

Space INTELLIGENCE NOTES

SPACE SYSTEMS INFORMATION BRANCH, GEORGE C. MARSHALL SPACE FLIGHT CENTER

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September 1962

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SOVIETS MAY LAUNCH SPACE LABORATORY STATION IN 1963. According to a staff report for the U. S. Senate Committee on Aeronautical and Space Sciences, the USSR space program may include a permanent manned space laboratory station for next year and a manned lunar landing by 1965. The report, released on May 31, 1962, is based on statements by top Soviet scientists.

The space station will probably serve as an assembly point for spaceships and as a launching and receiving pad. Orbital flights of about 10 days by three or more cosmonauts will first be necessary, however, in order to develop and perfect rendezvous techniques.

One U.S. prognosticator of Soviet space feats who contributed to the report is Mr. C. L. Zakhartchenko, a consultant to Detroit's Bendix Corp. One year before Nikolayev was orbited, Zakhartchenko predicted Soviet manned spaceflights of 5 to 10 days in 1962. His prediction was based on a statement by Soviet academician Professor N. A. Varvarov concerning space plans after the Gagarin flight.

Varvarov said: "This will be followed by the construction of flying laboratories with crews of several men, the launching of satellites to Mars and Venus, and the landing of a rocket with scientific instruments on the Moon.

"After having orbited the Moon and returned to Earth, rockets with crews will be launched to land on the Moon and return to Earth. All these tasks have been thoroughly thought out and can be implemented in the coming years,"

Mr. Zakhartchenko also believes that the Soviets will try to launch "either manned or automatic probes" toward Mars or Venus by 1964-65. These will depend upon the development of adequate life support systems for long voyages and radiation protection measures. (Source: Washington, D. C., Washington Daily News, August 15, 1962)

+ Lunar surface

WATER EXISTS ON MOON, RUSSIAN REPORTS. A water supply locked in ice may be waiting in dark Moon craters for the first astronaut landing there.

Huge lakes of ice are believed present in the sunless craters of the Moon's polar regions. However, scientists will have to wait for the first lunar landing to see if this is true, Russian scientists noted, because of the present impossibility of peering into the dark craters.

At the lunar poles, the Sun barely rises above the horizon, keeping the crater temperatures exceedingly low, Dr. V. D. Davydov, State Astronomical Institute, Moscow, said in reports received in the U.S. Under these conditions, it would take billions of years to evaporate even a thimbleful of water. (Source: Washington, D.C., The Washington Daily News, July 24, 1962)

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TITOV PREDICTS TRAVEL SOON TO PLANETS. Gherman Titov marked the eve of the first anniversary of his 25-hr space flight on August 6, 1961, with a prediction. He stated that the time is not far off when Russian space-ships shall travel to other planets.

Titov's statement, printed in the Communist party newspaper Pravda, also included a plea for increased Russian-American cooperation in outer space.

Pravda printed a joint interview with Titov and the first cosmonaut, Yuri Gagarin, in which Gagarin recalled that he had earlier predicted that the next manned Russian space flight "will certainly take place this year."

Vostoks 3 and 4 were launched on August 11 and 12, respectively. (Source The Chicago Tribune, August 6, 1962)

FRANCE TO ORBIT SATELLITES BY 1965. France recently announced officially that it plans to join the other great powers in the space race.

French Information Minister Alain Peyrefitte stated on August 22 that France is scheduled to place a 150-lb satellite in orbit by March 1965. Satellites three and four times larger will be orbited shortly following the first one. No further details were given.

The announcement was made after a cabinet meeting presided over by President de Gaulle. (Source: Washington, D. C., Washington Post, August 23, 1962)

BRITISH SATELLITE SENDS USEFUL DATA. Ariel, Britain's first Earth satellite, is reported by Denzil Freeth, Parliamentary Secretary for Science, to have produced interesting and valuable information about the ionosphere and higher atmosphere.

He commented: "Ariel at first behaved almost perfectly, but recently, transmission of data has been interrupted irregularly. The reason is not known but is being investigated."

The satellite was launched from Cape Canaveral by a U.S. Delta vehicle on April 26 of this year. (Source: Washington, D. C., Washington Post, August 3, 1962)

RUSSIAN SCIENTISTS BEST, TELLER SAYS. Dr. Edward Teller, renowned physicist and "father" of the hydrogen bomb, says the best scientists now are not in the United States but in Moscow.

He alluded to Russia's feat of orbiting two men at the same time.

The U.S. "must get people or equipment to the Moon for knowledge and for knowledge only", Dr. Teller told a conference of refrigeration engineers in Los Angeles on August 14.

"The important thing in establishing an observation post on the Moon is the overall look scientists will have of the entire universe and to establish possibly whether the universe had a beginning and what it looked like," he said. (Source: Washington, D. C., Washington Star, August 15, 1962)

Astronomy ✕
SOVIET ASTRONOMERS TO CONDUCT STAR STUDY IN CHILE. Sovetskaya Rossiya reported in July of this year that astronomers of the Pulkovo Observatory will go to Santiago, Chile, to study the stars of the Southern Hemisphere and compile a stellar catalogue. Observations will be carried out by a special semiautomatic photographic meridian circle, built in the Observatory workshop, which makes it possible to determine stellar coordinates with a high degree of accuracy. (Source: U.S. Dept. of Commerce, A.I.D. Press, No. 769, August 10, 1962, p. 1)

SA
SOVIETS SNUB OFFER OF TELSTAR RELAY. On August 13, Russia declined to cooperate in relaying live telecasts of its orbiting cosmonauts to the U.S. via Telstar.

Russell Tornabene, current chairman of a joint network committee to coordinate trans-Atlantic Telstar programs, said the plan met a "polite but firm negative response" in Russia.

The proposal was made to Mikhail Kharlamov, chairman of the Soviet State Committee of Radio and Television. Even if the Russians had agreed, such a transmission would have been very difficult, since pictures of the cosmonauts were received in Moscow for only 3 min at a time from the Vostoks. (Source: Washington, D. C., Washington Post, August 14, 1962)

Astronauts
U.S. AND SOVIET SPACEMEN TO MEET IN BULGARIA. American astronauts John Glenn and Alan Shephard will join their Soviet counterparts in an International Astronautics Congress at a Bulgarian Black Sea resort on September 23-29, it was reported from Sofia on August 29.

The official Yugoslav news agency Tanpig said the Americans would meet Yuri Gagarin, Gherman Titov, Andrian Nikolayev, and Pavel Popovich at the conference. (Source: The Chicago Tribune, August 30, 1962)

FROM THE SEMITECHNICAL LITERATURE

DO EARTH ORGANISMS NOW INHABIT MOON? Assistant Professor Carl Sagan of the University of California's Astronomical Department says we may never know whether life existed on the Moon before the landing of Lunik 2 and Ranger 4.

Although the Russians cleansed the exterior of Lunik 2 with steam and formaldehyde before launch, the interior was not cleansed at all. In Sagan's opinion, this leaves a high possibility of contamination if the spacecraft was punctured when landing.

Although Ranger 4 was cleansed entirely, it is feared that live organisms might have been released from unignited rocket fuel if the tanks burst upon impact.

Sagan stated his fears at the Conference on Lunar Exploration at Virginia Polytechnic Institute on August 13-17. Lunar experts attending the conference were in full agreement. He stressed the importance of precautions being made on future space shots. (Source: Missiles and Rockets, August 27, 1962)

COMPARISONS OF MERCURY AND VOSTOK SPACECRAFT L. Abramov, a Soviet engineer, compared the Mercury and Vostok spaceships in the Moscow newspaper Trud just prior to the launch of the Vostoks 3 and 4. The Soviet engineer claims the Vostok support systems to be far superior to those of the Mercury.

