of these regions, there are zones with opposite direction of movement, which renders the velocity field picture multiconnected. The average characteristic

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On the problem concerning the...

size of the movement elements depends on the maximum velocity. In the presence of a velocity superior to 300 m/sec, the average characteristic size is equal to $0.5 \cdot 10^5$ km. The maximum velocity of large-scale movements observed in the photosphere outside of the sunspots is equal to 450 m/sec. The distribution of the velocities corresponds - as it does in the sub-photospheric layers (RZhAstr, 1957, no. 10, 8233) - to the Pearson distribution. The RMS velocity is twice the velocity in the sub-photospheric layers; it is equal to 76 m/sec. The comparison of the movements with the magnetic field charts reveals that, in the photosphere, matter can move easily in the direction perpendicular to the magnetic field force lines, and that a polarity change is not accompanied by a change in the direction of movement. This indicates the absence of the "freezing-in" of the magnetic field into the matter. The velocity field in the sunspots and in their vicinity shows a flow-off of the gas from the active region at the photosphere level. The flow-in of the gas through the flocculi boundaries, the downward movement of the gas in the flocculi, its flow-off at the photosphere level below the flocculi and its upward movement in the nearest vicinity of the flocculi are indicative of the presence of a gas circulation, similar to the circulation that occurs over the spots. However, the flow of the gas entering the flocculi is by an order smaller

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than the flow of the gas in the downward radial direction; this shows the reality of the observed excess of the downward flow of gas over the upward flow. Apparently, small-area sections do really exist in the chromosphere, from which matter is ejected into the corona at enormous velocities, that are not recorded by the measuring device. High tangential velocities in the chromosphere and the relative immobility of the fine structure flocculi elements, observed in the H_3, K_3 and CaII lines, are indicative of the localization of the exciting agent in the photospheric and sub-photospheric layers. Large-scale movements, whose characteristic size is $\sim 10^5$ km, are observed in the chromosphere, the photosphere and the sub-photospheric layers. Medium-scale movements of elements, whose characteristic size is $4 \cdot 10^3 - 2 \cdot 10^4$ km, also occur in the chromosphere and the photosphere. The existence of smaller-scale movements speaks for the hierarchical structure of turbulent movements in the atmosphere of the Sun; the turbulent movement energy dissipation in the Sun's atmosphere is by 3 orders greater than in the chromosphere; in the sub-photospheric layers, it is by 4 orders greater than in the chromosphere. There are 27 references.

Author's summary

[Abstracter's note: Complete translation]

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S/035/62/000/005/048/098
A055/A101

AUTHOR: Stepanov, V. E.

TITLE: Determination of the average gradient of the magnetic field in the chromosphere

PERIODICAL: Referativnyy zhurnal, Astronomiya i Geodeziya, no. 5, 1962, 51, abstract 5A381 ("Izv. Krymsk. astrofiz. observ.", 1961, 25, 174 - 179, English summary)

TEXT: On the basis of photoelectric recordings of magnetic fields in the chromosphere (from lines H_3, CaII) and in the photosphere (from line Fe λ5250), the author determines the variation of the field strength with height. The magnetic field gradient at 50 gauss strength in the photosphere is 0.01 gauss/km. The magnetic field penetrates easily into the chromosphere, and its variation with height is slower than in the photosphere. The greater is the field strength, the greater is the field gradient.

Author's summary

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45126

S/712/62/027/000/007/015
A001/A101

24.6710

AUTHOR: Stepanov, V. Ye.

TITLE: Radiative equilibrium equations in atmospheres of magnetic stars

SOURCE: Akademiya nauk SSSR. Krymskaya astrofizicheskaya observatoriya. Izvestiya. v. 27, 1962, 140 - 147

TEXT: The author derived in a previous work published in the same journal, v. 19, 1958, p. 20, equations for radiation transfer at the presence of a magnetic field. Conditions for radiative equilibrium were expressed in the following form:

$$J_{\nu+} = \sigma_+ \left[k_+ \int_{4\pi} I_{\nu+}(\theta) \frac{d\omega}{4\pi} + k_- \int_{4\pi} I_{\nu-}(\theta) \frac{d\omega}{4\pi} \right];$$

$$J_{\nu-} = \sigma_- \left[m_+ \int_{4\pi} I_{\nu+}(\theta) \frac{d\omega}{4\pi} + m_- \int_{4\pi} I_{\nu-}(\theta) \frac{d\omega}{4\pi} \right]. \qquad (4)$$

In the present work the author develops a method for calculating coefficients

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Radiative equilibrium equations in...

