The Broadcast Engineers' Journal
30 Rockefeller Plaza
New York, N. Y.

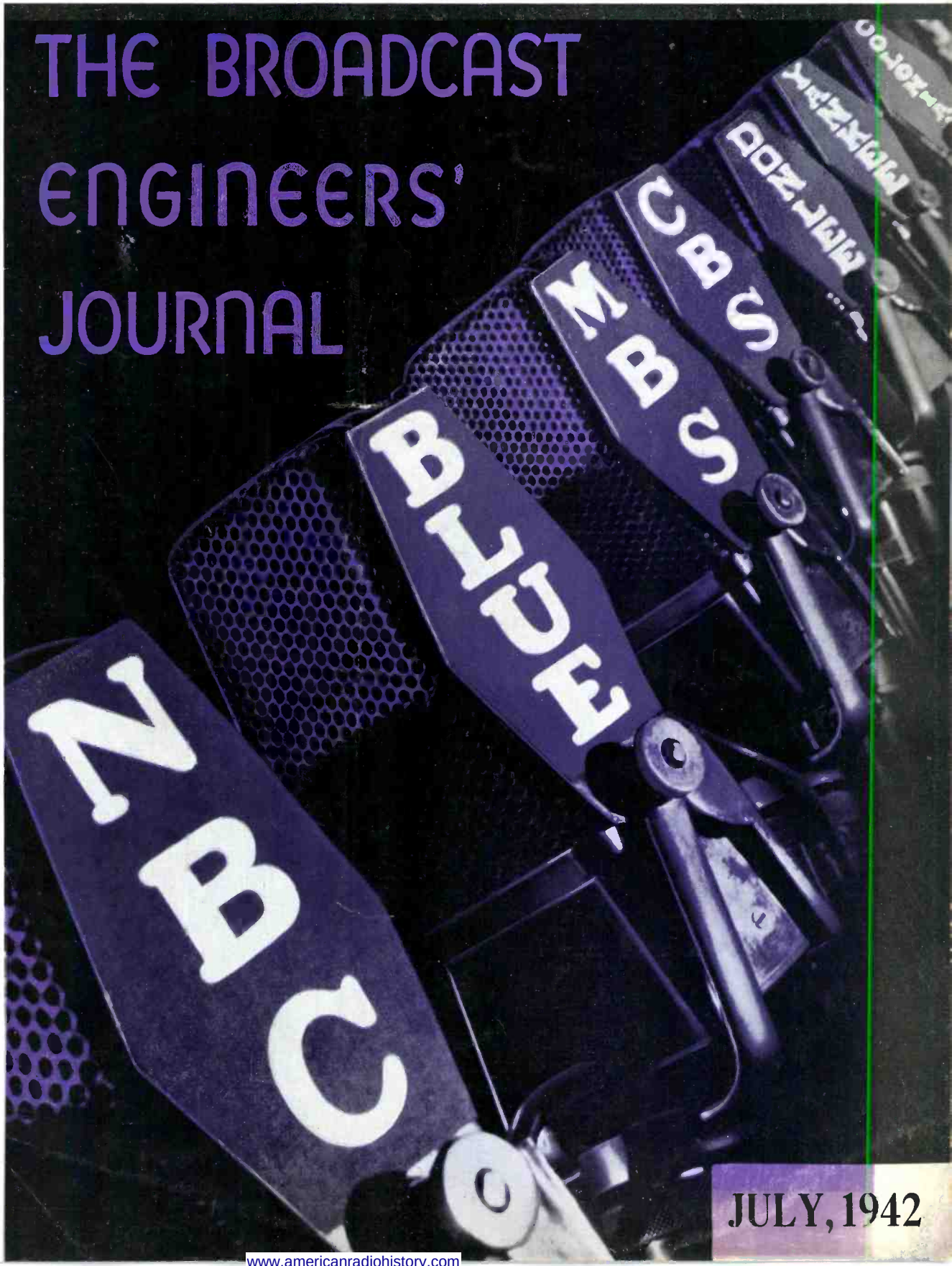
If addressee has moved, notify sender on Form 3547, postage for which is guaranteed

Sec. 562, P. L. and R.
U. S. POSTAGE
PAID
New York, N. Y.
Permit No. 2961

THE BROADCAST ENGINEERS' JOURNAL

NDRC: The Mobilization of Science in National Defense

Submarine Communication Bibliography



JULY, 1942

...this is the consensus of opinion from impartial tests conducted by major station engineers from coast to coast!

THE ONLY GUARANTEE OF ITS KIND IN THE ENTIRE INDUSTRY!

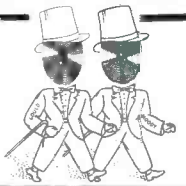
Gould-Moody "Black Seal" Glass Base Instantaneous Recording Blanks

TRY THEM AT OUR EXPENSE!

There are no ands, ifs or buts about our offer ! YOU'VE GOT NOTHING TO LOSE ! Ask for a trial order of Gould-Moody "Black Seal" Glass Base Instantaneous Recording Blanks. If, after trying a few, you do not find them entirely satisfactory, return the unused blanks, and keep the used ones with our compliments !

REMEMBER!

Broadcast engineers from coast-to-coast have said that "no better instantaneous recording blank was ever made". We back them up with our unqualified guarantee that "Black Seal" are as good as, if not superior to, any other blanks that you have ever used.



THE GOULD-MOODY COMPANY

RECORDING BLANK DIVISION • 395 BROADWAY • NEW YORK, N. Y.

THE BROADCAST ENGINEERS' JOURNAL

Volume 9, No. 7 — 409 — July, 1942

TABLE OF CONTENTS

The Broadcast Engineers' Journal is a privately printed monthly publication, issued by A.T.E. Publications, Inc., a corporation of the State of New Jersey. Address all communications to Editor's office: E. Stolzenberger, 116-03 91st Avenue, Richmond Hill, L. I., N. Y. Telephone VIrginia 9-5553. **THE BROADCAST ENGINEERS' JOURNAL IS THE OFFICIAL PUBLICATION OF THE N.A.B.E.T.**

Advertising rates and information supplied on request. Subscription, $1.50 per year; $3.00 for three years. Single copies, except Christmas Yearbook, 25c; Christmas Yearbook, 75c, subject to availability. All remittances in advance. Foreign: Add postage.

formerly A·T·E JOURNAL — DIRECTED TO BROADCAST ENGINEERS AND EXECUTIVES

The Mobilization of Science in National Defense

By Frank B. Jewett

President, National Academy of Sciences, Washington, D. C., and Vice-President, American Telephone & Telegraph Company

(In response to many queries about NDRC, its purpose, origin, and method of operation, we are happy to present this authoritative paper which originally appeared in the March 1942 Proceedings of the I.R.E.—Ed.)

THERE is perhaps no audience before which the role of science and engineering in modern warfare can more appropriately be discussed than one composed of members of the Institute of Radio Engineers. You are primarily communication engineers and of all the branches of applied science, that which has to do with the rapid transmission of intelligence is perhaps most vital to the successful use of the modern fighting instrumentalities. Rapid movement of troops and supplies over far-flung lines of action on sea and land and in the air are possible only on the basis of very effective systems of radio communication. In fact, more and more are means of communication assuming the function of a unifying influence which pervades the other arms of the military organization. They co-ordinate the movement of naval and aerial fleets. They enable infantry, tank columns, and formations of planes to operate as a single effective unit. They shrink as nothing else can, a 2,000-mile battle line to the compass of a single sector.

The telephone and telegraph and particularly the radiotelephone and -telegraph are, in effect, the keystone of the whole military arch. You members of the Institute of Radio Engineers are, therefore, exponents of a very vital department of technology, and I am particularly grateful to you for affording me the opportunity to speak here at this time to discuss the mobilization of science in the war program.

Further, it is not merely in the fields we ordinarily think of as communication that men who have devoted their lives to the problems of radio development are in a position to render great service.

One of the striking things connected with the development of new military tools, both offensive and defensive, is the astounding extent to which the fundamental phenomena on which electrical communication is based are employed. In some cases it is application of established techniques in entirely new fields. More frequently it is the pushing of our frontiers of knowledge farther out, and then applying that knowledge to the problems of war in three-dimensional space. Basically, every military problem hinges on the rapid and exact location of an enemy objective and in transmitting and utilizing the knowledge acquired. This may be for the guidance of a commanding officer; the accurate pointing, fuse setting, and firing of a gun; the release of an aerial bomb, or any one of a hundred similar things. Every single physical phenomenon which can be employed must be examined. Because modern science has changed the conditions of warfare from a slow-moving affair in localized areas to one of great rapidity over incredible distances of land, sea, and air, it is imperative that those phenomena which have given us radio be developed and utilized to the full.

While the initial problem is one of intense research and development, each step forward involves great numbers of skilled technicians in design, manufacture, maintenance, and operation of new implements. It seems clear that the demand for men trained in our art is bound to be enormous, not alone in the laboratory but in the services of supply and in the combat forces as well.

