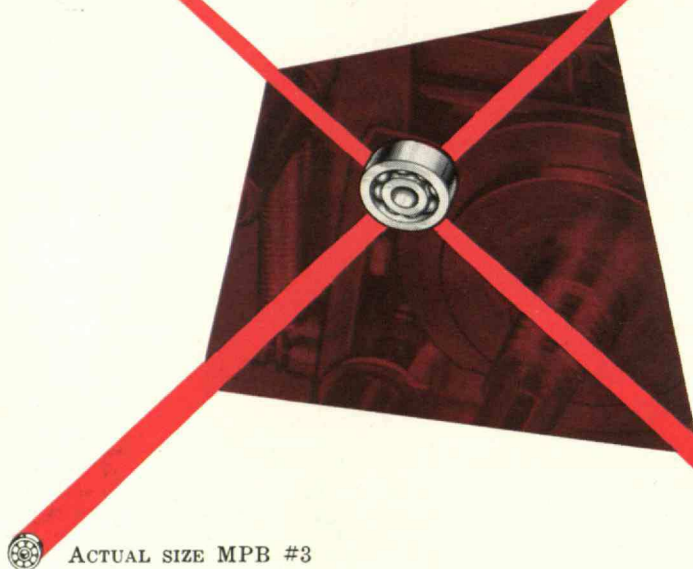


TECHNOLOGY

REVIEW *November 1954*



HOW MPB bearings solve miniaturization problem for Bendix Radio



ACTUAL SIZE MPB #3

MPB ball bearing used as Index Pawl in miniature frequency selector switch

OPERATING CONDITIONS — miniature ball bearing serves as index pawl in 4-position indexing device . . . bearing travels at 936 r.p.m. CRITICAL — low starting torque, low friction rotation . . . high impact loads . . . long, trouble-free bearing life. RESOLVED — by use of MPB No. 3, .1875" o.d. full-race bearing.

To quote Mr. John F. Wroten, Jr., mechanical engineer with Bendix Radio Division, these are some of the reasons why MPB bearings were selected in the miniaturization of their frequency selector switch: "The low friction rotation of the bearing practically eliminates drag in the indexing action, and reduces to a minimum the amount of power required for disengagement. Also, the bearing displays unusually high resistance to the frequent impact loads a detent stop of this kind must withstand Because rolling contact occurs between the pawl and the plate, the plate can be made of soft stainless steel."

For problems involving miniaturization, consult MPB, pioneer manufacturer of miniature ball bearings.

Miniature Precision Bearings, Inc., 103 Carpenter St., Keene, N. H.