$k_{\pm}$ and $m_{\pm}$ on assumption of purely coherent scattering in frequency and condition of stationary state. The expressions derived for these coefficients are functions of optical depth. Under certain conditions these quantities are equal to unity; if they do differ from unity, the amount of difference indicates the degree of optical orientation of atoms arising due to their excitation by polarized light with intensities I_+ and I_-. Therefore, the angular distribution of re-emission (effective) depending on direction does not follow the angular distribution which takes place in processes of absorption. The formulae of $k_{\pm}$ and $m_{\pm}$ are derived for some particular transitions, such as $j = 0 \rightarrow j = 1$, $j = 1 \rightarrow j = 0$, and $j = 1/2 \rightarrow j = 1/2$. It is shown that equations of radiation transfer taking into account scattering of coherent re-emission can be solved by the method of successive approximations, and the wanted accuracy can be attained. There are 5 figures.

SUBMITTED: May 1961.

Card 2/2

S/712/62/028/000/008/020
E032/E314

AUTHORS: Stepanov, V.Ye. and Gopasyuk, S.I.

TITLE: The structure of magnetic fields in active solar systems

SOURCE: Akademiya nauk SSSR. Krymskaya astrofizicheskaya observatoriya. Izvestiya. v. 28. 1962. 194 - 223

TEXT: The transverse and longitudinal components of the magnetic field were investigated for an active solar region, using the method described in a previous paper (Stepanov and Severnyy, present issue, p. 166) The magnetic field was recorded using the Fe λ5250 Å line (splitting factor 0.3/1), for which calibration charts were available so that the absolute magnitude of H and its angle to the line of sight could easily be determined. The active regions was followed for 8 days (September 1-8, 1961). Charts showing the magnitude of the field and its orientation are reproduced. Analysis of the charts showed that in sunspot regions the average transverse field was higher than the average longitudinal field by a factor of 2.3. This factor became 1.6 and 1.7 in the penumbra and umbra, respectively. The

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recorded distributions show that the structure of the magnetic field at the level of the photosphere in the multi-centre sunspot group resembles, in general, a dipole interaction pattern. However, when the distance between the sunspot umbras increases, an eddy structure appears in the penumbral region and its vicinity. This is due to the appearance of a finite azimuthal field component. The direction of the azimuthal field for the leader of the group was clockwise. The variation in the magnitude of the field vector for the leader of the group is found to be in excellent agreement with previous work (A.P. Severnyy - Izv. Krymskoy astrofiz. obs., 22, 12, 1960). The field falls off most rapidly in the penumbral region. The magnitude of the field at the penumbra-photosphere boundary is 500 Oe, while the angle between the field and the line of sight increases from zero at the centre of the spot to 60° at the above boundary. It then falls off slowly with increasing distance. Fig. 13 shows the variation in the field components with distance (in units of 500 km) for the leader of the group on April 5, 1961. A study of the bipolar structure of the umbra of the follower revealed the presence of strong azimuthal field components in neighbouring umbras. The

azimuthal component H_φ reaches its maximum on the $H_\parallel = 0$. The maximum value is equal to the value of $H_\parallel$ near the centre of the main umbra. The lines of force are parallel to the $H_\parallel = 0$ line and characterize the direction of the azimuthal component of the transverse field. The variation of $H_\parallel$ and H_φ with distance is similar to their distribution in a force-free field with cylindrical symmetry if it is assumed that the azimuthal components of two force-free fields of regions of different polarity can be added. An estimate is made of the conductivity coefficients for the partially ionized gas in the umbra and the neighbouring photosphere, using the magnetic-field data. The values of λ_0, λ_1, λ_2 and λ_3 for the umbra are 10^{12}, 6×10^9, 10^{10} and 4×10^{10} e.s.u., while the results for the photosphere are 2×10^{12}, 9×10^{11}, 8.5×10^{11} and 2×10^{12}, where λ_0 is the conductivity along the field direction, λ_1 is the conductivity in the direction perpendicular to the field, λ_2 is the Hall conductivity, and λ_3 is

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the conductivity associated with Joule losses. It turns out that the conditions existing at the sunspot umbra are favourable for the existence of near-force-free fields. There are 17 figures and 3 tables.

