2

USSR
ELECTRONIC AND PRECISION EQUIPMENT

Number 2 22 October 1958

Prepared by

Foreign Documents Division
CENTRAL INTELLIGENCE AGENCY
2430 E. St., N. W., Washington 25, D.C.

Approved For Release 1999/08/25 : CIA-RDP78-03107A000100020002-7

PLEASE NOTE

This report presents unevaluated information selected from Russian-language publications as indicated. It is produced and disseminated as an aid to United States Government research.

USSR ELECTRONIC AND PRECISION EQUIPMENT

Table of Contents

I. ITEMS OF SPECIAL INTEREST

A. Soviet Commentary

1. Elements of Technical Progress

It is impossible to make atomic devices, rockets, artificial earth satellites, electronic machines, and other modern equipment without the use of various automatic instruments and apparatus. Mechanization and automation have become an indispensable element of technical progress in socialist production. (Progress tyazheloy industrii v SSSR (Progress of Heavy Industry in the USSR), book by V. I. Kuznetsov, Moscow, 1958, p 53)

2. USSR Claims More Rapid Development of Germanium Than US

It took the US from 1942 to 1946 to take the production of germanium out of the laboratory and set it up on an industrial basis. In 1946, the US produced only one-half ton of germanium.

In the USSR, this work began after World War II, but went ahead much more rapidly. This was not because the USSR was following a beaten path, since the Americans did not disclose their manufacturing secrets. The USSR moved along more rapidly because it knew what could be achieved with the use of germanium (in which case American know-how [in application] was useful), and because it carried on this work on a broad front. In Leningrad, Moscow, and Kiev, numerous institutes and laboratories conducted research, and found ways to clean germanium.

Scientific research is continuing, and the variety of semiconductor materials is ever increasing. (Moscow, Znaniye-Sila, Jul 58, p 5)

3. USSR Gravitometers Called Superior to Those of US

Both the USSR and the US ship gravitometers to India, where they are used for prospecting purposes. Practice has shown that the gravitometers produced by the Leningrad Geologorazvedka Plant are superior in quality and reliability to those made in the US. This fact was disclosed in a letter from India received by the Ministry of Geology and Conservation of Mineral Resources.

Geologists of other countries are pleased with the Geologorazvedka Plant's products. In China, air-borne geophysical stations, truck-mounted ratio meters, and other instruments made by the plant are in operation. (Leningradskaya Pravda, 4 Apr 58)

4. Transistor Limitations Recognized

Ten years ago, a new device, the semiconductor triode or transistor, was developed. It seemed at that time that the transistor would eventually replace the vacuum tube.

At present a multitude of various semiconductor devices have been developed; new types of semiconductors are being developed and improved. However, it has now become clear that the new device cannot fully replace the vacuum tube in all its applications.

Nevertheless, because of its low power requirements, small size, low weight, high mechanical strength, and other qualities, the transistor is preferred over vacuum tubes in various portable apparatuses, in battery-fed equipment, and in military equipment. The transistor can also find wide application in motion-picture apparatus. (Moscow, Kinomekhanik, Aug 58, p 36)

B. Consumer Goods Deficiencies

Many Leningrad photography enthusiasts and professional photographers possess type Molniya photographic pulse lamps, and used them successfully as long as batteries for them were available. However, for several months, it has been impossible to acquire batteries for the Molniya, because they are shipped to Leningrad department stores very rarely and in small quantities.

Perhaps this does not bother the trade organizations, but it does affect us photography enthusiasts, because if we do not have batteries, we simple cannot use our pulse lamps. -- I. Ignatenkov, Leningrad (Moscow, Sovetskoye Foto, Jul 58, p 85)

A year ago, my wife and I bought our son Kostya a Smena-2 camera. After several films had been exposed, both the shutter and the self-timer broke down. We could not get the camera repaired at the rayon center, and a train trip to Vladimir produced no better results. It was finally necessary to ship the camera to Moscow to one of the listed recommended guarantee repair shops. After a long wait, the package was returned to us -- unopened. The personnel of the guarantee repair shop had refused even to accept the package at the post office.

Next year our son will be finishing 10-year school and we would like to know how best to mark this occasion, and what kind of present to give him. -- A. Tyurin, Stavrovo Village, Vladimirskaya Oblast

Approved For Release 1999/08/25 : CIA-RDP78-03107A000100020002-7

From the Editors: A similar situation has also been described in a letter from A. A. Anikin of Angarsk, who bought Zorkiy-S Camera No 56021556 in 1957 and subsequently found manufacturing defects in it. He has not yet received a reply [to his communication to the plant], a refund, or a camera in return for the defective one. We take this opportunity to ask the plant management what must be done. (Moscow, Ogonek, No 30, Jul 58, p 21)

The number of photography enthusiasts is rapidly increasing in the USSR, and each of them hopes eventually to become a master of his craft. However, the prerequisites to realization of such aspirations include not only skill and a good camera, but also good-quality film, photographic paper, chemicals, and enlargers, which are not currently available in the stores. Time after time we tradespeople have been unable to provide the prospective purchaser with such goods as cut film, light filters, interchangeable lenses, chemicals for both black-and-white and color development, cheap or expensive light meters, lens caps, cassettes, film clamps, etc.

The enthusiast has great difficulty trying to get an enlarger. Those which are available are either too expensive or of poor quality, and none are produced in sufficient quantity or variety. Practically the only enlarger available is the Smena, and it is far from satisfactory. In fact, it is often purchased for the sole reason that no other is available. Only 3,000 of the very-poor-quality Neva-2 enlargers are produced each year, and they can be purchased only in Leningrad.

The Voronezh base of Glavkul'ttorg [Main Administration of Wholesale Trade in Cultural and Sporting Goods] has supplied stores with EV-1 [electronic?] flash units without batteries. For example, the Moscow Central Department Store sold 3,000 flash units but was supplied with only 1,900 batteries to go with them.

The Moscow Photographic Accessories Plant of the Administration of the Metalworking Industry of the Moscow City Executive Committee is supposed to be producing a large variety of photographic equipment and accessories, but because of an extensive list of extraneous products currently in production there, this plant is producing only enlargers and floodlights in the photographic line.

At a conference of buyers held recently at the Moscow Central Department Store, photographic enthusiasts met with trade and industrial representatives. It is noteworthy that many new types of cameras were demonstrated at this conference, but no other photographic equipment or accessories were shown.

Enthusiasts and tradesmen are turning to the sovnarkhozes (councils of national economy) of Moscow City and Oblast, Voronezh, Khar'kov, Leningrad, Kiev, and others with requests for immediate production of the variety of equipment and accessories in current demand. -- S. Trelin, Deputy Commercial Director, Central Department Store; and S. Loskutov, Foreman, Cultural and Sporting Goods Department (Moscow, Trud, 11 Jun 58)

C. <u>Plants</u>

G. Zborynkin is deputy director of the Moscow Illumination Engineering Products Plant. (Moscow, Promyshlenno-Ekonomicheskaya Gazeta, 6 Apr 58)

[Comment: A fairly long article on this plant dealing with production and supply fails to give any direct or implied information on the nature of the plant's operations, products, or suppliers].

The Ramenskoye Electrical Machinery Plant (Ramenskiy elektromekhanicheskiy zavod) has converted its operations to a shopless basis. (Moscow, Leninskoye Znamya, 24 Apr 58)

[Comment: This appears to be a new plant.]

The Bobruysk Scales Plant (Bobruyskiy vesovoy zavod) adopted a number of new processing methods in 1957, including the chill casting of iron, the use of mechanically driven rollers for straightening cut steel strips, and the application of other devices in production. (Minsk, Sovetskaya Belorussiya, 25 Apr 58)

[Comment: This appears to be a new plant.]

The Ivan'kovo Thermometer Factory (Ivan'kovskaya fabrika termometrov) is the only factory of its kind in the USSR. It produces various types of consumer thermometric devices, which are used in all parts of the country. The factory produced about 3.5 million thermometers in 1957.

In 1958, the factory will produce about 4 million products, including more than 3.7 million indoor, outdoor, and vat thermometers and several hundred thousand sandglass cooking timers (timing from one to 12 minutes). (Moscow, Leninskoye Znamya, 3 Apr 58)

[Comment: This appears to be a new plant.]

A new electrical engineering plant has begun operations in Leninakan, Armenian SSR. It has already produced 300 welding transformers and will produce several thousand during 1958. The plant also expects to organize the production of other types of transformers. (Riga, Sovetskaya Latviya, 16 Apr 58)

The first stage of the Vladimir Electric Motor Plant (Elektromotornyy zavod) of the Vladimirskiy Sovnarkhoz went into operation in 1957. The plant has begun series production of electric motors up to 100 kw in power. High-production USSR-made machine tools and units are being installed in the plant shops; constant-flow lines and conveyers are being set up. The plant has a machine and assembly shop (1). (Moscow, Vechernyaya Moskva, 4 Apr 58)

(1) Photo available in source, p 1, bottom

The production buildings of the Vitebsk Electrical Measuring Instruments Plant are under construction along the bank of the Zapadnaya Dvina river. The production of instruments has already begun in one of the buildings. (Minsk, Sovetskaya Belorussiya, 12 Apr 58)

During the past few years, the grounds of the Yerevan Armelektro Plant imeni Lenin have been expanded considerably, new production buildings have been constructed, and the railroad line has been lengthened. So far, 25,000 trees have been planted over an area of more than 4 hectares. (Yerevan, Kommunist, 8 Apr 58)

D. Thermoelectric Generators

The Termoelektrogenerator Plant [also known as the Metallolamp Plant and the Radio Products Plant] of the Moscow Oblast Sovnarkhoz began the production of 2-volt thermoelectric generators in 1953. The TEGK-2-2 thermoelectric generators it now produces have a voltage of 100 volts. The kerosene lamp on which the thermoelectric generator is installed can be used simultaneously as a source of light.