For fifteen years following the first World War there were frequent articles on the probable role of science in future warfare. While this was quite natural in view of the part played by the airplane, the tank, and lethal gas in the titanic struggle of 1914-1918, the articles in the main evoked interest rather than concerted action directed toward full employment of science in preparation for more widespread and more deadly warfare.

Despite the fact that the decade and a half following the war was a period of the most productive activity in fundamental science research and of intense effort to apply old and new knowledge promptly in industry, this *laissez-faire* attitude in the military sector was largely a reflection of man's attitude generally toward war. The weariness of the struggle and the distaste for carnage and destruction, coupled with a naive faith that men had learned finally the lesson of war's futility, gave rise to the era of small appropriations to the military, to disarmament conferences, and to the League of Nations and similar efforts to organize the world for a settlement of international controversies by reasonable methods rather than by recourse to mass murder.

In the United States particularly, the decade of the 1920's saw this carried to the extreme. Warships were taken to sea and sunk or were laid up and the Army was reduced to the status of a moderate-sized police force—a force so small and scattered that no really effective training or development of radically new implements could be had. Appropriations were cut to the irreducible minimum of maintaining a national agency which the country would have liked to abolish entirely had it quite dared. In this atmosphere and under these handicaps it is to the credit of the Army and Navy that they did as well as they did. There was little money to spend on development and less still for research to produce entirely new instruments of war.

When the storm clouds of another world war began to form in the middle 1930's, the volume of articles on the place and importance of modern science in warfare increased enormously in both the scientific and lay press. So, too, did discussion of the need for insuring that scientific and technical men should be utilized in the fields of their competence and not inducted indiscriminately into combat services where men of less specialized training could serve equally

well. So far as lay discussion was concerned, it was largely emotional, frequently ill-informed, and sometimes fantastic. Naturally discussion among technical people was more realistic, but on the whole was mainly related to applying newly acquired knowledge and techniques to the improvement of existing military implements. The idea of organizing scientific research on a huge industrial scale, where the ultimate end of "all out war" was the industry to be served, was slow to emerge.

Probably the most difficult hurdle every industry has had to get over in the effective introduction of scientific research as a powerful tool in its operation, has been to realize that the most profitable research is that which is carried on with the least restraint imposed by current practice. Practice can be adapted to radically new ideas, but radical ideas rarely, if ever, evolve from mere improvements in current practice.

Research in military matters is no exception. War being a very ancient art, military men are on the whole extremely conservative as to new tools. Like doctors, long experience has made them cautious and with possibly a more than ordinary tendency to impose on a research project requirements of current practice which, in fact, hamper rather than help. Against this tendency is the fact that they are quick to adopt the radically new once its utility is demonstrated. War more than any other of man's activities puts a high premium on being in the lead.

As soon as war in Europe on a vast scale was seen to be imminent, the nations there commenced frantically to mobilize and organize their scientific and technical men and resources, and to establish effective liaison between them and the combat services. For more than a year after this movement was in full swing across the Atlantic, our aloofness from the struggle and our ardent desire to keep from being sucked into the tragic maelstrom operated to prevent any effective steps in the direction of mobilizing our vast scientific resources for total war. The military services endeavored to strengthen their scientific branches and here and there enlisted the aid of civilian science. They were hampered by inadequate funds, by the pattern of years of a starved organization imposed by an antiwar philosophy, and by the fact that civilian sciences, both fundamental and applied, were built up on a basis of operation in a slow-moving peace economy. The latter had no machinery for marshaling its forces for war and, in the main, it knew little of war's requirements and frequently preferred to follow the courses it understood and liked.

But about two years ago, it became apparent to a few individuals that the *laissez-faire* approach to the mobilization of science ought to be abandoned in favor of a more direct and forceful organizational approach. At that time there existed certain technical groups and associations which, on the one hand, called for strengthening, and on the other were of suggestive value in the search for a suitable organizational set-up. I have already remarked upon the scattered technical groups and laboratories within the Army and Navy which over the years had been doing commendable work, but had been given insufficient funds and encouragement. It was, of course, obvious that as the tension of the emergency increased, the responsibilities placed upon these technical groups would mount with a resultant need to augment their personnel, but it was equally apparent that they could not be expected to carry the full load of scientific development and adaptation.

Civilian participation in one way or another in the solution of military problems has come to be taken for granted. It was first given official recognition in the United States when the National Academy of Sciences was incorporated in 1863 by an Act of Congress. The charter of the Academy requires that whenever called upon by any department of the Government, it shall investigate, examine, experiment, and report upon any subject of science or art, the actual expenses to be paid from appropriations which may be made for the purpose, but the Academy shall receive no compensation whatever for any services to the Government. The Academy is, therefore, recognized as a continuing official adviser to the Federal Government and it must attempt to answer such questions of a scientific or technical nature as are officially submitted to it by members of Government Departments. A permanent channel of communication was thus created, but power to initiate traffic over it resides with the Government and no auxiliary machinery was created whereby the Academy or any other civilian agency might take the initiative in bringing before the Government matters of scientific importance.

Less than a year prior to the entry of the United States into the first World War, a significant step was taken designed to facilitate the use of the channel of communication between the Government and the National Academy. In 1916 the National Research Council was created by President Wilson, and a little later was to play a part in focusing civilian effort on the military problems then arising. The National Research Council was, and is today, a subsidiary of the National Academy of Sciences and, like the Academy, is largely an advisory body only and awaits the assignment of problems by one or another branch of the Government before it can seriously go to work. Moreover, the Council, like the Academy, is not in possession of free money, a corporate laboratory, and other research facilities and is, therefore, not well constituted to conduct research work on any extensive scale.

We turn our attention, therefore, to another agency contemporaneous with the National Research Council, which was created for the express purpose of establishing co-operative effort between military and civilian groups, and which was provided by Congress with funds necessary to create research facilities and to operate them when once created. This agency is the National Advisory Committee for Aeronautics, commonly known as the NACA. The law which created the Committee provides that it shall "supervise and direct scientific study of the problems of flight, with a view to their practical solution," and also "direct and conduct research and experiment in aeronautics." The Committee is composed of fifteen members, including two

representatives each of the War and Navy Departments. Throughout its more than twenty-five years of existence, the NACA has given ample testimony of the fruitfulness of co-operation between military and civilian groups, and moreover has provided a prototype as to an organizational arrangement for effecting such co-operative effort successfully.

When, some two years ago, the group to whom I have already referred became convinced that broader participation by civilian scientists in the whole military program was likely to be essential, they regarded the NACA as typifying the sort of organization they would like to see created. A plan was therefore drawn up envisaging a Committee composed in part of civilian scientists and in part of Army and Navy representatives. On the one hand, the Committee was charged with a broad study of the materials of warfare and, on the other, it would recommend and, if possible, initiate such research as it believed to be in the national interest.

The NACA was created in 1915 by an Act of Congress. The somewhat duplicative plan just referred to was submitted to President Roosevelt about a year and a half ago for such action as he saw fit to take. The proposal appealed to him and he decided to create the Committee by Executive Order. This Order established the Committee as a division under the Office for Emergency Management and confers upon them power to take the initiative in many scientific matters which they believed to have military significance. It also directed the Committee to develop broad and co-ordinated plans for the conduct of scientific research in the defense program, in collaboration with the War and Navy Departments; to review existing scientific research programs formulated by these Departments, as well as other agencies of the Government; and advise them with respect to the relationship of their proposed activities to the total research program. Moreover, and this is especially important, the Order directs them to initiate and support scientific research on the mechanisms and devices of warfare with the object

(Continued on Page Eight)

Bibliography of Submarine Communication

By Ed. Stolzenberger

THE present submarine warfare is a challenge to the ingenuity of every communications engineer in the country. This data is presented as a stimulus for original thought on the subject. Under-water communication has been carried out by sound or acoustic waves, both sonic and ultrasonic, and by electromagnetic waves of various frequencies. As is in general true in radio communication, minimum absorption occurs at the lowest frequencies and maximum directivity may be obtained at the shorter wavelengths, both for sonic and electric waves. Following the bibliography, a partial list of United States Patents relating to this subject is appended for further reference.

BIBLIOGRAPHY — 1914 - 1941

1941 Bibliography of Hydrophones, Series No.551. Science Library, Bibliography Science Musuem, London.

1941 Ultrasonics Absorption in water. Journal Acoustical Society of America. 12: No. 4, April p. 505.

1941 Ultrasonics wave absorption in highly viscous liquids. Journal Acoustic Society of America. 13: July p. 37.

1940 Absorption Supersonic waves in water and aqueous suspensions. Physics Review 57: 221-5 F 1.

1940 Submarine detection. Scientific American 162: 326 June 40.

1940 Submarine sounding by V. S. waves. Docks and Harbour Authority. 20: N 232 Feb. 40 p. 82.

1939 Electromagnetic hydrophones or "magnetophones." Hydropraghic Review 16 pp. 153-7.

1939 Absorption radio waves in water; possibility of signal from undersea craft. Science 90: 277-9 S 22 39.

1939 Supersonics. R. W. Wood, Brown Univ. 1939.

1939 Ultrasonics. L. Bergmann 8 H. Hatfield. Wiley.

1939 Application Supersonic Waves. American Society Naval Engineering Journal. 51: N 2 May pp. 285-9.

1939 Investigations on questions of radio conversation with submerged submarines. Tijds Nederland Radiogenortschap 8 pp. 271-95, Mar.

