CLASSIFICATION CONFIDENTIAL CONFIDENTIAL

CENTRAL INTELLIGENCE AGENCY
INFORMATION FROM
FOREIGN DOCUMENTS OR RADIO BROADCASTS

REPORT

CD NO.

50X1-HUM

COUNTRY	USSR	DATE OF INFORMATION	1950
SUBJECT	Scientific - Chemistry, laboratory equipment	DATE DIST.	7 Dec 1950
HOW PUBLISHED	Monthly periodical		
WHERE PUBLISHED	Moscow	NO. OF PAGES	13
DATE PUBLISHED	Aug 1950		
LANGUAGE	Russian	SUPPLEMENT TO REPORT NO.	

THIS IS UNEVALUATED INFORMATION

SOURCE Zavodskaya Laboratoriya, Vol XVI, No 8, 1950, pp 986-1001.

LABORATORY EQUIPMENT FOR CHEMICAL ANALYSIS

V. S. Syrokamskiy, et al.

The editorial office of the periodical Zavodskaya Laboratoriya (Plant Laboratory) issued a request to many workers of scientific-research institutes and plant laboratories, asking their opinion on and a qualitative evaluation of various instruments and apparatus used in laboratories for chemical analysis. Eleven answers are presented in this article. These answers, in the editor's opinion, are sometimes contradictory; but they reveal a necessity for paying serious attention to problems of improving the manufacture of laboratory instruments and glassware.

The editors consider as an efficient measure the selection of the best equipment for chemical analysis by the Analytical Committee of the Department of Chemical Sciences of the Academy of Sciences USSR. This equipment must be recommended for mass production. The editors suggest that the Committee on Measures and Measuring Instruments attached to the Council of Ministers USSR establish control over this production, since many organizations manufacturing equipment for chemical analysis are uncontrolled and do not carry any responsibility for quality of production. The editorial office asks readers of the periodical to continue to present their opinions and constructive suggestions.

I.

Professor V. S. Syrokomskiy, Head of the Chair
of Analytical Chemistry, Ural State University

After World War II, the manufacture of various equipment for analytical and quality control purposes was considerably increased. Production was developed by various plants and research institutes and also by experimental shops of higher educational institutions. But apparatus of inferior quality is frequently produced simultaneously with high-grade items.

CONFIDENTIAL

CLASSIFICATION CONFIDENTIAL

STATE	X	NAVY	X	NSRB	DISTRIBUTION
ARMY	X	AIR	X	FBI	

50X1-HUM

The absence of general combined catalogues and the lack of information on analytical equipment in scientific periodicals make the situation still worse. There are no good and complete instructions for equipment. In most cases the instructions and descriptions are so brief and unclear that they cannot be used at all.

It is recommended that the example of the radio industry be followed: new radio receivers are provided with detailed, well illustrated instructions.

Following are some observations on apparatus and instruments which have been used by the author in his practice.

Colorimeters and Photocolorimeters

Colorimeters of the Duboscq type, manufactured by Soviet industry, generally are better than those made in prewar times. They are more stable, and their readings are proportional to concentrations. These devices are quite adequate for mass control analytical work.

The author is more familiar with a photocolorimeter of the I. G. Perenezentsev system, manufactured by the Ural Scientific-Research Chemical Institute (UNIKhIM, Sverdlovsk). It is an excellent instrument of the compensation type with a unique device which eliminates the influence of temperature on the photocurrent produced by the selenium cell. Such instruments are still in the experimental stage of production. It is desirable to replace the illuminator with one more powerful and to equip the instrument with an iris diaphragm instead of the primitive slides.

It is extremely urgent to organize production of light filters in the form of sets of not less than 12 pieces and with precisely fixed wave lengths of the light passed.

It is also necessary to manufacture a quartz spectrophotometer with a photocell. This apparatus would permit selection of a narrow 5-10 $m\mu$ section of a spectrum in the range from 270 to 700 $m\mu$.

It is desirable to develop production of fluorescent lamps which secure, in combination with light filters, greater monochromatization of luminous flux. This suggestion refers to all types of photocolorimeters.

Polarographs

The laboratory of the Ural State University uses polarographs made by UFAN (Ural Affiliate, Academy of Sciences USSR) and also Czechoslovak instruments of the Neyedla firm.