The plant is now getting ready to produce the 16-watt TGU-1 thermoelectric generator for supplying power to the Urozhay two-way radio. The TGU-1 is installed on a kerosene-gas burner. The plant is also assembling an experimental model of a 200-watt thermoelectric generator (2) for the cathode electrical protection of oil and gas pipe lines. (Moscow, Leninskoye Znamya, 3 Apr 58)

(2) Photo showing the testing of a 200-watt thermoelectric generator available in source, p 2, top

E. Superior Equipment Exported to India

On 17 October 1957, a conference on problems of large-unit [package] installation of electrical equipment was held by the Technical Council of Tyazhpromelektroproyekt [State Planning Institute for Electric Power in Heavy Industry?]. One of the resolutions adopted by the Technical Council at the conference read as follows:

The maximum introduction of package devices and units into production is one of the main tasks of the plants of the electrical industry and plants of Glavelektromontazh [Main Administration for Carrying Out Electrical Installation Work]. Gosplan (State Planning Commission) should be requested to make it obligatory for plants of the electrical industry to supply USSR plants with the same kind of new package electrical equipment as that manufactured for the metallurgical plant in India, except that such equipment need not be adapted for tropical operation. Gosplan also should have producer plants supply cranes with all electrical equipment installed. It should continue to work with electrical plants toward expanding their products-lists and mastering the production of package electrical units. (Moscow, Promyshlennaya Energetika, Jul 58, p 35)

F. Leningrad Industry Represented at World Fair

Almost 50 percent of all the equipment made by RSFSR plants for exhibit at the Brussels World Fair was produced in Leningrad. Leningrad has long been famous for its precision instrument industry. Many new instruments have been made for the Brussels fair, including one for visual observation, motion-picture photography, and still photography, through a microscope, of heat-resistant metals and alloys undergoing high-temperature heating and tension in a vacuum. Another interesting instrument, produced at a Leningrad plant, is the two-beam automatic spectrophotometer, which can be used for solving many practical problems in science and industry. For the first time, an optical infinity micrometer has been developed. This instrument, which has no equal abroad, will be exhibited at the fair.

Television sets, some of which are still entirely new to Leningrad residents, will also be exhibited. These include the Mir, Yubiley, Zarya, and Znamya-58. The 21-tube Mir receives five channels and has a 440 by 320 mm screen. The Yubiley is a 13-tube, 12-channel table model.

The Yunost', Neva, Estafeta, Vympel, Sputnik-2, and other cameras will also be displayed at the fair. The new Neva and Leningrad cameras are especially noteworthy.

The Leningrad exhibits will be equal to or above the current level of world science and technology. (Leningradskaya Pravda, 12 Apr 58)

[Comment: For descriptions and illustrations of several of the Russian cameras on display in Brussels, see Popular Photography, Vol 43, No 4, New York, N Y, Oct 58, pp 22-32 and p 60]

G. Velour Paper to Replace Fabric

In various branches of the USSR national economy, such as the radio, instrument, jewelry, optical, and perfume industries, great quantities of high-quality expensive fabrics are used for technical needs. Most of these fabrics could be replaced by velour paper.

The Grigishkskiy Paper Mill has designed and put into operation an experimental unit for the continuous production of velour paper. (Moscow, Bumazhnaya Promyshlennost', Jul 58, p 22)

H. Unusual Change in Subordination

The Central Asian Officer of Elektrochasofikatsiya, which is located at ulitsa Chimkentskaya No 20, Tashkent, is now subordinate to the Ministry of Construction RSFSR. (Stalinabad, Kommunist Tadzhikistana, 1 Apr 58)

[Comment: Elektrochasifikatsiya was formerly known as the State Repair, Planning, and Installation Office of Glavchasprom (Main Administration of the Timepiece Industry), of the former Ministry of Instrument Building and Automation Equipment USSR.]

II. ELECTRONIC EQUIPMENT

A. Tubes and Bulbs

The Moscow Electric Bulb Plant is producing five new types of measuring photo cells: the TsV-6, the STsV-6, a cell with a bismuth-silver-cesium cathode, the F-2, and the STsV-2A.

The TsV-6, which is designed for receiving radiation in the red and infrared portions of the spectrum, is used for the type SF-4 non-registering quartz spectrophotometers. This vacuum photocell utilizes an oxygen-silver-cesium cathode mounted on a rectangular 18-by-30-mm nickel plate, and has a cylindrical bulb. The anode is made in the shape of a rectangular frame out of nickel wire.

The STsV-6 photocell is designed to receive radiation in the ultraviolet and visible parts of the spectrum. It is also used in the SF-4 nonregistering quartz spectrophotometer. The combined use of the TsV-6 and STsV cells makes it possible for the instrument to reach all parts of the spectrum. The STsV vacuum cell utilizes an antimony-cesium cathode mounted directly on the glass of the cylindrical bulb. The anode, which is mounted in the lower part of the bulb, acts as an antimony screen and vaporizer.

The photocell with a bismuth-silver-cesium cathode, which was designed for the SF-2 spectrophotometer, is used for receiving radiation in the visible part of the spectrum. This vacuum cell has a semitransparent cathode fused to one side of the spherical bulb. The anode, which acts simultaneously as a silver and bismuth screen and diffuser, is mounted in the center of the bulb. The bismuth-silver-cesium cathode was developed in the Soviet Union for the first time by A. A. Mostovskiy.

The F-1 vacuum photocell, which was developed in the USSR, is designed for instruments used in determining the percentage of alloyed admixtures in steel smelts and is based on the principle of photoelectric effect. The F-1, which initially had been called the STsV-9, has an antimony-cesium cathode and a uviol glass bulb with a drawn-out thin-wall eye. It differs from regular USSR-produced measuring photocells of this type in that it utilizes a special design protective ring, and has dichlordimethylsilane moisture-proof coating.

The STsV-2A miniature two-anode vacuum photocell is designed for use in bridge circuits. It receives the visible part of the spectrum, and has an antimony-cesium cathode located on a trough-shaped metal plate.

The circular-field photocell is a miniature-type vacuum cell with an antimony-cesium cathode, designed for work in the short-wave and visible parts of the spectrum. The anode and the metal cathode plate are mounted coaxially and are fused directly on the bulb wall.

Magnesium photocells are sensitive to the ultraviolet part of the spectrum and insensitive to the visible part. Because of the narrow range of uses for these photocells, they are still being produced only as individual models.

(Source gives detailed information on photocells.) (Moscow, Svetotekhnika, Jan 58, pp 3-11)

The BS-3 fluorescent lamp, which was developed by the Moscow Electric Bulb Plant, is used in the type LAS-5 mine lamp. (Moscow, Svetotekhnika, Jan 58, p 19)

B. Radio and Television Equipment

During the first quarter of 1958, one million radio receivers and 219,000 television sets were produced in the USSR. (Moscow, Promyshlenno-Ekonomicheskaya Gazeta, 13 Apr 58)

Retail prices of radio and television sets quoted in a lottery list for the Estonian SSR are as follows (in rubles):

Daugava radio receiver	765
Estoniya radio phonograph	2,200
Turist radio receiver	330
Daugava radio-phonograph	1,100
Akkord radio-phonograph	1,150
Rekord radio-phonograph	495
Rodina radio receiver	405
Rekord television set	1,850
Start television set	1,950
El'fa-7 record player	180

(Tallin, Supplement to Sovetskaya Estoniya, 8 Apr 58)

The following retail prices of a radio-phonograph and a television set were quoted in a lottery list for the Georgian SSR (in rubles):

Lyuks or Druzhba radio-phonograph	2,300
Rekord television set	1,750

(Tbilisi, supplement to Zarya Vostoka, 26 Apr 58)

The Riga Radio Plant imeni Popov is getting ready for the mass production of the Festival' high-class 12-tube radio receiver. The Festival' utilizes miniature tubes and semiconductors. It has seven wave bands and keyboard controls. It can be automatically tuned to a station by using a special remote-control panel. (Moscow, Promyshlenno-Ekonomicheskaya Gazeta, 11 Apr 58)

The Minsk Radio Plant is mastering the production of the new R-58 Class-2 radio-phonograph, which will have keyboard controls. (Minsk, Sovetskaya Belorussiya, 9 Apr 58)

The Moscow Radio Plant (Moskovskiy radiozavod) is the producer of the Temp-3 television set, which is assembled on a conveyer line. (Moscow, Trud, 25 Apr 58)

In 1955-1956, [USSR] industry began the series production of the type PTS-52 mobile television station, which had been developed by the All-Union Scientific Research Institute of Television. Because of certain design defects in the PTS-52, the new PTS-3 mobile television station was developed. This new television station is now being produced by a plant of the Leningradskiy Sovnarkhoz (Council of National Economy) in place of the PTS-52.

One of the first PTS stations has been sent to the Brussels World Fair.

(Source gives additional information concerning the PTS-3.) (Moscow, Tekhnika Kino i Televideniya, Jul 58, pp 25-32)

C. Communications Equipment

Specialists of the Scientific Research Institute of the Committee for Radioelectronics and workers of the Ministry of Communications USSR have developed a new, original apparatus.