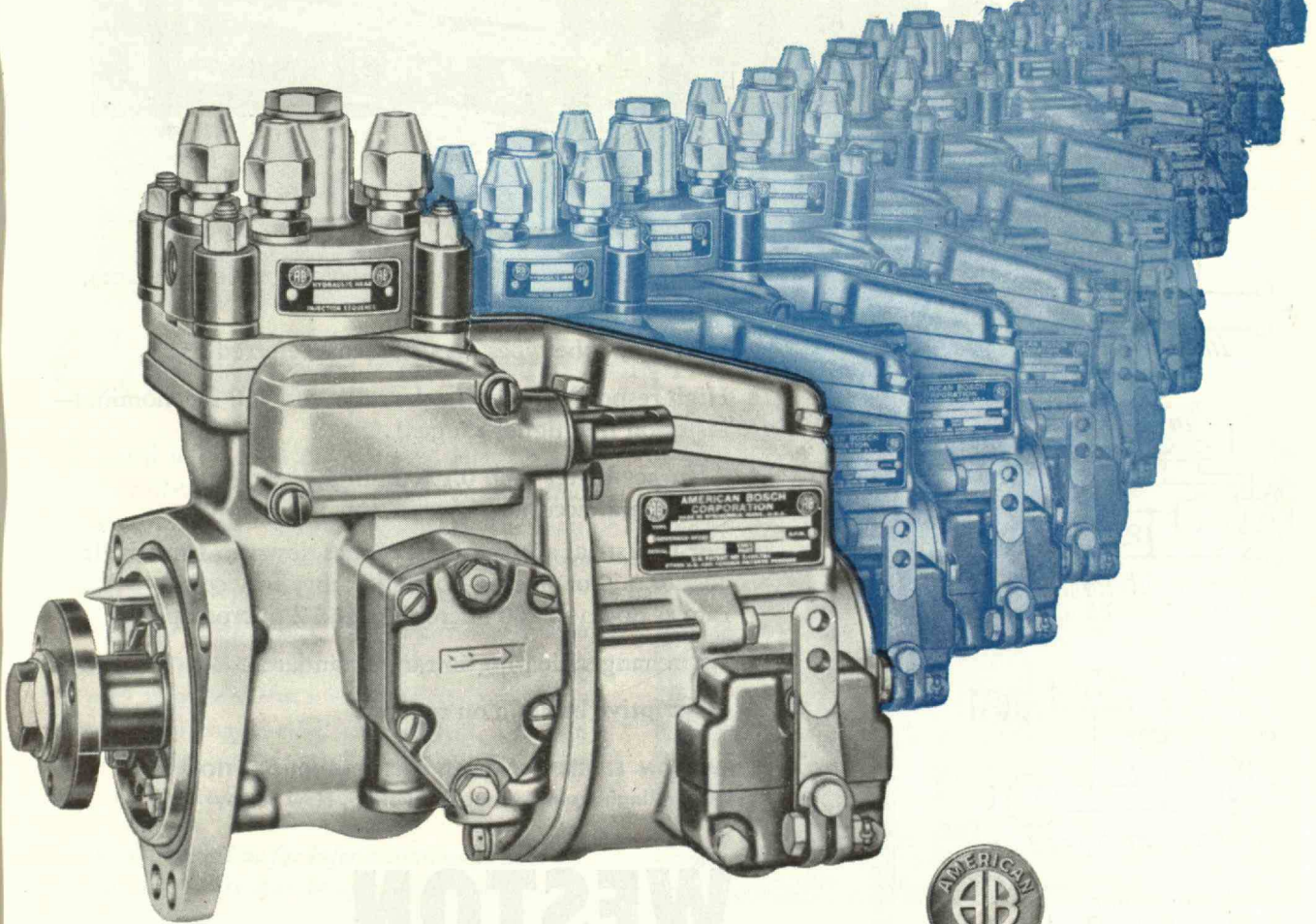
over 60,000 . . . and **STILL GROWING**

Over 60,000 American Bosch PSB single-plunger distributor-type Diesel fuel injection pumps have been produced since the pump was introduced several years ago.

Today, this simplified, lower-cost pump is being produced at a greater rate than ever before.

Here's definite proof of the acceptance of the PSB. It has literally revolutionized the concepts of fuel injection and made possible smaller, lower-cost Diesel engines . . . opening up new markets for Diesel power such as the farm tractor.

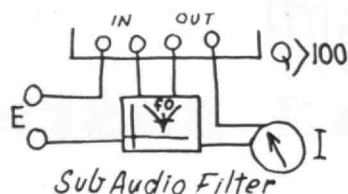
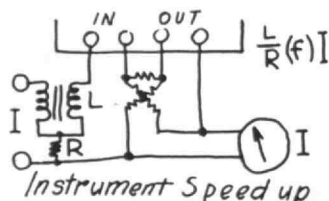
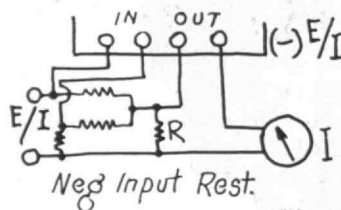
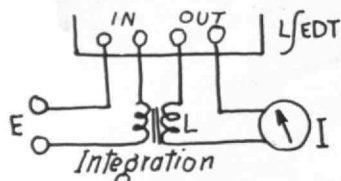
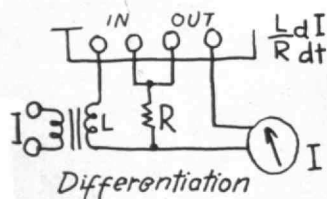
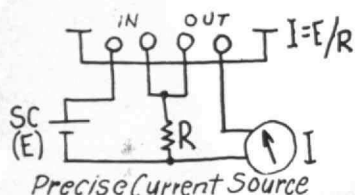
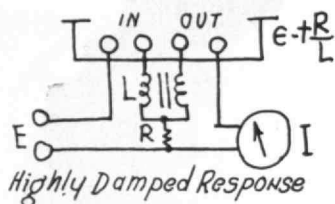
Tried and proved in the severest service, the PSB has rolled up remarkable records of performance—requires less maintenance—is easily serviced in the field. No wonder it has been hailed throughout the industry for its great contribution to Diesel progress. American Bosch Corporation, Springfield 7, Mass.



