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Carl Canfield (Borg Warner, Bellwood, Ill.). Paper No. 54-27-2.

ABSTRACT: Many individual problems remain to be solved in downhole instrumentation, but with today's advances in science the tools with which to attack these problems are available. The tests run to date have proven that it is possible to deal with Mother Nature on her own terms and come up with answers to secrets she has held for centuries.

"Use of High Speed Camera in Solving Some Dynamic Problems," by Robert Antrim (Pullman Standard Car Mfg. Co., Hammond, Ind.). Paper No. 54-27-3.

"Miniaturization of Transducer for Mobile Applications," by O. W. Sailer (Consolidated Engineering Corp., Pasadena, Calif.). Paper No. 54-27-4.

ABSTRACT: A review of transducer features and application techniques that result in the maximum of usable data from severe environmental conditions such as are encountered in mobile test work. Relatively simple procedures, in many cases will improve the end results precision many fold. This paper presents a summary of transducer features and application techniques for obtaining the most from the transducer as it is applied.

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ISA Session on Physical Properties Measurements.

Room 105.

Chairman, Howard C. Roberts (University of Illinois, Urbana, Ill.). Recorder, Richard E. Wendt, Jr. (Westinghouse Electric Corp., East Pittsburgh, Pa.).

"The Use of X-Ray Diffraction in the Determination of the Physical Properties of Solids," by Thomas L. Thourson (International Harvester Co., Chicago, Ill.). Paper No. 54-28-1.

ABSTRACT: The purpose of this paper is to show how the development of x-ray methods contributed to our knowledge of the nature of the solid state. Principles behind x-ray methods and the type of information obtained will be discussed.

"A Review of Thermal Conductivity and Thermoelectricity in Solids," by D. K. C. MacDonald and G. K. White (National Research Council, Ottawa, Canada). Paper No. 54-28-2.

ABSTRACT: Following an outline of the salient features of thermal conductivity in solids, the necessity for low temperature investigation and the experimental methods employed are discussed. The results obtained for some metallic elements, insulators and alloys are reviewed and shortcomings of theory and experiment discussed. The related phenomenon of thermoelectricity in which the "carriers" and scattering processes are similar to those appearing in the heat conduction of metals is discussed. Experimental data are reviewed and considered in the light of current theory.

"A Recording Calorimeter for Automatic Measurement of Specific Heats," by Theodor Gast (Tech. Hochschule Darmstadt, Darmstadt, Germany). Paper No. 54-28-3.

ABSTRACT: A new developed calorimeter allows to record heat capacities as function of temperature. Contrary to well known principles, the sample is not heated with constant power, but in such a manner, that its temperature increases with constant rate. The energy needed is counted and easily evaluated in terms of specific heat.

"Review of Sonic Methods of Determining Mechanical Properties of

Solids," by C. E. Kesler (University of Illinois, Urbana, Ill.). Paper No. 54-28-4.

ABSTRACT: A description of methods in use and of proposed methods for determining mechanical properties of solids through the use of methods involving the application of vibratory energy, causing stresses within the specimen not exceeding the elastic range of the material.

Tuesday, September 21, 1954
9:00 A. M.

Society for Experimental Stress Analysis Session I—Technical Session.

Room 101.

Chairman to be announced.

Welcome address by President Dr. Marshall Holt.

"Fillets without Stress Concentration," by Robert Lansard (Laboratories des Automobiles, Peugeot, Montbe-liard, Doubs, France).

ABSTRACT: In a circular fillet, however large the radius is, there is always a stress concentration.

It is possible to design progressive curvature fillets, in which stress is constant along the profile, so there is no more chance of failure in the fillet than anywhere else. This paper gives the profile of such fillets, in the case of plates in tension or bending.

"Structural Design Problems in Gas Turbine Engines," by P. N. Bright (General Motors Corp., Indianapolis, Ind.).

ABSTRACT: Specific structural design problems are discussed describing stress analysis methods now in use at Allison and indicating where new methods are being developed or are needed. Design development of several parts is described, showing the value of accurate stress analysis procedures. Problems discussed are: Rotating disc Stresses, Blade Retention, External Casing Stresses, Gyroscopic loads, 1 x P loads and moments, Bearing Supports, Split-Line Flanges, and Stress and Deflection Analysis of Turbo-Prop Interconnecting Structures. Static test results verifying some of the methods described are included.

"A Miniature Oscilloscope and Vibration Pick-up for Nodal Pattern Tracing," by S. N. Shafer and R. Plunkett (General Electric Co., Schenectady, N. Y.).

ABSTRACT: In analyzing the resonant frequency vibration of plates and plate-like structures, location of the nodal lines is useful for describing the nodes and for deciding if they are of importance. The easiest way to locate these nodes is to determine the vibration phase change with respect to the driving force.

The major problem in using this method has been in surveying the vibrating system with a vibration detector; it is difficult to watch an oscilloscope to determine phase change and observe the location of the detector at the same time. To overcome this problem we present here a small, hand-held oscilloscope which can be observed at the location of the pickup. We have used this in conjunction with a capacitance pickup which has the added advantage of not loading the system to be measured.

"Field Testing of Railroad Axles," by R. A. Moreau and L. Petersen (General Motors Corp., LaGrange, Ill.).

ABSTRACT: Railroad axles are used in large numbers and represent, therefore, a considerable investment. Railroad axles are among the most vital parts of a railroad locomotive or car because a failure of an axle can result in a very serious accident involving hundreds of lives and millions of dollars.

It is therefore no wonder that the American Association of Railroads and many Universities and Manufacturers have done a lot of work to determine the best design for a railroad axle. There is a lot of literature available about axles and the stresses they develop under various load conditions. There is, however, very little information available as to the load condition axles actually meet in service. The tests which will be described in this paper were undertaken for the purpose of determining what the axles are actually exposed to in the daily service on the American Railroads.

Tuesday, September 21, 1954
9:30 A. M.

ISA Session on Testing Instrumentation—Research and Development.

Room 300.

Chairman, Orval L. Linebrink (Battelle Memorial Institute, Columbus, Ohio). Recorder, C. Lincoln Jewett (Arthur D. Little, Inc., Cambridge, Mass.).

"Thrust Measuring Systems for Rocket Motor and Jet Engine Testing," by John D. Patrick, Jr. (White Sands Proving Grounds, Las Cruces, N. M.). Paper No. 54-29-1.

ABSTRACT: Paper covers the design of thrust measuring system for rocket motors and jet engines. This includes selection of transducers and their installation into the mounting system; the recording equipment used and the calibrating systems employed. Paper will include slides of thrust systems at White Sands Proving Ground.

"The Modern Stage of Non-destructive Testing and Research Work by X-Rays," by Dr. Richard Seifert (Richard Seifert & Co., Hamburg, Germany). Paper No. 54-29-2.

ABSTRACT: A report is given on modern types of German X-Ray apparatus for material examination, especially for field inspection, as well as on new designs for X-Ray diffraction work in conjunction with most recent auxiliary equipments.

"Instrumentation of a Supersonic Wind Tunnel," by Frank B. Kroeger (Ohio State University Research Foundation, Columbus, Ohio). Paper No. 54-29-3.

ABSTRACT: This paper describes a method of taking experimental measurements during the 3 to 10 second period of stable operation in a 12 x 12 inch open jet, high pressure blow-down type of supersonic wind tunnel. A method of using manometers under these conditions is outlined. A special pressure pick-up used in maintaining the stable period at a pre-selected level is described.

"A New Type of Insulation Measurement Instrument," by Harry H. Schwartz (Electro Design Co., Montreal, Canada). Paper No. 54-29-4.

ABSTRACT: The new type of insulation measurement instrument uses a permanent magnet rotor and fixed stator coils. This means that the coils have no mechanical stress on them. Testing is done at d-c potentials, obtained through rectification.

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ISA Session on Analysis Instrumentation—Industrial pH Measurement and Control.

Room 105.

Chairman, Henry Noebels (Beckman Instruments, Inc., Fullerton, Calif.).

Recorder, Edward S. Ida (Beckman Instruments, Inc., Philadelphia, Pa.). Introduction, by Porter Hart (The Dow Chemical Co., Freeport, Texas.).

"pH Recording and Control Application for Pulp and Water Purification," by A. P. Hyde (Bristol Company, Charlotte, N. C.). Paper No. 54-30-1.

"pH Control of Cooling Towers," by W. N. Greer (Leeds & Northrup Co., Philadelphia, Pa.). Paper No. 54-30-2.