"The air-conditioning system on the Soviet ship," Abramov says, "guarantees a normal concentration of oxygen in the cabin's atmosphere. The regeneration of the air's components is carried out with the aid of highly active chemical compounds." The Vostok ship is claimed to either build up or reduce the oxygen present as may be needed to supply the correct amount. "On the Mercury ship, pure oxygen is used in the cabin during spaceflight. It is supplied from the cylinders in which it is contained."

The cooling system on the Vostok is claimed far superior to Mercury. Abramov claims Gherman Titov maintained temperatures of from 10° to 25°C in the Vostok while Scott Carpenter endured temperatures up to 50°C.

According to Abramov, the Vostoks have two methods of landing the cosmonauts safely. They can either come down with the spacecraft or parachute separately. He gleefully cites Carpenter's overshoot and praises the exactness of Gagarin's and Titov's landings.

Abramov also remarked prophetically that it will be two years after the spaceflight of Gherman Titov before the Mercury program can attempt a 24-hour flight. (Source: Missiles and Rockets, August 20, 1962)

SUPERTHERMOPHILES FROM SPACE. Soviet medical scientists are convinced that life can exist in space. This view is based on research conducted by Ch. Bayryyev and S. Mamedov relative to thermophilic bacilli found in ozocerite (a mixture of solid hydrocarbons often found in paraffin oils) and meteors. + astromicrobiol.

Ozocerite, also called "fossil wax," has long been known for its ability to accelerate the regeneration of tissue. Bayryyev and Mamedov established that the active agents responsible for this phenomenon are thermophilic microorganisms known as "ozocerite bacilli." These bacilli were also found to be capable of surviving temperatures of over 150°C.

In pursuing their research, they later discovered the existence of ozocerite in meteors. This discovery led to their hypothesis that life can exist in space. They theorized that the interior of some meteorites does not exceed 150°C and would also contain sufficient hydrocarbon and water to maintain life. The theory was confirmed, according to Turkmenskaya iskra, June 27, 1962, when the scientists succeeded in extracting from meteors a superthermophilic bacilli, which has been named "meteorite bacilli." (Source: U.S. Dept. of Commerce, A.I.D. Press, Nos. 752 and 755, July 18 and 23, 1962)

RUSSIANS STUDY WAYS OF SENDING A MAN TO THE MOON. A recent article syndicated by a Soviet press agency discusses various methods which have been considered for sending a man to the Moon in the current decade.

Both direct ascent to the Moon and various orbital rendezvous techniques are being studied but no decision on which method will be used has yet been made public.

Yure Marinin, a staff writer for the Novosti Agency, discusses the problems in each method as follows:

"Direct ascent requires a 50- to 100-ton capsule to be lifted into space by a huge 'Mastodon' rocket weighing several thousand tons and standing 300 ft high.

"About 100 tank cars of liquid fuel would be required for this rocket, and the launching pad alone would cost billions of rubles.

"A plan for lunar launching from water is not expected to be worked out in this decade. One major problem is how to get the Mastodon to the launching pad. Rail and truck transport have been ruled out. Scientists are considering assembling the first stage on a barge. This stage alone would be 150 ft high and 50 ft in diameter.

"The barge would be floated to the launching area where other stages would be assembled on a second barge. This second barge would be used eventually as the launching pad.

"Assembling the entire rocket on the launching pad is considered less reliable than completing the assembly at the factory.

"Of the methods for sending man to the Moon and back, the Earth orbital rendezvous method is thought to be the most realistic. Several variations are possible.

"If there were no reliable rocket available to lift a 5-ton payload, technicians would favor hurling an unmanned spaceship into orbit and following it with a manned capsule weighing only 2 tons. The crew would then transfer from their capsule to the larger craft.

"The rocket engines needed for a soft Moon landing and return to Earth could be orbited with or without fuel. It is noted, however, that fueling in space under weightless conditions presents serious problems."
(Source: New York Times, August 2, 1962)

X
Astronauts
COSMONAUT TRAINING METHODS DISCLOSED. According to Colonel Yeugeni Petrov, Soviet Cosmonaut Group Commander, selection and training of the Soviet cosmonauts was very rigid.

Russ Space Prog. X
In the preliminary selection, primary attention was given to mental attitude, for as Petrov puts it, "If a man fell short in the basic attitudes, he could not hope to come through the many tests space flight would put him to." The candidates were apparently selected from among Russian jet aircraft pilots.

Full medical examinations were given and candidates who did not fulfill the requirements completely were dropped. With the remaining few, the actual training began. The first training was a toughening up process of physical exercises. This included sitting-up exercises every morning, gymnastics, and track and field work. Constant checkups and eliminations were made.

The second phase of training was a familiarization with the spaceship. According to Petrov, the Soviet cosmonaut was expected to know the details of construction, equipment, and the conditions a pilot would meet in space. A board of examiners tested the cosmonauts and eliminated the ones who failed to pass.

After several months, the physical training was expanded to include high diving, trampoline work, parachute jumps, and more complicated gymnastics. The parachuting included bailing out over water. This necessitated getting out of the straps and parting with the chute a dozen or so yards above the water and then diving headfirst into it.

A device called the "running path" was used to check conditioning. It consisted of a motor-driven belt on which the cosmonaut ran. The trainee wore numerous indicators connected to a control panel operated by an examiner who varied the speed of the belt and then noted results. Trainees not in proper condition were eliminated.

The cosmonauts were also subjected to conditions similar to those to be encountered in space. One device used was called a "rocking platform." It consisted of a round table that could rock in all directions. The trainee had himself hooked by a safety belt to the ceiling. This device tested for nausea. A second device used consisted of a soundproof chamber in which the cosmonaut was placed. Here he was subjected to pressure changes, bright flashes of light, and harsh sounds.

Petrov claims that their method of training is excellent and has given good results. The training continues at all times. The decision as to who will make the flight is not made until the final physical examination. (Source: Missiles and Rockets, August 20, 1962)

SOVIETS INTENSIFY RADIATION STUDIES. The Russians are stepping up the pace of their research on the potential hazards of all kinds of radiation.

A new institute, to be devoted to studies of medical radiology, is nearing completion at Obninsk in the Kaluga region, about 60 miles from Moscow.

Some research is already underway there in buildings completed during the last 6 months.

Its stated purpose is to study:

1. The biological effect of ionizing radiation;
2. The potential poisonous effect of radioactive substances if present in the body in sufficient quantities;
3. Means of protecting humans and animals against radiation of all types;
4. Ways of using radio isotopes and other radiation sources, particularly high-energy sources, for the diagnosis and treatment of various diseases.

An official of the Academy of Medical Sciences said the program included studies of fall-out effects.

The Russians have developed a number of devices for administering radioactive isotopes in medical diagnosis and treatment. (Source: New York Times, August 14, 1962)

Astronomy
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USSR OBSERVATORIES. Six new astronomical observatories are under construction in various parts of the Soviet Union, according to Professor Alexander A. Mikhailov, chairman of the USSR Academy of Sciences Council for Astronomy. Soviet Russia has 36 astronomical observatories in operation now.

New observatories are being built in Azerbaidzhan, Kazakhstan, the Ukraine, Novosibirsk, Irkutsk, and Tartu. Mikhailov says the Tartu facility will become the central astronomical observatory establishment of the Baltic Republics. (Source: Aviation Week and Space Technology, September 3, 1962, p. 23)

SOVIETS MAY USE COSMIC RAYS TO STUDY EARTH'S INTERIOR. Soviet scientists have suggested the use of cosmic rays to explore the Earth's interior for mineral deposits.

Cosmic rays possess a tremendous penetrating capacity and are absorbed to a certain degree by rock formations and minerals. It is proposed to direct the penetration of the rays into the Earth with the help of a so-called "cosmic telescope," a device which would consist of a system of Geiger counters lodged into a deep crevice. With the help of this narrow-beam telescope, it will be possible to establish not only the location but the size of deposits.