1938 Handbook of Echo sounding gear. Gt. Britain admiralty 37 pp.

1938 Ultrasonics & Supersonics Bibliog. Electronics. 11: 34 Jan.

1938 Propagation of Electro-Magnetic waves in water. Wireless Engineer 15: 67 Feb.

1938 Direct reading depthmeter. Electrotechnical Journal Japan 2: N10 Oct. p. 235.

1937 Magnetostrict under water sound receivers 2744 P. Mathematical Society Japan Proceedings 19 p. p. 250-254.

1937 Properties electromagnetic waves in water. Hochfrequenztech und Elektroakustik 50: Sept. pp. 73-79.

1936 Depth sounding by radio. Electronics 9: Oct. p. 20-1.

1936 Compact under-water telephone set using supersonic carrier waves. Institute Electrical Engineers Journal of Japan 56: P892-5.

1936 Echo sounders; their use for detecting fish. Electrician 117: Oct. 30, p. 522.

1935 Echodepth recording. Electrician 114:N2953 Jan. 4, P. 3.

1935 Systems of echo sounding Nature (London) 135: N3422 Je 1, p. 896.

1935 Magnetostriction echo depth recorder. Institute Electrical Engineers Journal 76: 461 May, Pp. 550-66.

1934 Direction finder for subs. Engineering 137: 401 Ap.6.

1933 Water wave telephony. Electrician 111: No.17, p. 609.

1932 Reflection methods for measuring the depth of the sea. Institute Electrical Engineers Journal 70: Feb. Pp. 269-80.

1932 Submarine signaling with the oscillator. Weekly Underwriter 126: Apr. 9, p. 836—

1931 Chap. X. Subaqueous sound ranging and signalling Acoustics by G. Stewart and R. Lindsay (Book) pp. 231-286.

1928 Transmission of sound through sea water. J. Franklin Institute. 206 pp. 779-807.

1927 A problem in under-water acoustics. J. Franklin Institute 204. pp. 791-3.

1926 A problem in under-water acoustics. J. Franklin Institute 202. pp. 627-35.

1925 Principles of sound signaling by Hart, M.D., and Smith, W.W. (book).

1924 Accurate determination of the speed of sound in sea water. Physical Review 24: Oct. p. 452-5.

1923 Oscillation engineering design of submarine acoustic signalling apparatus, translated from German, Proceedings Institute Radio Engineers 11 pp. 9-25.

1922 Experimental analysis of sound in air and water; some experiments toward a sound spectrum. Philosophical Transactions Royal Society A 222 pp. 131-58.

1921 On acoustic disturbance produced by small bodies in plane waves transmitted through water; with special reference to single plate direction finder. Proceedings Royal Society A 100. pp. 261-88.

1921 Reduction atmospheric disturbances in Radio Reception. Institute Radio Engineers Proceedings. p. 41.

1921 Light body hydrophones and directional properties of microphones. Proceedings Royal Society A. 100, pp. 252-260.

1920 Theory of receivers for sound in water. Physical Review 15, pp. 178-205.

1920 Detection of Subs. Proceedings of American Philosophical Society 59, pp. 1-47.

1920 Modern Marine Problems in War and Peace. Journal of Institute of Electrical Engineering. pp. 572-97, (vol. 110) 484-486, 521-523, 552-554.

1920 Submarine signaling. Engineering 110: Oct. 8, p. 490.

1920 Submarine signaling. Engineer 129, May 14, pp. 491-3.

1920 Production of sound under water by condensation of steam. Engineering 110: Oct. 29, pp. 561-3.

1920 Practical ideas for the engineer. Marine Review 50: July, p. 356-7.

1920 Tracking subs by radio. Popular Mechanics 33: April, p. 527-8.

1920 Submarine detection in an a.c. magnetic field. American Institute Electrical Engineers Journal, 39: Mar.-Apr., pp. 381-95.

1919 Submarine range finding by reflected sound waves. Scientific American 120: Jan. 25, p. 67—

1919 Science and its application to marine problems. Transactions N.E. Coast Institution Engineers and Shipbuilders. 35: pp. 386-410.

1919 Listening under water. Engineering 107: pp. 776-779.

1919 Long wave reception on ground wires (Subterranean and Submarine). Institute Radio Engineers Proceedings. p. 559.

1919 Short wave reception and transmission on ground wires (Subterranean and submarine). Institute Radio Engineers Proceedings. p. 337.

1914 Submarine signaling—the protection of shipping by a wall of sound. (Article) Consult American Institute of Electrical Engineers.

Partial List of U. S. Patents — 1918 - 1940

2164858 2085055 2033135 2024214
1994495 1986647 1968821
1883433 1858931
1742704
1690578 1684848 1670888 1632331 1624412 1611740
1610674
1598315 1583876 1586972 1579760 1548024 1533645
1523016 1504247 1500243
1496746 1486821 1480218 1482980 1472558 1473332
1446569 1440361 1440360 1426337 1415539 1414295
1400283
1397949 1394483 1394482 1393471 1391654 1380869
1388420 1371728 1367415 1353410 1348855 1348826
1348556 1348827 1344074 1324961 1300062
1293744 1292755 1287908 1278319 1272811 1252876

Love Above Everything — Or Else

(One-Minute Script)

Announcer: And now—the tender story of young love—the Story of Lucy Bridges. (Pause) (Quietly) Dear, sweet Lucy has been dancing at the country club—with the dashing local-boy, Amos Killfidget. There they were!—lost in ecstasy—when the music stopped. Lucy looked up into his face—and then Amos said—

Amos: (Passionately) Oh, Lucy dear! I love you so much. Say you'll be mine!

Lucy: But I—I hardly know——

Amos: I'm not rich like Joe Smith. And I haven't a big home—or a car—or a bank account like his. But I *do* love you, Lucy—I'll do anything for you.

Lucy: (Whispered) Then—tell me, Amos. Where can I find this man Smith? —*By Tom Gootee.*

Mobilization of Science in Nat. Defense

(Continued from Page Five)

of improving present ones and creating new ones.

The Order contemplated that the Committee would not operate in the field already assigned to NACA nor in the advisory field of the National Academy of Sciences and National Research Council. Parenthetically it might be noted that in this latter field the Academy and Council are currently engaged on advisory work for the Government for which the out-of-pocket expenses alone are at the rate of much more than $1,000,000 a year. A recent count shows that the present personnel of Academy and Research Council advisory committees runs to about 225. These figures will give an idea of the vital part which these fact-finding groups are playing in the present emergency. But to be a little more specific I might mention that one important committee of the National Academy is advising the Office of Production Management on the availability of strategic materials.

In order to formulate adequate rules for the utilization of materials of whatever sort, accurate knowledge as to their availability, as to new processes suggested for producing them, as to possible substitutes, and a thousand and one other basic questions must be answered. This can only be done by highly trained scientists and engineers. Only after they have answered can the urgent problems or proper utilization be handled. The Academy has assembled a group of the most distinguished men in the United States to give OPM this basic information.

Other examples are to be found in the services which the National Academy of Sciences and National Research Council are giving in advising the military departments on highly confidential matters; in the fact that the Medical Division of the National Research Council is the operating arm of the Medical Research Committee mentioned later, and in the service the Council is furnishing in selecting technical personnel.

Thus, in June, 1940, the National Defense Research Committee, more familiarly known as the NDRC, was born. It was constituted of eight members, two of these being high-ranking men from the Army and Navy respectively, five more being civilians well known for their experience in organizing and directing both fundamental and applied scientific research, and, as an eighth member, the Commissioner of Patents.

The Executive Order creating the NDRC omitted any reference to the biological sciences, and, in particular, to the medical sciences. However, during its first year of operation, experience accumulated to the effect that a broader program of attack would not only be useful but was, in reality, urgently demanded. This realization prompted a second approach to President Roosevelt, with the result that in June of last year he created two new functional groups. One of these was the Committee on Medical Research, to explore its indicated territory in the same manner that the NDRC had been exploring the physical sciences. Then, over and above both the NDRC and the Committee on Medical Research, there was placed the Office of Scientific Research and Development, usually referred to as OSRD. This latter office was placed in charge of Dr. Vannevar Bush, who until then had been Chairman of the NDRC. President Conant of Harvard was then made Chairman of the NDRC and Dr. Newton Richards of the Medical School of the University of Pennsylvania was made Chairman of the CMR.

