

INFORMATION REPORT

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Moscow Industrial and Agricultural Exhibit/
Models of Sputniks/Electronics Equipment

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PLACE AND COUNTRY

SOURCE

1. It is said that in 1956 nearly six million people visited the Moscow Industrial and Agricultural Exhibition from all over the Soviet Union, including about 25 thousand foreigners of many nationalities. We were present at the 1958 opening by Khrushchev and had time for only a hurried view through some of the buildings. The exhibition occupies about 500 acres with 21 pavilions housing some 60 thousand exhibits, many being shown for the first time, in a fine setting of flowers and trees with many lovely fountains. It is a striking picture of Soviet industrial progress and demonstrates the tremendous efforts that are being made in every field of Soviet endeavor. In passing one may mention the exhibits on the peaceful uses of atomic energy, on mechanization and automation, on developments in the chemical and electrical industries, on new agricultural machinery, trucks and coaches, and not least the US style motor cars. All of these are effectively presented, and when added to the spectacular Sputnik display in the Science Pavilion make up an impressive show. Full scale models of Sputnik I, II and III with side-exhibits of specialized and measuring apparatus, are shown and explained. Sputnik III is an impressive piece of work. It weighs about 2,900 lbs and carries over a ton of scientific equipment. It is nearly 13 ft long and about five feet diameter at the base, and could have contained a man. Undoubtedly this will come; meanwhile, instruments provide more information. Among the instruments carried are devices for determining the ionic content of the atmosphere, and the electric charge of the Sputnik itself; for measuring the earth's magnetic field and for studying corpuscular radiation from the sun. Provision is also made to record the number of collisions of the Sputnik with micro-meteorites. The satellite is fitted with solar powered batteries and radio equipment. The transmitting antennas, consisting of steel folded dipoles, can be seen on the opposite sides of the nose, while the four receiving antennas project backwards from the baseplate. It is said that instrumentation is provided for nine simultaneous observations which are transmitted down to earth. One of the intriguing features of the design of Sputnik III is the means for maintaining temperature equilibrium in its passage through space by automatically controlling heat radiation by means of adjustable vanes surrounding the lower portion of the cone. The general mechanical conception points to an advanced degree of technological development.
2. In the Pavilion of "Machine-building", which is the largest of the exhibition, the engineering industries are represented including electronics and communications, optics, cinema, etc. The Radio Section presented a particularly fine range of all kinds of tubes, transistors and components, including examples of 110° deflection cathode ray tubes, image orthicons, vidicons, photomultipliers, iconoscopes and image iconoscopes, a large variety of receiving tubes both miniature and sub-miniature types, low and high power transmitting tubes and magnetrons, semi-conductor devices with many different types of diodes and transistors, printed circuitry, magnetic materials, ferrites, piezo-electric quartz

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and barium titanates, resistors, condensers, etc. In one of the show cases there was also a small transistorized radio broadcast receiver in the form of a book. Many broadcast receivers and television sets, as well as industrial television and other professional equipment, analog and digital computers, and test measuring apparatus were on show.

3. The many people who have visited the USSR Pavilion at the Brussels World Fair must have wondered whether the exhibits that they saw there were perhaps especially made to impress the outside world. Having visited the Brussels Pavilion before going to Moscow, I would say that there should be no such illusions. The Moscow exhibition is many, many times more impressive and includes, with several additional examples, practically all the exhibits to be seen in Brussels.
4. Although most of the exhibition is devoted to the achievements of heavy industry, there is much evidence of greater activity in the consumer product field with improvements in clothing materials and furnishings, foods and home appliances. An exceptional case is worth mentioning perhaps in seeing in the show windows in Moscow and Leningrad good looking electric vacuum cleaners priced at 425 rubles (\$42.50) and electric floor polishers at 285 rubles (\$28.50).
5. Whether all the goods displayed at the Exhibition are available in the shops is quite another question. Certainly one does not see any of the larger new automobiles on the streets of Moscow. On the other hand, the new smaller VOLGA model is out in fair numbers and even being used as taxis. Nylon material is not available, but there is a somewhat similar German type of material called "Perlon". The price of goods in the stores seems to follow no clear pattern, presumably because the Government controls everything and can therefore decide what goods to subsidize and sell cheaply. TV sets run from about 1,250 - 2,500 rubles and radios about half those prices. There are many stores selling identical merchandise, but, of course, there is no competition.

[On File in CIA Library is a nine page extract in English from the USSR Industrial and Agricultural Exhibition Guide Booklet - Moscow 1957 - describing the exhibits in the following fields:

- a. Radio Engineering Industry and Communications.
- b. Instrument Making and Means of Automation.
- c. Optics.
- d. Cinema Industry.
- e. Metrology, Standards and Precision Measuring.