This new geophysical method of "radioscopy" of the Earth's layers by cosmic rays can be utilized for the isolation of any type of rock formations which differ from the ambient masses.

Professor A. Tarkhov will head a group of scientists planning to investigate the source of cosmic rays in the entrails of the Krivorog iron ore basin in the Soviet Ukraine. (Source: Izvestia, August 1, 1962)

SOVIET INFORMATION SERVICE. An article in Ekonomicheskaya gazeta, No. 27, June 30, 1962, tells of the extensively developed information service now being used in the USSR. It states that the Soviets have a wide network of organizations for dissemination, among scientists, engineering and technical personnel, and worker-innovators, of information relating to new inventions and achievements.

This network includes 84 All-Union and centralized professional information organs, 94 central offices of technical information at the Councils of the National Economy, over 4000 offices of technical information, 3000 "homes" and "rooms" of technology at industrial enterprises, and over 16,000 scientific and technical libraries. More than 60,000 people are employed in this network. (Source: U.S. Dept. of Commerce, A.I.D. Press, No. 751, July 17, 1962, p. 3)

FROM THE TECHNICAL LITERATURE

AERODYNAMICS

aerody +
ON THE COLLISION OF GAS JETS. N. N. Makeyev, in Prikladnaya matematika i mekhanika, Vol. 26, No. 2, 1962, presents an exact solution on the two-dimensional problem of the collision of gas jets flowing out of coaxial channels of finite width with parallel walls. With the aid of the theory of gas jets for subsonic velocities, the problem is reduced to a boundary-value problem for Chaplygin's equation, the solution of which is presented in the form of Fourier series. (Source: U.S. Dept. of Commerce, A.I.D. Press, No. 760, July 30, 1962, p. 3)

aerody X
SUPERSONIC FLOW AROUND AN INCLINED CIRCULAR CONE. An analysis of supersonic flow about a cone at an angle of attack which reconciles the findings of Stone, Ferri, and Willett is presented by B. M. Bulakh in Prikladnaya matematika i mekhanika, Vol. 26, No. 2, March-April 1962. His conclusion states that Stone's theory is correct outside the vortex layer adjacent to the cone surface (introduced by Ferri).

For conditions inside the vortex layer, a solution is found which is transformed into Stone's solution for conditions outside the vortex layer, i.e., which is an analytical extension of Stone's solution in the vortex layer. A solution is thus obtained which applies to the entire region between the cone surface and the shock wave. The behavior of constant entropy lines in the solution corresponds to Ferri's analysis.

It is also shown that logarithmic singularities at the cone surface are caused by the cutoff of the series of α , which represents the solution. These singularities do not exist if all terms of α^n (n being a natural number) are considered. (Source: U.S. Dept. of Commerce, A.I.D. Press, No. 760, July 30, 1962, p. 3)

ASTRONOMY

cosmogony +
SOVIETS CLAIM VERIFICATION OF SHMIDT'S ORIGIN OF EARTH HYPOTHESIS. The July 6, 1962, issue of Sovetskaya Latviya states that in an experimental verification of Otto Shmidt's hypothesis of the origin of the Earth, researchers at the Institute of Geochemistry and Analytical Chemistry, Academy of Sciences USSR, have melted a stone meteorite by the zone-refining method. As the melted zone moved slowly through the depth of the meteorite, certain changes took place. Silicate drops of the type formed when a meteorite falls on a planet were lost, as were gaseous and volatile substances. This is according to Shmidt's hypothesis concerning the formation of the Earth's atmosphere and the hydrosphere.

In the experiment, the melted zone carried with it matter from which glass basalt was formed and low-melting dunite formed a layer with a composition similar to that of the terrestrial olivine zone. The original material of the meteorite lay beneath this layer. At the end of the experiment the meteorite bore a striking resemblance to a model of the layers of the lithosphere. According to the Director of the Institute, this experiment proved Shmidt's hypothesis. (Source: U.S. Dept. of Commerce, A.I.D. Press, No. 766, August 7, 1962, p. 1)

FREE WATER ON MARS. A. I. Lebedinskiy and G. I. Salova report in Astronomicheskii zhurnal, Vol. 39, No. 3, 1962, that the total amount of water in the free state during the yearly hydrologic cycle on Mars has been estimated. This estimate is based on these two factors:

1. The upper limit of ice crystals in the Martian atmosphere as reflected by the degree of turbidity.
2. The amount of water in the solid state in the polar regions.

It is assumed that most of the snow in the polar zones is either on the ground or in the form of semitransparent low-lying clouds of ice crystals created by wind. The mean thickness of the snow cover on the polar caps is 0.01 g/cm^2 . Since in winter the polar caps occupy about 20 million km^2 , the total amount of water present is placed at $2 \cdot 10^{15}$. The results are in general accord with those obtained by Dollfus, but disagree with those of Vaucouleurs and Janesley. (Source: U.S. Dept. of Commerce, A.I.D. Press, No. 769, August 10, 1962, p. 1)

ASTROPHYSICS

METHODS OF SEARCHING FOR LOCAL SOURCES OF HIGH-ENERGY PHOTONS. Authors G. T. Zatsepin and A. E. Chudakov have proposed a different method for searching for high-energy photons.

Data on processes associated with cosmic rays in a number of astronomical objects is very important in solving many astrophysical problems. A source of such data may be found in high-energy photons which arrive at the Earth without deflection.

In a previous paper...a suggestion was made to use a method based on measuring the time for the relative delay of the passage of the front of the developing atmospheric shower through scintillators...for locating sources of photons with $E \sim 10^{12} \text{ ev}$ on the celestial sphere.

The authors believe that recording showers from primary photons with an energy $E \sim 10^{12} \text{ ev}$ in the solid angle $\Omega \sim 10^{-5}$ sterad can be achieved more reliably and using considerably simpler means if they make use of the Cerenkov radiation produced by a shower in the atmosphere. For this

purpose the recording of the light flash must be performed by a photomultiplier located at the focus of a large parabolic mirror. (The angular resolution of such a system can be brought up to a value of ± 1 deg.)

It is expedient to use several parallel oriented paraboloids in order to isolate the showers in accordance with the time coincidence of pulses. Here it is possible to record showers which have a power such that the number of light quanta collected by the photocathode exceeds 200... . Computations of the intensity of Cerenkov glow from a shower at sea level caused by a primary photon with an energy of 10^{12} erg yield a flux of ~ 50 quanta/m². In order to record such showers the area of the parabolic mirror must be 4m². Notwithstanding a number of shortcomings (the restriction of observations solely to moonless and cloudless nights), the proposed method seems to be more promising than the previous method (at least in searching for photons arriving from known radioastronomy objects). (Source: Soviet Physics-JEP, Vol. 41, pp.655-56, No. 2, August 1961)

ON ROTARY MOTION OF ARTIFICIAL CELESTIAL BODIES. G. N. Duboshin, reporting in Referativnyy zhurnal, Matematika, No. 12, 1960, considers the motion of two absolutely rigid bodies, the elementary particles of which mutually attract themselves according to Newton's law. The central solid body is a body of rotation revolving uniformly around its axis. The artificial body is also a body of rotation.

There are two different kinds of artificial bodies, an elongated and a contracted one with corresponding central main moments of inertia. The equations of the translation and rotary motion are set up under consideration of the first power of the contraction of the central body. The equations of the translation motion do not depend on the rotary motion and are separately integrated. The integration of the equations of the translation motion is a classical problem which is considered to be solved and well-known. The equations of the rotary motion cannot be integrated with the aid of known functions. Therefore particular solutions are sought.