"pH Measurement at Elevated Pressures and Temperatures," by R. J. Payne (E. I. du Pont de Nemours & Co., Parkersburg, W. Va.). Paper No. 54-30-3.

"A New Industrial pH System Designed for Easy Maintenance," by Gordon Blank (Beckman Instruments Co., Fullerton, Calif.). Paper No. 54-30-4.

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ISA Session on Production Processes—Power Subcommittee.

Ballroom.

Chairman, H. H. Johnson (Consolidated Edison Company of N. Y., New York, N. Y.). Recorder, J. S. Detwiler (Taylor Instrument Companies, Rochester, N. Y.).

"Application of Newer Process Control Concepts to a Steam Generating Plant," by Robert S. King (Corn Products Refining Co., Chicago, Ill.). Paper No. 54-31-1.

ABSTRACT: The operation of a large industrial multiple unit steam generating plant is treated as a process in which water, coal and air are used to produce steam. The latest process concepts are applied in the design of the control center resulting in a station where from essentially one position the operator easily observes all indications and records and manipulates all controls.

"Flue Gas Sampling for Controlled Combustion," by M. L. Umbenhauer (New York, N. Y.). Paper No. 54-31-2.

ABSTRACT: Correct location of sampling points and methods for best supervision of combustion efficiency in stream generators. Continuous oxygen analysis for maximum economy and combustion control through modern gas sampling methods direct from furnace.

"Instrumentation for the Control of Power Generating Nuclear Reactors," by Clyde C. Scott (Minneapolis-Honeywell Regulator Co., Philadelphia, Pa.). Paper No. 54-31-3.

ABSTRACT: From the time the first nuclear chain reactor was demonstrated eleven years ago, instrumentation for the control of nuclear reactors has been the subject of intense development. The objective of this paper is to discuss a reactor control system that is simple in construction and operation, yet provides adequate safety for the reactor and its operating personnel.

The system to be described utilizes fast acting relays in its operation, and eliminates drift problems associated with high gain d-c amplifiers. Equipment used in reactor start-up, power level operation, and safety will be described in detail.

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ISA Session on Meteorological Instrumentation and American Meteorological Society.

Room 200.

Chairman, Edwin M. Talbott, Jr.

(Bendix Friez Company, Baltimore, Md.). Recorder, Leo S. Craig (Month Electric Co., Neptune, N. J.).

"The NRL Aerograph," by R. E. Ruskin (Naval Research Laboratory, Washington, D. C.). Paper No. 54-32-1.

ABSTRACT: Will present description and characteristics of the new Navy aerograph for temperature, pressure, and humidity recording aboard aircraft.

"Aerobee Rocket Grenade Instrumentation," by Joseph R. Walsh, W. G. Stroud, E. A. Terhune, S. Weiland, and J. H. Verner (Evans Signal Corps Engineering Laboratories, Belmar, N. J.). Paper No. 54-32-2.

ABSTRACT: A series of experiments were conducted at White Sands Proving Ground, New Mexico, by SCEL to determine the temperature and wind structure from 100,000 to 300,000 feet. This paper describes the instrumentation required to conduct these experiments.

"An Improved Rapid Sequence System for Atmospheric Soundings to High Altitudes," by Henry Demboski (Navy Dept. Bureau of Aero., Washington, D. C.). Paper No. 54-32-3.

ABSTRACT: Will describe briefly the evolution of upper air sounding equipment as developed and used in the United States and lead up to a comprehensive technical description of the present design of the rapid sequence sounding system.

"A Fast Responding Electric Hygrometer," by Arnold Wexler, Frank E. Jones, S. B. Garfinkel, A. Krinsky, and S. Hasegawa (National Bureau of Standards, Washington, D. C.). Paper No. 54-32-4.

ABSTRACT: A humidity sensing element, made by vacuum evaporation of a thin film of potassium dihydrogen phosphate on glass or other base material, is described. The element has a high speed of response. The resistance of the element, which is a function of relative humidity, extends well into the megohm range and is measured by a vacuum tube electrometer circuit. The performance characteristics will be discussed.

Tuesday, September 21, 1954
2:30 P. M.

ISA Session on Testing Instrumentation—Low Temperature Instrumentation and Measurement Below 80° K.

Room 300.

Chairman, C. Lincoln Jewett (Arthur D. Little, Inc., Cambridge, Mass.). Recorder, R. P. Wherle (International Harvester Co., Chicago, Ill.).

"Production and Measurement of Temperatures below 1° K; Application to Nuclear Polarization," by Dr. L. D. Roberts and Dr. J. W. T. Dabbs (Oak Ridge National Laboratory, Oak Ridge, Tenn.). Paper No. 54-33-1.

ABSTRACT: The paper will be primarily a discussion of recently developed techniques for the measurement of temperature below 1° K. Some introductory material will be included, describing the methods by which these low temperatures are produced, and an application to nuclear physics.

"Methods of Spinning Rotors at High Speeds and Low Temperatures," by Dr. J. W. Beams (University of Virginia, Charlottesville, Va.). Paper No. 54-33-2.

ABSTRACT: Two methods of spinning rotors up to their bursting speed at liquid helium temperatures will be described. A number of applications of this new technique will be discussed.

"The Production of High Hydrostatic Pressures at Liquid Helium Temperatures," by Dr. Clayton A. Swenson (Massachusetts Institute of Technology, Cambridge, Mass.). Paper No. 54-33-3.

ABSTRACT: This paper will consist of a review of the difficulties involved in this work, and a critical summary of the methods which have been used. A satisfactory technique which obviates some of the difficulties will be described in some detail.

"A Frictionless Support Utilizing Electromagnetic Properties of Superconductors," by Dr. Ivan Simon (Arthur D. Little, Inc., Cambridge, Mass.). Paper No. 54-33-4.

ABSTRACT: This paper will consist of a discussion of the use of electrodynamic forces acting between superconductors and magnets for the realization of a support in which a body is levitated with no material contact with its surroundings.

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ISA Session on Analysis Instrumentation.

Room 105.

Chairman, Henry J. Noebels (Beckman Instruments, Inc., Fullerton, Calif.). Recorder, Edward S. Ida (Beckman Instruments, Inc., Philadelphia, Pa.).

"Some pH Applications in the Sugar Industry," by E. G. Clayton and D. Hall (Minneapolis-Honeywell Regulator Co., Philadelphia, Pa.). Paper No. 54-34-1.

Paper No. 54-34-2—to be announced.

Paper No. 54-34-3—to be announced.

Paper No. 54-34-4—to be announced.

A round-table discussion will be held after the final paper.

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ISA Session on Instrumentation for Transportation.

Room 101.

Chairman, J. J. McDonald (Consolidated Engineering Co., Chicago, Ill.). Recorder, W. A. Berger (Pullman-Standard Car Mfg. Co., Hammond, Ind.).

"Analog Computer Techniques Applied to Problems Concerning Transportation Equipment," by Jerry Roedel (Pullman-Standard Car Mfg. Co., Hammond, Ind.). Paper No. 54-35-1.

ABSTRACT: This paper will demonstrate how three simple problems of a type which might arise in the design of transportation equipment can be set up and solved by analog computers. The talk will be illustrated with actual analog equipment.

"Use of Mass Spectrometer in Analyzing Exhaust Gases," by H. Landsberg (Consolidated Engineering Corp., Pasadena, Calif.). Paper No. 54-35-2.

ABSTRACT: The principle of mass spectrometry as applied to an analytical instrument is briefly discussed. A recently developed continuous monitoring mass spectrometer is described with special emphasis given to its application in the analysis of engine exhaust gases.

"A Magnetic Tape Recorder for Flight Recording Use," by R. L. Sink (Consolidated Engineering Co., Pasadena, Calif.). Paper No. 54-35-3.

ABSTRACT: The problem of recording and recovery of precision data on magnetic tape is analyzed from the system viewpoint. A detailed examination of certain inherent characteristics of the tape transport mechanisms forces consideration of the method of modulation used in recording and methods of demodulation used in the recovery of the original information.

The paper is primarily concerned with the comparison of several appropriate systems for the recording of data on magnetic tape, including FM, PWM and a form of compound modulation (abbreviated CM) which has certain unique advantages when used with magnetic tape storage of data. The CM method of modulation and demodulation is characterized primarily by the fact that flutter in the tape transport has a minimum effect upon the accuracy of the intelligence signal and by the fact that stable a-c amplifiers can be used for recovering steady-state signals.