The UFAN polarograph is dependable and simple in operation. One of its shortcomings is the use of constantan wire resistors without preliminary aging. This causes changes in the readings after a certain period of time. Another defect is the absence of a mirror galvanometer in sets delivered for laboratory use. Since the mirror galvanometer required is of a special type, a great deal of time usually has to be wasted in searching for and adjusting this essential part of the polarograph.

The Czechoslovak polarograph has parts of high quality, but is assembled carelessly, and considerable time was spent in the laboratory adjusting the drum rotating mechanism.

Polarographs of the Gorkiy State University are nice-looking instruments, but their interior assembly is not quite satisfactory since all electrical connections are of thin wire, the resistance of which is very high and will vary under the influence of temperature, affecting the precision of the instrument.

Sanitized Copy Approved for Release 2011/07/22 : CIA-RDP80-00809A000600360805-8

50X1-HUM

Balances

The analytical balance type ADV-200 and microbalance type MA-20 proved to be good in operation. The ADV-200 balance has a constant sensitivity of 0.1 mg in weighing 0-200 g; the MA-20 microbalance has a constant sensitivity of 0.01 mg. Both types of balance are convenient in operation and permit considerably faster weighing than an ordinary analytical balance. An early increase in the production of these balances is desirable so that they will be available in every laboratory.

Potentiometers

The high-grade potentiometers of the Raps type, manufactured by the "Etalon" plant and other enterprises, are of very good quality. The high-resistance PV-5 potentiometer ("Etalon") are also good, permitting measurements to 2.5 volts. Mass production of inexpensive but dependable mirror galvanometers should be developed since the galvanometers manufactured at present by Soviet industry are excessively expensive.

A dependable and easy-to-handle type of potentiometer has to be designed to operate entirely from an ac line. Instruments of this type are needed for operations involving measurements in circuits with great resistance, e.g., measurements with a glass electrode.

The chair of analytical chemistry here developed such a potentiometer and a dependable vacuum-tube voltmeter (pH-meter) based on the conversion of dc into ac with subsequent amplification according to a vacuum-tube voltmeter circuit. The amplified current goes into a phase-sensitive rectifier and then to a galvanometer.

The instruments designed according to a bridge circuit or with special electric lamps are less convenient in operation.

II.

B. V. Mikhal'chuk, Senior Scientific Collaborator at the Scientific-Research Institute of Fertilizers and Insectofungicides

The colorimetric method of analysis plays a prominent role in present analytical practice. Soviet industry does not satisfy the requirements of laboratories in respect to instruments for colorimetric analysis. Many laboratories are forced to use homemade apparatus.

Visual colorimeters of the immersion type are not produced in sufficient quantity and are not always of good quality. Photoelectric colorimeters are still not in mass production. Numerous attempts to satisfy, to a certain extent, the urgent demand for photocolorimeters are not organized and frequently result in delivery to the market of instruments of inferior quality.

Among the unsuccessful models of photocolorimeters, the VNIVI (All-Union Scientific-Research Vitamin Institute) photocolorimeters put out by the TsNIL (Central Scientific-Research Laboratory) of Automatics of the Chemical Society imeni Mendeleyev should be noted first. The first instruments of this type were distinguished by poor photocells, galvanometers of low quality, unsatisfactory tanks, and an excessively high price. Photocolorimeters of the KFE-1 type designed by the VNIVI are manufactured incomplete without galvanometers, the test cell is poorly fitted, and they have low sensitivity.

Sanitized Copy Approved for Release 2011/07/22 : CIA-RDP80-00809A000600360805-8

Among instruments of good quality may be listed a photocolorimeter for liquids put out by the Ural Scientific-Research Chemical Institute (UNIKhIM). The instrument is designed according to a unique bridge circuit and has sufficient sensitivity. There are good reports on the quality of the photocolorimeters produced by the optical-mechanical plant. They are at present undergoing tests for continuous operation.

It is quite evident to the author that the problem of organizing mass production of photocolorimeters must receive immediate attention. It is necessary to collect and evaluate the numerous data accumulated by designers of photocolorimeters and to take into consideration the criticism and requirements of consumers. Only then can the most efficient type of photocolorimeter be developed for mass production. Such organizational work was performed before the last war by the Analytical Commission attached to the Academy of Sciences, but this work was not renewed after the war.