As it is well-known, these equations of the translation motion admit a circular solution which lies in the equatorial plane of the central body. In this case, the equations of the rotary motion admit the following particular solutions which are denoted as regular by the author:

1. Motion of the type "arrow". In this case the axis of revolution of the artificial body remains vertical to the radius of the orbit of the center of inertia of this body and forms a constant angle with the direction of speed of this center of inertia.
2. Motion of the type "spoke". In this case the axis of revolution of the artificial body remains vertical to the direction of speed of the center of inertia of this body and forms a constant angle with the local vector of the center of inertia of this body.

3. Motion of the type "swimmer". The axis of revolution of the artificial body remains vertical to the plane of the orbit of the center of inertia of the body.

The angular velocity of the autorotation of the body remains constant in all three cases. A stability examination in first approximation is carried out for every regular motion.

It is stated that in most cases the elongated and the contracted body show an inverse behavior concerning the stability of regular motions. For sufficiently small contraction, the equations of the translation motion admit solutions which are little different from Kepler circular solutions. Under certain exactly formulated assumptions, the author obtains for the precession and nutation angles the first terms of the expansions relative to the contraction. Here it appears that the nutation angle suffers no perturbations by the contraction of the central body, while the precession angle shows secular perturbations. (Source: English Abstracts, Vol. 5, July 1962)

CHEMISTRY

ANODIC SOLUTION METHOD FOR DETERMINATION OF HYDROGEN IN STEEL. S. M. Beloglazov, of Gorki Perm University, writing in Industrial Laboratory claims that he and fellow workers have improved the apparatus and used a new electrolyte to determine the presence of hydrogen in steel specimens using the Klyachko and Larina anodic solution method. He suggests the use of this method for the layer determination of hydrogen in metal after cathodic saturation.

The existing methods for determining hydrogen in steels require fairly complex apparatus. The anodic solution method can be used to determine gases in metals in any industrial laboratory. The analysis required the separation of the anodic space from the cathodic space, for which purpose two glass vessels were used, separated by a filter paper membrane. During operation, however, the tube in which the membrane is fastened on the side of the anodic vessel becomes choked with iron compounds and the current intensity falls. During the experiments, the paper membrane often breaks down during cleaning and the catholyte, which has become alkaline due to electrolysis, penetrates into the anodic space.

To separate the anodic space from the cathodic space a porous 0.5 liter ceramic beaker was used. Since the content of dissolved oxygen and nitrogen in steels is usually extremely small, it was assumed that practically all of the gas liberated was hydrogen. The "analytical part" of the instrument was therefore a simple microburet and for specimens weighing 10-15 g, a 0.5-1 ml buret. The main source of errors was caused by the adhesion of hydrogen bubbles (liberated during solution of the metal)

to the upper bell-shaped wide section of the buret. To overcome this source of error, an impact device was used. It had the form of an ordinary telephone relay having a small hammer with a rubber tip on its armature. The relay was actuated by a contact metronome. The whole of the apparatus is shown in Fig. 1.

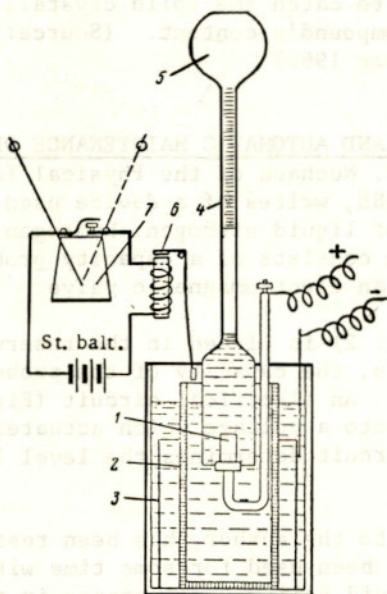


FIG. 1. Diagram of apparatus for determining hydrogen in steel by the anodic solution method:

- | | |
|--------------------------|----------------------|
| 1. Specimen | 4. Microburet |
| 2. Porous ceramic beaker | 5. Rubber bulb |
| 3. Copper cathode | 6. Relay |
| | 7. Contact metronome |

The steel was anodically dissolved in an electrolyte recommended by Yu. A. Klyachko and O. D. Larina (150 g NaCl + 25 g Seignette's salt per liter) at an anodic current density of 0.3-0.4 a/cm². With a higher current density, there is the risk of high results being obtained due to the liberation of oxygen on the anode, especially in a freshly prepared solution, when there is not yet a weakly acid medium at the anode.

The author also suggests the use of a 0.1 N solution of KBr containing 10 percent sodium citrate as the anodite, a 10 percent solution of Cu SO₄ as the catholyte, and a cathode of copper foil. An anodic current

density of 2.5-3 A/cm² can be used to determine oxides, sulfides, nitrides, and carbides in ferromanganese and ferrochrome. This method causes a transfer of iron to the ionic state and oxidation of the bromide ions at the anode forming elementary bromine. Complex soluble compounds are formed from the iron ions and sodium citrate leaving the steel specimens almost free of slime after anodic solution. By suspending a collodion bag under the specimen to catch the solid crystalline inclusions, data were obtained on the compound's content. (Source: Industrial Laboratory, Vol. 27, No. 12, December 1961)

Cryogenics

DEVICE FOR MEASUREMENT AND AUTOMATIC MAINTENANCE OF LIQUID NITROGEN AND LIQUID HYDROGEN. Yu. I. Nechaev of the Physical Institute of the Academy of Sciences, USSR, writes of a device used to measure and maintain the liquid level of liquid nitrogen, hydrogen, and helium in metal containers. The device consists of a capacity probe, a measuring circuit, a control circuit, and an electromagnetic valve.

The capacity probe (Fig. 2) is placed in the reservoir. As the level of the reservoir changes, the capacity of the probe changes with the level in the reservoir. An electrical circuit (Fig. 3) transforms the change in capacitance into a voltage which actuates the electromagnetic valve. This control circuit determines the level limits to be maintained.

This device, according to the author, has been tested successfully with liquid hydrogen and has been used for some time with liquid nitrogen. For it to work with liquid helium, an increase in the sensitivity of the level probe is necessary. (Source: Cryogenics, March 1962, pp. 175-176)

GEOPHYSICS

magnetic field

NEW INTERPRETATION OF THE GRAVITATIONAL FIELD. Authors A. M. Brodskii, D. Ivanenko, and G. A. Sokolik in an article appearing in Soviet Physics-JEP, stated that the variance requirement for the arbitrary spin equations relative to gauge transformation induces a vector field; here the vector nature of the field is prescribed by the locality of the transformation.

Analogously, assuming the parameters of the Lorentz group to depend on the coordinates, gravitational interaction prescribed by the tensor field is obtained in just as natural a fashion. They say it can be demonstrated that in the case of a spinor field, known affinity coefficients are obtained. For the Klein-Gordon equation, the gravitational coupling of a scalar field is prescribed by the ordinary affinity coefficient. (Source: Soviet Physics-JEP, Vol. 41, No. 4, October 1961, pp. 1307-1309)

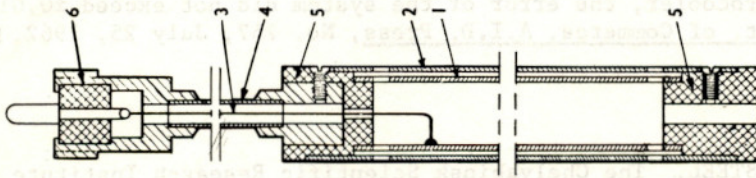


FIG. 2. Level Probe

1. Inner cylinder (material 1 x 18 N9T)
2. Outer cylinder (material 1 x 18 N9T)
3. Inner cylinder lead (PEL-0.2)
4. Outer cylinder lead (1 x 18 N9T)
5. Bungs (PTFE)
6. Cable connector