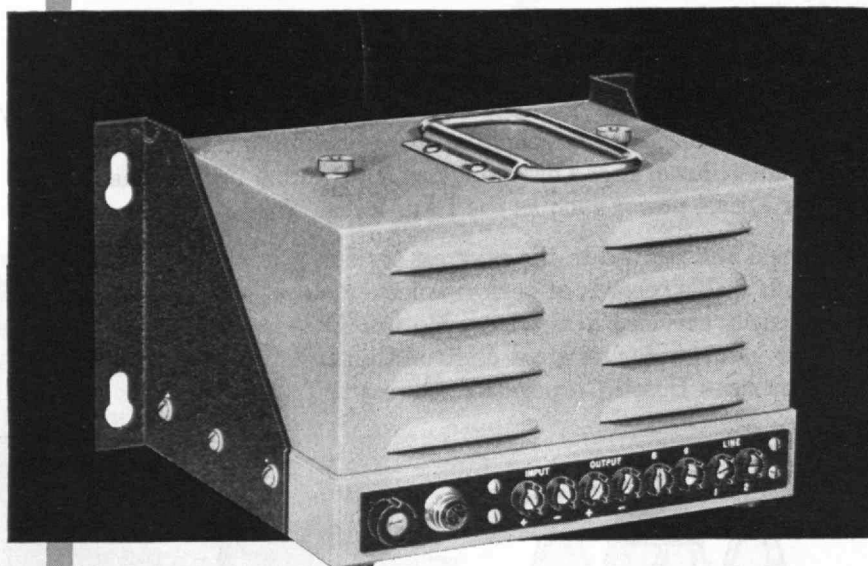
AMERICAN BOSCH

Weston Model 1411

SPECIAL APPLICATION SCHEMATICS



D-C INSTRUMENT AMPLIFIER



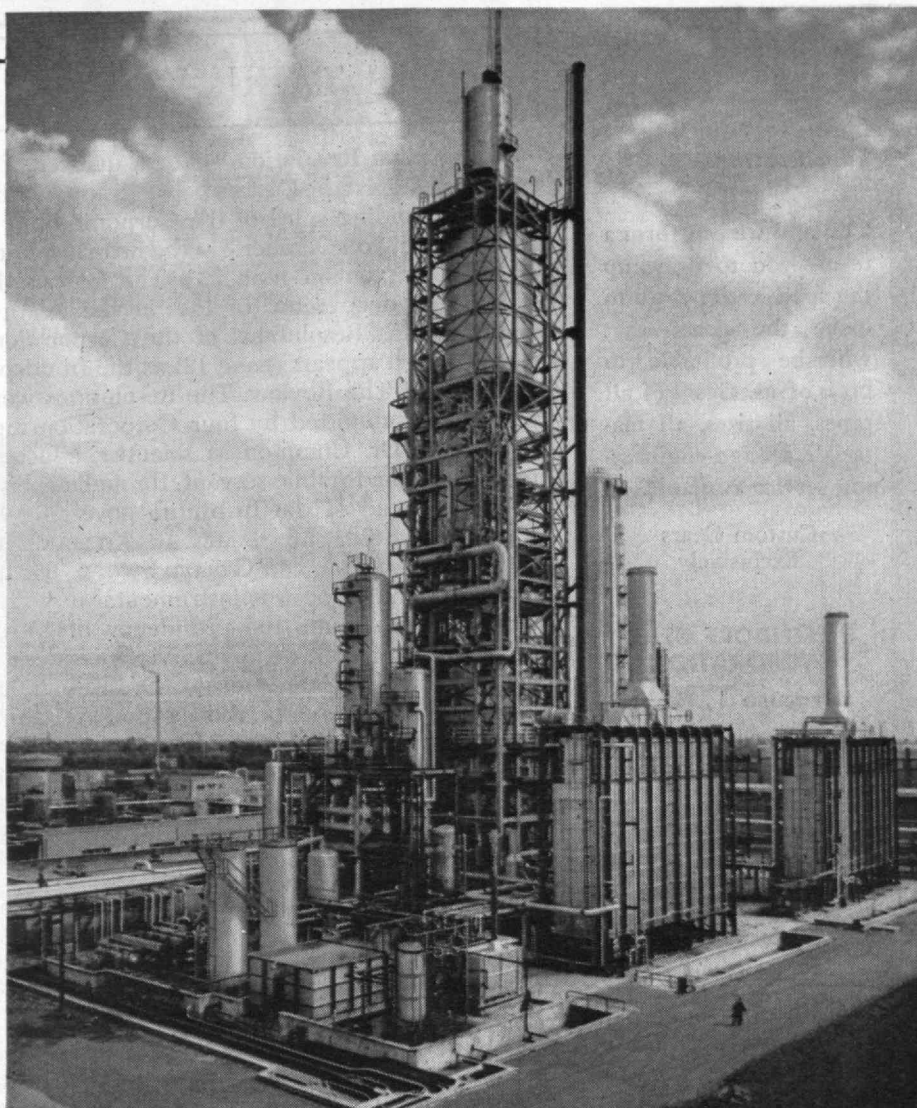
- ◆ A rugged, stable D-C Amplifier, with less drift.
- ◆ Has permanent components—no electrolytic capacitors, no choppers.
- ◆ Uses only tube types on standard Preferred list.
- ◆ High response speed (in the order of 1/10 sec. nominal—faster on the higher ranges).
- ◆ Accuracy better than 0.1% on higher ranges . . . 1% general accuracy.
- ◆ For industrial applications, ranges down to 1 millivolt and 20 microamperes—for laboratory service, ranges down to 100 microvolts and 2 microamperes.
- ◆ Interchangeable plug-in range standards.
- ◆ Descriptive bulletin on request.