In order to insure complete co-ordination of civilian and military research and development, Dr. Bush, as Director of OSRD, was provided with an advisory council consisting of the Chairmen of NDRC, CMR, and NACA; the Co-ordinator of Naval Research, and the Special Assistant to the Secretary of War performing a somewhat similar function in that service.

The Executive Orders creating these various committees naturally had to leave indeterminate the question of financial support. They are all subsidiary to the Office for Emergency Management and, like this Office, must look to Congress for the necessary operating appropriation. Thus far the appropriations, while not munificent, have been adequate. During its first year of existence the NDRC authorized research projects which totaled about ten million dollars. At the beginning of its second year, it was granted another ten millions and this was recently augumented by several millions more. To be more specific, the OSRD, during its first year of existence, will guide the expenditure of about twenty millions throughout the whole scientific field.

I should now like to take a few minutes of your time to explain the manner in which the expenditure of these funds is initiated and supervised. To begin with, let me point out that the work of the NDRC is divided into four major departments: Division A, of which Professor R. C. Tolman of California Institute of Technology is Chairman, deals with armor, bombs and ordnance, in general; Professor Roger Adams of the University of Illinois heads Division B on chemistry; Division C deals with transportation and communication, and submarine warfare, and I am its Chairman (this Division operates the subsurface-warfare laboratories); finally, Division D, which deals with instruments and numerous miscellaneous projects difficult to catalog, is headed by President Compton of Massachusetts Institute of Technology. It is in this Division that the microwave laboratory is organized.

To expedite discussions, surveys, and the general handling of the work, a further breakdown has been found desirable, the result being that each Division comprises several so-called Sections. Division B on chemistry, under Professor Adams, is divided into thirty-one Sections—which stands to date as a sort of record.

The work of a Section is entrusted to a Section Chairman, who in turn calls to his aid certain individuals who become permanent members of his Sectional Committee and who are known

technically as Members. Then there are others who may be asked to render advice and assistance from time to time and hence are called Consultants. Members and Consultants are officially appointed by the Chairman of the NDRC and are designated only after official clearance by the Army and Navy Intelligence and the FBI. Full consideration, therefore, is given to the basic requirements of the military services as regards the confidential handling of their problems. Because of its peculiar interest to you, I would note that the Section dealing with communication problems is under the direction of Dr. Jolliffe, who is a Vice Chairman of Division C.

Neither the five civilian members of the NDRC itself nor any of the Section Chairmen, Members, or Consultants are paid from public funds. Without exception, they are loaned to the Government by their employing organizations and frequently the loan is complete, the work being so voluminous and detailed as to require a man's full time. Thus, when I tell you that about 500 of the leading scientists of the country are encompassed in the present NDRC organization, you will see that the Federal Government and even the forgotten taxpayer are getting a lot of valuable consulting talent free of charge.

So far as I have now outlined it the functioning of the NDRC requires no public money except a very small amount for paid office assistants together with the traveling expenses of Members and Consultants. For the most part Members and Consultants do not carry on the research and development projects which the NDRC decides to promote — their duties are advisory and administrative. They formulate the problems which they believe it important to have undertaken, and then arrange with various scientific institutions to carry on the work. It is this last step which brings in the need for considerable sums of money. For instance, a project assigned to a particular university or industrial laboratory may require the full time of several of its staff together with that of numerous younger men hired specifically for the work in hand.

(Continued on Page Fifteen)

Hollywood Activity — N. A. B. E. T. P

By Bob Brooke

JIM BROWN RETURNS FROM SUCCESSFUL NY MEETING . . . Hollywood Hot Spell . . . Blue Network News . . . O'Kelly to New York . . . Vacations . . . Summer Repairs . . . Reports From Gang in the Service . . .

JHB'S NY TRIP . . . Just talked to Jim Brown on the phone as he pulled in from NY . . . Reported a generally successful meeting and a great trip . . . Much hospitality shown as he stopped off at various offices . . . Visiting Washington, Chicago, and New York . . . Was entertained at dinner by Chicago chapter . . . Reports Horstman hale and hearty in new job . . . Visited NBC alumni at Fort Monmouth . . . Captain Figgins has forgotten delicate tummy and is eating and drinking in good old Army style . . . we wonder about his feet . . . He has completed a company commander's course and was transferred to Salt Lake City the day Jim saw him . . . (Bob Schuetz and wife have rented Figgins' beautiful little place in the valley for duration) . . . Jim also saw Bob Callen, Fred Shidel, Tom Gootee, and some of the rest at Monmouth . . . Reports Karel Pearson now a first lieutenant and in command of a company . . . Jim also saw Cappy and Paul Green in NY and reports them well and doing fine . . . Otherwise all was business, and details of that will be forthcoming long before this reaches you . . .

Ex-President Ed. Horstman congratulates Jim Brown on his recent election to President of N.A.B.E.T.

SUN . . . Summer came with all its fury the first day in July . . . Cool spring fogs left us and not even our usual on-shore breezes helped cool the city . . . Joe Kay did a Mexican border desert insert for the Army Hour and came back telling of 137° heat . . . A story on his very exciting trip, if he finds time between fixing his house, and stories of Mrs. Kay expecting later in the year . . . Beach and waves were marvelous for the weekend Fourth holiday . . . However, feminine operatives report a serious dirth of males between the ages of ten and sixty . . . Ray Ferguson writes to thank the JOURNAL for the issues forwarded . . . Sez they're a Godsend when you're away from home . . . Sez if the waves at Santa Monica miss him, he misses them a million times more . . . was down at the old place myself yesterday and the beauty of sea and mountains seemed much more vivid in wartime . . . Found myself memorizing it in case I too should join up . . . Also noticed more public attention to the sea in wartime . . . Occasional glances to make sure that that fishing boat wasn't a sub . . . A certain feeling that our beautiful and

Chicago Chapter dinner in honor of President Brown. From left to right: Alusic, Johnson, Bernheim, Eisenmenger, Platz, Heiden, Butler, Aldred, Kelley, Brooks, Hockin, Holm, Wehrheim, Forgach, Schreyer, Kempkes, Keller of WLS, Luttgens, President Brown of Hollywood Chapter, Fulton of WLS, Rife, Horstman, Cummings, Daugherty of WLS, Schneppner, chairman of Chicago Chapter, and Nehlsen of WLS. Also present but extremely busy taking the pictures shown was Robert R. Jensen.

resident Jim Brown Visits Eastern Chapters

usually friendly Pacific isn't now quite so friendly . . . Chicago Jim Thornbury spending much time at the beach and his Chicago night club tan is now gradually changing to a deep California sun tan . . . Sez he hasn't learned to ride the surf yet but can now line up a good figure two blocks away . . . Hi . . .

BLUE NETWORK . . . Denny Denechaud, Blue Chief Engineer, heading for Glacier Lodge on vacation . . . Carl Lorenz fishing the local ponds on vacation . . . Denny with a new secretary, Miss Fountain, and bubbling over with beauty, too . . . Dr. Knight from Chicago doing a fine job on a swell show, Dinah Shore . . . Lum and Abner back to remoting from the Pathe Picture lot while shooting on their latest picture . . . Clete Roberts and Norman Dewes to 29 Palms for insert to "This Nation at War" . . . Reports from there say that Clete, a licensed pilot, flew a glider from untow at 2,000 ft. to 12,000 ft. and landed it . . . Updrafts on the desert are so great that the boys sometimes have to spin their frail craft in order to loose altitude for landing . . . Denny reports only telephone circuits into 29 Palms were farm party lines strung along fences, trees, and uninsulated poles . . . Two shows from there lately have been 100 per cent, however . . . Blue back in the Ambassador Hotel with Freddy Martin's orchestra after a layoff of more than a year . . . Ambassador Coconut Grove was NBC exclusive for fifteen years and it seems good to be back in the old place again with Blue Network shows . . . Denny tells many amusing stories of sailors off the Lexington and back in San Diego before the story broke trying to side step direct questions of "Where's the Lex and why aren't you on it" . . . the boys had a million answers, all variations on "Damned If I Know Where She Is" . . .

MISC . . . Jake and Gert O'Kelly headed back to NY recently as Jake was transferred there in connection with his Government Engineering job . . . George Foster expecting an addition to his family any day . . . Earl Sorenson ill with flu the last week of his vacation . . . Sax riding the bus to work from his home in Westwood . . . Mrs. Saxton now senior Air Raid Warden for Women in her district . . . Fullaway upped to senior lieutenant in the Navy . . . DeWolf and family vacationing at Yosemite . . . Cap- staff and the Kyser show back the 27th . . . Looks like Mackenzie would make instructor in navigation for Air Force . . . With Catalina closed the Beach and South Coast resorts of Laguna and Balboa will take the brunt of vacationers from Southern California . . . No boat trip to Catalina this year, Andy . . . Two new men come to us from Police Radio and Mutual network . . . Mr. Young and Mr. Bryant are with us and welcome . . . Master Control's window is now boarded up on the inside with plywood, and reports come from there that a photographic art study might be the right decoration . . . Adams and Miller to the High Sierras fishing . . .

