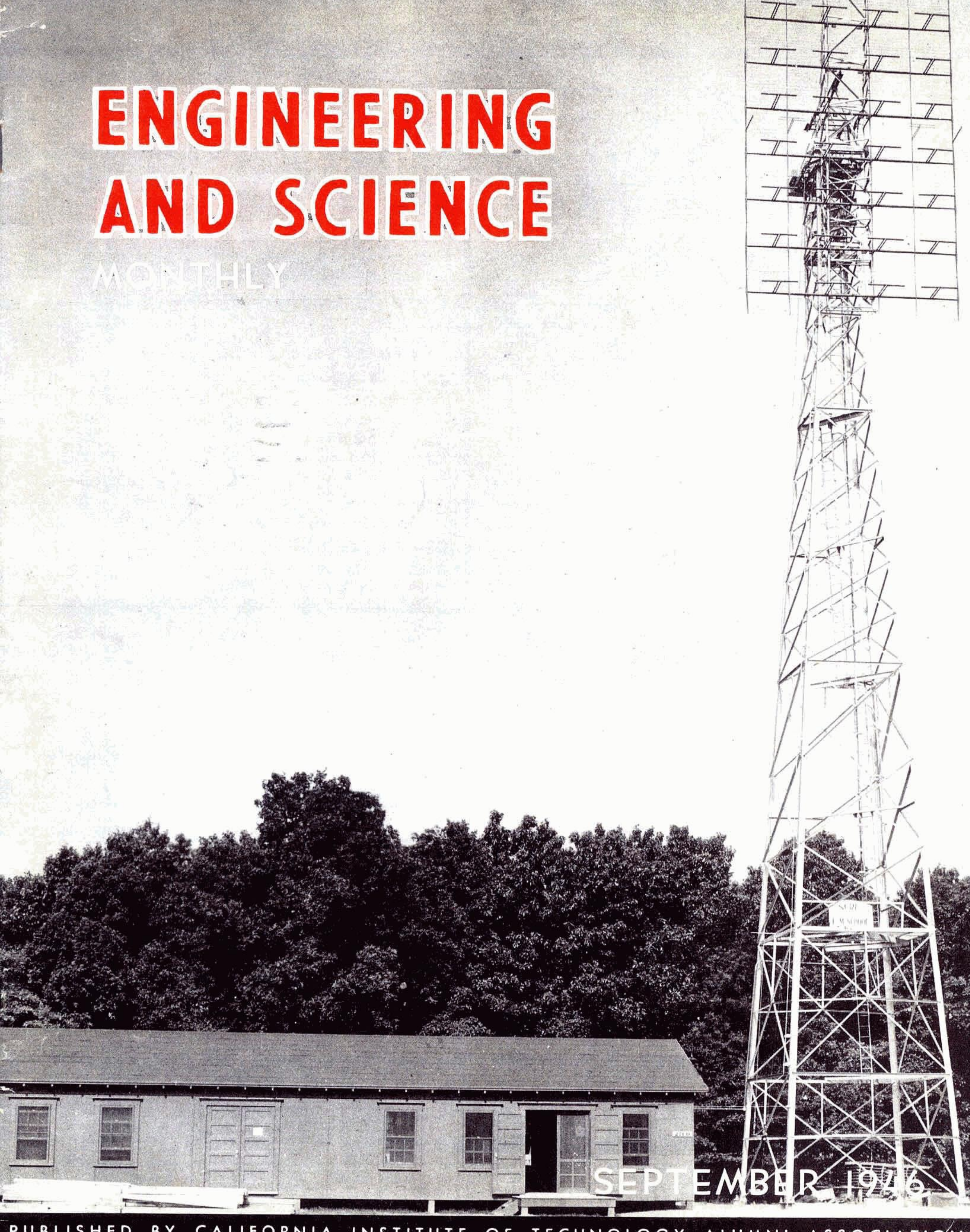
ENGINEERING AND SCIENCE

MONTHLY



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BY-LINES

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Martin H. Webster graduated from the California Institute of Technology in 1937 and then went to the Harvard Law School in Cambridge, Massachusetts. After graduating in 1940 Mr. Webster was associated with a firm in Los Angeles until September 1942 when he joined the U. S. Army. After release as a lieutenant in February 1946, he opened his own offices in Los Angeles.

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COVER CAPTION:

The antenna for a long range search radar. The SCR 271. This antenna was modified by the addition of more radiating elements to send radar signals to the moon.

This illustration and those with Dr. Pickering's article are used through the courtesy of the U. S. Army Signal Corps.