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614 Frelinghuysen Avenue, Newark 5, New Jersey

WESTON

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Instruments



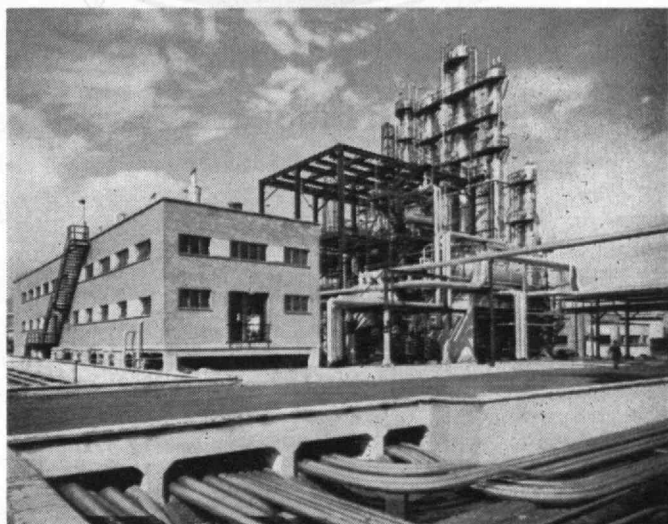
The new Condor catalytic cracking unit has a capacity of 15,000 barrels per day. The crude unit in the background has a capacity of approximately 45,000 barrels. Condor's new gas plant and compressor building are shown below.

Condor-AT RHO, NEAR MILAN

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Write or call us for information as to how our experience may be of assistance to you.



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*Many types are available to military specifications for Reliable Tubes



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THE TABULAR VIEW

Corporation Resolution.—For a quarter of a century, KARL TAYLOR COMPTON was the presiding officer and guiding spirit of the Corporation of M.I.T. At its meeting on October 4—the first since the death of Dr. Compton on June 22—The Corporation expressed its deep sense of loss in the death of its chairman, in "Resolutions of the Corporation," the text of which appears (page 12) as the frontispiece of this issue of The Review. The Resolutions were prepared and submitted by four Corporation members who knew Dr. Compton as scientist, educator, administrator, and public servant, throughout his entire period as head of the Institute's governing body—VANNEVAR BUSH, '16, JAMES R. KILLIAN, JR., '26, ALFRED L. LOOMIS, and GERARD SWOPE, '95. In large measure, Dr. Swope was instrumental in getting Dr. Compton to assume the presidency of M.I.T. Dr. Bush was professor, dean, and vice-president during Dr. Compton's administration. Dr. Killian has had long and intimate association with Dr. Compton in the Institute's many administrative problems and succeeded him as president in 1949. Dr. Loomis has often worked closely with Dr. Compton, especially during World War II when M.I.T. was responsible for the Radiation Laboratory.