That's all for now . . . More later - - - 73.

President Jim Brown Addresses the Chicago N.A.B.E.T. Chapter

TECHNICAL PRESS REVIEW

By Ed. Stolzenberger

A digest of leading technical articles in the current contemporary press.

[In these busy times few engineers can spare the time required to read all the current technical literature. It will be the purpose of this regular feature to provide an index of current technical articles on radio broadcasting and related subjects.—Ed.]

Bell Laboratories' Record

for June, 1942

Magnetic Fluxmeter

By E. L. Norton

A gas discharge pulse generating circuit forms part of the equipment that permits measurement of voltage induced in a relay by the operation of a neighboring relay.

Factors Controlling Man-Made Radio Interference

By R. A. Shetzline

This article is a "must" for Transmission, Design, and Maintenance Engineers concerned with wire line and radio reception noise problems.

The Bell System Technical Journal

Quarterly — June, 1942

The Future of Transoceanic Telephony

By Oliver E. Buckley

A comprehensive and chronological account of the trials, tribulations, and degree of success in this interesting field that started with a submarine Morse cable, progressed to long wave and then short wave radio-telephony, while research continued with submarine cables that resulted in a cable design that would pass a band of 48,000 cycles, and have its own built-in vacuum tube repeaters! — operating from a 2,000 volt source supplied at the cable terminal.

Communications

for June, 1942

Direct Frequency Measurements

By Don Langham

The feature of this article is an auxiliary oscillator of unique design for interpolation.

Dividing Networks for Two-Way Horn Syctems

By Colin A. Campbell

Design considerations, formulas, and curves for the connection of high and low frequency loud speakers to a single amplifier output.

Electronics

for June, 1942

Reference and Directory Issue. Featuring Industrial Tube Chracteristics, Tubes and Their Functions, and Tubes at Work.

Also useful, is the comprehensive Buyer's Guide, compiled alphabetically by products.

Proceedings of the I.R.E.

for June, 1942

Hearing, the Determining Factor for High-Fidelity Transmission

By Harvey Fletcher

This paper gives the requirements for ideal systems for the transmission of speech and music. These requirements are based on: 1. Measurements of the threshold and frequency limits of the hearing of more than 500,000 people at the New York and San Francisco World's Fairs; 2. Measurements of the discomfort level of sound; 3. Measurements of room noise in a wide variety of locations; and 4. Measurements of the frequency limits and the maximum and minimum levels of speech, orchestral music, and various instruments of the orchestra. From this information and from judgment tests it is concluded that substantially complete fidelity in the transmission of orchestral music is obtained by use of a system having a volume range of 65 decibels and a frequency range from 60 to 8,000 cycles per second. Substantially complete fidelity for the transmission of speech is obtained by a system having a frequency range from 100 to 7,000 cycles per second and a volume range of 40 decibels. Preliminary experiments comparing a single channel system and a two channel stereophonic (auditory perspective) system showed that stereophonic transmission with an upper frequency limit of 5,000 cycles per second was preferred to a single channel transmission with an upper limit of 15,000 cycles per second. A definite improvement was obtained in the stereophonic system by using three channels instead of two.

The Effect of Fluctuation Voltages on the Linear Detector

By John R. Ragazzini

A mathematical analysis of the effect which fluctuation voltages have on the operation of a linear detector is pre-

sented. Expressions of the audio frequency noise spectra and the root-mean-square values of the audio noise outputs under various conditions of operation are derived. The modulation and modulation compression effects which fluctuation voltages introduce in the useful signal output are evaluated. The harmonic distortion of the useful signal output caused by the presence of fluctuation voltages is given. Finally, an expression of the audio signal-to-noise ratio which results when fluctuation voltages are applied simultaneously with a modulated carrier is derived. Experimental equipment and methods used for checking many of these results are described and experimental results are presented.

The Use of Vacuum Tubes as Variable Impedance Elements

By Herbert J. Reich

The magnitude and phase angle of an impedance may be varied by means of circuits incorporating vacuum tubes. The analysis of several circuits show that they may be considered to be equivalent to a parallel combination of reactance and resistance. In certain circuits the effective resistance may be made infinite, these circuits acting like pure reactance, the magnitude of which may be controlled by means of electrode voltages. Vacuum tube circuits containing only resistances and capacitances may act like an inductive reactance shunted by a negative resistance. Some types of "resistance-tuned" oscillators are based upon such circuits and may be readily analyzed from this point of view. By the use of an inverse feedback amplifier it is possible to obtain very large effective capacitance or very low negative resistance, the magnitudes of which may be varied by means of the amplifier gain.

The Relative Sensitivities of Television Pickup Tubes, Photographic Film, and the Human Eye

By Albert Rose

The Threshold scene brightness which a picture reproducing device can record, a measure of its "operating sensitivity", depends not only upon the lens speed and the exposure time, but also upon the amount of detail in the recorded image. A general expression for the "operating sensitivity" of a picture reproducing-device is obtained which includes these factors together with the threshold number of quanta per picture element. This parameter characterizes the "true sensitivity" of the given device. The "true" and "operating" sensitivities of four types of television pickup tubes, photographic film, the human eye, and an ideal picture reproducing device are obtained. Eye and film have of the order of one one-hundredth the "true sensitivity" of an ideal picture reproducing device. Some recent television pickup tubes have of the order of one one-hundred-thousandth the "true sensitivity" of an ideal device. To compare "operating sensitivities" the same exposure time and equivalent lens systems are taken for the three devices. A television pickup tube which has a photoelectric response of ten micro-amperes per lumen and makes full use of the storage principle can record scenes with no more illumination than that required by some of the "faster" photographic films. The relatively low "operating sensitivity" of film results from the large amount of intrinsic picture detail (a picture element is taken to be a single grain). The human eye has a range of "operating sensitivities" extending from that of film to a value several thousand times higher. This range depends upon the ability of the eye to coarsen the detail of its perceived image as the scene brightness is lowered.

San Francisco News

By Frank Barron

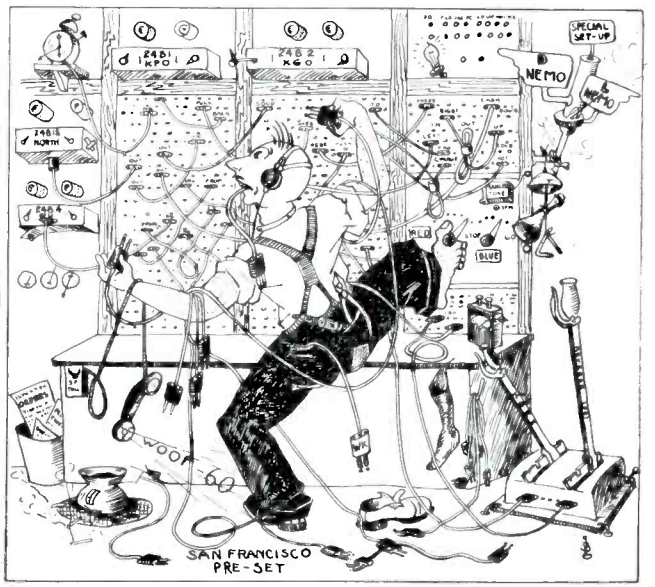
VACATION time and all hands changing plans from previous years to meet the current rubber and gasoline shortage. The boys on early leave know what they can do, but the later vacationists speculating whether to stay home and dig in the victory garden, or whether they will be able to carry out previous plans.

Getting accustomed to the atmosphere of the new building now and don't get lost in the corridors making pierheads from one studio to another and trying that short-cut down the back stairs we had always figured on using.

Audience reaction in studio "A" for the big programs shows that San Francisco was ripe for its own "RADIO CITY." Some want to stay for double features!

Master Control operators quickly grasped all of the mysticism of preset operation at the start, however there was the usual expected upsets. Jim Summers, CR, upon getting into one unexpected tangle could only throw up his hands and holler "tilt," a carry-over from his pin-ball machine days at the old address. The rest of the boys hadn't stopped kidding Jim about it before some Dutch Uncle tapped Jim on the shoulder and informed him that he had mysteriously inherited $1,000. Now it appears as if the rest of CR is trying to get Jim's famous "tilt."

Inasmuch as any pictures of the Master Control Board in the new S. F. Radio City are strictly taboo due to the national emergency, we have been unable to publish any reproductions dealing with the new home for NBC and the Blue for San Francisco. However, we hereby submit a reprint of the type of pre-set that the boys in San Francisco CR graduated from upon the completion of the new building here. This cartoon by Johnny Grover, anner, contains more truth than many of our outside members



probably will admit, but until Uncle Sam beats Hirohito and Hitler, this will have to suffice instead of the new board. Bascially, the new board looks pretty much like the cover that our Journal used to use and which seemed so mysterious, due to the numerous buttons visible.