"A Vibration Insensitive Acoustic Infrared Detector," by A. J. Davies and R. G. Martin (Shell Petroleum Co., Ltd., Thornton Research Centre, Chester, England). Paper No. 54-35-4.

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ISA Session on Meteorological Instrumentation and American Meteorological Society.

Room 200.
Chairman, Dr. E. S. Corwin (Bureau of Aeronautics, Washington, D. C.). Recorder, Christos Harmantas (U. S. Weather Bureau, Washington, D. C.).

"Infrared Absorption Hygrometer," by Rex C. Wood (U. S. Weather Bureau, Washington, D. C.). Paper No. 54-36-1.

ABSTRACT: A recording infrared absorption hygrometer which measures the absolute humidity in a short light path is described. Record is obtained on a remote self-balancing potentiometer. Use is made of the 1.37 U water vapor absorption band and a 1.24 U reference band. Isolation is by means of transmission type interference band-pass light filters. Infrared detection is by means of a lead sulfide photocell and amplifier. Isolation filters are contained on a sector wheel which is rotated to chop an infrared beam. A self-balancing null system is employed whereby the energy in the absorption band is kept equal to the energy in the reference band at all times. Balance is maintained by automatically varying the temperature of the lamp supplying the infrared energy, and the temperature of the lamp is a measure of the water vapor in the sensing path. An index on the lamp temperature is obtained by means of a monitor photocell, and meter or recorder. Included is a discussion of flight tests made on an airborne version of the equipment.

As a test of the apparatus, deflection experiments have been performed on aluminum plates and the results are compared with those of some tests previously recorded in the technical literature as well as with theoretical results. Tests may readily be performed in the linear range, the non-linear elastic range, or the plastic range of deformation. The latter case is usually referred to as the "bulge test".

"The Compression Hygrometer," by H. D. Bailsford and James M. Brady (Brailsford & Company, Inc., Rye, N. Y.). Paper No. 54-36-2.

ABSTRACT: A new instrument, presently in the development stage for the measurement of relative humidity makes use of the physical principle that when a sample of air or other gas containing water vapor is compressed, saturation will occur if adiabatic heating can be avoided.

"An Airborne Meteorological Recording System," by Dr. J. Bellamy and Earl L. Washburn (Cook Research Laboratories, Skokie, Ill.). Paper No. 54-36-3.

ABSTRACT: This paper describes the evolution and development of airborne meteorological recording system employing a novel form of record. This system, conceived and developed under Air Force contracts, is capable of being read both visually and by automatic scanning means, and therefore may be used as both an inflight navigational aid and as a post-flight source of meteorological data. The form of record called Unitary Decimal Digital, is printed on a paper chart roll. Input conversion from a shaft position to decimal digital contacts without ambiguity, is also described.

"A Method of Instrument System Analysis," by Malcolm Smith (Cook Research Laboratories, Skokie, Ill.). Paper No. 54-36-4.

ABSTRACT: A systematized block diagram technique is employed to facilitate the determination of those parameters which can be derived from complex instrument systems. Instrument redundancies are easily revealed and most accurate methods of parameter determination can be determined. Discussion of the application to airborne instrument systems is made.

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Society for Experimental Stress Analysis Session II—Technical Session.

Ballroom.

Chairman to be announced.
"New Apparatus for Study of Deformation of Clamped Circular Plate Loaded with Lateral Pressure," by W. H. Hoppmann, II. (Johns Hopkins University, Baltimore, Md.).

ABSTRACT: A new apparatus has been devised for experiments with circular plates or membranes under lateral pressure. Bolts normally used to provide the edge clamping in plate tests of this type have been made unnecessary by use of a lever device for producing clamping pressures through a uniform centering head. A device is also provided for assuring that the peripheral load on the edge of the circular plate be uniform.

A rotatable mercury column is provided so that any required pressure may be applied normally to the plate with as slow a loading rate as desired. Pressures up to 30 psi have been used in tests on very thin plates with the present apparatus, but the design may be readily modified to provide any pressures desired.

As a test of the apparatus, deflection experiments have been performed on aluminum plates and the results are compared with those of some tests previously recorded in the technical literature as well as with theoretical results. Tests may readily be performed in the linear range, the non-linear elastic range, or the plastic range of deformation. The latter case is usually referred to as the "bulge test".

"Pressure Tank and Instrumentation Facilities to Study the Strength of Vessels Subjected to External Hydrostatic Loading," by E. E. Johnson and E. Wenk, Jr. (David Taylor Model Basin, Washington, D. C.).

ABSTRACT: When investigating the strength of submarine pressure hulls, tests with small scale models are conducted both to verify the performance of a specific new structure and to corroborate general equations used in design. In this paper there is described a new facility which has been developed in accordance with these purposes, at the Taylor Model Basin for studying pressure vessels of various shapes under the action of external hydrostatic loading. The tank is 8 feet in diameter and 14 feet long and is arranged to accommodate the specimen under test such that free access is allowed to the interior of the specimen at all times. Inspection of suspected damage is thus facilitated as well as the installation of auxiliary strain and deflection instruments. A special closure system has been provided for the tank which permits rapid installation of the model or removal after test.

Where these and other design features had not been previously employed, measurements were made during the proof test of the tank to verify their accuracy.
In the expectation of buckling modes of failure in the specimens being tested, special provision was made for a deflection measuring device by which the shape of the specimen could be continuously measured. Details are given of this instrument which consists of a shaft seated in the model, and on which is mounted a displacement sensing gage that can be rotated around the shaft for measurements at any desired angular orientation. The electrical output from the gage is magnified 50 times by suitable electronic amplification, and recording accomplished with a proportional linear pen motion. Records are made on a large disc which is caused to rotate synchronously when the gage rotates around the shaft so that a plot is obtained on polar coordinates of the entire shape of the cross-section. One such recording disc is employed for measurements of each selected station along the instrument shaft.
With this device, observations can be made conveniently of the initial shape of the structure prior to a test, as well as the change in shape before and during buckling under the action of external pressure.
Instrumentation results are also briefly described showing the manner in which such observations have been employed to study weakening effects of initial imperfections on the buckling strength of cylindrical shells.

Instrumentation results are also briefly described showing the manner in which such observations have been employed to study weakening effects of initial imperfections on the buckling strength of cylindrical shells.

"Creep in Bonded Electric Strain Gages," by Hudson Matlock (University of Texas, Austin, Texas), and Sophus A. Thompson (Missouri, Kansas and Texas Railroad, St. Louis, Mo.).

ABSTRACT: A series of room-temperature creep tests has been performed on a selected group of bonded resistance-wire strain gages. The tests were part of a program to develop reliable methods for using bonded gages for foundation studies and other long-time structural problems. The gages tested were Baldwin SR-4 Types A-8, A-11, AB-3 and ABD-1 and Gustafsson-Huggenberger Type GH-1.

Pairs of gages were mounted on heat-treated steel beams so that while one gage was subjected to tension a similar gage was strained in compression. Strain levels of 2,000 and 1,000 micro-inches per inch were held constant for periods of about 75 days. Frequent observations of indicated strain were made during the loading period and for 19 days after unloading. A special circuit was used to eliminate errors from switch-contact and lead-wire resistance changes, and regular sets of reference readings were taken to verify circuit stability.

Creep of considerable magnitude (up to about 16 per cent of the applied strain) was observed. Creep in gages loaded in compression was in most cases significantly greater than in the corresponding tension gages. Also the time-rate of creep decreased more slowly in the compression gages. Type ABD-1 ("dual-lead," bakelite-base type) appeared to be extremely stable after the first few days.

Appraisal of potential creep characteristics in other gage types can probably be based on the results presented. Specific causes of creep have not been isolated by the study because of the wide range of physical features among the types tested. The results seem to indicate that no single factor is solely responsible.

"Metallic Foil Strain Gages," by E. J. Micevicz (Naval Ordnance Laboratory, Silver Spring, Md.).

ABSTRACT: This paper explores in somewhat greater detail the properties and performance of metallic foil strain gages. Different methods of manufacturing gages from copper-nickel, platinum-iridium, and nickel foil have been attempted and the results obtained are reported. Gage factor measurements, pressure coefficients, fatigue characteristics, transverse sensitivities, operating tem-

perature limits, hysteresis errors and dynamic response will be discussed. Information on rapid and convenient mounting methods using a dried film adhesive will be presented as well as suggestions for using the gages with standard strain recording equipment.

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Society for Experimental Stress Analysis.

Rooms 101, 102, and 300.
Chairman, A. O. Bergholm (Franklin Institute, Philadelphia, Pa.).