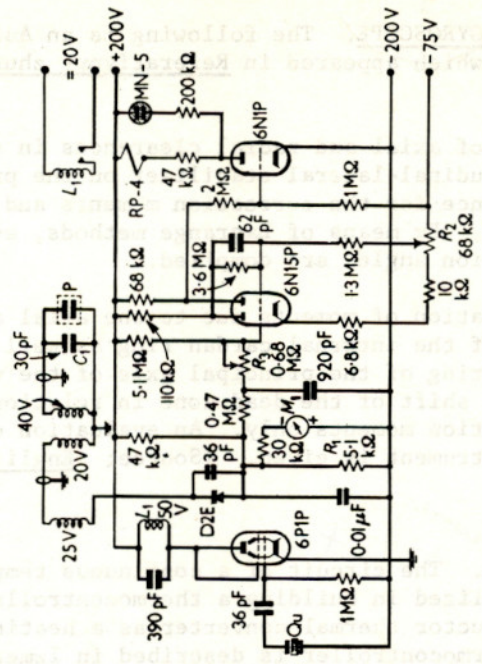


FIG. 3. Electric Circuit

- P: Level probe
 L₁: Electromagnetic valve winding
 M₁: Microammeter

MECHANICS

EFFECTS ON VERTICAL FLIGHT GYROSCOPE. The following is an Author's Abstract by S. Makarikhin which appeared in Referativnyy zhurnal, Mekhanika, No. 7, 1961.

"The problem of the effect of axial and radial clearances in the overhung bearings of the longitudinal-lateral stabilizer on the precision of its work (with an allowance for the correction moments and dry friction moments) is considered. By means of Lagrange methods, equations of motion for small precession angles are compiled.

It is shown that the origination of moments due to the axial and radial clearance in the bearings of the internal cardan ring as well as the radial clearance in the bearing of the principal axis of the vertical flight gyroscope leads to a shift of the dead zone in relation to that conditioned by the dry friction moments only. An evaluation of the optimum accuracy of the instrument is given. (Source: English Abstracts, Vol. 5, July 1962)

CONTROLLER FOR A THERMOSTAT. The circuit of a continuous temperature-control system has been utilized in building a thermocontroller for a thermostat using a semiconductor thermal converter as a heating (or cooling) element. This thermocontroller is described in Izmeritel'naya tekhnika, No. 5, May 1962, by G. L. Iosel'son and A. S. Dzyuba.

An MMT-4 thermistor connected to an arm of an ac bridge is employed as a sensor. The error voltage of the bridge is amplified by a 2000-gain three-stage ac amplifier with high input resistance and a paraphase circuit in the output stage. The amplified voltage is applied to the power amplifier. The power-amplifier output voltage, which is a function of both the amplitude and phase of the error voltage of the bridge, is rectified by a germanium full-wave rectifier, after which it feeds the semiconductor thermal converter of the thermostat. In tests with a cryostat and microcooler, the error of the system did not exceed $\pm 0.01^{\circ}\text{C}$. (Source: U.S. Dept. of Commerce, A.I.D. Press, No. 757, July 25, 1962, p. 4)

METALLURGY

NEW HIGH-STRENGTH STEEL. The Chelyabinsk Scientific Research Institute of Metallurgy has developed the medium-carbon steel 35X2ГCBA, containing by percentage 0.32-0.38 C, 1.4-1.8 Cr, 0.9-1.2 Mn, 0.6-1.0 Si, 0.7-1.1 W, 0.35 max Ni, and 0.025 max each S and P, as a substitute for the more expensive Ni-containing high-strength steels 30X2ГН 2, 30XН3А, 45XНМФА, et al. The new steel has high mechanical properties and its hardenability and NDT temperature are equal to those of steels 45XНМФА

and 30XH 3A. Its optimum quenching temperature is 880°C. Representative mechanical properties after tempering at 200°, 400°, and 600°C are given in the following table:

Temp. (°C)	Tensile strength (kg/mm ²)	Yield strength (kg/mm ²)	Elongation (percent)	Reduction of area (percent)	Impact strength (m-kg/cm ²)
200	193.0-203.0	180.0-186.0	9.0-12.0	39.0-45.0	6.4-9.0
400	148.0-155.0	135.0-142.0	10.0-12.0	39.0-50.0	4.8-5.7
600	105.0-117.0	95.0-105.0	14.0-16.0	57.0-60.0	10.0-14.0

The new steel has low susceptibility to quenching crack formation and can readily be hf-induction hardened. The optimum temperature for such hardening is 900° to 920°C. After tempering at 160°C, a hardened surface layer has a hardness of $R_c = 56-60$. The high hardenability of 35X2ГCBA steel permits a homogeneous metal structure to be obtained, even in large cross sections. (Source: U.S. Dept. of Commerce, A.I.D. Press, No. 748, July 12, 1962, p. 4)

METAL POWDER FILTERS. The Institute of Powder Metallurgy and Special Alloys, Ukrainian Academy of Sciences, has investigated sintering conditions for nonspheroidal iron-powder compacts. This work was performed, according to the March-April issue of Poroshkovaya metallurgiya, in an attempt to improve their permeability and make possible their use as high-efficiency diesel fuel, petroleum, and lubricating-oil filters.

Various methods of activated sintering as well as the effect of additions of P, Cu, and Ni were studied. It was found that specimens made from Fe + 10 percent Cu (the latter introduced as $CuCl_2$) possess the maximum permeability. The air permeability of specimens 4 mm thick made from this composition (sintered for 2 hr at 1100°C) with a pressure gradient of 300 mm Hg was 7.0 liter/min·cm², which is more than three times that of specimens made from iron powder alone. Copper additions increased oil permeability by a factor of 2.5 to 3. According to preliminary tests, iron-copper filters 2 mm thick with 40 to 55 percent porosity filter off all particles larger than 2 μ. Blueing the filters by either immersion in potassium nitrate or oil increases their corrosion resistance. (Source: U.S. Dept. of Commerce, A.I.D. Press, No. 748, July 17, 1962, p. 4)

ALLOYS OF MAGNESIUM AND RARE-EARTH METALS. According to Tsvetnaya metallurgiya, Vol. 5, No. 2, 1962, heat-resistant magnesium alloys with rare-earth metals (REM) can be produced by electrolysis of the fused chlorides. Alloys of this type were produced in experiments conducted at the Leningrad Polytechnic Institute.

Alloys with the maximum REM content were obtained at 15 to 40 percent REM chlorides in the electrolyte. At 3 to 4 percent MgCl in the electrolyte, alloys with up to 20 percent REM were obtained. These alloys are lighter than the electrolyte and float on the surface. The optimum temperature of the process was found to be 700° to 900°C. Alloys with less than 20 percent REM can be obtained at 700°C. The construction of the electrolyzer is determined by the density of the desired alloy. The results of the experiments can be used for the whole Mg-REM system. (Source: U.S. Dept. of Commerce, A.I.D. Press, No. 761, July 31, 1962, p. 3)

PNEUMATIC TRANSDUCER. Figure 4, appearing in Priborostroyeniye, No. 2 February 1962, shows the basic diagram of a new pneumatic device developed at the design bureau of the Institute for Automation in Nonferrous Metallurgy for measuring the flow, pressure, and level of aggressive media, particularly liquids.