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Monthly

The Truth Shall Make You Free

CONTENTS FOR SEPTEMBER, 1946

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Let 'George' Do It?

MEN of the technical professions are generally clear thinkers and are willing to tackle difficult problems in design, research, construction, or production; but when political problems arise, they are more likely to say "Let George do it." This is not an intelligent attitude for men who have been taught through schooling and experience to attack a problem logically by securing the pertinent data, evaluating those data, and obtaining an answer. Technical men may answer by saying that politics are outside their field of knowledge and training and should therefore be left to the politicians. This reply is only a poor rationalization, and a reflection of an attitude of indifference and loose thinking or no thinking at all. Every citizen of the United States of America is a partner in democracy: if he leaves matters of government to "George", he may find himself with fewer liberties, with a less efficient government controlled by men whose thinking is distorted, and whose approach to important problems is illogical. "George" leads the people into a state of confusion, possibly to his own advantage. Perhaps the present situation of governmental turbulence may be at least partially the result of this indifferent attitude on the part of not only technical men but others also.

Whenever small groups gather, severe criticism is aimed at the way our government is operated. One man says it is harder to secure materials and equipment now than during the war; another is having difficulty in securing personnel; another cannot produce a certain consumer product because the cost of production is too high for the price he is permitted to quote. The housewife cannot obtain meat, the contractor cannot secure lumber, the printer cannot get paper, and the veteran cannot buy a new white shirt. These things are discussed frankly. This is good, but what is done about it? Government operation is considered too big a problem; technical men as individuals cannot reach a solution and so they return to their respective technical jobs.

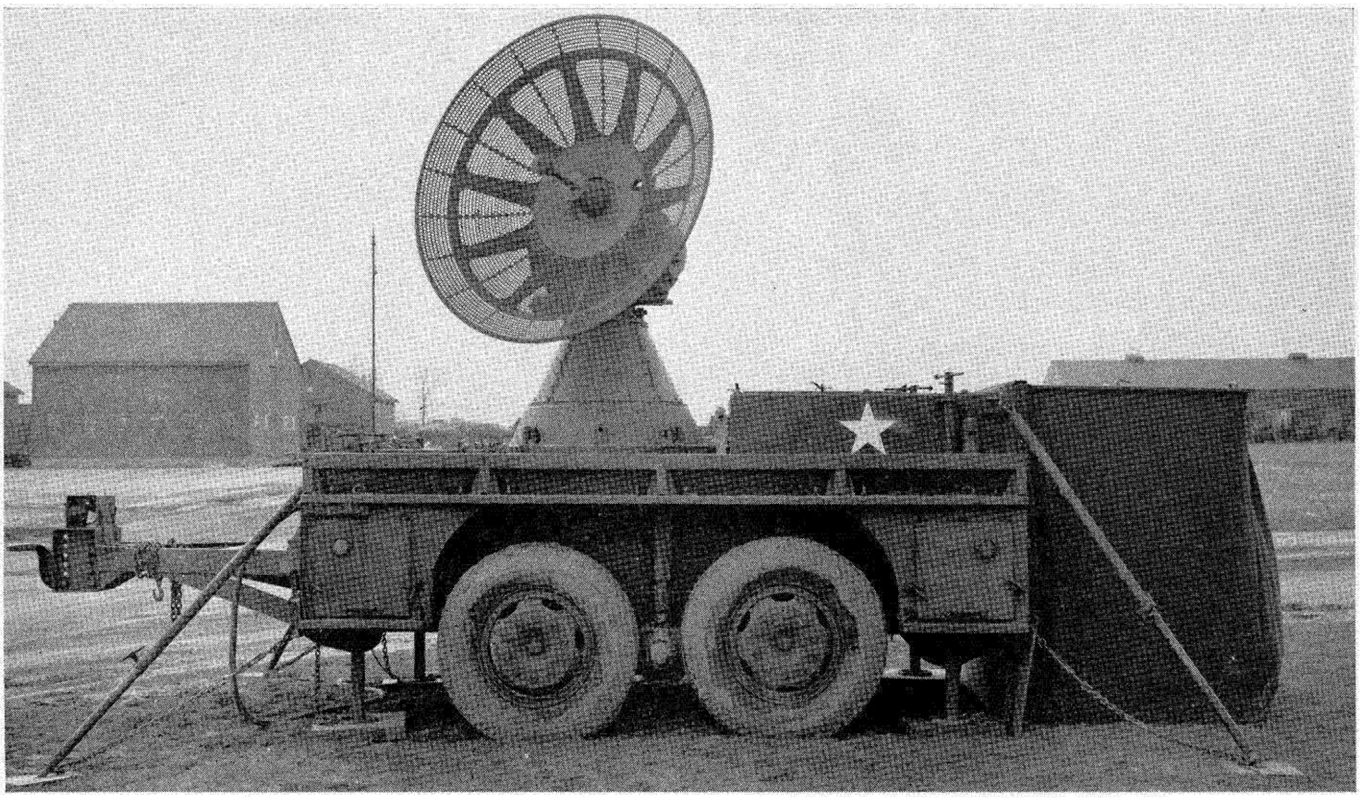
The technical man may have divorced himself from any participation in politics except the placing of an unpremeditated mark on a ballot, because most politicians do not think in the same manner as he does. The operation of a government does not lend itself to analysis in the light of fundamental physical laws—at least not yet—as does a design problem, even though certain assumptions must be made. In government, one is dealing with human beings whose reactions have not been reduced to simple natural laws, and hence seem to present an insurmountable problem to technical men. But isn't there something the technical man can do to contribute to problems in government? Yes: As a minimum contribution he can not only discuss problems and criticize actions, but also take his electoral power seriously by carefully analyzing the ability of men running for office who will represent him.