Educational Lectures on Application and Use Techniques of SR4 Gages, Stresscoat, and Photoelasticity.

These lectures will appeal to those who are not thoroughly conversant with some of the methods for investigating strain and stress concentration. Demonstrations will be conducted by persons well versed in their particular field.

ISA Session on Testing Instrumentation—Dynamometry.

Room 300.

Chairman, R. P. Wherle (International Harvester Co., Chicago, Ill.). Recorder, V. J. McDonald (University of Illinois, Urbana, Ill.).

"Eddy Current Induction Dynamometers," by Thomas Skarakis (Eaton Mfg. Co., Kenosha, Wis.). Paper No. 54-37-1.

ABSTRACT: Application and operation of eddy current dynamometers.

"Dynamometers and Their Control for Torque Measurement," by Hal Gibson (General Electric Co., Schenectady, N. Y.). Paper No. 54-37-2.

ABSTRACT: There are in general three types of dynamometers, motoring, absorption and transmission. The electrical cradled motoring, or absorption dynamometer has been continually improved for 70 years and is today the Master Standard of torque measurement. However, merely cradling an electrical machine and adding a weighing system does not make a dynamometer.

The control of a dynamometer is just as important as the dynamometer, to make a successful dynamometer system. To obtain a successful dynamometer system, clear specifications with illustrations of special requirements should be prepared as standards for dynamometers and control are not available.

"The Measurement of Jet Engine Thrust by Hydraulic Load Cells," by H. A. Mills (A. H. Emery Co., New Canaan, Conn.). Paper No. 54-37-3.

ABSTRACT: This paper describes a method of measuring static thrust of jet engines. It outlines the characteristics of a typical hydraulic weighing system and illustrates operating results obtained on several configurations of test stands.

ISA Session on Production Processes—Metals Subcommittee.

Ballroom.

Chairman, J. Ward Percy (United States Steel Corp., Kearny, N. J.). Recorder, Earl Seagrave (Celanese Corporation of America, Cumberland, Md.).

"The Practical Examination of the Furnace Pressure Control for an Open Hearth Furnace," by Isamu Oka and Atsuhiko Noda (Kobe Steel Works, Ltd., Kobe, Japan). Paper No. 54-38-1.

ABSTRACT: Some investigations have been made on the behaviors of an open hearth furnace pressure control system. The procedures of tests and the results obtained are described.

"Automatic Sample Cleaning System for Cement Kiln Continuous Gas Analyzers," by Richard Post (Minneapolis-Honeywell Regulator Co., Philadelphia, Pa.). Paper No. 54-38-2.

ABSTRACT: The automatic determination of oxygen in the exhaust gas from a dry process cement kiln is a difficult problem. The gas sample contains large quantities of dust, water vapor, as well as corrosive sulphur compounds, and is at a temperature of 1200-1600° F. This paper describes a cleaning system to overcome these conditions and discusses the factors considered in the design of its components. These include: materials of construction, gas velocity, system volume, moisture removal, sample cooling, and maintenance.

"Computing Instrumentation for Utilizing Surplus By-Product Fuel Gas on Steel Re-heating Furnaces," by J. Fred Maienshein, Richard Post, and Joseph Hornor.

ABSTRACT: Describes instrumentation which simultaneously applies fuels to a reheating furnace as a function of temperature and load. Gas is supplied as a function of its availability; the liquid fuel requirement is then computed and supplied automatically to meet total fuel demand.

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Society for Experimental Stress Analysis Session III—Panel Discussion on Methods of Attacking Research Problems—Administration of Scientific Research Laboratories.

Room 105.

Moderator, E. Wenk, Jr. (David Taylor Model Basin, Washington, D. C.).

"Justification for Research," by Dr. J. A. Hutcheson (Westinghouse Research Laboratories, East Pittsburgh, Pa.).

"Origination of Laboratories," by Dr. M. J. Day (Armour Research Foundation, Chicago, Ill.).

"Selection of Personnel," author to be announced.

"Stimulation of Research Productivity," by Dr. R. D. Bennett (U. S. Naval Ordnance Laboratory, Silver Spring, Md.).

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Society for Experimental Stress Analysis Session IV—Panel Discussion on Methods of Attacking Research Problems—Simulated Service Testing.

Room 106.

Moderator, Prof. T. J. Dolan (University of Illinois, Urbana, Ill.).

"Problems Pertaining to Aircraft," by S. A. Gordon (Battelle Memorial Institute, Columbus, Ohio).

"Problems Pertaining to Pressure Vessels," by L. K. Kooistra (The Babcock & Wilcox Co., Barberton, Ohio).

"Problems in Earth Moving Equip-

ment," by A. H. Pickford (Caterpillar Tractor Co., Peoria, Ill.).

"Problems in Propeller Industry," by D. G. Richards (United Aircraft Corp., East Hartford, Conn.).

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Society for Experimental Stress Analysis Session V—Panel Discussion on Methods of Attacking Research Problems—Model Testing.

Room 200.
Chairman, Prof. William M. Murray (Massachusetts Institute of Technology, Cambridge, Mass.).

Speakers to be announced.
ISA Technical Division Session—Panel Forum on Problems of Flight Test Instrumentation.

Room 101.
Chairman, R. C. Mann (General Electric Co., Cincinnati, Ohio). Recorder, Floyd Simpson (Industrial Engineering Corp., Louisville, Ky.).

Panel Members: R. E. Conover (Wright Air Development Center, Wright-Patterson A. F. B., Ohio).

W. R. Orme (General Electric Co., Schenectady, N. Y.); Arthur T. Snyder (Boeing Airplane Co., Seattle Wash.); and J. Newcomb (Douglas Aircraft Co., Los Angeles, Calif.). Paper No. 54-39-1.

ISA Session on Testing Instrumentation—Vibration Measurements Committee.

Room 300.

Chairman, V. J. McDonald (University of Illinois, Urbana, Ill.). Recorder, H. R. Karp (Thomas A. Edison, Inc., West Orange, N. J.).

"Determination of Sinusoidal Accelerations at Levels Near ± 1g. by Chatter Method," by C. W. Kissinger (National Bureau of Standards, Washington, D. C.). Paper No. 54-40-1.

ABSTRACT: An accelerometer is described, in which a loose mass chatters when peak level of sinusoidal acceleration exceeds ± 1g. The relation is derived between the point in the cycle at which the mass makes contact, and the acceleration level. Range and accuracy of the method are discussed.

"High 'G' Calibrations by Impact Methods Using Ballistic Pendulum, Air Gun and Inclined Trough," by T. A. Perls and C. W. Kissinger (National Bureau of Standards, Washington, D. C.). Paper No. 54-40-2.

ABSTRACT: The need for calibrations at high levels of acceleration is discussed. The theory is presented for a method of obtaining such calibrations by impact methods, using an electrical integrator. The method does not involve a knowledge of either the pulse shape or the pulse width, although the latter is limited from both above and below by practical considerations related to the integrator and to the test accelerometer. Three actual test schemes are described, including the use of a simple ballistic pendulum, an air gun, and an inclined trough.

"A Basic Method of Determining Design Characteristics of Accelerometers by Rotation," by W. A. Wildhack

TECHNICAL PROGRAM

and R. O. Smith (National Bureau of Standards, Washington, D. C.). Paper No. 54-40-3.

ABSTRACT: The earth's gravitational field furnishes a convenient sinusoidal forcing function for a vibrating system (e. g., an accelerometer) rotating in a vertical plane. The centrifugal field decreases the restoring force on the vibrating mass. Resonance occurs at lower frequencies and with greater amplitudes than in the case of excitation by linear vibration. The response ratio (vibration amplitude/static displacement caused by gravity) is greater than unity for all damping ratios up to unity. The resonant frequency for zero damping occurs at 0.707 times the natural undamped frequency. From measurements of the maximum response ratio, and of the higher frequency at which this ratio decreases to unity, one may determine both the damping ratio and the undamped natural frequency of any system whose damping ratio is less than unity. The response equation for the rotational excitation is given, and the solutions are presented in graphic form. Experimental test results obtained by this method are included.

"Calibration of Accelerometers Under Steady State and Transient Conditions," by James Turnbow (University of Texas, Austin, Texas). Paper No. 54-40-4.

ABSTRACT: Description of a technique for calibration of accelerometers under both steady state and transient conditions and the comparison of results obtained for two types of barium titanate accelerometers, a bonded wire resistance accelerometer, and an unbonded wire resistance accelerometer.