Desalting the Oceans.—With something like three-quarters of the earth's surface covered by water, it may come as a surprise to many that man could face the serious problem of water shortage. Home and industrial uses of water have expanded greatly in the past half century, and the world's population continues on its upward trend. Before ocean water can be made serviceable for most uses, its salt must be removed economically. A survey of present-day methods of purifying water, and an estimate of the cost involved in each case is presented (page 15) in an article by THOMAS K. SHERWOOD, '24, Professor of Chemical Engineering and, from 1946 to 1952, Dean of the School of Engineering at M.I.T. Dr. Sherwood's stimulating article was presented before the Society of Arts at the Institute last spring.

Process of Aging.—As a sequel to his article in the May, 1954, issue of The Review ("Is There a Limit to Human Life?") JAMES A. TOBEY, '15, discusses "The Process of Aging" in this issue (page 21). The topic is of interest to social scientists and administrators for the problem it creates as the average age of the nation's population continues in its upward course. But it is of interest to the individual as a means of indicating how certain baleful effects of life's inevitable onward march can be minimized or alleviated, and in developing the art of aging gracefully and graciously. Dr. Tobey has four degrees, a colonelcy, at least one book, and many magazine articles to his credit.

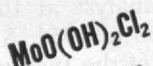
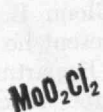
Russian Air Power.—In an article whose main purpose may be said to be that of cautioning against over-optimism, JACK W. RIZIKA, '47, reviews prog-

(Concluded on page 6)

MOLYBDIC OXIDE

-a versatile intermediate

Molybdic oxide, MoO_3 , is the intermediate for the synthesis of a large family of molybdenum chemicals.



These oxychlorides are volatile, soluble in water and organic solvents, and chemically reactive. MoO_2Cl_2 is obtained by the action of chlorine on the dioxide or trioxide, $\text{MoO}(\text{OH})_2\text{Cl}_2$ by hydrogen chloride on the trioxide.



The soluble alkali and ammonium molybdates are prepared by dissolving the oxide in the appropriate base. Insoluble molybdates are formed by precipitation or calcination.



The dioxide is insoluble, infusible, involatile, and rather inert chemically. It is obtained by reduction.

ORGANIC COMPLEXES

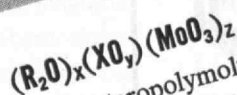
Soluble complexes are formed with many hydroxy and dibasic acids, and with polyhydric phenols.



Polymolybdates are known where n is 1, 2, 3, 4, 6, 8, 10 and 16.



Permolybdates with values of n of 1, 2, and 4 may be obtained by treating molybdates with hydrogen peroxide.



The heteropolymolybdates form an enormous family of high-molecular-weight acids and salts that can be tailor-made to your specifications. X can be almost any element in the periodic table. Most heteropolymolybdates are soluble and are readily formed in acid solution from simple molybdates or molybdic oxide.

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Write for Bulletin IA15

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THE TABULAR VIEW

(Concluded from page 4)

ress in Russian aeronautical technology from World War I to the present time. His article in this issue (page 23) clearly shows the benefits which Russian aeronautical technology derived from research work conducted in Germany during the Hitler regime, and emphasizes the need for evaluating present Soviet air strength in realistic terms. Mr. Rizika received the S.B. and S.M. degrees from M.I.T. in 1947 and 1949, respectively, and continued graduate work at Harvard University between 1949 and 1953. He was project analyst at the Glenn L. Martin Company from 1953 to 1954. At present he is working with a member of the Institute's Department of Mechanical Engineering, and with the Aircraft Gas Turbine Division of General Electric Company.

Place for Gladness.—At its quarter-century reunion at M.I.T. last June, PROFESSOR ERWIN H. SCHELL, '12, in charge of the Course in Business and Engineering Administration, made the principal address at the reunion luncheon of the Class of 1929. Professor Schell's inspiring remarks, "A Place for Gladness," appear on page 27 of this issue of The Review. Since his appointment as assistant professor in 1917, Professor Schell has been a popular and highly respected Faculty member who has maintained close contact with his former students.

Science for Man's Welfare.—In his annual message to the M.I.T. Corporation, JAMES R. KILLIAN, JR., '26, President, warned that patriotic and dramatic service of science in national defense could divert attention from its true character as a humanizing, creative, and spiritual force. A wider recognition and understanding of the beneficent nature of science and of creative intelligence is called for, says President Killian, whose report is summarized on page 29 of this issue.