M. N. Vostokov, chief engineer of the Scientific Research Institute of the Committee for Radioelectronics, states that a special apparatus for the high-frequency addition of city connector lines has been built and successfully tested. This means that on one pair of city connector lines, it is possible now to carry on 30 simultaneous two-way conversations instead of only one.

The 30-channel communications apparatus has been designed with the utilization of miniature parts, printed assemblies, and semiconductors. It provides high audibility for a considerable distance. The institute is working with the Long-Distance Communications Equipment Plant of the Permskiy Sovnarkhoz to produce a set of this equipment for Stalingrad.

The new equipment is suitable for local and long-distance communications, and can also be used on medium-length radio relay lines. (Moscow, Leningradskaya Pravda, 22 Apr 58)

III. COMPUTERS

The recently developed M-3 computer is the first small computer made in the USSR. It has 780 vacuum tubes and about 3,000 semiconductors. It covers an area of less than 3 cu m, and its operational speed is much slower than that of the M-2 computer. Nevertheless, in 8 hours, it can do more work than could 200 persons operating modern electrical adding machines. The M-3 is designed for planning and scientific research institutes and for higher educational institutions. It is undergoing continued improvement.

Great successes have been attained in the development of cybernetic machines. A calculating machine is being developed which will be able to carry out 30,000 logical solutions, 8,400 additions, or 1,200 multiplications per second. It will store 8 million facts concerning more than 150,000 designations of objects and apparatus. Each day, the machine will be able to make 37,500 changes in the stored data and to calculate these changes.

In recent years, computers have been put into ever greater use in the control systems of many various processes. Machines are already controlling the entire industrial process in some oil refineries.

Similar machines are used for controlling the operations of an automatic plant for the production of motor vehicle engine blocks and a radio plant, and for governing motor vehicle traffic. They are used for various tasks of a logical character, such as the translation of a text from one language into another. In principle, the machines are capable of solving any problem that can be expressed in terms of elementary logical operations. For this reason, their utilization capabilities are very broad in scope.

The future improvement of electronic control machines will depend mainly on the adoption of high-quality semiconductors, magnetic equipment, and radio components, as well as on the scientific research done in the fields of physics and electrical engineering.

The creation of machines capable of performing 100,000 operations per second is well within the realm of reality. At present a new unit without mechanical moving parts has been developed, which enables an electronic computer to store millions and even billions of binary digits. (Progress tyazheloy industrii v SSSR (Progress of Heavy Industry in the USSR), book by V. I. Kuznetsov, Moscow, 1958, pp 56-58)

Approved For Release 1999/08/25 : CIA-RDP78-03107A000100020002-7

Research on computer circuits and the design of new mathematical machines is carried on in the laboratories of the Scientific Research Institute of Computer Machine Building. One of the most interesting divisions of this institute is the Division of Electrical Simulation [or Electrical Analogy].

According to V. B. Ushakov, chief designer of this division, several electrical simulation units for different purposes are being series-produced in the USSR; namely, the IPT-5, the MPT-9, the MN-7, and the MN-8.

V. B. Ushakov shows us two machines in one of the laboratories, the MN-7 and the MN-8. The MN-7 occupies the space of a desk, and is used for solving relatively simple equation systems. The MN-8, which is the largest simulating unit in the USSR, occupies a 60-square-meter room.

The MN-10 is a miniature simulating machine, the smallest type of mathematical machine. This is the first time in the world that a simulating machine has been built up exclusively with the use of transistors. It requires only the power input of a 100-watt lamp. In spite of its small size, this machine solves extremely complex problems of higher mathematics.

Other machines and devices under development in the division are a computing unit for controlling power processes in electric arc furnaces, a device for selecting the optimum cutting conditions for metal-cutting machine tools, and the electrical simulator of a rolling mill.

V. I. Dobrosmyslov, chief of another division, shows us machines which will be used for processing the results of the forthcoming 1959 census of the population of the USSR.

Another interesting new machine is the electronic digital tabulator, which is designed for carrying out accounting, statistical, bookkeeping, and planning operations. This machine, which will replace the existing T-5 tabulator, will be put into large-scale use in machine-computing stations, where it will perform mathematical, astronomical, and scientific calculations in all areas of the national economy (3).

In another laboratory, we can see a machine for winding ferrites, which are used today in many mathematical machines. Ferrites look like minute rings with internal diameters of 2-2.5 mm and external diameters of 3-4 mm. This machine actually performs work with a jeweler's precision. Wire that is only tenths of a millimeter in gauge is wound on the ring. The work is done completely automatically. (Moscow, Leninskoye Znamya, 3 Apr 58, p 2)

(3) Photo showing the verification of the solution of a control problem on a mathematical machine available in source, p 2, bottom

The computing center of the Institute of Mathematics and Mechanics of the Academy of Sciences Uzbek SSR has been in existence for one year and has a staff of about 60 specialists. These specialists studied the operation and design of electronic computers in Moscow and other cities and received the most help from the workers of the institutes of the Academy of Sciences USSR, where the BESM computer was designed and the Strela computer is in operation, and from the workers of the plant where the Ural electronic computer is produced.

The Ural computer, which was designed by B. I. Rameyev, is being series-produced by USSR industry and is being put into operation at large enterprises. One such machine has been acquired by India.

The Ural computer is the first universal computing machine to be set up in Central Asia. It is being assembled with care, since it has more than 1,000 vacuum tubes; tens of thousands of transistors, resistors, and capacitors; and more than 11 kilometers of wire.

If the Ural is properly set up, it will be able to solve any mathematical problem arising in the activities of scientific research institutes and large plant design bureaus of the Uzbek SSR. For instance, in 4 hours it can solve a system of differential equations depicting the flight of an aircraft, a 400-day task for a person operating an automatic calculating machine.

In addition to its electronic circuits, the Ural has complex mechanical units, such as printers. These units require the skill of a master watchmaker to assemble. (Tashkent, Pravda Vostoka, 9 Apr 58)

Pneumatic computers have been developed in a laboratory of the Institute of Automatics and Telemechanics of the Academy of Sciences USSR. These machines, which are driven by compressed air, are still very new, but they can already be applied in various operations in place of electronic computers. However, they cannot as yet completely replace electronic machines, which are so expensive and cumbersome, because their speed is so much slower. An electronic computer can carry out hundreds of thousands of mathematical operations per second, while the operating speed of pneumatic machines is still measured in fractions of a second. Nevertheless, pneumatic computers will find application in the chemical, petroleum refining, and power engineering industries.

Designers are toying with the idea of making parts for pneumatic computers out of plastic instead of metal. The units themselves will be made similar in appearance to vacuum tubes, and will be plugged into programing devices.

Cybernetics minus electronics is a new, very important field of technology. (Moscow, Sovetskaya Rossiya, 20 Apr 58)

IV. INSTRUMENTS

A. Research and Development

In October 1957, a plenum of the Central Board of the Scientific and Technical Society of the Instrument Making Industry took place.

M. Ye. Rakovskiy, deputy chief of the Division of Electrical Engineering and Instrument Making Industry, Gosplan (State Planning Commission) USSR, in a speech devoted to the future of instrument-making under the reorganized industrial system, mentioned that the USSR instrument industry is now 136 times as large as it was before World War II, but still fails to meet the demands of the national economy.

According to the resolution of the 20th Congress of the CPSU, the USSR is setting up the groundwork for the development of over-all automation and mechanization of industrial processes. Consequently, capital outlay for instrument-making has increased considerably. In 1958, a large amount of production space will be added to enterprises producing computing and mathematical machines and instruments for the automation of production processes.

The joining of the electrical and instrument industries within a single division of Gosplan USSR facilitates better and more extensive specialization of enterprises and cooperation among them.

To raise the technical level of the instrument industry, a number of new design bureaus and scientific research institutes have been founded. At the same time, the gradual construction of new plants is taking place, and a number of existing enterprises are to be converted into bases for experimental work, where scientific research institutes and design bureaus can produce instruments in small series. The most immediate task of the instrument industry is the proper distribution of work among scientific research institutes and design bureaus.

In the resolution adopted by the plenum, Gosplan USSR was informed of the following wishes expressed during the discussion of Rakovskiy's speech:

NIIVesprom [Scientific Research Institute of Scales and Instruments] should be transferred to Gosplan USSR as a central branch institute in the field of weighing devices and testing machines.

The products-lists of instruments, especially thermal power-engineering control instruments, should be expanded in the USSR.

Experimental bases of scientific research institutes and design bureaus should be expanded.

The control over newly organized institutes and design bureaus should be concentrated in Gosplan USSR, at least during their organizational period (2 or 3 years) and until the nature and extent of their work is determined. (Moscow, Izmeritel'naya Tekhnika, No 3, May-Jun 58, p 99)

The TNIISA (Tbilisi Scientific Research Institute of Instrument Making and Automation Equipment), one of the large scientific research institutes of the Georgian SSR, has successfully completed its first year of existence. It has already developed a number of original industrial process control mathematical machines.

G. Zedginidze is deputy director of the TNIISA in charge of the scientific sector.

(Source gives additional information on the institute's research.) (Tbilisi, Zarya Vostoka, 8 Apr 58)

During the 37 years of Soviet rule, the Georgian SSR has become a highly industrialized area. The decisive role in the rapid development of its industry was played by the successful training of native workers and specialists. The proportion of persons with higher education in the Georgian SSR is greater than in some Western countries.

The advance of industry was accompanied by the development of the production of instruments and automation; however, the growth rate of instrument-making in the republic is far behind the growth rate of industry as a whole.