The absence of a supervising center in the manufacture of barrier-layers photocells is seriously hampering the progress of photocolorimetry.

Although considerable theoretical and experimental work has been conducted, resulting in the development of excellent barrier-layer photocells, e.g., GOI (State Optical Institute), these photocells are not being mass-produced.

The production of measuring devices for photocolorimeters is not sufficiently satisfactory. Galvanometers especially designed for photocolorimeters are not manufactured, and incidental galvanometers of inappropriate type have to be used in many cases. Investigators also need, in addition to a pointer galvanometer, the high-sensitivity instruments. Ordinary mirror galvanometers are bulky and not quite suitable for laboratory conditions. The problem may be solved by the introduction of portable mirror galvanometers of the "multiflex" type, but these instruments are not manufactured by Soviet industry and again we have a situation wherein makeshift devices are prepared by individual miscellaneous organizations.

Glass cells, light filters, and other parts are not produced, and only by special order is it possible to obtain at GOI gelatin light filters with required spectrum characteristics. One plant manufactures excellent glass light filters, but they never reach the laboratories. There is no place to order test cells.

The situation is somewhat better, but still far from perfect, in the field of equipment for polarographic analysis. The best instruments are the polarographs of Gintsvetmet (State Research and Production Institute of Nonferrous Metals). They are equipped with an excellent mirror galvanometer and a set of glass parts for the polarographic installation. Visual polarographs made by the Gorkiy Chemical Institute are a little lower in quality but still good.

Until recently, laboratories had no convenient and sufficiently precise potentiometers for determining pH in solutions. The LP-3 vacuum tube potentiometers, manufactured by MOSKIP /Moscow Division of Testing and Measuring Instruments Trust?/, partially satisfy these requirements.

MOSKIP also produces a good instrument, LU-1, for potentiometric titration, but final evaluation of its quality is possible only after observation over a long period of operation.

Good and dependable pointer galvanometers of the GPKP type for 17 mv are now being manufactured by Soviet industry. These galvanometers are designed for use with platinum versus platinum-rhodium thermocouples, but may be also used successfully for photocolorimetric work after modification of the dial. GMP zero galvanometers manufactured by the same plant are dependable in operation but their sensitivity is insufficient for certain operations.

Glavelektrotochpribor (Main Administration for Electrical Precision Instruments) in the Ministry of the Electrical Industry manufactures the M21 magnitoelectric mirror galvanometer with illuminator and P31 indicating device. This instrument is of high quality and satisfies all requirements for this type of galvanometer.

The Arctic Scientific-Research Institute in Leningrad manufactures a mirror self-leveling galvanometer of very small size. The instrument has many good features but also some deficiencies. Due to the light weight of the galvanometer, suspended with a universal joint, self-leveling is easily disrupted by movement of the air in the laboratory. This defect may be eliminated by surrounding the galvanometer with a protective shield with a cutout opposite the mirror. The spherical mirror is very convenient with regard to simplification in the construction of the illuminator. A clear image of an incandescent filament is projected on the dial, but this requires using bulbs with a nonspiral filament. It is extremely difficult to find such bulbs on the market.

The Glavelektroapparat plant of the Ministry of the Electrical Industry produces ferroresonant voltage stabilizers. These instruments, tested in long-term operation, proved to be very efficient and are successfully used in individual photocolorimetric systems and for a great many experimental works which require constant voltage (for example, for an installation with a rotating electrode in amperometric titration).

Only a small fraction of the instruments and apparatus required by plant and research laboratories are mentioned here. In the author's opinion, it is the task and duty of all workers in plant laboratories and research organizations to present for publication their observations and suggestions, thus stimulating correction and improvement of laboratory equipment.

III.

Ye. I. Grenberg, Chief of the Chemical Laboratory
of the Plant imeni Lenin

On the basis of laboratory practice in the plant imeni Lenin, certain conclusions and suggestions may be made.

Analytical Balances

Those of the "Gosmetr" system are insufficiently stable under working conditions in a plant laboratory and frequently fail in operation. Balances of the "Metron" system are better and up to the standards of accuracy and sensitivity required of analytical balances.