The second of each month is always an important date with the S.F. Chapter of N.A.B.E.T., as that date is the signal for a general meeting of the members and the latest information and/or problems are discussed. A fine of two bucks is assessed to any member who does not attend, providing his watch list does not automatically excuse him. Sufficient leeway is granted that it does not work a hardship on any member, and all of the boys are strictly in favor of the plan. The usual monthly meeting is sufficiently spirited that it is well worth the time of attendance, not to mention the change in cooking in the dinner provided.

As a wartime measure or, more truthfully, due to the modesty of the transmitter crews, viz., KGO and KPO, your correspondent is considering the establishment of carrier pigeon service between these important plants and the home office, as repeated requests for information from these units of our organization have failed. Probably Mort Brewer hasn't been fishing lately, or Jimmy Ball is too busy with his model railroad.

Mobilization of Science in Nat. Defense

(Continued from Page Nine)

The number of such projects now approved and, for the most part, contracted out to universities and industrial research laboratories stands around 600 while the number of contracting institutions is over 100; and when it is stated that the total value of the projects thus far determined upon is upwards of twenty million dollars, you will realize at once that the monetary resources of the scientific world would not be adequate to conduct the program on a gratuitous basis. The contracts vary all the way from those involving a few thousand dollars to those calling for two to three hundred thousand dollars per month. I have no doubt but that many of you here today are working either full or part time on one or more of these NDRC contracts.

The question is frequently asked as to how many technical people have been drawn into the civilian defense effort which the NDRC directs, but obviously this is quite difficult to estimate, let alone to enumerate in detail. I have already mentioned that there are about 500 scientists in the NDRC organization serving as Members, Consultants, etc. It seems likely that somewhere between two and three thousand scientists are at work on defense projects as employees of contractors with about an equal number of less highly skilled individuals assisting them as laboratory assistants, technicians, etc. Then, if the situation which I know to exist at the Bell Telephone Laboratories is to be taken as a criterion, we must add to this scientific group another very considerable array of technical people who call themselves engineers as opposed to physicists and chemists—an array which if enumerated would no doubt total four to five thousand.

Recent figures from the Bell Telephone Laboratories might be of interest as perhaps typifying the situation found in a number of industrial laboratories which are fulfilling defense contracts, some for the NDRC and some directly for the Army and Navy. A rough count shows that about 600 of our technical staff are now engaged directly on a full-time basis on defense projects. When I say that they are "engaged directly" on defense projects, I am excluding those who by circumstances arising out of the defense program have been forced to devote themselves to such problems as the finding of substitute materials and the engineering of emergency telephone projects.

Another aspect of the NDRC plan of operation which I should like to stress is its "no-profit" feature. This applies alike to contractors and to employees of contractors. Perhaps this point can be brought out most clearly by reference to a specific situation. The University of California is acting as a contractor to the NDRC on a large project which involves an annual expenditure of around one million dollars. Certain members of the California faculty are employed on a full-time basis on the project and in switching from teaching to defense work have incurred no change in rates of pay. The University has also hired from other faculties certain individuals to augment the defense staff and they likewise, have gone over without changes of salary, although a payment is made to compensate for the cost of moving in the case of both single and married men. It is also stipulated explicitly that the university, as contractor, will derive no monetary profit from the work and the same requirement is exacted of industrial laboratories and other types of contractors.

The "no-profit no-loss" proposition has involved the adoption of certain more or less arbitrary but seemingly equitable rules of accounting. Thus, a university is usually allowed an overhead payment amounting to 50 per cent of the salaries which it pays to its members employed on a defense project. Similarly, an industrial laboratory, by virtue of the fact that it has to operate with commercial

(Continued on Page Twenty)

Behind the Mike By Con Conrad

D. J. KEMPKES, NBC Engineering Chicago, now on military leave and is located at Ft. Monmouth as a Lieutenant in the Signal Corps.

P. J. Moore, Transmission Engineer for NBC Chicago, to the Signal Corps at Ft. Monmouth. Moore took his military leave to become a Lieutenant.

R. E. Hunt, new to the engineering staff of NBC Chicago. Hunt is on duty with NBC until called to active duty with the Air Corps. He hails from down Texas way.

E. G. Squires, new to the engineering staff, at NBC Chicago. Squires was formerly connected with The RCA Institutes in Chicago. He comes to NBC with a well rounded radio background.

A. A. Harrison, new to the engineering staff at NBC Chicago. He joins the maintenance staff. His former duties were with broadcast stations in Peoria, Ill., and Lincoln, Neb.

F. E. Golder, formerly connected with the traffic department of NBC Chicago, has transferred to the engineering department.

Francis Morse has joined the staff of WKZO, Kalamazoo, Mich. He hails from WBBZ, Ponca City, Okla.

Curtis Mason and L. H. Blatterman, co-chief engineers for KFI-KECA, have taken all necessary precautions for the operation of their equipment under emergency conditions. Their staffs have been supplied with the necessary gas masks and other emergency equipment.

Larry Dammert has taken military leave from WLW, Cincinnati, to become a Lieutenant with the Signal Corps.

Milt Hall has joined the engineering staff of KOA, Denver. He replaces Bill Kumpfer, who has resigned to work with Civil Service in Electronics.

Dave Harpley, WQAM, Miami, engineer, very happy over the arrival of a new daughter. So be it with Paul Sloane, engineer of KDKA, he welcomes to his home the arrival of a son.

Emmett Voeller has been added to the staff of WOWO-WGL in Ft. Wayne, as a summer relief engineer. Along with the change other additions are made to the staff, Richard Voeller and William Foos doing summer relief.

William Sanburn, new to the staff of WHO, Des Moines. Harold Rissler, formerly of WHO, is now stationed at the Jefferson Barracks in Missouri.

W. S. Crooks has been appointed chief engineer for WFVA, Fredericksburg, Va. He was formerly connected with WBTH and WLOG.

Jon M. Larson, formerly of NBC Chicago and New York, has joined the staff of the Coordinator of Inter-American Affairs as engineering consultant.

Jimmy Creel is new to the staff of WRBL, Columbus, Ga.

Paul Horton has resigned his duties with KFRO, Longview, Texas, to study radio engineering at Texas A. and M. College.

Kenneth Mcleod, W65H development engineer, has taken leave of his duties in Hartford and is doing special research work for the Government.

William Danneman has joined the engineering staff of KVOR, Colorado Springs; his former duties were with KYUM, Yuma, Ariz.

John G. Gould has joined the engineering staff of KGFJ, Los Angeles, having resigned his post with KIEV, Glendale, Calif.

Walter J. Tucker, Jr., chief engineer, WNLC, New London, Conn., has resigned his position and enlisted in the U. S. Navy. His enlistment makes the third from the staff of WNLC.

The Way It Ought to Happen

(One-Minute Script)

Announcer: And now, kiddies, the story of Moose Dutton —and the adventures of the Great Northwest! (Pause) (Quietly) Yesterday, when we left our hero, Moose Dutton —he was being held prisoner in a deserted shack, by that notorious outlaw, Fiedelman Spiers. With gun in hand, Fiedelman was preparing to shoot our hero—when Moose said—

Moose: (Thru clenched teeth) Drop that gun, Feidelman!

You—you despicable cur! Why, you wouldn't dare kill me! (Calmly) You wouldn't *dare* shoot an officer of the Royal Canadian Northwest Mounted Police!

Pause:

Fiedelman: (Thru clenched teeth) The hell I wouldn't.

Sound: Six gun-shots.

Hero slumps to floor. —*By Tom Gootee.*

ALL ABOUT JUKE-BOXES

(In One Easy Lesson)

By Tom Gootee

A JUKE-BOX is a seventh illegitimate cousin of the phonograph (among other things) and therefore distantly related to radio. So you really should know something about it—and what makes it tick.

A sort of musical din is dispensed by Juke-Boxes, of one kind or another. Any musical critic will verify my statement that there is nothing quite like it.

But first consider the history and background of this mechanical Extravaganza.

A man named Edison probably started the whole thing, but he can't be held entirely responsible. A number of modernistic improvements in the original phonograph would render the present-day Juke-Box almost unrecognizable to Edison.

For instance, late in 1920 a man named Goldfarb thought of the idea of crossing the phonograph with a slot machine. After a year of planting and cultivation, a grotesque monstrosity bloomed forth—and with certain modifications has staggered on its musical way. In the spring of 1926 a man named Geezle built a huge box, or shell, around the Eyesore, and decorated the outside with forty or fifty different kinds of paint, chromium and glass. The result was a little atrocious. And later refinements certainly haven't helped matters any.

The actual operation of the Juke-Box is a marvel of scientific development.