SUBMITTED: December 22, 1961

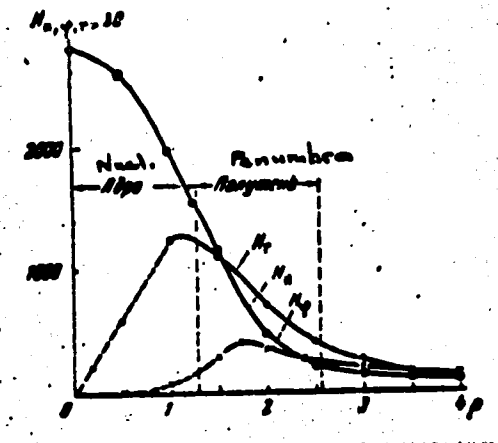

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Fig. 13:

S/712/62/028/000/012/020
E010/E401

AUTHOR: Stepanov, V.Ye.

TITLE: The atomic absorption coefficient of light with mutually perpendicular polarization, taking into account anomalous dispersion in the presence of a magnetic field

SOURCE: Akademiya nauk SSSR. Krymskaya astrofizicheskaya observatoriya. Izvestiya. v.28. 1962. 252-258

TEXT: The author extends further the formalism developed by D.N.Rachkovskiy (Izv. Krymskoy astrofiz. obs., v.27, 1962, 148) for absorption coefficients with allowance for changes of refraction indices within absorption lines. Using his expressions for absorption exponents and presenting different polarizations in the complex-vector form, the author derives the following final formulas for the effective absorption coefficients of light with mutually perpendicular polarization taking into account anomalous dispersion

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$$s_{\pm} = \frac{1}{2}\left[(s_1 - s_2) + \frac{1}{2}(2s_0 - s_1 - s_2)\sin^2\gamma \pm \right.$$
$$\left. \pm (1-\delta)\sqrt{\frac{1}{4}(2s_0 - s_1 - s_2)^2 \sin^4\gamma + (s_1 - s_2)^2\cos^2\gamma}\right]. \quad (36)$$

The polarization state for these coefficients is determined by the formula

$$\left(\frac{D_{\parallel}}{D_{\perp}}\right)_{\pm} = i\frac{\frac{1}{2}(2s_0 - s_1 - s_2)\sin^2\gamma \pm \sqrt{\frac{1}{4}(2s_0 - s_1 - s_2)^2\sin^4\gamma + (s_1 - s_2)^2\cos^2\gamma}}{(s_1 - s_2)\cos\gamma}. \quad (37)$$

where s_0, s_1 and s_2 are absorption coefficients (per one atom) for subcomponents of splitting (s_0 corresponds to the transition $\Delta m = 0$); γ - inclination angle and δ - a quantity depending on the strength of magnetic field H, refraction indices, angle γ, and representing the effect of anomalous dispersion. Its change as a function of distance to the middle of a spectral line is

shown in the figure. The effect of anomalous dispersion results in a decrease in the difference between the two absorption coefficients s_+ and s_-, for states with mutually perpendicular polarization. The author then considers the effect of anomalous dispersion in the magnitude of signals from the longitudinal and transversal components of a magnetic field, in the case of an optically thin absorption line at a narrow slit of the magnetograph photometer. The corresponding expressions for these signals are

$$\Delta\delta i_{\parallel} \approx (1-\delta)(s_1 - s_2)\cos\gamma; \quad (41)$$

$$\Delta\delta i_{\perp} \approx (1-\delta)(2s_0 - s_1 - s_2)\sin^2\gamma \sin 2\chi. \quad (42)$$

These equations show that the anomalous dispersion effect decreases the magnitude of signals, since $0 \leqslant \delta \leqslant 1$. The author concludes that the use of narrow photometer slits for photoelectric recordings of magnetic fields may noticeably distort the magnitude of signals in the case of strong magnetic fields, $H \approx 1800$ gauss, and inclination angles $\gamma \approx 20$ to $40°$. The

The atomic absorption ...

effect on signal magnitude of anomalous dispersion is negligible for slits used in the Crimean Astrophysical Observatory for recording magnetic fields. There is 1 figure.

SUBMITTED: December 22, 1961

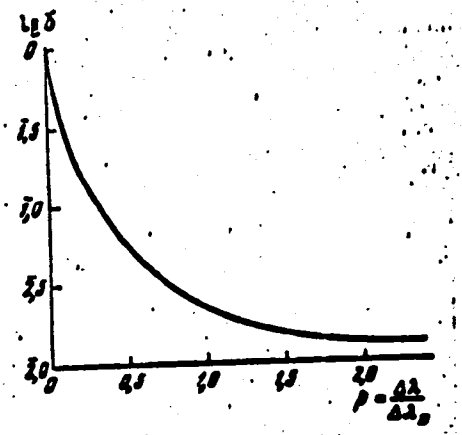

Fig. Change of lg δ as a function of distance to the line center, in terms of Doppler half-widths, for H = 1700 gauss, $\gamma = 40°$ (Fe λ 5250 Å)

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STEPANOV, V.Ye., doktor fiz.-matem. nauk

The 22d Symposium of the International Astronomical Union.
Vest. AN SSSR 33 no.12:71-72 D '63. (MIRA 17:1)

ACCESSION NR: AP4007513 S/0214/63/000/001/0055/0067

AUTHOR: Kuklin, G. V.; Stepanov, V. Ye.