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The Exhibition aims to promote technical progress in the Soviet Union. It seeks to point out the reserves lying latent in different branches of industry and to show workers, technicians and heads of industrial enterprises possibilities for increasing output while allowing for a steady, planned reduction of costs. New machines, technological processes, and the latest achievements in automation and in remote and electronic control are demonstrated at the Exhibition.

Thousands of Soviet industrial workers and technicians come to this school of advanced experience to exchange information on their achievements and to borrow the most progressive methods of labor.

PAVILION OF MACHINE-BUILDING

This is the biggest pavilion of the Exhibition. The display, which occupies a floor space of nearly 20,000 square metres and is divided into 15 sections, shows the leading branches of industry in the Soviet Union.

The open demonstration grounds adjoining the pavilion on the north and east exhibit large-size equipment, lorries and special-purpose automobiles, high-voltage apparatuses, agricultural machines, and fire-fighting equipment.

RADIO-ENGINEERING INDUSTRY AND COMMUNICATIONS

This section occupies Halls Nos. 20 and 21, in which are displayed samples of piezoelectric articles, radio parts and units of radio apparatuses, electric vacuum apparatuses (sources of light, radio valves, electron-ray and Roentgen tubes), semi-conductor and radio-measuring instruments, wireless sets and radio-gramophones, broadcasting and receiving TV apparatuses, radio-relay and re-broadcasting stations and radio-relay communication apparatuses, electric vacuum and semi-conductor instruments.

There are new types of midget receiving-amplifying valves, which are much superior to similar valves put out previously.

The 6X111 triode-heptode that is exhibited has extraordinarily fine operational qualities. Its prime use is for converting frequencies in superheterodyne receivers. The triode and heptode parts of this valve may be used independently.

The midget 6T1511 outlet pentode is likewise superior to the formerly produced 6T19 pentode. One of its advantages is that it can operate under a reduced anode tension of up to 170-180 volts. On view there are new types of midget transconducting long-wearing heating valves for radio apparatuses, radio-relay and long-distance communication lines; a wide range of generator valves for various

In the long, medium and short wave bands, the sensitivity of the 8-watt Rossiya set is not below 50 microvolts, and in the ultra-short wave band - not below 8 microvolts. The Rossiya has knobs for regulating tone on low and high frequencies separately, an automatic amplification regulator, and a keyboard band changer. The acoustic system consists of 5 dynamic loudspeakers which ensure high fidelity.

Table radio-gramophones of the same class are represented by the Lux and Druzhba. All the details and units - ultra-short wave blocks, variable capacity condenser blocks, intermediate frequency filters, selenium rectifiers, keyboard band changers, and so forth - are uniform in the Rossiya, Lux and Druzhba.

The 6-watt Kontsert is representative of first-class radio-gramophones. Built on the basis of a unified chassis and details of a first-class wireless set, the Kontsert consists of a 7-valve combined all-wave superheterodyne first-class wireless set, a universal electric record player, and a built-in revolving magnetic aerial. The set has knobs for regulating tone on low and high frequencies separately, tone-compensation regulation of sound, smooth regulation in the intermediate frequency AM band, and automatic amplification control. In the long, medium and short wave bands the set's sensitivity is not below 200 microvolts, in the ultra-short wave band - not below 20 microvolts. The acoustic system consists of four dynamic loudspeakers. Wave bands are changed by means of a keyboard.

Second-class wireless sets and radio-gramophones are represented by the 1-watt Baikal radio-gramophone, a 6-valve superheterodyne which receives AM broadcasting stations operating in the long, medium and short waves, and FM broadcasting stations operating in the ultra-short wave band. The set has an electric record player. Its sensitivity on long, medium and short waves is not below 200 microvolts, and on ultra-short waves - not below 20 microvolts. It has an ultra-short wave dipole and a keyboard band changer.

The acoustic system consists of two LD-5 loudspeakers.

Also on view there are small 0.1-watt portable wireless sets (Nov, Turist, Novost) and automobile radio sets. The Nov is a third-class 4-valve superheterodyne with feed from dry or storage batteries. It ensures reception in the long and medium waves with a sensitivity of not below 400 microvolts. Energy consumption from batteries - 1.3 volts. The set is assembled by the printed circuit method.

Radio communication and broadcasting. In this section the exhibits include a Strela-M radio-relay communication-line apparatus for multi-canal radio-relay communication lines extending over distances of up to 25,000 kilometres. In joint operation with a K-24 compression apparatus, the Strela-M ensures communication in 24 telephone canals. It also ensures a separate canal for service communication with selective calls.