Apparatus for Determining Carbon in Ferrous Metals and Ferroalloys

Such apparatus is manufactured by the State Glass Plant at Klin. It is necessary to improve the absorbers and cock section since tubes are frequently broken near the three-way cock. Cases of alkalis being sucked into the cock section are numerous. Performance of the floats should be improved and they should close the outlet channels. The apparatus must be manufactured with a set of endiometers for the combustion of materials with various contents of carbon.

Photocolorimeters

Our laboratory uses instruments of the A. L. Davydov design, prepared by the Dnepropetrovsk Chemical-Technological Institute. The instrument is suitable for mass control analyses and also for research purposes. The rheostat for fine adjustment must be redesigned since this particular part of the instrument frequently fails in mass analysis.

Titration photocolorimeters are used to determine manganese and chromium in high-alloy steels. The instrument, designed by the Chair of Analytical Chemistry of the Dnepropetrovsk State University, is adequate for mass control analysis. The titration cell must be enlarged.

The "φ" galvanometers of the Leningrad Physicotechnical Institute are excellent instruments, and are used for various purposes, particularly in photocolorimetric and amperometric titration. These galvanometers are very dependable and possess the necessary accuracy and sensitivity. However, the galvanometers of this type manufactured by the shops attached to the institutes in Dnepropetrovsk do not have the required qualities and fail frequently.

An instrument for amperometric titration, to determine chromium, manganese, and vanadium in alloy steels, has been designed by the Chair of Analytical Chemistry of the Dnepropetrovsk Chemical-Technological Institute. It is quite suitable for mass control analysis and research work.

The production of many instruments is inadequate at present. The following instruments may be noted as examples: φ galvanometers, analyzers of gases in metals, pH-meters, apparatus for electroanalysis, current rectifiers, and instruments for potentiometric analysis and amperometric titration.

The development of mass production of equipment for plant laboratories is an urgent matter.

IV.

A. F. Gorin, Director of the "Manometr" Plant, Moscow
S. S. Olenin, Chief of the Central Laboratory

In addition to quality control of products, semiproducts, and raw materials, the tasks of plant laboratories also embrace the development of new technological processes and the solution of scientific and technical problems arising in the production process. For the successful fulfillment of these functions, laboratories must be provided with qualified personnel and high-quality equipment. However, plant laboratories do not always receive proper attention and often their activity is limited to control operations over incoming materials and outgoing products. It is the authors' opinion that plant laboratories must be enlarged, provided with highly qualified personnel, and equipped with the required instruments and apparatus of proper quality. Some industrial establishments manufacture many units of laboratory equipment with defects which must be eliminated as soon as possible. The authors present below an evaluation of the equipment used in the central laboratory of their plant.

Balances

Several analytical balances are used in the laboratory. The standard second-class balance of the "Etalon" plant is of high quality, sensitive, and easy to operate. It may be recommended for weighing materials up to 5 kg with accuracy of 5 mg. However, insufficient weights are given with this balance.

Considerably lower in quality is the standard third-class balance for 20 kg manufactured by the "Gosmetr" plant. Because of careless assembling and packing, the balance was received with bent pointer and adjusting screw on the beam. During operation of this balance, its prism is frequently displaced from the support, because of incorrect finishing of the prism edge.

50X1-HUM

The generally good analytical balances of the "Gosmetr" plant have quite a few serious defects. A balance received in 1949 lost its sensitivity after several months of operation. The use of the rider was impossible, and pans with their stirrups frequently slipped off the prism edges.

It is recommended that the manufacture of balances with automatic control of weights be increased since this type of balance is considerably more convenient and accurate than the ordinary analytical balance.

The balance pans must be protected with glasses for cases involving the handling of some aggressive substance, but such glasses are not supplied by "Gosmetr."

It is necessary to increase production of analytical weights, which should be sold separately from the balances.

The assay balance of the "Gosmetr" plant is a good, sensitive, and convenient device and its production should be increased. It is desirable that weights for this balance be sold separately since it is apparently impossible to obtain such weights at present.