The [Tbilisi] Gidrometpribor Plant has done significant work in the development of hydrometeorological instruments. It now produces up to 40 different hydrometeorological and measuring instruments, of which 15 are exported to foreign countries. The production of so-called albedometers, pyranometers, and actinometers, which are designed for measuring the intensity of the sun's radiation, occupies a prominent place in the plant's activities. The plant also produces highly sensitive galvanometers, which are used in sets of instruments for measuring the sun's radiation.

Another plant [unidentified] has mastered the production of more than 14 new types of telegraph apparatus and automatic attachments for them, including page teletypes using Russian and international codes. One of these is the RTM-51 page teletype.

Medical instruments have been developed in various medical scientific research organizations of Georgia. A great number of automatic instruments for the production of medicine and for the processes of chemicopharmaceutical plants have been developed in the Scientific Research Chemicopharmaceutical Institute. N. Kutateladze, an academician of the Academy of Sciences Georgian SSR and an inventor of many instruments, has contributed greatly to the development of the above-mentioned automatic instruments.

Considerable work in the development of new automation equipment has been carried out by the Chair of Automation of Production Processes of the GPI (Georgian Polytechnic Institute) imeni Kirov and by the Division of Automatics and Telemechanics of the Institute of Power Engineering imeni Didebulidze, Academy of Sciences Georgian SSR. Among the developments of the GPI are an electrohydraulic regulator for the automatic regulation of frequency and power interflow in electric power systems, developed by Prof N. Gabashvili and Engineer Kamkamidze, and a new principle of an electrothermic (electric melting) unit to replace high-frequency electric melting furnaces, developed by I. Machavariani, Candidate of Technical Sciences.

Because of the availability of skilled specialists in the Georgian SSR, especially in the field of electrical engineering, a network of scientific research institutes, planning and design bureaus, and instrument-making plants has been set up. These plants have already begun the production of new types of automatic instruments and apparatus.

The largest in this network of institutes and design bureaus is the TNIISA, which is mainly occupied with the development of control-type computers for production processes. This institute has developed specialized computers for processing data on the results of tests of various newly designed complex machines.

The TNIISA has been in existence not more than a year, but has already solved a number of concrete problems, especially the creation (in mock-up stage) of an original computer for calculating the charges of cupola furnaces.

The Institute of Electronics, Automatics, and Telemechanics of the Academy of Sciences Georgian SSR conducts scientific research on new systems of automatic control and regulation, the use of modern electronic machines for solving certain logical type problems, and other subjects.

The newly organized NII Avtomatprom [Scientific Research Institute for Industrial Automation?] and the Proyektpribor [Instrument Design?] Bureau are engaged in the development of control equipment, automation equipment, and automated constant-flow systems for the light and food industries. The Avtomatprom Planning and Design Institute is solving a number of new problems concerning automation in the metallurgical, chemical, and ore-extraction industries.

An important part in determining the operations of instrument-making organizations, especially immediately after the reorganization of industry, has been played by the branch divisions of Gosplan USSR, the Scientific and Technical Committee of the Council of Ministers USSR, and most important, by the Scientific and Technical Committee of the Council of Ministers Georgian SSR. The creation of a Georgian SSR branch of the Scientific and Technical Society of the Instrument-Making Industry in 1957 is also of considerable importance.

(Source gives additional information on instrument-making in the Georgian SSR.) (Moscow, Priborostroyeniye, Jul 58, pp 19-22)

B. Industrial Automation and Control Equipment

The USSR has succeeded in putting the first self-adjusting automatic control system into operation in the metallurgical industry. This system controls a-pipe-welding machine, which makes pipe out of metal strip.

At present, work is being done toward applying self-adjusting systems in the control of chemical processes. The successful completion of this task will be of great value to the national economy. It is hoped that reactions will be accelerated and that raw material losses can be cut considerably. These very complex studies have only begun, but we can clearly see the methods by which they will be resolved. (Moscow, Nauka i Zhizn', Aug 58, p 9)

Although the Leningrad Lenteplopribor Plant is new, its products are already widely used in industry. Many of the units displayed at the Brussels World Fair have instruments made by the plant. In addition, certain of its instruments will be displayed independently. They include, first and foremost, an automatic electronic recording potentiometer with a three-position regulating unit, which is designed for measuring and regulating temperatures and voltages. Two other electronic recording instruments produced by the plant will be displayed at the fair.

This is all highly sensitive and precise equipment, which more or less characterizes the nature of the plant. In 1957, the plant began the production of ten new types of products; it is now getting ready to begin production of at least 15 other types. It is giving special attention to the development of instruments for the chemical industry. -- N. Chezhin, Chief Engineer, Lenteplopribor Plant (Leningradskaya Pravda, 12 Apr 58)

The Tallin KIP Plant began the production of PRS pneumatic programed regulators in 1951. These regulators are designed for controlling the temperatures in an autoclave during the process of sterilizing canned goods.

In 1952, the plant began the production of the PR programed regulator, which it put into series production during the second half of 1953. The PR is designed for the simultaneous automatic regulation of temperature and relative humidity or two separate temperatures.

The Tallin KIP Plant mastered the production of the PRZ pneumatic programed regulator in 1956-1957 and produced an experimental consignment of them during the second half of 1957. The PRZ is designed for the automatic regulation of temperatures in the treatment of construction materials and products by boiling in autoclaves. (Moscow, Priborostroyeniye, Aug 58, pp 24-27)

The Moscow Fizpribor Plant is producing the new universal KEP-12U universal instruments, which are designed for regulating various industrial processes. (Moscow, Vechernyaya Moskva, 12 Apr 58)

C. Scientific Instruments

Mass spectrometers, which were originally developed for physical research, are now being used in various fields of science, in new technology, and in various branches of modern industry. Mass spectrometers are designed for analyzing chemical and isotopic compositions of gaseous, liquid, and solid substances.

Work in mass spectrometry is progressing in the direction of developing instruments in which the separation of ions of various masses takes place in magnetic fields and those in which the separation takes place in accordance with the difference in acceleration time of the ions and changes in their energy.

The method of separation of ions of different masses in a nonuniform magnetic field is used in mass spectrometers of high resolution capacity. Instruments of this type, which were first developed in the USSR, allow a resolution of from 5,000 to 7,000.

Mass spectrometers developed in the USSR include the following:

The MI 1301, developed by the NII MRTP [Scientific Research Institute of the Ministry of Radio Engineering Industry] and produced by the GSKB (State All-Union Design Bureau) for Analytic Instrument-Making, is designed for analyzing the isotopic composition of gases and easily-vaporized substances.

The MI 1303 mass spectrometer is designed for analyzing the isotopic composition of gases and vapors of liquids and solids. It was developed by the NII MRTP and is produced by the GSKB for Analytic Instrument-Making.

The MI 1305 mass spectrometer, which was developed and is being produced by the GSKB for Analytic Instrument-Making, is designed for the analysis of the isotopic composition of gases and vapors of liquids and solids and can take the place of both the MI 1301 and MI 1303.

The MKh 1302 mass spectrometer, developed by the NII MRTP and produced by the GSKB for Analytic Instrument-Making, is designed for analyzing the isotopic and molecular composition of gases and easily vaporized substances. Separation of ions occurs in a uniform sector magnetic field.

The MKh 1303 mass spectrometer, developed by the Institute of Chemical Physics of the Academy of Sciences USSR and the GSKB for Analytic Instrument-Making, is designed for the analysis of the molecular and isotopic composition of gaseous, liquid, and solid mixtures of substances. Ion separation occurs in a uniform sector magnetic field.

The MV 2301 mass spectrometer, developed by the Institute of Physical Problems of the Academy of Sciences USSR and the GSKB for Analytic Instrument-Making and produced by this same GSKB, is designed for the analysis of the isotopic and molecular composition of gases and easily vaporized substances. Separation of ions occurs in a nonuniform magnetic field.

The MI 1101 mass spectrometer, developed by the Physicotechnical Institute of the Academy of Sciences USSR and the GSKB for Analytic Instrument-Making, is designed for the rapid analysis of the isotopic content of alkaline metals. Ion separation occurs in a uniform sector magnetic field.

The MI 1306 mass spectrometer, developed by the GSKB for Analytic Instrument-Making, is designed for analyzing the isotopic composition of microquantities and microconcentrations of solid substances. Ion separation occurs in a uniform magnetic field.

The MKh 5201 mass spectrometer, developed by the Physicotechnical Institute of the Academy of Sciences USSR and the GSKB for Analytic Instrument-Making, is designed for the continuous analysis and registration of six different components of complex gaseous mixtures in industrial enterprises.

The MKh 6401 mass spectrometer, developed by the West Siberian Branch of the Academy of Sciences USSR and the GSKB for Analytic Instrument-Making, is designed for the analysis of the molecular chemical composition of gases within the range of masses between 2 and 60. Separation of ions of different masses depends on the degree of energy acquired in the high-frequency electrical fields of the three-screen cascades.

A magnetodynamic mass spectrometer with high resolution capacity has been developed by the Physicotechnical Institute of the Academy of Sciences USSR and the GSKB for Analytic Instrument-Making. It is designed for the analysis of the isotopic and molecular composition of gases. The ions separate during their acceleration along a spiral trajectory into a uniform magnetic field.

The production of mass spectrometers in the USSR is handled by the GSKB for Analytic Instrument-Making and its experimental plant.

Source gives detailed information on all of these mass spectrometers, along with illustrations and diagrams). (Moscow, Pribory i Tekhnika Eksperimenta, No 3, May-Jun 58, pp 3-15)

Enterprises of the Leningradskiy Sovnarkhoz (Council of National Economy) are making a new large telescope, which will have a tube 10 meters long and over 3 meters in diameter. This 70-ton instrument will rotate automatically on its axis with the precision of a chronometer.