ISA Technical Division Session.
Room 200.

Chairman, D. C. Little (Army Medical Research Laboratory, Fort Knox, Ky.). Recorder to be announced.

"Interference of Two-Position Controllers," by Yasundo Takahashi (University of Tokyo, Japan). Paper No. 54-41-1.

ABSTRACT: The tuning modes of operation play important roles in determining the behavior of industrial processes equipped with two sets of two-position controllers. Useful information regarding such behavior are given through extended application of approximate frequency response method developed for simple loop discontinuous control systems.

This paper presents a rapid method of finding tuning patterns for cases when one control system interferes with the other, and when the two control systems affect each other. For the former case, analog computer test results are given, showing the thresholds of tuning. For the latter case, the general procedures of analysis are introduced, taking a practical example of a vapor compression evaporator control. More general view of operating modes is given by assuming process response of dead time plus linear reaction curve. The same principle leads to a new method of two-variable linear control system design, which possesses a desirable feature for system synthesis so long as the properties of individual control loops and coupling elements are treated separately.

"On the Rolling Friction," by Taro Hisado (Government Industrial Research Institute, Nagoya, Japan). Paper No. 54-41-2.

ABSTRACT: In this study the author intends to search for the relations between rolling friction and load, radius of curvature, contact length, material and surface condition, and then intends to establish a fundamental law of rolling friction, and as its particular application, to make clear the resistance of knife-edges.

"Cross-Check System for EMF and Resistance Standards in a Meter Laboratory," by Robert E. McCallum,

Sandia Corporation, Albuquerque, N. M.). Paper No. 54-41-3.

ABSTRACT: This is a system for cross-checking a standards group consisting of L & N type K2 potentiometer, standard cells, voltmeter, shunt, standard resistors. It consists of procedures which are demonstrated with equipment. A simplified demonstration pot and lantern are also used.

"Automatic Data Handling System for Process Plants," by J. F. Bishop, A. C. Knudsen (Beckman Instruments, Inc., Pasadena, Calif.); and L. P. Lan-neau and M. O. Germand (Esso Standard Oil Company, New York, N. Y.). Paper No. 54-41-4.

ABSTRACT: Automatic data handling equipment which has been extensively applied in wind tunnel and various atomic energy installations is now finding use in industrial process plants. An instrument has been built which accepts millivolt signals from primary sensing elements. This device incorporates a multi-channel scanner, measures and converts signals into absolute digital values. This new machine not only logs data automatically on an electric typewriter, but permits storage of digital information in a card or tape punch system.

In this paper the general requirements and advantages for this type of system are discussed with reference to the possible widespread use in petroleum and chemical process plants. Instrument design, consideration, and solution are described.

ISA Technical Division Session —
Panel Discussion on Automation.

Session 54-42 cancelled.

ISA Session on Testing Instrumentation—General.

Ballroom.

Chairman, S. A. Hluchan (Oak Ridge National Laboratory, Oak Ridge, Tenn.). Recorder, H. F. Rondeau (American Meter Co., Inc., Erie, Pa.).

"An Instrument for Viscosimeter Measurement of Time of Fall of a Plummet Within a Pressure Vessel," by A. J. Rodgers and J. W. Heyd (Mound Laboratory, Miamisburg, Ohio). Paper No. 54-48-1.

ABSTRACT: An instrument is described which will measure the time of fall of a plummet at uniform velocity with an accuracy reproducible to within $\pm 1\%$. The plummet, which contains a few millicuries of Co^{60} , is located within a pressure vessel. The falling plummet is detected at two points in the path of fall by two pairs of Geiger-Mueller counters. Coincident pulses from the Geiger-Mueller counters actuate a timer to measure the elapsed time of fall between the timing points. A novel method of preventing premature actuation of the timer by random coincident pulses is described.

"Balances and Microbalances Quartz Fiber Microbalance," by R. G. Olt (Mound Laboratory, Miamisburg, Ohio). Paper No. 54-48-2.

ABSTRACT: Development of a sealed sample carrier and loading chamber permits remote operation of a Kirk-Craig type quartz-fiber microbalance within a vacuum-tight housing. Advantages gained from remote sample handling in the vacuum-tight metal housing include: reduction of health hazards associated with radioactive samples, control of atmospheric effects on the samples, and increased speed and precision in weighing. The principles developed for remote operation of a microbalance within atmospheric, thermal, and radiation shielding may be extended to other work requiring remote handling and radiation protection of operators.

"A Method and Devices for Connect-

ing to Revolving Thermocouples," by Prof. Walter Robinson, Owen E. Buxton, Jr., and J. R. Barnum (Ohio State University, Columbus, Ohio). Paper No. 54-48-3.

ABSTRACT: Compact devices are described which have been developed and used for transmitting to a high-speed recorder the emf of 6 to 24 iron-constantan thermocouples, embedded in machine members revolving at speeds of up to 10,000 rpm. Mercury is used as a fluid conductor between stationery and revolving circuit elements.

"A Magnetic Amplifier Type Temperature Controller for Long Duty Cycle and Low Maintenance," by W. T. Hage (The Babcock & Wilcox Co., Alliance, Ohio). Paper No. 54-48-4.

ABSTRACT: Improvements in the techniques of testing metals at elevated temperatures have made necessary a temperature control of improved long-term stability.

To this end a temperature control using magnetic-type components has been developed. For two years thirty-two units have been controlling temperatures on high temperature creep and stress rupture tests. Their performance has been very satisfactory.

Wednesday, September 22, 1954
7:00 P. M.

Society for Experimental Stress Analysis.

Rooms 101, 200, and 300.

Chairman, A. O. Bergholm (Franklin Institute, Philadelphia, Pa.).

Educational Lectures on Application and Use Techniques of SR4 Gages, Stresscoat, and Photoelasticity.

These lectures will appeal to those who are not thoroughly conversant with some of the methods for investigating strain and stress concentration. Demonstrations will be conducted by persons well versed in their particular field.

Thursday, September 23, 1954
9:30 A. M.

ISA Session on Testing Instrumentation—Flow Measurement Session.

Room 300.

Chairman, H. R. Karp (Thomas A. Edison, Inc., West Orange, N. J.). Recorder, C. E. Fry (Westinghouse Electric Corp., East Pittsburgh, Pa.).

"Measurement of Viscous Fluids with Round Edged Orifices," by H. V. Beck (American Meter Co., Inc., Erie, Pa.). Paper No. 54-43-1.

ABSTRACT: Conventional primary devices, generally used in the measurement of fluid flow, are sharp square-edged orifices, nozzles or Venturi tubes. These commonly used devices are quite satisfactory for the measurement of gases and non-viscous liquids; however, they are seriously limited in the measurement of viscous liquids since the coefficients of discharge vary so greatly with the fluid viscosity. This paper concerns the round-edged orifice whose coefficient of discharge is practically independent of viscosity changes over a wide range of flowing conditions. The author wishes to point out to measurement personnel the important niche occupied by the round-edged orifice in fluid flow measurement which he feels cannot be filled as simply by any other existing device.

"Application of Directly Heated Thermopile to Gas Flow and Vacuum Measurement," by W. M. Bunker

(Hastings Instrument Co., Inc., Hampton, Va.). Paper No. 54-43-2.

ABSTRACT: If a thermopile is supplied with constant heating power, with alternate junctions maintained at ambient temperature, the temperature difference between the hot and cold junctions, and thus the thermopile voltage output, is dependent on certain physical properties of the gas and its rate of flow past the thermopile. By means of suitable design of the thermopile enclosures and associated instrumentation, this effect can be used for a very sensitive measurement of velocity of flow, pressure difference, vacuum, thermal conductivity, composition of certain gas mixtures, and other quantities. This principle provides measurements which are independent of ambient temperature effects.

"A Quick Response Variable Flow Control Device," by V. L. Streeter (Illinois Institute of Technology, Chicago, Ill.). Paper No. 54-43-3.

ABSTRACT: The theory and design data for a new flow control principle is developed, wherein a disc moves within a profiled throat section such that the annular area is inversely proportional to the pressure drop across the disc. The disc motion is resisted by a non-linear spring on an adjustable support, such that shifting of the support allows an infinitely variable adjustment of discharge over the design range.

"Computation of Fluid Flow and Pressures in a Network," by Jack Warga (Electro Data Corp., Pasadena, Calif.). Paper No. 54-43-4.

ABSTRACT: This paper presents an analytical and computational approach to problems involving steady flow (direct currents) in a network conducting fluid or electricity.