Furnaces

The carbon combustion furnaces made by the "Elektrodelo" plant operate for a long time without repair, but spare parts for these furnaces are not manufactured. The furnace is equipped with a chromel spiral which, when burnt out, frequently has to be replaced with a spiral made of ribbon nichrome. Since the resistance of nichrome is different from that of chromel, the transformer burns up from overloading. Production of spirals for these furnaces is highly recommended.

It is very desirable to organize production of laboratory thermocouples for furnaces for carbon combustion.

Carbon combustion furnaces made in the "Platinopribor" plant are considerably lower in their operational qualities than the "Elektrodelo" plant's furnaces. As a rule, in $1\frac{1}{2}$ or 2 months of operation at 1,100-1,200°, the spiral is burnt out and the molten metal penetrates into the walls of the porcelain tube, causing destruction of a new spiral at the same place.

Production of furnaces with a nichrome heating unit for 800° must be discontinued, since such a low temperature is seldom used in combustion processes.

The laboratory and heat-treatment shop of the "Manometr" plant employ muffle furnaces from the "Platinopribor" plant with automatic temperature control and rheostats. These furnaces are generally good, but they do have certain defects: the chamotte muffle begins to conduct current after heating up to 800-900°, the thermoregulator gives erroneous readings after a certain time in operation, and the rheostat slide is sometimes jammed, causing rupture of the rheostat spiral.

"Platinopribor" plant drying ovens for 250° with an automatic thermoregulator show good performance and may be recommended for mass production. However, construction of the thermoregulator should be improved because of its frequent failure in functioning after a certain period of operation.

The highest rating may be given a tube furnace with maximum temperature of 1,200° and with rheostat temperature control. This furnace is manufactured by the "Platinopribor" plant and designated for correction of thermocouples. The furnace installed in the authors' plant has operated for 2 years without repair.

To determine phosphorus and molybdenum in steels, the chemical section of the laboratory uses a "Moskip" photocolorimeter. The instrument showed very good performance and may be recommended for use in plant laboratories. It is necessary to organize production of spare light filters and glass cells, the absence of which very often hampers operations.

The Rechitsa plant must be notified that its porcelain mugs frequently crack when heated, and leak even without visible cracks.

Production of measuring glassware without the Kommerpribor stamp must be discontinued, since the use of such glassware in plant laboratories is prohibited. The Kommerpribor stamp must be applied with hydrofluoric acid instead of paint, as is the frequent practice at present.

The fitting of cocks and valves in apparatus for carbon determination should be improved, since operation of the installation as a whole depends on the quality of these parts.

It is necessary to improve the quality of the pencils for marking glass, manufactured by the "Kirillovskiy Khimik" artel of the Mosoblles-promkhimsoyuz (Moscow Regional Wood Industry Chemical Union). They cannot be used at all; they must be remelted.

Considerable increase in the production of ashless filters is desirable, since present production does not provide sufficiently for the needs of laboratories.

The authors' plant conducts a great many analyses of nonferrous metals and uses Fischer's electrodes for electrolytical determination of copper and lead. At present, installations using these electrodes are not manufactured. It is urgent to develop an electroanalytical 5-6 unit installation which would include the rectifier, electrode holders, mixing device, and control panel with separate instruments for each unit.

Equipment for Spectrum Analysis

The following instruments are installed in the authors' laboratory: an NIIF (Scientific Research Institute of Physics) steeloscope, an NIIF steelometer, the ISP-22 spectrograph with spark and arc generators, a microphotometer, a spectroprojector, and a microscope for measuring wave lengths. All these instruments are used for quantitative and semiquantitative analysis of ferrous and nonferrous metals and alloys.

Application of a steeloscope for semiquantitative determinations in many cases decreased by two or three times the length of analysis.

The NIIF steeloscope is a convenient instrument of sufficient accuracy, but has certain deficiencies, as observed in the authors' laboratory: the location of spectrum lines does not correspond to the readings given on the instrument chart; determination of silicon is possible only at a content of 0.9-1% and greater; switches of the steeloscope get out of order too soon and must be replaced.

It is advisable to install a protective glass on the lens of the steeloscope; otherwise, particles of molten metal, thrown by the arc at the moment of analysis, damage the lens.

The ISP-22 spectrograph deserves the best evaluation. The instrument is easy to operate and simple to handle. The IG-2 spark generator secures normal functioning of the spectrograph and may be recommended for wide application in spectral laboratories.