This telescope, one of the largest in the world, was developed by a group of specialists headed by Chief Designer B. K. Ioaniisiani, a Lenin Prize winner.

A large tower pavilion, designed by D. Kh. Yenikeyev for the installation of this telescope, is being erected at the Crimean Astrophysical Observatory. (Kishinev, Sovetskaya Moldaviya, 6 Apr 58)

Workshops of the Moscow Mechanics Tekhnikum produce the type POB-14 four-channel universal oscillograph.

(Source gives additional details on this instrument.) (Moscow, Pribory i Tekhnika Eksperimenta, No 1, Jan-Feb 58, p 147)

D. Electrical Instruments

During the past 10 years, production of electrical measuring instruments in the USSR has increased fivefold. However, the volume, quality, and variety of types of instruments are unsatisfactory. Some plants produce outmoded AC panel instruments, frequency meters, miniature instruments, measuring bridges, electric meters, and other instruments.

While the products-list of laboratory instruments is equal to that of instruments produced abroad, it is still insufficient to meet USSR demand. Very few high-sensitivity instruments, such as voltmeters with very low current requirements and instruments of precision classes 0.2 and 0.5 for low voltages and currents, are being produced. Not enough high-sensitivity mirror galvanometers are being produced. USSR scientific institutes are in great need of galvanometers which are resistant to vibration and jarring, high-sensitivity fluxmeters, and DC and AC comparators.

There is an insufficient variety of AC instruments of precision class .05.

Currently produced class 0.2 instruments with scales 300 mm in length must be replaced by much smaller instruments with scales 150 mm in length. It is necessary to have 80- to 100-mm scales on precision class 0.5 instruments instead of 150-mm scales.

Approved For Release 1999/08/25 : CIA-RDP78-03107A000100020002-7

USSR industry produces millions of panel electrical measuring instruments per year, in about 60 different versions. Most of the currently produced instruments need to be revised because of their insufficient precision. It is also necessary to raise the sensitivity of the panel instruments, particularly microammeters and millivoltmeters, and to decrease their current consumption. There is a need for instruments in housings 80- and 160-mm in diameter, with scale angles of 240 degrees, which will aid in reducing the size of instruments and the panels in which they are mounted. Miniature instruments up to 25 mm in diameter are not being produced.

The production of rod-mounted instruments has only begun. The replacement of cores and support bearings with rods at the Leningrad Vibrator Plant has made possible a saving of more than 7 rubles per instrument. The use of rods on panel instruments alone would bring about a saving of several millions of rubles per year. However, the introduction of rod-mounted instruments is going much too slowly.

USSR electrical instrument plants are conducting a campaign for cleanliness in their production areas. However, instructions and regulations in effect at present are not always observed by leading personnel of plants and sovnarkhozes. The instrument industry should have the same standards of cleanliness as the food and other industries.

The development of electrical instrument making requires a continuous development of new instruments and the simultaneous improvement of earlier developed types, by increasing their precision and reliability through the use of new materials and manufacturing methods, such as the use of printed circuits, semiconductors, radioisotopes, organosilicon insulation, automatic presses and machine tools, especially multispindle winding machines for microwire and microresistors, and automatic galvanizing vats. Experience of large foreign firms has shown that the coordination of scientific work, design work, and manufacturing is of great importance. Many firms are developing large research, design, and manufacturing centers which are able to develop and adopt new technology very rapidly.

Under USSR conditions, such centers should be developed by the sovnarkhozes. It is necessary that united design and technological divisions or bureaus be founded at instrument plants. Well-equipped plant laboratories should be subordinated to these divisions or bureaus. These organizations should be constantly informed of the latest achievements both in the USSR and abroad. (Moscow, Izmeritel'naya Tekhnika, No 6, Nov-Dec 57, pp 65-67)

At the Moscow, Leningrad, and Vil'nyus plants which produce the SO-2 type single-phase electric meter, a very scarce alloy of tin, lead, antimony, and copper had to be used for making the drums of the indicating mechanism.

At the beginning of 1957, the [former] Ministry of Electrical Engineering Industry USSR proposed that these enterprises convert to the production of indicating drums by combined extrusion and pressing out of mark A-00 aluminum sheet, 3 mm in thickness. This proposal was based on the example of the Czechoslovak Krizik Plant, which produces the same kinds of meters.

The Moscow and Leningrad plants began the production of aluminum drums in 1957. The Vil'nyus Electric Meter Plant was supposed to begin using their method on 1 January 1958.

In September 1957, an expanded meeting of the plant's production and technical council took place. At this meeting, it was resolved that the know-how of the Leningrad plant would be appropriated for the manufacture of aluminum drums. At the same time, it was resolved that the development of a method proposed by Pidlisnyy, chief engineer of the Vil'nyus plant, would be continued.

However, when Pidlisnyy came back from a leave of absence, he began to insist that his method be adopted [when developed] instead of the Leningrad method. As a result, the conversion to the production of aluminum drums was disrupted. All kinds of experiments and research are being conducted at the plant, but nothing has been accomplished so far.

The Leningrad plant has already saved more than one million rubles for the country, while the Vil'nyus plant continues to consume the scarce alloy. Is not Pidlisnyy's experimentation much too expensive for the state? -- V. Bugrov, Engineer, Vil'nyus Electric Meter Plant (Vil'nyus, Sovetskaya Litva, 3 Apr 58)

The Mytishchi Electric Meter Plant is located at Yadreyevskoye shosse 2, Mytishchi, Moskovskaya Oblast. (Moscow, Leninskoye Znamya, 9 Apr 58)

The Saransk Elektrovypryamitel' Plant has produced the AII-70, which is a new universal apparatus for testing cable and solid and liquid dielectrics, using high-voltage AC and DC. The main component of the AII-70 is a mobile panel and a kenotron attachment. Starter-regulator and signaling equipment and a high-voltage transformer are installed in the panel.

The maximum voltage for AC testing is 50 kv; the maximum for DC is 70 kv. The high-voltage transformer's output power rating is 2 kva per minute.

The AII-70 is considerably smaller and lighter than previously produced apparatus of this type. The plant will save at least 1.5 million rubles per year by converting to its production. (Moscow, Promyshlenno-Ekonomicheskaya Gazeta, 18 Apr 58)

E. Scales

The Armavir Armalit Plant is selling model A-1, 10-ton truck scales in unlimited quantities. -- Advertisement (Moscow, Promyshlenno-Ekonomicheskaya Gazeta, 4 Apr 58)

The production of mobile truck scales has been organized at the Konstantinovka Vtorchermet Plant, and the production of stationary truck scales has been organized at the Zhdanov Vesotochmash Plant. The Stalinskaya Oblast Executive Committee has adopted a resolution to install truck scales at every kolkhoz in the oblast. (Moscow, Izmeritel'naya Tekhnika, No 3, May-Jun 58, p 19)

F. State Committee for Standards, Measures, and Measuring Instruments

The Committee for Standards, Measures, and Measuring Instruments has organized an exhibition of the work of its subordinate organizations in Hall No 5 of the All-Union Industrial Exposition of 1958.

Many various types of calibration instruments are exhibited, including the TKh-4 tachometric unit made by the Leningrad Etalon Experimental Plant. This unit is used for checking tachometers and tachometer instruments within the range of 40 to 4,000 rpm and has an error not exceeding plus or minus 0.1 percent of the measured speed.

(Source describes several calibration instruments displayed at the exposition). (Moscow, Izmeritel'naya Tekhnika, No 3, May-Jun 58, pp 15-16)

As a result of the reorganization of industry and construction, the GKL (State Control Laboratories for Instruments) of the Committee for Standards, Measures, and Measuring Instruments have acquired the right to check and inspect measuring devices, not only actually at individual industrial enterprises, but also through the sovnarkhozes. The Ivanovo GKL has established a close working relationship with the Ivanovskiy Sovnarkhoz.

Provisions were made in 1957 for the organization of three base laboratories: one was organized out of the Promenergo [Industrial Power Engineering] Office; the other two at the Ivmashpribor [Ivanovo Machine and Instrument?] Plant and at the ZIP [Control and Measuring Instrument] Plant.