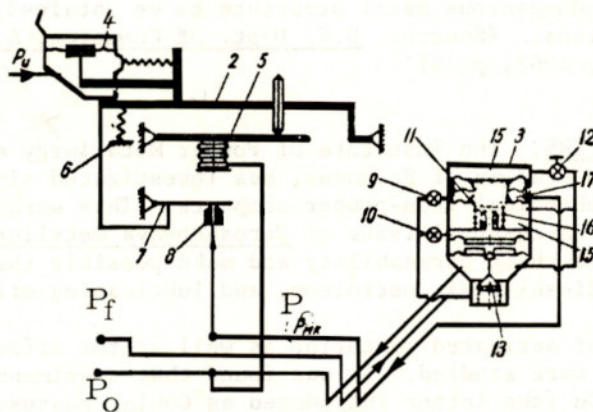


FIG. 4

- | | |
|---|---|
| 1. Sensing unit | 12. Control-throttle valve |
| 2. Converter | 13. Valve |
| 3. Isochronous amplifier | 14. Pressure spring |
| 4. Membrane | 15. Positive feedback chamber |
| 5. Feedback bellows | 16. Negative feedback chamber |
| 6. Balancing spring | 17. Comparators |
| 7. Flapper | P_f - Air pressure of feed |
| 8. Nozzle | P_o - Output pressure on recording device |
| 9. and 10. Throttle valves | P_c - Pressure in chamber between throttles |
| 11. Nozzle-flapper systems of the amplifier | |

An isochronous pneumatic amplifier in the transducer eliminates the liquid dampers and low-frequency, high-amplitude oscillations of the output signal usually found in similar devices. Basic units of the device are shown as 1, 2, and 3 of Fig. 4.

The interchangeable sensing unit provides for pressure differentials from 0 to 400 and 0 to 4000 mm water column. The transducer parts in contact with the aggressive media are made of corrosion-resistant materials (teflon, titanium).

This transducer has been successfully used in the processes of cleaning titanium tetrachloride. The basic error of the transducer does not exceed 1 percent, while the error due to the imbalance in measuring static pressure from 0 to 4 kg/cm is <1.5 percent. Error due to temperature variation amounts to 1 percent per 10°C for a transducer with a teflon membrane. (Source: U.S. Dept. of Commerce, A.I.D. Press, No. 709, May 16, 1962, p. 2)

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SOME ASPECTS OF HIGH TEMPERATURE STABILITY. M. Yu. Bal'shin and Dai Shou-Khuei, reporting in Izvestiya-OTN-Metal. i toplivo, No. 3, 1961, discuss their findings on an investigation which was to verify experimentally the mechanism of phenomena arising in a solid body as the result of cyclic heat treatment with rapid temperature changes. Graphite in which no solid oxides form, was used as the material for study.

In the first series of experiments, graphite of two types was investigated: A (of higher electrical conductivity, sp. gr. 2 g/cm^3) and B (of lower electrical conductivity, sp. gr. 1.8 g/cm^3). Prior to and during heat treatment, the electrical resistance of the specimens was measured at room temperature in order to show the effect of cyclic heat treatment (heating to 1000°C followed by quenching in water).

In the second series of experiments, graphites A and B impregnated with bakelite were investigated (1.5-2 and 3-4 wt. percent of bakelite, respectively). After impregnation with bakelite, the specimens were polymerized by heat treatment, being maintained for 8 hr at $60^{\circ}\text{-}70^{\circ}\text{C}$ with subsequent gradual raising of temperature up to 150°C . The specimens were then submitted to the same cyclic heat treatment as in the first series of experiments, and the electrical resistance measured under similar conditions.

In the 3rd series of experiments, graphite B specimens were impregnated with bakelite and two layers of cotton cloth wetted with bakelite were stuck to their surface. They were subsequently subjected to the same heat treatment for polymerization ($60^{\circ}\text{-}150^{\circ}\text{C}$), as in the second series of experiments. The polymerized specimens were heat treated by soaking for 2 hr at 1250°C in vacuum, as a result of which carburization of the

fabric coating as well as of the bakelite inside the specimens occurred. The specimens were then subjected to cyclic heat treatment and the electrical resistance was measured as in the first and second series.

It was confirmed experimentally that the internal stresses caused by temperature variation during cyclic heat treatment lead to a decrease in the contact surface (increase in electrical resistance). Compressive stresses, associated with the presence of minute voids in bodies containing dispersed particles, lead to the opposite effect: a fall in resistance and an increase in the contact surface (effect of sintering or self-healing of defects). The high temperature stability of a body depends not only on the properties of the material, but also on its dimensions and shape. Surface coatings can increase the high temperature stability of a body. (Source: Soviet Technology Digest, January 1962, p. 33)

MICROSCOPY

SOVIET REPORT ON ELECTRON MICROSCOPY IN JAPAN. V. M. Luk'yanovich, in an article appearing in Industrial Laboratory, discusses various aspects of radio microscopy and elaborates on the use of this science in Japanese industry.

He states that electron microscopy has developed very rapidly during the last few years. At the present time, microscopes with a resolving power of $\sim 10 \text{ \AA}$ are almost universally available. Electron microscopes of powers less than this have rarely been successful because the replica method does not make it possible to fully utilize their high resolving powers.

All electron microscopes are subject to radio chemical reactions which are caused by electron irradiation. This occurs in two different ways. In one case, molecules of hydrocarbons (oil and lubricant vapors) disentergrate leaving a layer of carbon and other material to coat the sample and prevent further study. The other problem is "combustion" of the carbon layer due to the oxygen residue in the gaseous phase. The first problem is more serious as the residue material grows at the rate of up to 10 \AA/sec . Experimenters use as little current through the specimen as possible to slow this process.

Japanese scientists have been very successful in developing facilities to enable them to perform additional operations such as microdiffraction investigations, subjecting the specimens to various treatments inside the device (cooling, heating, gas-treatment, and deformation), and taking motion pictures by means of a built-in camera.

Electron microscopes have been very useful in industries in Japan where they have been tried. At the Toyo Toki Company, one of the largest ceramic factories in Japan, a microscope was used to inspect raw materials and

finished products to discover the cause of flaws. Information gained virtually eliminated waste. Similar studies have been made in porcelain plants, and in one instance, the output of suitable insulators for high-frequency use was increased from 25 to 90 percent.

Some Japanese steel mills have used this new technology to investigate surfaces of mill rolls for flaws. By doing this, the quality of their thin-sheet steels was improved. Another example where electron microscopy has played a significant role is in the manufacture of magnetic tapes. Tape companies by studying the granulometric composition of raw materials greatly advanced the quality of their products.

Other areas of industry reporting improvement in products, quality control, or reliability include: metal welding, enamel paints for automobiles, rubber products, concrete, lubricants, and photographic materials.

Mr. Luk'yanovich concludes with the statement that the electron microscope is not only a wonderful technical instrument but also has tremendous possibilities for use in Soviet industry. (Source: Industrial Laboratory, Vol. 27, No. 12, June 1962)

NUCLEAR PHYSICS

THERMAL SHOCK IN REACTOR FUEL-ELEMENT TUBES. O. D. Kazachkovskiy, writing in Atomnaya energiya (Soviet Journal of Atomic Energy), Vol. 12, No. 3, March 1962, states that the danger of thermal-shock damage to fuel-element tubes resulting from reactor scram has been investigated by analyzing the dependence of temperature-drop variation in the tubes on the amount of time elapsed after the reactor is shut down. The following simplified assumptions are made.

1. Heat-release flux is uniform before the reactor scram.
2. Heat capacity of the tube can be neglected.
3. Heat transfer in the vertical direction is small and can be neglected (coolant flow is assumed to be upward).
4. There is no temperature jump between the fuel-rod--tube and tube--coolant surfaces.
5. Coolant flow velocity is quite high.
6. After the reactor is shut down (at the moment $t = 0$), the heat release instantaneously drops to zero.