It is desirable that the spark generators be manufactured on the basis of complete interchangeability of parts. Spectrum methods of analysis are receiving increasingly wider application in Soviet industry, but it is very difficult to obtain standards for spectrographs. The laboratory of the Ural Institute of Ferrous Metals produces a very small quantity of spectrographic standards, insufficient to satisfy requirements for ferrous metals. As a result, the majority of plants have to make their own standards, which is not always possible.

V.

Ye. I. Fogel'son, Senior Engineer-Researcher of the Chemical Laboratory of the Automobile Plant imeni I. V. Stalin

In the process of developing photocolorimetric methods of analysis, the authors' laboratory used a photocolorimeter of the Central Laboratory of Automatics at the Chemical Society imeni Mendeleyev. Quite a few serious defects were revealed and the instrument is not in use at present.

A photocolorimeter of the UNIKhIM system was also tested. Poor results were obtained in analysis of synthetic solutions of nickel by the method of forming a complex compound of nickel with dimethyl glyoxime. Plotting of a calibrating curve was impossible on the basis of these results. Light filters are not included as standard equipment. The quality of these instruments is still unsatisfactory.

A universal electrometric pH-comparator of the S. A. Strelkov system showed unsatisfactory performance. Readings of this instrument do not guarantee correct determination of pH.

The "Tekhnoves" analytical balance has its scale on the beam graduated from the end of the beam but not from the middle point on both sides, as it should be. This inconvenient method of graduation is used also for a damped microbalance.

There is no arrangement for manufacturing good analytical balances with damper for quick weighing without using a magnifier.

Purchase of weights separately from balances is very difficult. This situation should be corrected.

VI.

D. G. Sukhov, Head of the Chemical Laboratory of the "Elektrostal'" Plant

At present, the plants of the Ministry of Instrument Building and some other enterprises are fabricating a great number of various instruments and apparatus for chemical and physicochemical analysis, but the quality of some of this equipment is not sufficiently high. In 1949, the laboratory of the "Elektrostal'" plant received two visual colorimeters constructed by the Leningrad Mechanical Technicum. Both colorimeters have a defective mechanism for regulating lifting and lowering of cylinders. The pair of prisms on one colorimeter do not give uniform illumination of both fields of view. For all practical purposes, it is impossible to use this colorimeter.

In many cases of analysis, the laboratories could use electromechanical centrifugal machines. The Stalingrad Medical Equipment Plant manufactures these centrifuges according to the requirements of biochemical laboratories. The volume of test tubes does not exceed 10-15 ml, whereas for analysis under plant laboratory conditions these tubes must be of 50 ml volume.

50X1-HUM

Up to the present, Soviet industry has not resumed production of the "Agropribor"-type potentiometers which measure potential with the aid of a slide. Production of these instruments, with a modification in the form of the calomel electrode, is desirable.

The instrument-building industry does not produce any electrolytic installation for mass analysis (16-20 simultaneous determinations). Chemical laboratories have to use their own primitive, inadequate constructions.

Spectrum analysis methods are widely applied in the Soviet metallurgical industry. During the last war, the Leningrad Optical-Mechanical Plant began to manufacture quartz ISP-22 spectrographs which are now being used by many industrial enterprises. These spectrographs have an excellent finish and are easy to operate, but, at the same time, they have some defects which must be eliminated as soon as possible.

The main defects are as follows: it is impossible to obtain clear focus on the spectroprojector over the entire field of view because of defects in the optical part of the instrument; activators get out of order because of poor insulation of the winding or because of imperfections in the assembly circuit; platinum reducers have insufficient difference in density gradients and do not permit sufficient accuracy in quantitative determinations of certain elements.

Other instruments for spectrum analysis also have defects. For example, a portable steeloscope has a deficiently designed arc generator, which becomes greatly overheated in more or less prolonged operation.

It should be emphasized that a great obstacle to wider application of spectrum analysis of metals in industry is the discontinuance of the manufacture of visual steelometers, their condensers, and transformers for the steelometric arc.

VII.