(Source gives further information on activities of the GKL within the Ivanovskiy Sovnarkhoz.) (Moscow, Izmeritel'naya Tekhnika, No 3, May-Jun 58, pp 17-18)

The following measures and measuring instruments have been approved by the Committee for Standards, Measures, and Measuring Instruments, on the basis of state tests, for use in the USSR:

Type	Producer
M363 panel moving-coil voltmeter	Krasnodar ZIP Plant
Ts25 panel rectifier ammeter	[Omsk] Omelektrotochpribor Plant
Ts25 panel rectifier voltmeter	Omelektrotochpribor Plant
Ts26 panel rectifier ammeter	Omelektrotochpribor Plant
Ts26 panel rectifier voltmeter	Omelektrotochpribor Plant
U592 unit	[Kiev] Tochelektropribor Plant
IIN-3M inductometer	a Leningrad plant
IMI-1 magnetic inductance meter	a Leningrad plant
Li-3 Lecher wires	a Vyborg plant
VMT-D resonance wavemeter	a Kazan' plant
TM-14 hydrogeological glass mercury thermometer	Klin Thermometer Plant
TL-16 glass mercury thermometer for Class II international standard elements	Klin Thermometer Plant
R310, R321, and R331 measuring-type electric resistance coils	Krasnodar ZIP Plant
M365 small portable moving-coil ammeters	Krasnodar ZIP Plant
M365 small portable moving-coil voltmeter	Krasnodar ZIP Plant
M358 panel moving-coil ammeter	Krasnodar ZIP Plant
M358 panel moving-coil voltmeter	Krasnodar ZIP Plant
M362 panel moving-coil voltmeter	Krasnodar ZIP Plant
M362 panel moving-coil ammeter	Krasnodar ZIP Plant

Approved For Release 1999/08/25 : CIA-RDP78-03107A000100020002-7

Type	Producer
GS-100I signal generator	a Gor'kiy plant
ST-5, ST-6, ST-7 and ST-8 attachments for the IZV-1 vertical length-meter (dlinomer)	a Leningrad plant
PG-100 hydraulic presses	Plant No 2 of the Moscow City Sovnarkhoz
P518 calibrated booster resistor	Tochelektropribor Plant
143p electric meter	Mytishchi Electric Meter Plant
145p electric meter	Mytishchi Electric Meter Plant
2PG-250 testing presses for testing construction materials with pressure up to 250 static tons	Moscow Machinery Plant No 5 of Glavtonnel'metrostroy, Ministry of Transport Construction USSR
GMK mechanical vibration generator	a Leningrad plant
IEA-P capacitive asymmetry meter	a Leningrad plant

(Moscow, Izmeritel'naya Tekhnika, No 3, May-Jun 58, pp 101-102)

V. PHOTOGRAPHIC AND MOTION-PICTURE APPARATUS

The following prices were quoted in a lottery list for the Estonian SSR:

Prize Awarded	Price (rubles)
Smena-2 Camera	180
FED-2 Camera	600
Zorkiy-S Camera	600
Zorkiy-2s Camera	700

(Tallin, supplement to Sovetskaya Estoniya, 8 Apr 58)

The Rostov-na-Donu base of Posyltorg [All-Union Mail Order House] of the Ministry of Trade RSFSR advertises the following cameras for sale:

Camera	Price (rubles)
Lyubitel'-2 with f:2.8 lens	163
Moskva-5 with f:3.5 lens	540
FED-2 with f:2.8 lens	724
Zorkiy-S with f:3.5 lens	622
Zorkiy-2s with f:3.5 lens	724
Zorkiy-4 with f:2 lens	1,541
Kiev-IIIA with f:2 lens	2,254

(Yerevan, Kommunist, 8 May 58)

Types PIM-3 and PIM-4 electronic-optical converters are the most modern USSR-made converters of this type for use in extra high-speed photography. (Moscow, Svetotekhnika, Feb 58, p 29)

The Krasnogorsk Machinery Plant of Moskovskaya Oblast has started series production of the Zorkiy-5 camera. This plant will soon start production of the new Zorkiy-6 and Zorkiy-7 cameras. (Riga, Sovetskaya Latviya, 18 June 58)

The Moscow Electric Bulb Plant has completed preparations for the production of the Luch-57 electronic flash unit. This unit is powered by a high-voltage dry-cell battery and operates at 40, 60, and 100 watt-second outputs, thus permitting the use of two flash heads simultaneously. (Moscow, Novyye Tovary, No 6, Jun 58, p 14)

The Moscow Kinap Plant has produced the first models of the TKS-3 motion-picture camera, which was designed by the All-Union Scientific Research Motion-Picture Photography Institute. It can be used for making background scenes for motion pictures from miniature models.

The TKS-3, which was developed by a group of scientific workers headed by V. I. Omelin, has an original optical system. It can be used especially successfully for making color science-fiction and fantasy films. (Kishinev, Sovetskaya Moldaviya, 8 Apr 58)

During the past 2 years, a considerable increase in the number of new developments in the field of motion-picture equipment has resulted from the organization of two special design bureaus devoted to the development of new motion-picture equipment and cameras, and from the attention given to this type of work at NIKFI [Scientific Research Motion-Picture Photography Institute] and at other enterprises.

Until recently, the unsatisfactory assortment, number, and sometimes even quality of motion-picture cameras had been impeding the work of motion-picture studios, particularly in the national republics. Nothing had been done in the production of special types of motion-picture equipment, such as "combination-type," high-speed, or even 16-mm equipment. As a result, considerable time and talent on the part of many organizations have recently been concentrated on the solution of these problems.

The motion-picture cameras of various types and purposes listed below show the results of the work. These do not include cameras currently under development which will be completed during and after the second half of 1958.

Under the direction of designer G. A. Shmidt, the MKBK (Moscow Motion-Picture Equipment Design Bureau) of the Moscow City Sovnarkhoz (Council of National Economy) has developed and put into production a new type of motion-picture camera, the SK-1, for making 35-mm [sound] synchrozied motion pictures on either wide-screen or standard format.

Under the direction of designers B. I. Radchik and S. I. Nikitin, MKBK and NIKFI have designed the 2KSS motion-picture camera for making 35-mm [sound] synchronized motion pictures of standard format. A model of this camera has been made by the Moscow Moskinap Plant.

The design bureau and operators' equipment shop of the Kiev Art Film Motion-Picture Studio imeni A. P. Dovzhenko has completed development and manufacture of models of the new 35-mm US-1 motion-picture camera for synchronized motion pictures. This camera was developed under the direction of designers V. N. Matisson and V. V. Alekseyev.

Since 1957, the Moscow Moskinap Plant has been producing the new 35-mm KS-32MSh Moskva motion-picture camera developed under the direction of Sh. S. Gol'tser, which is designed for wide-format motion pictures when used with an anamorphotic lens, and also for standard-format motion pictures.

Also, since 1957, the Moscow Moskinap Plant has been producing the 35-mm KSRSh Konvas Avtomat manual-type motion-picture camera designed by V. I. Mantsvetov and based on the 1KSR camera desgned by V. D. Konstantinov. The KSRSh Konvas Avtomat can be used to make either wide or standard-format motion pictures.

Together with the [Moscow?] Central Documentary Film Studio, MKBK is completing the development and testing of a model of the new 35-mm ARK manual-type motion-picture camera for making documentary films.

Under the direction of operator F. A. Leontovich, the Central Documentary Film Studio has completed development and has made a model of a special 35-mm modified Konvas Avtomat motion-picture camera for underwater filming. This camera is currently being tested in the Black Sea and Moscow Basin areas.

Under the direction of designer E. P. Dychkov, MKBK has completed development of a 16-mm 16-SP-1 professional motion-picture to be used for ordinary motion pictures or for television.

MKBK is currently completing the testing of a new high-speed 1KSK 35-mm motion-picture camera manufactured by the Moscow Moskinap Plant.

According to a design developed under the direction of designer V. I. Omelin of NIKFI, the Moscow Kinap Plant has manufactured models of a new 35-mm special TKS-3 motion-picture camera for trick photography.

Also under the direction of Omelin, the Scientific Research Motion-Picture Photography Institute has developed a new triple-film SKP-1 motion-picture camera for making panoramic motion pictures on 35-mm film.

(Source contains further detailed information and illustrations of the cameras mentioned above, as well as information on lenses.) (Moscow, Tekhnika Kino i Televedeniya, No 6, Jun 58, pp 6-15)

The Leningrad Lenkinap Plant is the producer of the type KZVT-5 sound reproduction apparatus for the panoramic motion-picture theater at the Soviet pavilion of the Brussels World Fair. -- S. Kuznetsov, Director, Lenkinap Plant (Leningradskaya Pravda, 12 Apr 58)

VI. ELECTRICAL PRODUCTS

A. Standardization

Little attention is being paid to normalization [departmental standardizatim] industry. This has resulted in a much too great assortment of parts produced, especially those designated as hardware.

Many examples of the low level of normalization activities in the electrical industry can be cited. For instance, different requirements for compiling blueprints have been established at different enterprises. Materials on the compilation of technical documents, which were issued in 1954 by the Technical Administration of the former Ministry of Electrical Engineering, need certain revisions.

Designers in the course of their work must use various handbooks, but do not have any kind of systematized materials. There is a need for single branch design norms, based on Konstruktorskiye normy (Design Norms) of the Leningrad Branch of the All-Union Planning and Technological Institute.

There is practically no normalization activity in the field of process engineering. Certain of the existing standards for cutting and measuring tools were drawn up many years ago and no longer meet current requirements.

Electrical plants use a large quantity of plastic and nonferrous metal parts, which are still not covered by any branch standards. Neither are there any recommendations for using any kinds of standards utilized in other branches of industry. For this reason, the Cheboksary Electrical Equipment Plant is still using outmoded 1945 plant standards for a part of its allowances for plastics.

The main organ for normalization and standardization, the TsBSN [Central Bureau of Standardization and Normalization] of the NII Elektropromyshlennosti [Scientific Research Institute of the Electrical Industry] should become the central reference area for any plant standards within the limits of the electrical industry. This would aid in the adoption of individual subassemblies and parts.

The development and issuance of new branch standards should be preceded by a careful analysis of existing technical documents. As many branch standards as possible should be issued; then designers will be able to select the the most successful variants available instead of drawing up new ones. However, to this day, the TsBSN of the NII elektropromyshlennosti has developed only a few branch standards.

Approved For Release 1999/08/25 : CIA-RDP78-03107A000100020002-7

Branch normalization should be separated from plant normalization. At a plant, it is expedient to normalize only what is characteristic for the given enterprise and could not be used at other plants. There is no need for each plant to issue standards for allowances for plastics and nonferrous castings, hardware, design components, general reference data, design manufacturability norms and other items. Such standards should be developed by a main organ.