The effect of the assumptions on the results is discussed. Analysis shows that the temperature drop at any point in the tube and at any instant after the scram is below the initial, that no thermal shock under the given conditions occurs, and that the maximal thermal stresses exist under steady-stage operating conditions and are reduced after the heat release is discontinued. It is noted, however, that although there is no danger of thermal-shock damage to fuel-element tubes, a high rate of

change of thermal stresses can cause undesirable consequences, owing to the possibility of fatigue damage to the tubes. (Source: U.S. Dept. of Commerce, A.I.D. Press, No. 701, May 4, 1962, p. 1)

FISSION CHAMBER. Figure 5, taken from Pribory i tekhnika eksperimenta, No. 2, March-April 1962, shows the cross section of a small fission chamber designed for measuring neutron flux in the range from 10^4 to 10^8 n/cm²/sec under a γ -flux of up to 10^4 r/hr in small-access areas (slits up to 1.5 mm wide and 300 to 400 mm deep). The sensitive volume, 1.45 mm in diameter and 40 mm long, is at the end of a needle 300 to 400 mm long. The chamber is filled with argon at 15 atm.

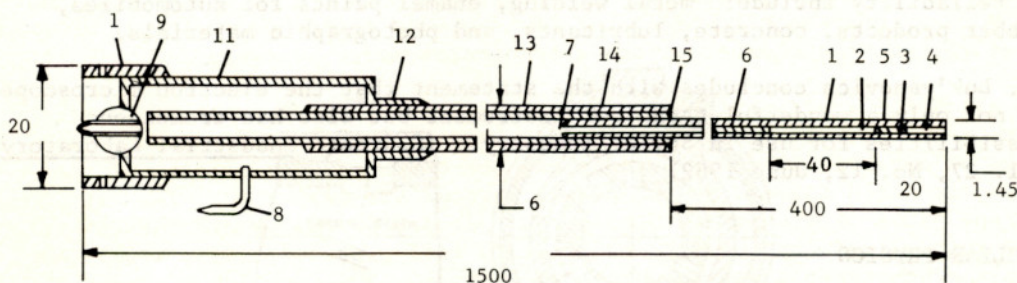


FIG. 5

- | | |
|--|---|
| 1. Sensitive volume | 8. Copper tube for evacuating and filling the chamber |
| 2. Anode (tungsten wire coated with fissionable material along the total length) | 10, 12, and 15. Sleeves |
| 3. and 14. Stainless steel tube | 11. Compensating volume |
| 4. Copper plug | 13. Ceramic insulator |
| 5, 6, and 9. Glass insulators | (Tin and silver were used as solders.) |
| 7. Tungsten and copper soldering | |

The central electrode is coated with a layer of natural uranium 0.3 mg/cm² thick or 90 percent-enriched uranium 3 mg/cm² thick. (Source: U.S. Dept. of Commerce, A.I.D. Press, No. 745, July 9, 1962, p. 1)

PHYSICS

NEUTRINO SCATTERING BY NUCLEONS. The cross section for scattering of neutrinos by nucleons has been calculated on the basis of an anomalous muon interaction model proposed by I. Yu. Kobzarev and L. B. Okun' in 1961. These calculations are reported on by V. B. Mandel'tsveig in the May 1962 edition of Zhurnal eksperimental'noy i teoreticheskoy fiziki,

According to this theory, neutrino scattering by nucleons is realized by means of the exchange of hypothetical neutral X-mesons, which can interact with muons, muon neutrinos, and baryons. The maximum values of cross sections were determined to be of the order of 10^{-7} barn. These calculations confirm the feasibility of experiments to verify the muon interaction model. (Source: U.S. Dept. of Commerce, A.I.D. Press, No. 761, July 31, 1962, p. 1)

MECHANICAL-TO-ELECTRICAL ENERGY CONVERSION BY A STEADY PLASMA FLOW. V. M. Sarychev reports in the Zhurnal prikladnoy mekhaniki i tekhnicheskoy fiziki, No. 2, 1962, on a study of the flow of plasma in a magnetohydrodynamic generator under isothermal conditions of energy extraction. This study analyzes mathematically the isothermal motion of a one-dimensional flow of a compressible nonviscous fluid with a finite conductivity in a flat rectangular channel across a transverse magnetic field.

To allow for a variable electric potential along the channel, segmented electrodes are assumed. The external load of the electric circuit can also be arbitrarily distributed along the channel. The effects of the magnetic field induced by the plasma current are neglected. Two different types of plasma are considered: seeded plasma, where the gas is not ionized and the impurity material is fully ionized; and a weakly ionized homogeneous gas in which conductivity is a function of gas density. Each is analyzed with respect to the magnetic field, voltage, and channel flare angle, which are held either constant or variable along the channel. The possible values of current, gas pressure, load resistance, and the geometry of the channel are determined as functions of gas velocity. (Source: U.S. Dept. of Commerce, A.I.D. Press, No. 724, June 7, 1962, p. 1)

PRODUCTION ENGINEERING

EXPLOSIVE HOLE PIERCING IN PLATES. V. G. Kononenko and K. I. Zaytsev writing in Kuznechno-Shtampovochnoye Proizvodstvo, No. 2, 1962, discuss in detail a device which uses explosives for piercing holes, particularly in heavy plates. This device is said to weigh only 25 kg, yet it can execute work comparable to that done by conventional presses of 50 to 75 tons capacity.

The equipment (Fig. 6) consists of the cartridge and firing mechanism (1), the barrel (2), silencer (3), the punch (4), the die (6), and the clamp (7). A component to be pierced (5) is shown in position.

The speed of the punch necessary for penetration of the plate can be obtained by varying the weight of the powder charge, the mass of the punch, and the length of the barrel. It is necessary to increase the weight of the powder charge by 8 to 10 percent to compensate for incomplete ignition.

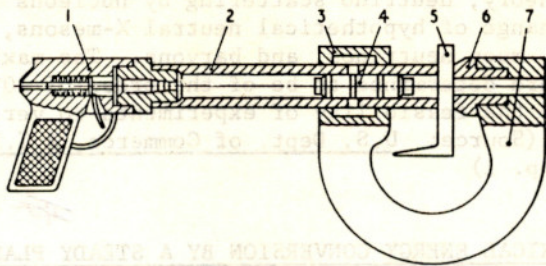


FIG. 6. Schematic arrangement of equipment for piercing holes by explosives

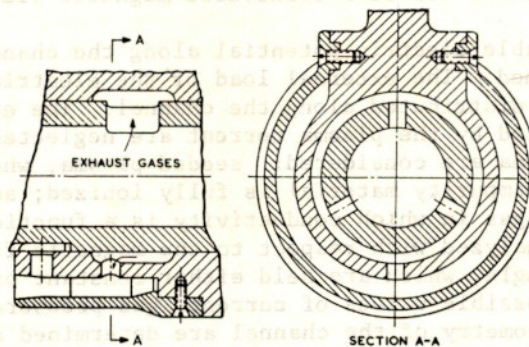


FIG. 7. Schematic arrangement of a design of silencer used in explosive piercing

One of the essential conditions for practical application of explosive piercing is elimination of noise produced by detonation. The type of silencer selected (Fig. 7) was determined by tests to be the best. (Source: Engineers Digest, Vol. 23, No. 6, pp. 77-78, June 1962)

INDIRECT EXTRUSION OF AL AND MG ALLOYS. A method of indirect extrusion of aluminum and magnesium alloys is suggested by M. Z. Yermanok and G. M. Shcheglov in Tsvetnyye metally, No. 5, May 1962, for use in presses in which the stroke is quite short.