Following a discussion of some conditions insuring the existence of a unique solution to the problem, two iterative computational methods are described. The first one apparently new, converges to the solution under all conditions; the second method is an application of the Newton-Raphson procedure with certain computational refinements.

Society for Experimental Stress Analysis Session VI—Technical Session.

Ballroom.

Chairman to be announced.

"The Interference Screen Method for Isopachic Patterns (Moire Procedure)," by G. Mesmer (Washington University, St. Louis, Mo.).

ABSTRACT: The isopachic lines can be seen or photographed as lines of equal thickness in a transparent optical flat model or in combination with a second optical flat, by interference. The necessary optical flat surfaces, however, are inconvenient for engineering purposes.

Dose and Landwehr (Naturwissenschaften, Vol. 26, page 342, 1949, Berlin), proposed to use the screen of two systems of interference lines to build the isopachic pattern.

This paper describes the development of this method for practical application. The pattern of the lines of equal thickness of a plane transparent model (not optically flat) is visible by interference of the two rays reflected at the two surfaces.

The apparatus is described. It consists of one monochromatic light source, one lens, one coated mirror (half reflecting), and a camera. The model materials are discussed, customary plexiglass shows the screen lines clearly. The procedure, the calibration, and the evaluation are explained; some examples are shown.

TECHNICAL PROGRAM

The procedure has been used and expanded in the meantime (paper of Daniel Post, November, 1953, SESA); different possible arrangements and their features are discussed.

"Quantitative Three Dimensional Photoelasticity," by M. M. Leven (Westinghouse Research Laboratories, East Pittsburgh, Pa.).

ABSTRACT: A number of techniques have been advanced for the photoelastic determination of the two-dimensional stress distribution on the free surfaces of three-dimensionally stressed models into which the stresses have been fixed or "frozen".

Some investigators have chosen slices approximately normal to the surface and by means of oblique incidence have determined the stress distribution on the surface. Others, including the author, have suggested surface or "skin" slices tangent to the surface. These "skin" slices are investigated with normal incidence light to give the maximum shear stress directly. Separation of the principal stresses is accomplished by determining the directions of the stresses at a point on the surface and making an auxiliary slice along one of these directions.

Again, in regard to the actual measurement of the retardations which will generally be small, a number of methods are available, including Tardy or Babinet compensation with or without a photometric null indicator and color matching.

All of the above methods have been evaluated for the degree of accuracy to be expected from each using two problems: transverse holes in shafts subjected to tension and shafts with circumferential grooves subjected to pure torsion. Curves of stress concentration factors for these two cases are presented.

Errors can be reduced to $\pm 5\%$ or lower using either color matching or Tardy compensation without the use of photometric devices. This accuracy can be obtained with either method of slicing, i.e., normal slices and oblique incidence or surface slices and normal incidence of the light. Present results indicated that the method of normal slices and oblique incidence is the better method from the standpoint of simplicity and accuracy for a given thickness of slice.

"Solution of Torsional Problems with the Aid of the Conducting Sheet Analogy," by N. E. Friedmann, Y. Yamamoto, and D. Rosenthal (University of California, Los Angeles, Calif.).

"An Investigation of Discontinuity Stresses in Pressure Vessels by Means of Three-Dimensional Photoelasticity," by L. W. Smith (Combustion Engineering, East Orange, N. J.), and G. K. Cooper (Purdue University, Lafayette, Ind.).

ABSTRACT: Discontinuity stresses in pressure vessels have been under study for many years, and the need for group action in the field prompted the Pressure Vessel Research Committee (PVRC) to conduct an organized research program. Since it would be impossible to complete a testing program which would permit the formulation of empirical formulas for pressure vessel design, the Design Division of PVRC established a testing program to obtain accurate data from several pilot tests on model vessels. Photoelastic analysis of pressure vessel models was desirable in order to more thoroughly investigate the stress distribution across the thickness of the vessel, particularly in the critical knuckled region.

This paper presents the results of photoelastic tests on two conical head models machined from solid blocks of Fosterite. One model represented a typical cone head vessel with a sharp transition between the cone and cylinder, while the other, a toriconical head model, had a torus section joining the cylinder and conical head.

The standard technique for "freezing-in" stresses was applied to each model. After test, thin longitudinal and circumferential slices

were removed from the vessels at appropriate locations. Radial, longitudinal, and circumferential stresses were separated from the photoelastic data by integration of the equations of equilibrium for an axis-symmetric solid of revolution.

The results are presented in graphical form to show the stress variation across the walls of the vessels. The effect of local discontinuity decayed rapidly with distance from the head-cylinder junction for both models. At points sufficiently removed from the intersection, the stress distribution was similar to that for a beam in bending.

A high shear stress gradient was observed near the inner surface at the head-cylinder intersection of the conical head model.

The moment distribution along the cylinder as determined experimentally did not agree with the theoretical moment distribution.

American Institute of Chemical Engineers Session I—Symposium on Instrumentation for Materials Handling. Room 101.

Chairman, S. D. Ross (Minneapolis-Honeywell Regulator Co., Philadelphia, Pa.). Vice-Chairman, A. H. McKinney (E. I. duPont de Nemours & Co., Wilmington, Del.).

Introductory Remarks—C. G. Kirkbride (President, American Institute of Chemical Engineers).

"The Scope of the Materials Handling Instrumentation Field," by W. B. Heinz (Heinz Engineering Co., Arlington, Va.).

ABSTRACT: A general review is given of the field encompassed by instrumentation in the solutions of materials handling problems with particular emphasis on the chemical industry. Paper is to form background for specific papers which follow; types of equipment not covered by specific papers will be mentioned briefly.

"Level Measurements in Granular Solids," by F. S. Becker (Sun Oil Co., Marcus Hook Pa.).

ABSTRACT: Several years ago the Gage-tron was adapted for the measurement of level of fluidized catalyst; a review is given of improvements in design and application of this instrument to make it a more valuable tool. For certain control applications the capacitance type instrument appears more suited, and some experience in this field is reported.

"Applications of Ohmart Equipment to the Measurement of Process Variables," by H. L. Cook, Jr. (The Ohmart Corp., Cincinnati, Ohio).

ABSTRACT: Theory of operation and general performance data for Ohmart equipment is reviewed. Applications are covered for: (a) level control in reactor vessels, (b) high level alarm for coking drum, (c) liquid-liquid interface detection in pipelines, (d) automatic shut-off in batch process, and (e) control of slurry density.

"The Application of SR-4 Strain Gages to Materials Handling," by W. H. Bosworth (Ruge-deForest, Inc., Cambridge, Mass.).

ABSTRACT: Operation of SR-4 strain gage system is reviewed and typical applications in materials handling are described, namely: (1) pressure control on oil and gas pipelines, (2) crane scale, (3) an automatic weight recording and controlling system, and (4) a weight indicating and integrating (totalizing) system.

"Turbine Type Flow Meters in Materials Handling," by George Fitzpatrick (Potter Aeronautical Co., Union, N. J.).

ABSTRACT: Types of chemical fluids measurable with vane type flow meters are reviewed. Theory of operation is briefly covered, includ-

TECHNICAL PROGRAM

ing digital system for totalizing flow rates—a system usable also for counting units in production. Application of a predetermining counter is described, wherein the system automatically cuts off flow when a preset quantity is reached.

ISA Session on Aeronautical Instrumentation. Room 200.

Chairman, Orin Greenwood (Aro, Inc., Tullahoma, Tenn.). Recorder to be announced.

Aeronautical paper to be presented by representative of Convair. Paper No. 54-44-1.

"Design of Aircraft Component Test Stands," by Eugene H. C. Brown (Industrial Engineering Corp., Louisville, Ky.). Paper No. 54-44-2.

ABSTRACT: This paper is a brief evaluation of the designs in use at present and a presentation of designs new to the test stand field, but borrowed in many cases from process control methods where they have been adequately tested and proved in performance.

ISA Technical Division Session. Room 105.

Chairman, Thomas W. Marshall, Jr. (R. F. D. No. 2, Verona, Pa.). Recorder to be announced.

"Use of Meter Relays in Industrial Process," by Paul St. Amour (Assembly Products, Chagrin Falls, Ohio). Paper No. 54-49-1.

"Compressor Blade Pressure Gage," by R. C. Reid (General Electric Co., Evendale, Ohio). Paper No. 54-49-2.

"Using Modern Potentiometer Recorders in Research" (A film by E. I. du Pont de Nemours & Co., Wilmington, Del.).