It would be expedient to utilize standards that are common to various branches of machine building. For instance, a portion of the standards drawn up within the system of the State Committee for Radioelectronics could well be used in electrical enterprises.

Up to 1951, every producing plant had its own products-list for magnetic control stations. These lists were based on types, circuits, and planning organizations' requirements, such as those from TsKB Elektroprivod [Central Design Bureau for Electric Drive]. In 1951, a departmental standard for control stations for DC electric motors and low-voltage induction motors was issued. This standard was drawn up by the TsKB Elektroprivod with the participation of producing plants of the former Ministry of Electrical Engineering Industry and main planning organs. Later, standards were issued for control stations of synchronous electric motors (drawn up by the TsKB Elektroprivod) and multispeed induction motors (drawn up by the Cheboksary Electrical Equipment Plant).

All of these documents (with the exception of the 1951 standard) fully meet current requirements. The 1951 standard was experimental in nature. Soon it was necessary to revise it and add to the products-list of the Central Stations. However, the TsKB Elektroprivod, which was supposed to do this, failed to make the recommended revisions. This led the Cheboksary Electrical Equipment Plant to use the 1951 standard for producing the series BN and PN, the BNV and PNV, the series BU and PU for tropical climates (developed by the TsKB Elektroprivod) and various other stations, including the series SNM, BNP, and PNM. These stations duplicate to a certain degree standardized magnetic stations produced by the Cheboksary and Khar'kov plants.

This unlimited pile-up of various duplicated types of control stations impedes their normalization and makes the products-list of these stations overly cumbersome. In addition, the TsKB Elektroprivod uses various solutions for the same problems in its projects; it also utilizes obsolete subassemblies and structures.

When assignments for the production of new control stations developed by TsKB Elektroprivod are given to the producing plants, harm is wrought by the inflated products-list, which includes identical or nearly similar stations differing mainly in their names and designations. The TsKB does not trouble itself over unification and normalization of parts and sub-assemblies, although this could sharply cut down the products-list of stations. (Moscow, Standartizatsiya, May-Jun 58, pp 84-85)

B. Controls and Relays

The Cheboksary Electrical Equipment Plant is the producer of the types BN and PN magnetic control stations for two- three- and four-speed electric motors; they are expressly designed for single-series A and AO 45-55.0-kw, 1,500-rpm electric motors.

(Source gives specifications of these control stations.) (Moscow, Promyshennaya Energetika, Jul 58, p 40)

In 1957, the Cheboksary Electrical Equipment Plant began the production of the types IT-85 and IT-86 overcurrent relays, which utilize AC for operation.

(Source gives full descriptions of these relays.) (Moscow Elektricheskiye Stantsii, May 58, p 90)

Industry produces many types of relays based on various operational principles. Each types has its own merits and faults, and the selection of a relay type depends on the function it will perform in an automatic system.

Motor-driven time relays are designed for long time delays and are highly precise. However, these are complex and expensive, and their service life does not exceed 100,000 closings.

Clockwork relays are more simple, but their range of time delay is limited to 30-40 seconds and their service life is short.

Electromagnetic time relays are the most simple, and have the longest service life, but their delay is limited to 5-7 seconds, and they can operate only on DC.

Recently, electronic time relays have been put into use on a wide scale. Although they are free from many faults, they require preliminary heating for their tubes and must be constantly connected to their power sources. In addition, certain electronic relays, such as the RVE-4 and ERV-6C have a long contact return delay, amounting to 7 seconds.

Thyratron relays, which have been developed, are free from these deficiencies. They are simple, cheap, and reliable; their service life exceeds that of output electromagnetic relays and can amount to millions of closings. The use of cold-cathode thyratrons enable the relay to be ready for operation at any time. A thyratron time relay can tolerate a high frequency of closings, up to ten per second. Power input is never more than 5-8 volt-amperes. Because of their advantages and great versatility, thyratron relays will have a broad range of uses.

(Source gives detailed information on thyratron relays.) (Moscow, Vestnik Elektropromyshlennosti, Jul 58, pp 52-56)

C. Switches and Fixtures

The PMT panel switch is used in thermal control circuits for the consecutive switching of thermocouples or resistance thermometers to a measuring instrument. It can be used for switching 4, 6, 8, 12, or 20 thermocouples or resistance thermometers. Its dimensions are 110 by 110 by 225 mm; its weight is no more than 1.5 kg.

The PP-56 DC potentiometer is a Class 3 portable measuring instrument utilizing a compensating circuit system. It is designed for measuring small quantities of electromotive force, voltage, and current; for checking and calibrating pyrometric millivoltmeters; and for checking automatic Class 0.5 potentiometers and industrial thermocouples. The instrument has a built-in galvanometer, a Class 0.5 standard element, a source of regulated voltage, and a power source. The PP-56 measures 269 by 226 by 177 mm and weighs 5.5 kg.

Orders for the PMT switch and the PP-56 potentiometer should be sent to the L'vov Teplokontrol' Plant at ulitsa Popova 16, L'vov. -- Advertisement (Moscow, Pribory i Tekhnika Eksperimenta, No 3, Jun 58, p 117)

The series SU and PR lighting panels utilizing automatic switches, and made by the Khar'kov Electrical Machinery Plant, have proved satisfactory in operation and deserve to be utilized on a wide scale. (Moscow, Svetotekhnika, Feb 58, p 3)

Ten years ago, the Moscow Elektrosvet Plant adopted the name of the great Russian scientist and inventor, Pavel Nikolayevich Yablochkov. Since then it has been known as the Elektrosvet Plant imeni P. N. Yablochkov.

B. I. Lyubetskiy is director of the plant. (Moscow Svetotekhnika, Feb 58, p 28)

Yu. Ya. Zemel' is chief engineer of the Riga Electrical Installation Products Plant. (Moscow, Svetotekhnika, May 58, p 27)

D. Insulators

On 2 and 3 December 1957, a conference on the production of glass insulators was held in Moscow under the sponsorship of the State Scientific and Technical Committee of the Council of Ministers USSR, the Ministry of Electric Power Stations, Gosplan (State Planning Commission) USSR, and Gosplan RSFSR. Achievements of Western countries in the development, production, and utilization of glass insulators were noted. The necessity for the rapid organization of large-series production of line and apparatus insulators of both alkaline and alkali-free glass in the USSR was stressed.

The conference noted the extensive valuable research and design work done in the development of formulas and processes for the production of glass insulators and other work in this line done by the following enterprises: The VEI [All-Union Electrical Engineering Institute], the VNIIS [All-Union Scientific Research Institute for Glass], the L'vov Polytechnic Institute, the experimental glass plant of the VNIIS, L'vov glass plants No 1 and 2, SKB "Steklomashina" [The "Glass-Making Machinery" Special Design Bureau], and the Special Design Bureau of Orlovskiy Sovnarkhoz (Council of National Economy).

Very important work in the organization of the production of glass insulators is being done in 1958 at the VNIIS and GPI-3 [State Planning Institute No 3?], with the aid of the VEI. The personnel of the Komi Sovnarkhoz and the Komielektrosteatit Plant, who are building the first USSR plant for the production of alkali-free glass insulators, have arrived at a point where they will be able to put the first stage of the plant into operation in 1958.

The conference noted that in order to alleviate the insulator shortage in the USSR, it was necessary, along with to the construction of electric porcelain plants, to do everything possible to organize the mass production of glass insulators at existing plants, such as Avtosteklo Plant No 25 of Stalinskiy Sovnarkhoz and L'vov Plant No 2 of L'vovskiy Sovnarkhoz, and at plants under construction, such as the Komielektrosteatit Plant and the Ordzhonikidze Insulator Plant. Moreover, the construction of low-voltage glass insulator plants in the Saratovskiy Zaporozhskiy, and Belorussian sovnarkhozes must be completed as soon as possible.

The conference considered it necessary to ask the councils of ministers of the RSFSR, Ukrainian SSR, and Belorussian SSR and the Komi, L'vovskiy, Saratovskiy, Zaporozhskiy, and Belorussian sovnarkhozes to provide for the allotment in 1958 of adequate funds to put plants currently under construction into operation during 1958 and to ensure the construction of new glass insulator plants in 1958 and 1959.

The conference advises that 1959-1965 plans for the construction of glass insulator plants be worked out with the end purpose of creating large automated plants.

(Source gives additional information on the manufacture of glass insulators.) (Moscow, Elektricheskiye Stantsii, May 58, pp 91-92)

The USSR has many electric insulator plants, an electroceramics institute, and several special design bureaus, which have played a significant role in electrification and communications. The most important contribution made by the electric insulator industry has been in the field of high-frequency techniques. It has developed modern steatite insulators for high-frequency purposes. Another great achievement is the production of porcelain for 400- to 500-kv electrical equipment. Such insulators were first used in the USSR on the Kuybyshev-Moscow transmission line.

In connection with the development tasks undertaken by the electric insulator industry, there is great need for the expanded production of insulators, particularly line insulators, as soon as possible.

Certain electric insulators are designed for installation on electrical equipment; the size and characteristics of high-voltage circuit breakers and transformers depend on the quality of the electric porcelain used. Many currently produced electroceramic components do not conform to present-day requirements of the electrical industry. There are complaints about the quality of other insulator types.

The lag of the electric insulator industry is the result of the slow construction of new production facilities and the insufficient implementation of advanced technology and equipment. Many insulator plants have been under construction for a long time. The construction of the Gzhel' Elektroizolyator Plant, the Slavyansk Electric Insulator Plant, and other plants has been going on for almost 10 years. The construction start of the newly planned Irkutsk Line Insulator Plant (Irkutskiy zavod lineynykh izolyatorov) is being disrupted.