For one thing, the turntable (which should revolve at 78 revolutions per minute) invariably spins around at from 90 to 100 r.p.m.—because the tavern customers don't like slow music with their beers. A five-cent piece entitles you to hear any of twenty or thirty of these jazzed-up selections, boomed out of a 500-watt amplifier through a 10-watt speaker. The several hundred lights and neon displays are thrown in free. Some models come equipped with spigots for beer, hat-racks, benches to park yourself between dances, and a small space for checking luggage. A few of the larger models even come equipped with either a one- or two-car garage, for the exclusive use of the tavern owner or barkeeper.

For five cents you can listen to "Star Dust," "Melody in F," or the "Hut Sut Song." For five cents you can get Wayne King, the Andrew Sisters, or Bing Crosby. For five cents you can be the life of the party.

Since Juke-Boxes are stocked with popular (so-called) records, you can generally tell how far you are from town by the records. The older the records are—the farther you are from civilization. A few boxes in the backwoods of Los Angeles are still playing "Bei Mir Bis Du Schoen"—which will probably give you an idea.

If you have a tavern and want to install a Juke-Box, all you do is knock out one booth for dancing space, knock out another booth for the Juke-Box, and then shut off all the fans.

Or you can put one of the things in your own home. Then you can invite your friends over every night, and soon make enough money to open up a branch office downtown.

You Have to Know How (One-Minute Script)

Announcer: And now—Chapter 67,443—of the Story of Little Morphine Annie. (Pause) Listen!

Annie: (Spoken through clenched teeth, as though in severe anguish, a little chiding perhaps albeit not without a touch of languid kindness to her voice, as though she had been spoken to and had not heard. Must be quite terse, but with a sense of reverent humbleness; not too excited nor yet reserved; should be pedantic with only a slight twinge of remorse. Must top following seven speeches, but with a moving kindness and understanding, a sterness of tone.) Hm-m-m-m-m????

—*By Tom Gootee.*

New Shure Catalog

Shure Brothers have just issued a new catalog designed to aid in the proper selection of microphones for various war and vital civilian applications.

It shows the new Shure line which has been simplified to meet today's problems. Information is presented in concise practical form. Technical data is given on Shure dynamic, crystal, and carbon microphones for use in ordnance plants, Army camps, air terminals, broadcast stations, police mobile and station transmitting equipment, industrial war factories, OCD control centers, and all other important microphone applications.

An interesting story also tells how microphones are accurately measured.

This catalog is an excellent guide for any of the above uses and may be obtained free of charge by writing to Shure Brothers, 225 West Huron Street, Chicago, Illinois.

Denver News

By V. E. Andrews

SUMMER is officially here and KOA is again preparing for the familiar "Nature Sketches" broadcasts. As in previous summers, the broadcasts originate in the Colorado Rockies near Estes Park, Colorado. The park naturalist, Raymond Gregg, plans trips for the younger sex in the hills of the Rocky Mountain National Park. From various selected spots, subjects pertaining to nature (rock formations, vegetation, birds, etc.) are fed to the NBC network. This is the programming side, but the engineering angle is more interesting, eh what! In other words, each Saturday requires a short-wave relay job—and lots of fun for the engineering department. The mobile unit (1942 Ford station wagon) is being equipped to accommodate an ND-20, six storage batteries to generate 120 volts AC by means of a Janette converter, premax antenna, etc. Within 300 feet of the pick-up point, the program is short-waved from the mobile unit to a Ranger station at the outskirt of Estes Park, or to the Morraine Museum at the base of Trail Ridge Road. Many programs have originated atop Trail Ridge in a snowbank—about 12,000 feet high! Broadcast circuits are available at either receiving location to send the program to Denver. ND-25s, ND-14, frequency measuring equipment, ND-10s, etc., are used at the base point. Who wouldn't enjoy working on a set-up like this?

Don't believe "Barney" Nesbitt has hit the print since he joined the transmitter gang in May, 1941. Nesbitt is another ham (W9PO) without a hobby at the present.

Another newcomer is George Pogue who takes over vacation relief at the transmitter. Pogue and Nesbitt are both from KFKA in Greeley—Pogue being chief engineer for eight years.

An addition to the studio is Milt Hall who hails from KLZ. It won't be long till Hall will know plenty about spinning platters!

It has been suggested by our re-elected chapter chairman, Russ Thompson, that the Journal povide space to honor our fellow workers who have been called to active service. To that honor roll we could enter the following Navy men: Lieut. Commander J. A. Slusser, who was recently promoted from Lieut. and is now stationed in Ireland; Lt. Glen Glasscock is serving in San Francisco, and Al McClellan is somewhere in Hawaii.

Vacations are around again. So far, Kahle spent three weeks around home; Blake and Nelson took up a little angling; Fell is heading for California, and Neal hopes to finish his sailboat to get it afloat.

Bill Kumpfer left NBC to become a senior engineering aide at the Radar Labs at Belmar, N. J.

Kahle is getting the "33 1-3 RPM Jerk" since he took over Blake's Blue playbacks. Now each have to split up the days for sanity's sake.

Cleveland News

By Bert Pruitt

THE members of the Cleveland N.A.B.E.T. Chapter held their election meeting at the Hollenden Hotel, Friday evening, June 5th.

A near 100 per cent turnout found the food delicious, drinks excellent and the arguments vociferous.

Harold Brandt (TE) succeeds himself as chairman. Frank Whittam didn't crack a smile, or frown, as the election returns made it obvious that he was riding high to a glorious victory. He repeats as secretary-treasurer. Congratulations, boys. You did an A-1 job last year and we know you will do the same this year.

A rather humorous incident took place while we were seated around a huge table groaning with what you might call malted-milks.

Just when someone seconded the motion to something or other, the door to Parlour-H swung open, admitting an elderly man wearing horn-rimmed glasses.

"Is this the N.B.C. convention?" questioned the man.

"Well . . . " stalled Chairman Brandt. "I suppose you might call it that."

"Fine," beamed the man. "Is Reverend . . . What is in those bottles?"

"Holy water."

"Holy water? . . . Where from?"

"Mecca," someone fom the back of the room offered.

"Are you Mohammedans?" answered the stranger with a look of disbelief.

"Presbyterians," answered a Studio Engineer.

"Presbyterians?"

"Yes."

"Then what are you doing at an NBC Convention?"

"Isn't it according to Hoyle?" Brandt looked at Whittam.

"Well . . . yes . . . I suppose so . . . But are you certain this is the NBC Convention?"

"We are N.A.B.E.T. members of N.B.C."

"What does the N.A.B.E.T. have to do with it?"

"National Association of Broadcast Engineers and Technicians."

"Well, that explains it." The stranger laughed when he said this.

"Explains what?"

"I'm looking for the Northern Baptists' Convention. It must be in Parlour-F."

* * *

"Laugh and the World Laughs with You"—At least that's what we are told, so we take it for granted that when you shoot, the world does likewise. In fact, that very thing is happening out at our transmitter.

Art Butler (assistant station engineer) is one of Ohio's better skeet shooters. The other men realized that Art was taking all the blue ribbons so they bought guns, shells and instruction books.

Brecksville residents often cast an anxious eye to the south. They aren't certain whether it's the Brecksville Pot Shots or an invasion.

Bang away, boys . . . skeet isn't what some of us are accused of shooting.

* * *

WTAM has a Kentucky Colonel! Well . . . at least the equivalent. The only difference is of geographical nature.

Hugh Walker (TE) is the owner of one of the fertilist pecan growing plantations in North Carolina. Slightly under 500 acres, we understand.

We heard rumors to the effect that Hugh is a Colonel so we called him for verification.

"Yes, suhh . . . " the Colonel answered.

"Well, Hugh . . . Colonel . . . what all do you raise on your plantation?"

"Pecans."

"Say, Colonel . . . could you get our Christmas nuts at a discount?"

"What's that?" stuttered the Colonel.

"How about a discount on our Christmas nuts?"

"Nuts to you!"

* * *

John Cheeks (TE) and John Disbrow (OS) recently gave a lecture at Baldwin Wallace College. The lecture was pertaining to defense. The pretty coeds in the audience made good use of their notebooks. 73 till next issue.

Mobilization of Science in Nat. Defense

(Continued from Page Fifteen)

capital and is subjected to a variety of forms of taxation from which the university is exempt as well as other expenses, is allowed an overhead of 109 per cent of the salary item.

I suppose it depends upon one's point of view as to whether the effort I have just outlined appears large or small. On the one hand, it seems fairly certain that it is only a beginning and must expand further. On the other hand, it is certainly large already when contrasted with any civilian effort which was able to assert itself during the last war. And looking back to the situation which existed a quarter of a century ago, it is difficult to understand why the then available civilian agencies were not unleashed to an extent commensurate with their obvious capabilities. True, the National Research Council was created to assist with the solution of defense problems, but it was, as I have pointed out, in the position of a doctor waiting for clients; it could not adopt the attitude of an aggressive salesman and initiate attacks on what it regarded to be important military problems. Hence we can declare that as regards organization notable progress has been made.