In this method (see Fig. 8), the billet 5 is first precompressed by stem 1 and dummy block 2 until it fills the container (a). Die carrier 9, die holder 7, and die 6 are withdrawn (b) from container 3, which is force-fitted into housing 4. The billet is pushed to the front edge of the

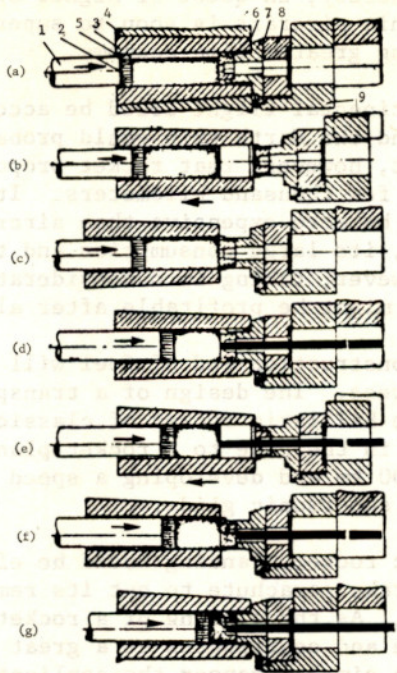


FIG. 8

container, which is then withdrawn into the extreme rear position (c). The container with the billet moves toward the die carrier, the die holder moves into the container, the metal flows through the die, and the first stage of extrusion is completed (d). The extrusion of the remaining part of the billet can be completed by either direct or indirect extrusion in several stages (e, f, g).

Experiments showed that in the extrusion of $\bar{\Pi}$ 16 (AA 2024) and B 95 (AA 7075) alloys at 350° to 400°C, when stress caused by friction is 3.5 kg/mm², the required extrusion force decreases by 18 to 28 percent. Experimental extrusion under production conditions showed similar results. (Source: U.S. Dept. of Commerce, A.I.D. Press, No. 761, July 31, 1962, p. 3)

SPACECRAFT

ROCKETS FOR AIR PASSENGER TRANSPORTATION. An article by Andrzej Marks, which appeared in Zkrzydłata Polska, No. 37, 1961, deals with the problem of utilization of rockets and rocket planes as a means of mass transportation. To the author this seems a natural trend in the development of

recent aircraft design, whereby, in quest of higher speeds and efficiency of air travel the supersonic aircraft is soon to supercede its subsonic forerunner in accomplishing greater time-economy.

With rockets, an intercontinental flight could be accomplished in less than an hour, while a round-the Earth trip would probably require less than 2 hr. One can expect, however, that rocket propulsion will be used on shorter distances of a few thousand kilometers. It is true, that rocket communication will be more expensive than aircraft communication because of expensive fuel, its large consumption and the high construction cost of rockets. However, taking into consideration the time-saving and turn-over capacity it might be profitable after all.

The unit cost of rocket construction and of fuel will tend to decrease along with technical progress. The design of a transportation rocket may vary from a very large ballistic rocket of classical shape with built-in passenger cabins in the cone to a rocket plane which, after reaching an altitude of 100 km and developing a speed of a few km/sec, could then begin its long supersonic glide.

In the case of a ballistic rocket, landing would be effected by using deceleration devices or brake parachute to cut its remaining speed on reentry of the atmosphere. As the gliding of a rocket increases considerably its flight range and contributes to a great extent to economical fuel consumption, in a similar manner the application of a jet-assisted takeoff provides the vehicle with a high initial acceleration, prior to switching on of the rocket engines proper.

Because of low efficiency of rockets at low speeds, it seems that both aviation and rocket research decided together to use turbo-jet auxiliary engines. According to the author, the effects of g-forces during takeoff and landing and strong vibrations could be overcome by a careful choice of flight-parameters. Although the formerly mentioned effects would cause no particular discomfort to an average passenger, rocket travel could certainly not be recommended to ailing or constitutionally weak persons.

In respect to perfect visibility, a spaceship would be at a great advantage over the aircraft, for an entire heavenful of stars would be available for observation to the passengers, irrespective of night or day thus compensating them for lack of other sensations.

In conclusion, it seems almost certain that with progress in rocket engineering, they will become even safer means of passenger transportation than modern conventional aircraft. An automatic control of the spaceship's navigational system would be the decisive safety factor for travel at high speed, especially, at the rocket landing stage. On the other hand, it is highly improbable that rockets can entirely supercede conventional aircraft as the sole means of transportation. (Source: English Abstracts, Vol. 5, July 1962)

SATELLITE OBSERVATORY. Z. Dobrichovsky, reporting in Věda a technika mládeži, No. 9, 1962, describes the probable shape and arrangement of an observatory 10 to 12 m high and 4 m in diameter which will orbit the Earth at approximately 800-km altitude and 28,000-km/hr velocity. In the opinion of prominent Soviet scientists, the launching of such a vehicle could be a reality in 3 to 4 years. Four-man crews, in 60-day shifts, would make observations and measurements. The relief crews and supplies would be delivered by rockets. (Source: U.S. Dept. of Commerce, A.I.D. Press, No. 750, July 16, 1962, p. 5)

BOOKS. The following book reviews have been selected from various publications as noted:

Samsonov, G. V. and V. I. Konstantinov, Tantalum and Niobium. Translated by Ya. Vatssek from the Journal-Hutnicke Listy, XV, No. 9. (Czechoslovakia Rep.) nd.

The book under review critically examines, in nine chapters, methods proved in practice and problem questions. The authors used over 550 literature sources as well as their own experiments.

Chapter 1 covers a description of the properties of tantalum and niobium, their alloys, and the uses to which they might be put.

Chapters 2 and 3 cover the metals as ores and different ways of extracting them in the pure form. Unfortunately, no mention is made here of the iodide method (thermal decomposition of halogens, basically of iodides) of extraction.

Processing the metals by different means is covered in chapter 4. A brief metallography is included at the end of the chapter.

Chapter 5 is very brief and describes the obtainment of tantalum or niobium platings with metallic or nonmetallic bases. The influence of various factors on the process is considered.

The analytical chemistry of the two metals and the physical methods of determining them are discussed in chapter 6.

Chapters 7, 8, and 9 are the best and most important in the book. They cover binary, ternary, and quaternary alloys and multicomponent systems. The chapter on twin alloys is very large; the chapters on ternary and quaternary alloys are briefer and contain mostly structural data.

A section at the end of the book gives collections of characteristic properties of different alloys of the metals and their fields of use; the composition of each alloy is also indicated.

In conclusion, the book is very good. In it can be found reliable basic information.

This review is based on an article by Mr. Ya. Vatssek. (Source: Journal of Non-Ferrous Metals, July 1962)

Horecky, P. L., Libraries and Bibliographic Centers in the Soviet Union. Indiana University, Bloomington, Indiana. 1962.

This book gives a very comprehensive picture of libraries and bibliographic centers in the Soviet Union, including the day-to-day functioning of these institutions and their place in the Soviet cultural system.

It includes chapters on the legal deposit copy system and the organs of bibliographic registration, library networks and collections, catalogs and cataloging, library buildings and equipment, the library profession, general libraries, science and technical libraries, libraries at educational establishments, the library networks of the U.S.S.R. Academy of Sciences and of the Republic Academies of Sciences, libraries for the humanities, social sciences, and socio-political literature. (Source: Russian Technical Literature, No. 6, April 1962)

n.a., Osteuropa Naturwissenschaft (East Europe National Sciences). Stuttgart S.: Deutsche Gesellschaft für Osteuropakunde e.v.

Osteuropa Naturwissenschaft is a semiannual bulletin of about 80 pages issued by the Deutsche Gesellschaft für Osteuropakunde. It contains detailed articles, supported by statistics, on general and specific subjects. Included are articles on the rate of development of Soviet science, the annual report of the Soviet Academy of Sciences, teaching science in Soviet schools, machine construction under the Seven Years Plan, research on geometry in the Soviet Union, astro-botanics, and universities in China.

At the same time, this publication indicates specialized bibliographies-- for instance, on aeronautics and astronautics or on mathematics, both of original literature and of translations, and reviews new books on relevant subjects. (Source: Russian Technical Literature, No. 6, April 1962)

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