Mechanization and automation are much poorer in the insulator industry than in other branches of industry. Not until 1957 did a few enterprises begin using mechanized constant-flow lines. Up to 30 percent of the insulators produced are baked in low-production uneconomical hearths.

The insulator industry is slow in introducing new economical materials into production.

Specialization is also in an unsatisfactory state. For example, the Leningrad Proletariy Plant, in addition to electric insulators, produces steatite components, although a special radioceramics plant exists in the same city.

Most of these deficiencies have been "inherited" from the former Ministry of Electrical Engineering Industry, which did not pay sufficient attention to the production of insulators. After the reorganization of industry,

Approved For Release 1999/08/25 : CIA-RDP78-03107A000100020002-7

the sovnarkhozes took control over the production of electric insulators. The Komi Sovnarkhoz has taken measures to accelerate the construction of the Komisteatit Plant. The possibilities for the organization of new electric insulator enterprises are being explored in the Moldavian and Azerbaydzhan SSRs.

However, in some economic regions, little attention is being given to the production of insulators. For example, in the Krasnoyarsk economic region, the [Krasnoyarsk Sibizolyator] Insulator Plant is equipped with 1929-1930 model machinery, but the sovnarkhoz is not helping it to modernize its equipment. Under such circumstances, the plant will be unable to supply its products to the new electric power installations under construction in East Siberia.

The GIEKI (State Institute of Electroceramics) plays an insufficient role in the production of insulators. Its connections with insulator plants, particularly those located in peripheral areas, are very poor.

Recently, the first all-union conference of workers of the electric insulator industry took place. It was noted here that in order to raise electric insulator production, it is necessary to finish the construction of enterprises as soon as possible and to adopt measures for improving production.

For satisfying the needs of power engineering and the electrical industry, it is necessary, first and foremost, to set up sections for the production of high-durability porcelain insulators at the Proletariy Plant, the Elektroizolyator Plant, the [Kamyshlov] Uralelektroizolyator Plant, and the [Moscow] Izolyator Plant.

It is recommended that the so-called hard porcelain, type KM-1, be used for high-durability insulators. It is extremely necessary to accelerate the development of small high-durability suspension insulators, so that their series production can begin in 1958. The Izolyator Plant must speed up its preparations for the production of capacitor bushings of all types, including small bushings using solid insulation instead of oil for voltages of 110 and 220 kv.

Much has to be done in the mechanization of production and the implementation of new manufacturing methods.

The electric insulator industry needs the cooperation of planning organs, which should arrange for the production of industrial equipment for insulator plants and for the organization of special grinding and dressing pegmatite plants to supply high-quality raw materials for insulator plants.

It would also be advisable to arrange for the transfer of insulator plants now under the Ministry of Electric Power Stations to the sovnarkhozes. (Moscow, Promyshlenno-Ekonomicheskaya Gazeta, 13 Apr 58)

E. Cable

The Tashkent Electric Cable Plant supplies special cable for submersible pumps to the petroleum industry. Although in previous years the plant fulfilled its obligations for the petroleum industry, lately it has begun to lag in this respect. As a result, hundreds of new modern pump units have not been put into operation.

As a result of the intercession of the Tashkentskiy sovnarkhoz, the plant has improved its operations somewhat. A new armoring machine has been installed. The production of KRBK and KRBP cable has increased since the beginning of the 1958. Nevertheless, many deficiencies remain. Although the plant's capacity for making submersible-pump cable has increased by one third, the production plan has been raised by only 8.5 percent.

With available equipment, the plant is capable of producing at least 1.5-2 times as much cable as the plan specifies. However, because of a shortage of semifinished products, machine down-time has become a common occurence. The plant management has reconciled itself to this state of affairs.

The shortage of semifinished products stems mainly from the high reject rate at the plant. On some days, from 80 to 100 percent of the KRBK cable is rejected after testing because the rubber insulation breaks down under the action of electric current. The management fails to improve the operations of the rubber processing shop, where rubber is produced by the most primitive manual methods. These methods are used alongside such modern equipment as the ANV-3 and ANV-4 continuous vulcanizing units and an automatic rubber-rolling machine. Plant specialists have designed a semiautomatic line for the rubber processing shop, but work on building the line is proceeding extremely slowly.

The Scientific Research Institute of the Cable Industry is supposed to develop new cable designs for the petroleum industry. It is located on the plant grounds, but does not give concrete aid to it. The output of many gauges of KRBK cable has been delayed. The petroleum industry is not satisfied with the KRBP flat cable. Although the technical specifications for this product were received by the plant and institute in 1955, the latter has failed even to make experimental models of it. (Moscow, Promyshlenno-Ekonomicheskaya Gazeta, 11 Apr 58)

During the first quarter of 1958, the Moscow Moskabel' Plant produced and supplied more than 20 km of armored cable, 14 km of control and distribution cable, and a large quantity of wire for repairing electrical equipment in rural areas. These products were ordered by the Ministry of Agriculture RSFSR and were delivered ahead of schedule.

However, serious misunderstandings arose with regard to the fulfillment of the orders of the Ministry of Agriculture USSR. According to the plan of the Glavsnab [Main Administration of Supply] of that ministry, the Moskabel' Plant was to have supplied it with a substantial quantity of products during the first quarter. Despite all the efforts of the plant workers, they were unable to fill this order on time.

This is mainly the result of poor planning and faulty distribution of the plant's products by Glavsnab of the Ministry of Agriculture USSR. According to the first quarter plan, the plant was supposed to make 5,700 meters of armored cable for this main administration, but the assignment was not fulfilled because the main administration refused to accept 2,300 meters of the cable which was delivered and gave no instructions as to where to ship the rest of the products.

Although more than 8 km of telephone cable was supposed to have been produced for the Ministry of Agriculture USSR, the plant did not ship any because the Glavsnab did not specify the shipping destination until 10 March.

There is a great need for direct contacts between the plant and kolkhozes. Once, the Gigant kolkhoz of the Moldavian SSR requested the plant for aid in equipping an electric power station. The plant was capable of aiding the kolkhoz, but was unable to solve the problem independently; it had to waste time getting permission for this from superior organizations.

Certain kolkhozes in Mordovia, in Voronezhskaya, and in other oblasts tried to deal directly with the plant. However, their requests had to be refused because neither the kolkhozes nor the plant had the proper permission, even though the plant would have been able to supply the kolkhozes with needed materials without detriment to its basic production.

In the future, plant directors should be granted the right to deal directly with kolkhozes, after all, the kolkhozes applying for help usually need such a small quantity of material, that no harm could possibly result to a plant's main production. Such materials may also be allotted from basic production waste and nonsaleable products, which are of no use to the plant but of inestimable value to kolkhozes. -- M. Kutsevol, Director, Moscow Moskabel' Plant (Moscow, Moskovskaya Pravda, 25 Apr 58)

F. Explosion-Proof Machinery

From 14 to 19 April 1958, an all-union scientific and technical conference on coal mine electrical equipment and explosion-proof premises and installations was held in Stalino. A total of 31 lectures were given.

V. S. Tulin, chief specialist of the Division of Electrical Industry of Gosplan USSR, gave a lecture on the research, development, and production of explosion-proof electrical equipment.

In other lectures, it was noted that at present the electrical industry produces a comparatively small variety of low-voltage explosion-proof induction electric motors, namely, series MA140, TAG, and KO for work in gas and dust-filled mine atmospheres; and series TAG and KO for work in explosive mediums of category 2 and group B, and category 3 and group G.

There is a very limited variety of apparatus and instruments for use in present-day types of production where there is danger from explosions. These are series PMV magnetic starters; series PR-700 oil-filled manual starters; series PM-700 oil-filled magnetic starters; type KU-700 oil-filled control keys; control posts; gate-control panels; and brake magnets.

In one lecture, the deficiencies of existing series of explosion-proof electric motors were noted, as was the necessity for the production of series A squirrel-cage motors over 100 kw in power in a highly explosion-proof version.

In the resolution of the conference, it was noted that up to now, no dry-type explosion-proof mine power transformers and mobile substations, remote-controlled high-voltage distribution boxes, low-voltage magnetic starters with sparkproof control systems, fireproof-shielded mine cables, or 110-kw explosion-proof electric motors have been produced.

There is an extremely limited products-list of electrical equipment for operation in explosive or aggressive mediums of the chemical, petroleum, and gas industries. There are no extra-high reliability explosion-proof versions.

The temporary regulations for the production of explosion-proof electric machines and low-voltage apparatus, which were developed in 1939, are obsolete and must be basically revised.

The Giproniselektroshakht (State Institute for the Planning and Research of Explosion-Proof Electrical Equipment), which was organized in 1957, is being developed at a snail's pace.

Approved For Release 1999/08/25 : CIA-RDP78-03107A000100020002-7

The utilization of arc-resistant plastics with high mechanical stability and moisture resistance, ceramic and other arc-resistant materials, wear-resistant contact compositions, heat-resistant insulation materials, and high-quality magnetic materials is being delayed because the chemical and other industries produce such materials in insufficient quantities.

(Source gives detailed information on the conference.) (Moscow, Promyshlennaya Energetika, Aug 58, pp 34-37)

G. Batteries

The Saratov Alkali Battery Plant has develoned the 2ZhN-24 storage battery, which is used for powering fluorescent mine lamps. (Moscow, Svetotekhnika, Jan 58, p 19)

* * *