S. I. Solomonov, Head of the Chemical Laboratory of the "Serp i Molot" Plant

Frequently, instruments of good quality appear on the market incomplete or without spare parts. For example, a very good photocolorimeter of the A. L. Davydov system is manufactured without a galvanometer and without a device for power supply of lamps. Therefore, after purchasing this instrument, some laboratories cannot use it because there is no galvanometer, rectifier, or battery.

The bomb in calorimeters for determining the heating value of fuels is not sufficiently long-lived. A hydrostatic balance is on sale without spare floats. These floats, made of glass, are frequently broken. The balance cannot be used, since there are no separate floats on the market.

Automatic values of absorbers in the most popular apparatus for determination of carbon by combustion are frequently of very poor construction and cause rejection of the absorbers.

Ordinary nonvolumetric glassware produced by the Klin Plant cracks at slight changes of temperature.

VIII.

L. L. Kunin, Head of the Chemical Laboratory
of the "Dinamo" Plant

At present, photocolorimeters are not standardized and a great variety of systems is manufactured by various organizations. Sometimes instruments of entirely incorrect construction may be found on the market. The authors' laboratory purchased a photoelectric KFE-1 colorimeter from the All-Union Scientific-Research Vitamin Institute. This instrument is made by the shop for control-measuring instruments of the Ministry of Cinematography USSR.

The instrument must give an accuracy of 2-3% and reproducibility of 0.5 division of the scale. However, these characteristics are never shown in operation. For example, in the determination of silicon in steel in the form of molybdenum blue with the green filter included in the KFE-1 set, disagreement with the gravimetric method amounted to from 0.03 to 0.08%, with the GOST-established permissible error set at 0.04%. Reproducibility of measurements considerably differed from rated data. Deviations reached two and sometimes three divisions of the rheochord scale.

The main defects of the KFE-1 colorimeter are as follows: the test cells are cylindrical instead of having parallel walls; the zero reading of the galvanometer is attained by rotation of the illuminator itself; the set of light filters is incomplete (there is no yellow filter); the light filters do not provide for obtaining a monochromatic beam of light; instruments are incomplete (no galvanometer); power for the light source is supplied from a line through a transformer without voltage stabilizer; and, there are no condensers for directing the light beam through the vessels with solutions to photoelectric cells. It is desirable to eliminate the above-listed defects in designing a standard photocolorimeter.

IX.

Professor Yu. A. Chernikhov, Head of the Laboratory
of the Scientific-Research Institute
B. M. Dobkina, Senior Scientific Collaborator

The authors consider it necessary to renew production of several laboratory instruments which were manufactured during prewar times and proved quite satisfactory in operation.

In 1939 - 1941, the authors used a colorimeter with two selenium TS-3 ("Tsvetomer") photocells of MOSKIP. This instrument, designed with the utilization of optical and electric compensations, operates on two circuits. The first one permits the use of current directly from a power line and therefore is the most convenient system. The galvanometer is connected as a zero instrument and readings are taken from the scale of a sliding resistor (rheochord). In the second circuit, a battery is used for power supply and readings are taken from the scale of a galvanometer. A 6-8 volt automobile-type bulb serves as a light source. The glass vessels, cemented with glue, were insufficiently acid-resistant; they should be replaced with fused vessels.

Just prior to the war we introduced this colorimeter into laboratory practice at the Balkhash Copper-Smelting Combine for determination of minimum amounts of molybdenum by the photocolorimetric method. The instrument was very easy to operate and should be mass-produced after suitable modernization.

The very simple "Agronom" pH-meters were manufactured before the war. They could be adjusted for potentiometric titration. The expensive pH-meters and potentiometers manufactured at present are of more complicated design and less dependable.

Pointer and mirror galvanometers with sensitivity from 10^{-6} to 10^{-9}a were made by the Physics Institute of Leningrad University. They were inexpensive and manufactured in great number. Galvanometers of this type are now in short supply and hard to obtain. It is necessary to organize again the production of these instruments.

Starting in 1934, the Ukrainian Affiliate of Giredmet (State Institute of Rare Metals) in Odessa, under the supervision of Professor Ye. S. Bursker, manufactured good polarographs.

As a result of improving these instruments, the institute developed the high-grade model No 8 in 1940 - 1941. Unfortunately, production of these polarographs was discontinued after the war. The experience of the Odessa Giredmet should be utilized and production renewed.