Visitors will see a TTPB all-wave receiving apparatus for sound telegraph (sustained and tonal) and telephone reception

from an open aerial in the 12-25,000 megacycle wave band. The receiver's sensitivity is not below 6 microvolts. It has provision for semi-duplex reception.

The new Sirena automobile radio station is for communication on ultra-short waves. It is designed for emergency communication with ambulances. Unfailing communication is guaranteed over a distance of up to 30 kilometres. The radio station is fed from a 6-volt automobile power circuit.

Television apparatuses. All the TV sets exhibited in this section basically differ from the models put out formerly. They have new cathode-ray tubes with a rectangular screen, elliptic loudspeakers, new types of radio valves, uniform units and details. This has made it possible to design compact sets and achieve higher quality images and sound accompaniment. The TV sets - Mir, Yantar, Rubin, Znamya, Soyuz and Start - exhibited in this section receive five TV programs.

The Start is assembled by the printed method on three pressed footings.

TV sets with 4MK26 tubes have a 255 by 340 mm screen. They are represented by three models - Znamya, Rubin and Temp-3. The Temp-3 receives 12 television programs and three ultra-short wave FM programs. TV sets with 5MK26 tubes are represented by two models - Mir and Yantar - with 315 by 420 mm. screens. On view there is a Moskva projection TV set with a 900 x 1,200 mm. screen.

Visitors can acquaint themselves with a TPCO-20 re-broadcasting station which ensures reception at points located more than 150-200 kilometres from a TV station, and a model of a radio mast that can be lengthened to a height of up to 500 metres.

Interest is attracted by the IITY-0, IITY-1 and IITY-2 industrial television installations for remote television control of various operations and technological processes. There are numerous other radio-broadcasting and communication exhibits.

INSTRUMENT-MAKING AND MEANS OF AUTOMATION

Halls Nos. 22 and 23 show the progress made by Soviet industry in the output of technological control instruments, means of automatizing various production processes, special watches and clockworks, weights, dynamometers, and material-testing machines.

Visitors will see methane, hydrogen, oxygen and hydrogen sulphide gas analyzers for the automatic control of the composition of various gases;

automatic electronic potentiometers, hygrometers, and other instruments;

new metal-testing machines: MYM-5000 fatigue-testing machine, YM-5 universal testing machine, TK-2 cone durometer, prolonged heat-resistance and creep testers, and the TKM automatic durometer.

The attention of specialists will be attracted by instruments and regulators for the automatic regulation of various technological processes; operating mock-ups which demonstrate the automatic feed of a catalyzer on a catalytic cracking installation, the regulation of combustion in a boiler with a chain grate.

Other exhibits in this section include:

the main parts and units of an automatic regulation hydraulic system that is being widely used for automatizing power, metallurgical, marine and other aggregates (built on a block principle, these hydraulic regulators are simply designed, reliable in operation and easy to adjust);

numerous electronic instruments of normal and small sizes for controlling operating regimes in one or many points with electric and pneumatic regulation devices;

multi-point instruments with devices that flash signals when temperatures reach a danger level;

secondary instruments equipped with electric and tele-metering devices that transmit the readings of measuring instruments (transmitters);

samples of new high-class precision logometers designed for work in conditions where explosions may occur; manometric thermometers; regulators for automatizing air-conditioning installations (all these instruments are shown in operations);

a scheme for the complex automation of thermal power stations (central stand);

a mock-up of a steam boiler diagram showing the points of control and organs of regulation (a device which signals deviations from fixed limits is shown in operation on this mock-up);

AYC pneumatic unified unit-type system of regulation (the regulators were designed only recently and their mass production is being organized). (A feature of this pneumatic system is that with the help of a comparatively small number of blocks it permits reproducing various regulation systems. It may be used for automatizing plant processes with an intricate scheme of regulation);

pressure and temperature transmitters, various regulating blocks and secondary instruments (the operation of pneumatic system regulators is demonstrated by the regulation of temperature in a mock-up of a thermal furnace).

In recent years, technological processes have been controlled and regulated by new methods based on the employment of radio active radiation and ultra-short and supersonic waves. There is a great future for these methods as they allow taking high-precision measurements without disturbing the plant process. The radioactive instruments displayed in the centre of the hall include a level meter, a durometer and a vacuum gauge. In addition, there is an ultrasound

flow meter and an ultra-short wave level meter.