**Thursday, September 23, 1954
2:30 P. M.**

ISA Technical Division Session on Magnetic Flow Meters. Room 300.

Chairman, H. G. Elrod, Jr. (Case Institute of Technology, Cleveland, Ohio). Recorder to be announced.

"Industrial Application of Electromagnetic Flow Meters," by G. H. Giczewski (Bowser, Inc., Fort Wayne, Ind.). Paper No. 54-45-1.

ABSTRACT: An electromotive force is induced in a fluid moving in a pipe at right angles to an alternating magnetic field. The theory of operation of the electromagnetic flowmeter is discussed briefly and references cited. The associated electronic circuitry is discussed in detail and test results presented to substantiate the claims. Applications and uses in industrial metering control, with reference to automatic processes, are evaluated with respect to present methods of flow measurement.

"Industrial Application of Electromagnetic Flow Meters," by Jan Boeke (The Foxboro Co., Foxboro, Mass.). Paper No. 54-45-2.

ABSTRACT: The principle of the Electromagnetic Flow Meter is explained. It is shown that the E. M. Flowmeter offers many advantages over conventional flow meters in those cases where it can be applied. The range of applicability can be deduced from the data furnished.

ISA Session on Testing Instrumentation—Oscillography. Room 200.

Chairman, C. E. Fry (Westinghouse Electric Corp., East Pittsburgh, Pa.). Recorder, S. A. Hluchan (Carbide and Carbon Chemicals Co., Oak Ridge, Tenn.).

"Principles of Multichannel Oscillography," by C. A. Heiland and K. C. Rock (Heiland Research Co., Denver, Colo.). Paper No. 54-46-1.

ABSTRACT: Multichannel—oscillography (a method of simultaneously recording time-variations of analog-voltages originating at separate points) employs multiple galvanometers in parallel magnetic fields. Their current and voltage sensitivities, dynamic and step-function response, integrating action, and relation to transducer response are discussed, as are the optical and photographic problems. Basic parameters recorded are variations in length, time and mass; vibrations; temperature; and optical, chemical, nuclear and electrical quantities. Techniques are outlined for the following fields: aircraft design, atomic energy, automotive industry, chemical processing, construction, electrical engineering, geophysics, hydraulics, medicine, military engineering, petroleum, ship building, railroad engineering, telemetering and well-logging.

"Transducers: The Tools of Instrumentation," by Leon Seldin (Allen B. DuMont Laboratories, Inc., Clifton, N. J.). Paper No. 54-46-2.

ABSTRACT: In this paper are discussed the basic scientific phenomena upon which transducer elements are based: i.e., resistive, capacitive, electromagnetic, optical, etc. Transducers using these elements are described and illustrated. Emphasis is placed on variety of methods which may be used to perform the same function; the choice being the task of the engineer.

"Evaluation of Engineering Designs of Industrial Instruments," by S. S. Sturgeon (The Foxboro Co., Foxboro, Mass.). Paper No. 54-46-3.

ABSTRACT: Description of Foxboro methods of evaluation of new designs of industrial instruments, including methods of simulating adverse environmental conditions. Descriptions of special test equipment, including water manometers operating at 2,000 psi static, micromanometer for calibrating to 1/10% down to 1" of water, and dead weight testers at 200,000 psi, etc. Typical test results on industrial instruments will be presented.

"Applications of Multichannel Oscillography," by K. C. Rock and C. A. Heiland (Heiland Research Co., Denver, Colo.). Paper No. 54-46-4.

Society for Experimental Stress Analysis Session VII—Technical Session. Ballroom.

Chairman to be announced.
"Rotating Beam Deflection Studies," by J. B. Tiedemann (University of Kansas), T. E. Pardue, and Irwin Vigness (Naval Research Laboratory, Washington, D. C.).

ABSTRACT: Mild-steel cylinders, while rotating about their axes, were bent transversely by forces applied perpendicular to their lengths. The magnitudes of the forces, and of the internal energy losses per cycle, were determined as a function of angle of bend. Experiments were made on separate specimens, at different constant rotational speeds and at different constant rates of transverse bending. Rotating cylinders exhibited an obvious yield at much less load than did non-rotating specimens. This yield occurred when the maximum stress in the rotating specimen was approximately equal to the yield stress as determined by a tensile test of the material. The load supported by a rotating specimen increased nearly linearly with deflection after yield. Non-

rotating specimens would continue to large deflections at nearly constant load after a small amount of plastic strain. For small plastic strains, rotating specimens were less rigid than non-rotating specimens. For large plastic strains, the reverse was true.

When the time-rate of transverse bending was held fixed, changes of rotational speeds from 8 to 10,000 rpm had little or no effect upon the apparent yield point. When the ratio of rate of transverse bending to rotational speed was held constant, increasing the rotational speed caused by apparent yield point to increase. If this increase in apparent yield is due to a delayed yield effect, the specimen must have a memory of the number of cycles with stress above the static elastic limit that occurred prior to yielding.

The amount of work hardening, as measured by the load supported for a given deflection, reached a constant value after the first few cycles at a given deflection, and thereafter was not increased until the deflection was increased.

"An Investigation of the Dynamic Properties of Plastics and Rubberlike Materials," by R. A. Eubanks (Illinois Institute of Technology, Chicago, Ill.), D. Muster (General Electric Co., Schenectady, N. Y.), and E. G. Volterra (Rensselaer Polytechnic Institute, Troy, N. Y.).

ABSTRACT: Experiments, carried out on plastics and rubber-like materials under impact loadings, are discussed. The mechanical and optical parts of the apparatus used are described, the theory of the experimental method is outlined, and the influence of the principal causes of mechanical and optical errors associated with the method are evaluated. The results obtained on the various materials tested are presented.

(The material presented in the paper is based on an investigation conducted at the Illinois Institute of Technology, Chicago, Illinois, under the sponsorship of the Mechanics Branch of the Office of Naval Research, Washington, D. C., Contract No. N7onr32911, Project No. NR 064 369.)

"On the Relation Among Stress, Strain and Impact Velocity in Copper Wires Submitted to Longitudinal Impact," by Carlo Riparbelli (Cornell University, Ithaca, N. Y.).

ABSTRACT: An experimental investigation having the aim of determining directly the stress as a function of time in a copper wire under longitudinal impact is presented. The investigation is originated from the previous observation that the propagation velocity measured at the wave front is the one valid for elastic waves, even in presence of plastic flow.

The experimental scheme consists of measuring the velocity of the hammer producing the impact as a function of time. The acceleration obtained by one derivation provides the measure of the force present at the section under impact.

The time rate of plastic strain results linearly related to the stress, within a limited range, above which a deviation from the linear law is observed.

Data from the literature as well as data obtained directly are utilized for an estimate of the numerical coefficients, under some simplifying hypotheses.

"Elimination of the Transient Strain Fluctuations Which Result from Longitudinal Impact of Bars," by J. M. Krafft (Naval Research Laboratory, Washington, D. C.).

ABSTRACT: This investigation has shown that the longitudinal impact of two elastic bars produces a wave of constant strain plus a rapid strain fluctuation of period about that time which would be required for a longitudinal wave to traverse the bar diameter. Measurements of the strain wave are made with wire resistance gages and oscillographic recording apparatus. The observed fluctuation is somewhat greater than actual strain variation as a result of an induced signal voltage; this

effect is attributable to magnetostriction. The characteristic strain fluctuation can be modified by the interposition of padding material such as grease or solder between colliding surfaces. A slightly conical nose on one of the colliding bars is also beneficial. The magnetostrictive distortion can be reduced by careful demagnetization of the bar, selective connection of gage elements or by use of non-magnetostrictive bar material.

American Institute of Chemical Engineers Session II—Symposium on Instrumentation for Materials Handling. Room 101.

Chairman, S. D. Ross (Minneapolis-Honeywell Regulator Co., Philadelphia, Pa.). Vice-Chairman, A. H. McKinney (E. I. duPont de Nemours & Co., Wilmington, Del.).

"Instrumentation for Specific Gravity Measurements and Weighing in Storage Tanks, Drum Filling, and Cranes," by C. E. Roessler (Automatic Temperature Control Co., Philadelphia, Pa.).

ABSTRACT: A differential transformer device (gravitometer) used for recording the control of interface of liquid pipeline products is described. Also covered is an electro-hydraulic load cell weighing system, with field reports of applications to: (1) tank weighing in nylon processing, (2) filling drums with petroleum products on conveyor line, and (3) crane scale with remote indicator.