X.

Professor Yu. A. Klyachko, Head of the Laboratory of TSNIIChM (Central Scientific-Research Institute of Ferrous Metallurgy), A. G. Atlasov, Senior Scientific Collaborator

Among the existing methods for determining gases in metals, the vacuum melting method deserves to be rated highly. This method permits simultaneous determination, from one sample, of the total content of hydrogen, oxygen, and sometimes nitrogen, i.e., it permits obtaining the most complete characteristic of gas content in metals.

Assembly of the installation for the vacuum-melting method is quite difficult, since the apparatus is composed of various parts manufactured by industry for other purposes.

The installation consists of three basic parts: the furnace for melting metals under high vacuum, the system of vacuum pumps, and the gas-analytical device.

There are two types of furnaces for the vacuum melting of metals: induction heating furnaces and resistance furnaces. The first type, which has better operational characteristics, requires complicated electrical equipment.

The "Platinopribor" plant manufactures a laboratory induction furnace for vacuum melting, but this furnace can be used in the assembly for gas determination only after considerable modification.

Resistance furnaces with tube graphite heating units have somewhat lower operational characteristics but are simpler in operation.

Power supply for both types must permit regulation over a wide range of temperatures (up to 2,200-2,500° in induction furnaces and up to 2,000-2,200° in resistance furnaces).

The furnaces manufactured lately give the required temperature but often do not provide the necessary vacuum. Furnaces of the TsNIIT MASH (Central Scientific-Research Institute of Heavy Machine Building) type are entirely satisfactory.

The system of vacuum pumps maintains a vacuum in the furnace and collects liberated gases. It consists of a high-vacuum mercury-vapor pump, glass mercury-dropping pump, and oil forevacuum pump.

Sanitized Copy Approved for Release 2011/07/22 : CIA-RDP80-00809A000600360805-8

The high-vacuum pump must have a sufficiently high effect for critical forevacuum pressure (up to 20-40 mm Hg) and a capacity of 10-15 l/sec. These requirements may be satisfied by a multistage metallic mercury-vapor pump; the oil-vapor pump, in spite of its high capacity, is unsuitable for this purpose. It is necessary to renew the manufacture of mercury-vapor pumps.

The mercury-dropping pump may be made by an experienced glass blower. The design developed by the VIAM (All-Union Institute of Aviation Materials), in the authors' opinion, is superior to the designs of foreign firms.

The oil forevacuum pump has a secondary significance in the installation, and a low-power pump of 20 l/min capable of producing a vacuum up to 0.02 mm Hg is adequate.

The analyzer for determining CO_2, CO, H_2, and N_2 includes two vacuum meters for pressure ranges from 1 to $1X10^{-3}$ mm Hg and from 0.1 to $1X10^{-4}$ mm Hg and an optical pyrometer for 700-2,200°.

Thus, the installation for determining gases is not very complicated, but the improvisation of separate parts is complicated. Therefore, it is necessary to organize mass production of complete equipment.

XI.

V. A. Medvedovskiy and A. I. Zak,
Scientific Collaborators of the Institute
of Physical Chemistry, Academy of Sciences USSR

The LP-3 vacuum-tube potentiometer produced by MOSKIP is a very good instrument which has wide application in laboratory practice where accuracy may not exceed 0.1 pH or 10 mv.

This instrument may be used for measuring pH and for potentiometric titration in both stationary and field laboratories.

The instrument operates on dry batteries, among which a filament battery for the tube amplifier fails most frequently. Since it is very difficult to obtain a spare battery of this type, it is recommended that additional terminals be placed on the side wall of the box for connecting a storage battery in place of the dry battery.

The GMP galvanometers, manufactured lately, are inferior to the inexpensive galvanometers of the N-111 and N-IV types which previously were manufactured by the Institute of Physical Instrument Building in Leningrad. Application of GMP galvanometers in compensation devices as a zero instrument decreases the accuracy of potential measurements.

It is necessary to organize the production of inexpensive, sensitive ($1-2X10^{-7}$a) zero instruments, which are required by electrochemical laboratories. Use of the multiflex reflecting optical system would be a substantial advantage in this instrument but would make the instrument more expensive.

- E N D -