There are some extremely interesting computing machines: general- and special-purpose continuous action electro models; supplementary apparatuses that extend the possibilities of electromodels; registering instruments and indicators and infra-low band frequency instruments that show the frequency and transient dynamic characteristics of systems of automatic regulation and control and of their separate appliances. These instruments also allow taking various measurements in the range of frequencies between zero and the lower limit of the sound range (from 0.01 to 50 c.p.s).

Continuous-action electronic machines are designed for the solution of common linear differential equations of up to the 9th and 16th order with correspondingly constant and variable coefficients. These equations help to describe the dynamics of various mechanical and electrical processes as a result of which with these machines it is possible to reproduce real processes in laboratory conditions and subject them to detailed experimental research. One of the special electromodels, the automatic ATF-1, is designed to solve differential equations of motion.

OPTICS.

On the central stand in Hall No.24 there are samples of optical glass workpieces for articles of various sizes - from tiny object glasses to huge blocks for astronomical mirrors and lenses; samples of ordinary and colored optical glass, quartz glass and synthetic crystals. Exhibits describe the technology of producing optical glass and the properties and features of this glass.

In this section visitors will see:

modern microscopes used for research (one of these is the EM-4 electronic microscope, an instrument with high magnetic optical properties that gives strongly magnified images in passing electronic rays and allows seeing particles measuring as little as 0.02 micron);

an interesting universal biological microscope with an M5M-6 set of appliances for medical and biological research (in addition to its ordinary functions, it allows photographing objects on a film or plate, magnifying them up to 1,425 times);

Mineralogical and metallographic microscopes and microscopes used by nuclear physicists;

optical control and measuring instruments widely used in machine-building for extra-precise measurements of length, thickness and angles, and for controlling surface finishes;

new instruments for non-contact control (the OBM-1 non-contact optical micrometer controls the machining of details with an accuracy of ± 0.01 mm. without stopping the lathe);

an MJK-49M microscope which measures the pitch and mean diameter of a detail with an accuracy of ± 0.002 mm. and half the angle of an internal thread profile with an accuracy of ± 10 minutes;

numerous spectral laboratory instruments and apparatuses for studying emission spectra, absorption, dispersion and luminescence of substances;

instruments that comprise a modern laboratory set for emission spectral analysis;

ЭЭС-1 photoelectric steelometer (exhibited for the first time) for express quantitative analyses of low-alloy steels and other alloys (in metallurgy, where speed and accuracy are needed, the ЭЭС-1 takes only two or three minutes to determine the content of an element with an accuracy of 1-2%);

the new СМ-11 steeloscope for rapid visual qualitative and quantitative spectral analyses of the most frequently used steels and non-ferrous alloys.

A number of other new exhibits: an ЭЭК-56 photocolorimeter for determining the concentration of fluid solutions by their light-absorption in the visible and ultra-violet regions of the spectrum; an ЭУ-58 universal photometer for photometric operations, for measuring the ability of transparent mediums to pass light, the brightness coefficient of diffused surfaces, and brilliance, whiteness, etc; the ring-type increased accuracy ЭМ-56 polarimeter for measuring the angle of rotation of the plane of polarization within a range of 0-360° with optical-active transparent solutions and homogeneous fluids with an accuracy of $\pm 1^\circ$;

a revolving electric lighthouse, which emits 2,000,000-candle-power periodic beams that can be seen from a distance of up to 60 kilometres (lighthouses of this kind are being built in all Soviet waters);

projecting instruments (Hall No.23a): diasopes, epidiasopes and a microprojector;

instruments used for defectoscopy in machine-building and the textile industry as well as for diagnosing certain diseases and determining the viability of seeds of agricultural crops.

Among the various astronomical, optical and geodetic instruments and cameras in Hall No.25 there are:

an ЭИИ technical level for determining land elevation above sea level (the mass production of this instrument was started recently);

an improved-design ЭА-2 high-accuracy level for determining elevations with an accuracy of 0.05 mm. from a distance of 75 metres (this allows it to be used in construction and erection jobs where high accuracy is especially important);

a new TT-5 theodolite-tachometer for measuring horizontal and vertical angles with an accuracy of 30", for measuring magnetic azimuths and determining distances by means of a thread distance gauge and a vertical rod or range-finding cap;

a new AJT-7 mirror-lens telescope designed by D. Maksutov, corresponding member of the U.S.S.R. Academy of Sciences (it enlarges objects 100-570 times and is used for visual observations and for photographing and taking spectrographic and photometric measurements of heavenly bodies. This system has won worldwide recognition);

more than 20 cameras for amateur and technical and special photography, new high-speed lenses for movie cameras and television apparatuses, highly sensitive exposure meters, magnifiers, Molnuya flashlamps, etc.