"Application of Gravimetric Feeders in Continuous Processing," by A. A. Melnychuk (Omega Machine Co., Division of B-I-F Industries, Providence, R. I.).

ABSTRACT: For continuous processes, two new model feeders and pneumatic devices on present model feeders are described. Applications are covered as follows: (1) operation of a group of feeders paced by a pneumatic signal, (2) use of a pneumatic type feeder on hot, pulverized aerated solids, and (3) use of new

TECHNICAL PROGRAM

continuous loss-in-weight feeder for toxic, corrosive, or hygroscopic materials.

"Electrical Auto-Batch Weight Control System for Solids," by B. L. Sutton (Gilmore Industries, Inc., Cleveland, Ohio).

ABSTRACT: An electronic weighing system is described, comprising a hopper of 500-lb. capacity suspended from a single SR-4 type U-1 load cell and an electronic instrument. System automatically batches four different materials from storage in varying proportions based upon predetermined settings of control selector circuits. System can be placed on repeat cycle, or set up for one batch only.

"Solving Low Capacity Flow Control Problems," by W. P. Griffiths and J. Procopi (Milton Roy Pump Co., Philadelphia, Pa.).

ABSTRACT: New uses of controlled volume pumps as flow control instruments in the chemical industry are described, including: (1) resin addition to paper pulp, (2) dyehouse water treatment, and (3) fuel oil inhibitor injection. Of particular interest is a completely automatic control and feed of a continuous polymerization process from a centralized control panel.

"Applications of Instrumentation to Proportioning by Weight in the Process Industries," by W. M. Young (Richardson Scale Co., Clifton, N. J.).

ABSTRACT: Certain types of instruments utilized in batch process control are outlined, namely: dial scale with transducer, servomechanisms operating in conjunction with the transducers on dial, electronic control relays, associated circuitry, and load cell applications. Typical applications of these instruments are covered.

"Electronic Weighing in the Chemical Industry," by V. C. Kennedy, Jr. (Streeter-Amet Co., Chicago, Ill.).

ABSTRACT: Uses of electronic weighing equipment in the chemical industry are de-

scribed, with emphasis in the special justifications and design problems. The development of punch tape and card applications is also considered.

ISA Technical Division Session. Room 105.

Chairman, Dr. S. Kaufman (Shell Development Co., Houston, Texas). Recorder to be announced.

"Modern Instruments and Methods for Radioactivity Measurements and Tracer Research," by Wolfgang Stremme (Friesseke & Hoepfner, Erlangen-Bruck, Germany). Paper No. 54-50-1.

ABSTRACT: Instruments and counting methods are discussed. A short review of applications is given.

"Pressure Transmitter for Liquid Metal Systems," by Adolf J. Bialous (General Electric Co., Schenectady, N. Y.). Paper No. 54-50-2.

ABSTRACT: A pneumatic force-balance type pressure transmitter developed for use in liquid metal systems for operation up to 100 psig and 1,000 F is described. Performance characteristics observed during both normal and abnormal operating conditions are presented. Design considerations, advantages, limitations, and field experience are discussed.

"A Closed Cascade of Controllers," by Francesco Baldo (Societa Edison, Milano, Italy). Paper No. 54-50-3.

ABSTRACT: The paper describes the particular behavior of a loop consisting of the temperature controller, level controller, and pressure controller in boiler with tilting burner.

"A Coating Device for Reporting Hydrologic Data," by Claude R. Daum (Bureau of Reclamation, Denver, Colo.). Paper No. 54-50-4.

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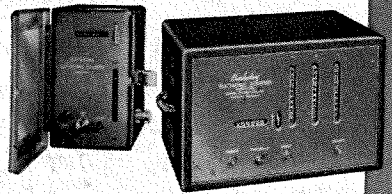
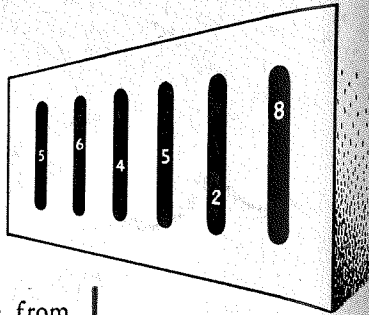
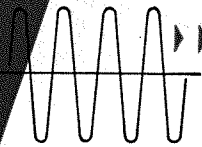
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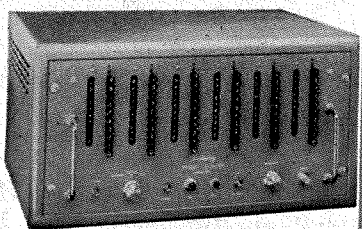
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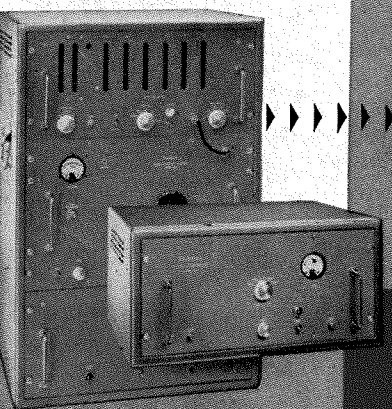
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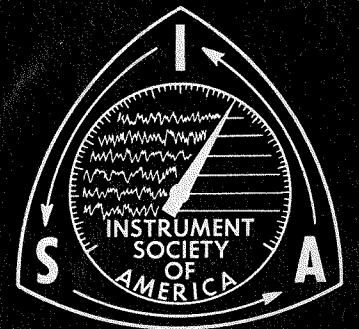
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EDITORIAL	50
GENERAL INFORMATION	61
TECHNICAL PROGRAM	67
EXHIBIT INFORMATION	96-103

Complete Table of Contents Page 1



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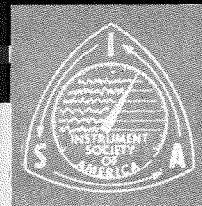
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VOLUME 1

NUMBER 9

SEPTEMBER 1954

EDITORIAL

- WELCOME, By W. A. Wildhack, President
INSTRUMENT SOCIETY OF AMERICA..... 50
- NATIONAL AND INTERNATIONAL INTEREST
IN INSTRUMENTATION, By Dr. A. V. Astin..... 53
- INSTRUMENTATION AND THE ISA, By Robert J. Jeffries..... 56
- BETTER LIVING THROUGH INSTRUMENTATION,
By Richard Rimbach..... 58
- GREATEST ISA MEETING EVER AWAITS YOU IN PHILADELPHIA.. 60

SPECIAL FEATURES

- PROGRAM INFORMATION FOR FIRST INTERNATIONAL
INSTRUMENT CONGRESS AND EXPOSITION..... 61
- DAILY NATIONAL COMMITTEE MEETINGS SCHEDULE..... 64
- MAP OF PHILADELPHIA..... 65
- TECHNICAL PROGRAM 67
- FLOOR PLAN OF PHILADELPHIA CONVENTION HALL..... 96
- EXHIBITORS AND PERSONNEL..... 103

TECHNICAL SECTION

- FREQUENCY RESPONSE IN THE INSTRUMENT INDUSTRY,
By Rufus Oldenburger 157
- A PROGRESS REPORT ON TRANSISTORS, By Nathaniel B. Nichols.. 161

SOCIETY ORGANIZATION AND OPERATION

- INTRODUCTION 174
- NATIONAL COMMITTEES 174
- NATIONAL COUNCIL DELEGATES 180
- PRESIDENT'S PROGRESS REPORT..... 181
- NATIONAL OFFICERS' ANNUAL REPORTS..... 182
- STAFF CHANGES IN THE NATIONAL OFFICE..... 186
- THE VALUE OF ISA MEMBERSHIP, By Charles W. Covey..... 188
- THE JOURNAL LOOKS AHEAD ... A MEMO TO OUR READERS,
By Robert J. Jeffries 190

REGULAR FEATURES

- ENGINEERING DESIGN NOTES 164
- MAINTENANCE AND OPERATION 169
- SHOP LAB NOTES 172
- ELECTRONICS IN INSTRUMENTATION..... 173
- LOCAL SECTION NEWS..... 191
- SECTION PRESIDENTS, SECRETARIES, AND MEETING DATA..... 205
- EDUCATION 209
- PATENT ABSTRACTS 213
- TECHNICAL LITERATURE OF INTEREST..... 215
- NEW MEMBERS 220
- EMPLOYMENT SERVICE 222
- INSTRUMENT MAN'S CALENDAR 223
- DIRECTORY OF ADVERTISERS..... 224

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