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QUIET TUBE

The U.S. Navy Bureau of Ships is interested in anything which would extend the range of its early-warning radar stations. Since a target is identified by distinguishing a pip on a radar screen from smaller, noise-generated irregularities, any reduction in noise would make the pip more discernible.

Our Research Laboratory has been working under Navy sponsorship for the past few years to design a strong, low-noise tube for microwave applications. Such a tube has now been developed, in collaboration with our Tube Department. In this tube noise is reduced by keeping the electrodes extremely close together, thus reducing the transit time the electrons require to travel from cathode to grid. The shorter the transit time, the smaller the noise factor.

The new tube, designated GL-6299, is not a single-frequency device, although it was designed for use at microwave frequencies. In fact, it exhibits improved performance throughout the radio and audio-frequency ranges. For usefulness over a large frequency range, it has been made adaptable for use in circuits of the cavity, parallel-line, or lumped-constant type. Despite its small size, it operates at currents and voltages comparable to those of conventional receiving tubes. It is being marketed by our Tube Department in Schenectady.

MAGNETIC SIGNATURES

Determining the magnetic characteristics of a metal can be a long and tedious business. The usual method requires long calculation, using data gathered from sensitive ballistic galvanometers. But that's been changed.

Our General Engineering Laboratory in Schenectady has developed a device called a D-c Recording Hysteresigraph, which eliminates the hours of laborious measurement and calculation. It traces the magnetic

"signature" of a metal directly onto a scaled chart in a matter of minutes. It is able to do this with the use of two fluxmeters, which integrate the flux voltage continuously.

The new instrument is expected to be a valuable quality-control device for manufacturers of special steel. Laboratories can also make use of it in obtaining accurate data on commercially-available materials and in the development of new alloys.

LIFE PREDICTER

The conventional way of finding out how long a fluorescent lamp will burn before it fails is to let it burn until it fails. But now the engineers of our Lamp Division at Nela Park, Cleveland, can make a pretty good prediction beforehand.

Other things being equal, they find, the life of a fluorescent lamp is proportional to the amount of emission coating on the cathode. By weighing this emission coating, the life of the lamp can be estimated.

Our engineers at Nela Park have developed a rapid method of testing such lamps for the quantity of chemical on their cathodes without breaking open or lighting the tubes. The lamp is compared in an electronic circuit with one having an uncoated cathode. When current is applied, the coated cathode is slower to increase in temperature. The difference is roughly proportional to the weight of the emission coating, and it can be read on a meter.

RADIOACTIVE SILICONES

Our Silicone Products Department in Waterford, New York, recently made joint announcement with Abbott Laboratories of North Chicago, Illinois, of an Abbott Laboratories project making radioactive silicones available for medicine and industry. Such silicones may prove to be a valuable research tool in certain areas. Radioactive silicone fluids, for

example, are made readily measurable in minute amounts by the incorporation of Carbon-14, and they are expected to offer a clearer insight into the behavior of silicones in the human body than could previously be obtained.

The new fluids have been designed for laboratory and clinical test work. They will not be a part of finished medicinals sold to the consumer. In conformity with Atomic Energy Commission practice, such initial studies must be conducted on animals only.

FILM FIXER

What camera fan hasn't spent hours in a darkroom trying to minimize the harmful effects of scratches, dust, or fingerprints on his favorite 35-mm negative? Thanks to Dr. C. Guy Suits, vice president and director of our Research Laboratory, all three of these defects can now be corrected.

Dr. Suits, one of whose hobbies is photography, found that most of the troublesome damage from scratches occurred in the film base or in the gelatine overcoat, rather than in the silver image between. He reasoned that a liquid with the right properties might fill the "valleys" formed by scratches and eliminate the valley side surfaces that scatter light. Although glycerine has been used for this purpose, it is very viscous and forms bubbles.

He finally found the solution in a silicone oil, which has been named Refractasil. Not only did it solve the scratch problem, it also turned out to be a highly satisfactory cleaner, removing fingerprints like magic. And with a special circulating container designed by Dr. Suits, it served to remove dust particles, as well.

Equipment using the Suits technique may soon be marketed by another manufacturer. Refractasil, the silicone oil, is already in production in our Silicone Products Department at Waterford, New York.

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