CINEMA INDUSTRY

In Hall No.25 the display consists of movie cameras and illumination apparatuses, machines for developing black-and-white negative and positive films and for printing copies of color films, film-projection and sound-recording apparatuses, control and measuring instruments, and samples of films and paper. Diagrams, charts and photographs show technological processes for the production of materials for motion pictures, motion pictures, movie cameras and equipment, and the growth of the cinema and film-distribution networks in this country.

Among the exhibits there are:

interesting movie cameras - 2KCC for studio work with simultaneous sound recording (the distinguishing features of this camera are that it uses a mirror shutter and a short-focus optical lens), Rodina (model 3KCK) camera for newsreels and scientific films; Konvas-Avtomat portable camera for newsreels, and an amateur 16mm camera for color and black-and-white films;

a projector for screening microfilms with the necessary enlargement;

an M3-11 cartoon-filming camera (also exhibited by the Odessa Kinap Works);

various kinds of illumination apparatuses for film studios and outdoor work;

a 40II-2 laboratory developing and drying machine for black-and-white negative and positive films (the outstanding feature of this machine is that it does not need a dark room. Its productivity is regulated by a variator within the range of 50-300 metres per hour);

a stationary film projector, apparatuses for showing wide-screen stereophonic films, a modernized Odessa-2 mobile projector for color and black-and-white films, a combined cinema and radio installation, tape recorders and other apparatuses.

METROLOGY, STANDARDS AND PRECISION MEASURING

The work of the State Service of Scales and Measuring Instruments is shown in Hall No.5. Visitors will see a chart of standard measures and of the network of organs of the State Service of Scales and Measuring Instruments which ensure the correct reproduction of standard units of measurement on working measures and instruments.

In this section visitors can acquaint themselves with the system of ensuring unified measures:

instruments and installations for measuring mass, pressure, hardness, angular velocity, light and other radiation, and for recording temperature, time and frequency for linear, angular, radio-engineering, electrical, magnetic and other measurements;

a travelling laboratory for checking measures, pressure and mass measuring instruments, linear and electrical measuring and other apparatuses on the spot where they are used.

In addition to the natural exhibits, there are posters, drawings and explanatory diagrams covering all spheres of precision measuring.

capacities, photocells and photoelectronic multipliers, gas-filled triodes, ignitrons, current and voltage stabilizers, alpha, beta and gamma counters, operating mockups of a klystron and a magnetron, and a new rectangular cathode-ray valve (kinescope) measuring 35, 43 and 53 cm. along the diagonal.

In the national economy increasing importance is being attached to semi-conductor apparatuses. Samples of the semi-conductor instruments and apparatuses produced by the radio-engineering industry can be seen in this section. A big group of exhibits consists of point rectifying germanium diodes that are used in measuring apparatuses, TV sets and wireless receivers. These diodes do not react to mechanical influences, work reliably in conditions of high humidity and retain their operational properties during storage or prolonged service. They last for more than 10,000 hours.

Other exhibits include silicic mixing diodes for converting frequencies in superheterodyne radio receivers with 1-cm. and 10-cm. bands; silicic rectifying diodes which are used as detectors for receiving devices in receivers that directly amplify the 10-cm. band; planar and point germanium triodes used chiefly to amplify electric signals;

semi-conductor photoresistances and thermoresistances used in various types of radio apparatuses (the sensitivity of the ECK-1 semi-conductor photoresistance is 12 times higher than that of the CL18 photocell);

a wide selection of radio-apparatus details and units (the most diverse kinds of condensers, piezo-electric articles, relays, new types of loudspeakers, resistances and many other exhibits);

various kinds of light sources put out by the radio-engineering industry;

dozens of electric incandescent lamps for the most diverse purposes, luminescent and special lamps and other illumination appliances.

Relaying apparatuses. RIT-2 portable apparatus for relaying speech and music from theatres, concert halls, stadiums, etc.

KBY-15 command-broadcasting installation, which is a radio-relaying unit for sea and river vessels. It is used for relaying radio broadcasts and shipboard commands.

Radio sets and Radio-gramophones. All the new radio sets and radio-gramophones displayed at the Exhibition fall into one of five classes: superior, first, second, third and fourth. The most characteristic superior-class radio-gramophone is the Rossiya console model. This is an all-wave 11-valve combined superheterodyne equipped with a universal electric record player. It ensures reception in the long, medium and short waves and may be tuned in on ultra-short wave FM broadcasting stations operating in the 64.5-73 megacycle band. The built-in revolving aerial improves the quality of the reception.