TITLE: Motion of gas and magnetic field in a sunspot

SOURCE: Solnechny*ye danny*ye, no. 1, 1963, 55-67

TOPIC TAGS: gas velocity field, magnetic field, magnetic field configuration, sunspot, penumbra, umbra, effective mass rotation, rotation templet, magnetic force line, sunspot photograph, chromosphere, spectral line, magnetic force tube

ABSTRACT: The rotational motion of gas masses in a large sunspot was studied by means of several maps drawn each day, with time intervals of 30 min to 1.5 hr. Radial velocities of gas motion changed from day to day. The effective rotation of gas was computed from mean radial velocities for the umbra, the penumbra, and the whole spot. The rotation is clockwise, with a mean velocity of 179 ±48 m/sec for the whole spot. The angular velocity of gas rotation in the umbra is twice that in the penumbra. The direction of rotation of gas masses in the spot coincides with twists in the magnetic force lines. The

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ACCESSION NR: AP4007513

vertical motion of gas is unstable, with rapid changes of direction. The mean lifting velocity is -150 m/sec and the sinking velocity, +120 m/sec. The spiral structure of the penumbra is surprisingly similar to the spiral form of magnetic force lines. Kuklin and Stepanov conclude that streams of gas flowing from a sunspot follow along magnetic force lines, pass through the photospheric layer, and go into the chromosphere. Orig. art. has: 8 figures and 3 tables.

ASSOCIATION: Institut zemnogo magnetizma, ionosfery* i racprostraneniya radiovoln Sibirskogo otdeleniya AN SSSR (Institute of Terrestrial Magnetism, Ionosphere, and Propagation of Radio Waves, Siberian Department, AN SSSR

SUBMITTED: 00 DATE ACQ: 21Jan64 ENCL: 00

SUB CODE: AS NO REF SOV: 006 OTHER: 011

Card 2/2

DANDUROV, Mesrop Ivanovich, prof.; KOROL'KOV, Nikolay Mikhaylovich, inzh.; LIMANOV, Yu.A., prof., retsenzent; STEPANOV, Ya.I., inzh., retsenzent; KARAMYSHEV, I.A., inzh., red.; KHITROVA, N.A., tekhn. red.

[Maintenance and reconstruction of tunnels]Soderzhanie i rekonstruktsiia tonnelei. Moskva, Tranzheldorizdat, 1962. 185 p. (MIRA 15:11)
1. Chlen-korrespondent Akademii stroitel'stva i arkhitektury SSSR (for Dandurov).
(Tunnels—Repair and reconstruction)

STEPANOV, Ye., ekspert vsesoyuznoy kategorii po sluzhebnomu sobako-vodstvu.

Raising and training dogs. Voen. znan. 37 no. 2:36 F '61. (MIRA 14:1)

(Dogs--Training)

STEPANOV, Ye.

Liquid disinfection. Zashch. rast. ot vred. i bol. 10 no.9: 7-9 '65. (MIRA 18:11)

1. Glavnyy agronom Karagandinskoy stantsii zashchity rasteniy.

STEPANOV, YE.

PA 26/49T93

USSR/Radio Receivers, Crystal Controlled Jan 49

"Crystadnye," Ye. Stepanov, 3 pp

"Radio" No 1

Design of various crystadynes, and device for checking effectiveness of various crystals when paired with other elements (zincite paired with carbon and steel, ferrosilicon with graphite, etc.).

[redacted]

26/49T93

STEPANOV, YE. PA 42/49T106

USSR/Radio Receivers, Crystal Controlled Apr 49
Batteries, Radio

"An Attachment for Crystal Sets," Ye. Stepanov, 1 p

"Radio" No 4

Photograph and diagram of attachment consisting of a zincite-steel crystal and an 8-12 volt battery to increase the range and volume of crystal sets.

42/49T106

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"A Low-Frequency Amplifier for the 'Komsomolets' Receiver," Radio, No. 7, 1949.

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"A Home-Made Filament Rheostat," Radio, No. 7, 1949.

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"An Out put Transformer," RADIO, No. 11, 1949. Moscow. -c1949-.