As to future expansion of our civilian-defense effort, it is becoming increasingly essential to bear in mind the potential shortage of trained personnel. Without insinuating anything as to guilt, the chemists declare that this is a physicist's war. With about equal justice one might say that it is a mathematician's war. The visible supply of both physicists and mathematicians has dwindled to near the vanishing point, consistent with the maintenance of anything like adequate teaching staffs in our universities. If this civilian defense effort is to expand, and such indeed now seems imperative, the limiting factor, therefore, may be a shortage of highly trained individuals and not a shortage of financial aid.

This leads me to state a few general observations concerning the past and future of our work. It is quite apparent that to date the burden of NDRC contracts bears much more heavily upon some institutions than upon others. At the outset this has necessarily been the case. While serious attention has at all times been given to the subdivision of projects so that they could be farmed out as widely as possible, a limit is frequently reached beyond which it isn't practicable to go in the matter of division. And in many cases, no division at all could be entertained, a situation that has given rise to a few large contractors, of which I cited the University of California as an example.

In the assignment of the early contracts, it has been natural, in fact essential, to lean heavily upon those institutions, both academic and industrial, which for one reason or another have been peculiarly fitted to transfer quickly from peacetime to wartime problems. This has been done with a view to conserving time. But the stages of the program to follow will doubtless involve a broader survey of the situation to find locations where new problems can be lodged with a minimum of interference to essential defense work and teaching now in progress. In this survey a guiding principle will be to utilize men and facilities *in situ* whenever possible, thus preserving the "going value" of groups who are accustomed to working together. In the face of crises, the human tendency is usually to do the reverse, it being so easy for central agencies to ignore established but not well-known organizations, and attempt to cope with an emergency by calling workers from right and left to some new location. As a matter of fact, this tendency was beginning to make an appearance even as long as two years ago when the fundamental plan of the NDRC was under discussion. Had the tide then setting in been allowed to run on for some months unimpeded, the result inevitably would have been a literal army of uprooted scientists in Washington and other central points, sitting around idly waiting for vast amounts of research equipment which had been placed on order, but was not much nearer materialization than that, to be installed in hastily constructed laboratories. This would have been the easy and disastrous way. Fortunately the creation of the NDRC came in time to stem such a tide.

Another present problem, and it is the last with which I shall trouble you, is one which by its existence supplies evidence that real progress has already been made in some of the research programs thus far initiated. It has to do with shortening the time gap between proven laboratory research results and the stage where mass production can be undertaken. Some of the laboratory results already achieved hold such promise that every day which intervenes before their widespread utilization becomes a serious matter. Obviously the problems to be met here cover a wide range of equipment and materials—as wide as that marked out by the scientific results themselves—and since they involve large-scale manufacture, the whole plan must be carefully worked out with other official agencies, particularly the Office of Production Management and the armed services. I am sure, however, that we are prepared to meet and solve these problems, and rather than be concerned with the difficulty of making progress along this avenue, I think all who are guiding the work of the NDRC would exclaim to the ranks of scientists and technicians, "Bring on your results, the more the better, and we will guarantee them a speedy passage to the firing line!"

In the foregoing, I have attempted merely to sketch the setup of organized civilian research and development created for the war emergency. Obviously, it is only a part of the total effort which is being mobilized. It would be unfair to thousands of scientists and engineers to infer that the main results were dependent on the work of these agencies.

The scientific departments of the armed services are being greatly enlarged; industrial laboratories are turning more and more of their efforts to direct and indirect war work and engineers everywhere are active. Fundamental and applied science are on the march.

NO ADVERTISING

can alter the characteristics of

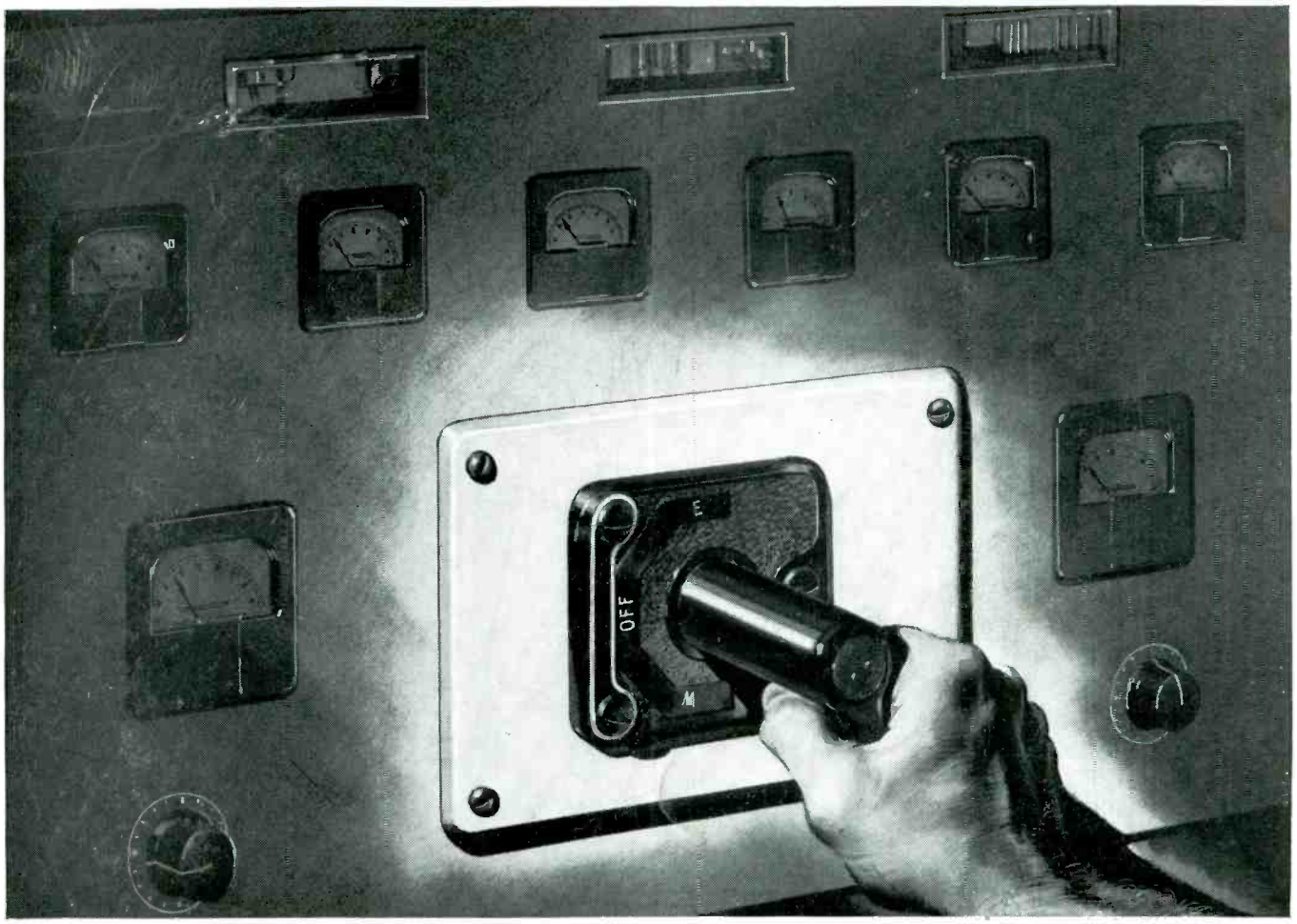
GLASS BASE

Instantaneous Recording Blanks

Sparkling performance is characteristic of ADVANCE products

ADVANCE RECORDING PRODUCTS CO.

36-12 34th Street **STillwell 4-7837** **Long Island City, N. Y.**



This switch directs the steerable radio beam . . . flashes radio spearheads of truth into the darkness of occupied Europe.

THIS WEAPON IS *Anything* BUT SECRET!

Today America possesses a war weapon of great range—and it's no secret. That weapon is international radio . . . hurling projectiles of truth more than *3,000* miles across the Atlantic—and across the wide Pacific.

International broadcasts by NBC rely for their effectiveness on important developments from RCA Laboratories. The beam aerial, for instance—controlled by the switch you see above—"searchlights" broadcasts to distant points, with an enormous increase in effective power.

Through such directional aerials, WRCA and WNBI, operating with power of 50,000 watts, reach Europe with a signal strength that would require 1,200,000 watts if broadcast from a non-directional aerial.

Forty-one years ago, the first wireless signals were sent across the Atlantic. Yet today, thanks largely to RCA research, America is hurling messages into the war-torn areas of Europe with an impact that even small, compact receivers have no difficulty in picking up.

RADIO CORPORATION OF AMERICA

PIONEER IN RADIO, ELECTRONICS, TELEVISION

RCA Building, New York, N. Y.

The Services of RCA: RCA Manufacturing Co., Inc. • R.C.A. Communications, Inc. • Radiomarine Corporation of America
RCA Laboratories • National Broadcasting Co., Inc. • Blue Network Co., Inc. • RCA Institutes, Inc.