Making this choice requires information. Scientific training stresses the accumulation and evaluation of facts. Surely the stake any man has in the United States Government warrants his gathering enough basic information to understand it, and in the case of men schooled in the scientific method, this gathering and evaluating should be second nature.

Involving more than an active interest is actual participation in governmental matters. Men of science held high government posts during the recent war, and were responsible for the successful execution of difficult legislative and administrative problems. However, the legal profession has always had a strong grasp on politics. It is probably logical for this condition to exist, for the men of this profession have been educated to deal with laws; they have studied law. Hence it may be right that they should be best suited to make laws. However, technical men should not only make sure that they select the best men of the legal profession to represent and to govern them. It would be highly advantageous for a few technical men to try out their scientific approach on some of these problems by themselves standing for political office.

A more practical step, which can be more easily taken by the technical man to retain his democratic privileges, is participation in local government and civic affairs. Some engineers and scientists do engage in such activities, but they are relatively few. The rest are, in their own minds, too busy with their technical problems to protect their rights as citizens. Those few who have actively participated in civic work are not to be congratulated, but should be humbly thanked for doing their duty. Any man who crusades in an intelligent manner for a higher quality of public education or for better government should not be honored, but given help.

What will you do about this situation? Let "George" do it?



A radar set designed for fire control problems. The SCR 784. This unit is highly mobile and was intended for use on beach heads.

Radar-Military Weapon or Civilian Lifesaver?

by W. H. PICKERING

RADAR to the moon — two and a half seconds for the round trip: is this an indication of the peacetime applications of radar, or may we expect some more immediate and practical benefits from the vast development of radar by all branches of the military services? Before answering this question, let us review some of the facts about radar which have recently been released to the public.

The basic idea of a radar system is well known. It consists essentially of a radio transmitter which sends out a beam of electro-magnetic energy i.e. radio waves. If the beam strikes an object, some of the energy will be reflected or scattered and, in general, some energy will return to the sender. A suitable receiver then serves to indicate the presence of the reflecting object. If the time for the round trip of the radio waves can be measured, the distance to the object is known, and if the beam is sharply defined, the direction of the object is likewise known. To measure the travel time of the waves, a sharp pulse of energy is transmitted and the time required for the echo to return is measured on a cathode ray oscilloscope. Since the waves travel at 186,000 miles a second, they cover about 1,000 feet in a microsecond, so that an echo occurring one microsecond after the pulse represents an object 500 feet distant. Therefore, if distances are to be measured to an accuracy of say 50 feet, time must be measured to an accuracy of one ten millionth of a second.

In order to get a sharply defined beam of energy it is necessary to use a transmitting antenna which is much greater than a wave length in its dimensions. This phenomenon is exactly analogous to the diffraction of light through a pin hole. If the hole is so small as to be comparable in its dimensions to the wave length of the light, then light waves passing through the hole are not restrained to a geometrical beam but spread out over a large area. In optics we are accustomed to think in terms of sharp beams because the wave length of the light is usually much smaller than the dimensions of the apparatus. However, with radio waves, the opposite situation usually holds and we think of the waves as spreading out in all directions. But if the antenna is large compared with the wave length, the radio energy may be constrained into a narrow beam.

If we ask what range of detection may be expected with a radar set, the answer is obviously dependent on the magnitude of the reflected signal. However, it is worth noting that the energy received back at the sending station from a given target will decrease at least as fast as the inverse fourth power of the distance to the target. Therefore, in order to double the range, the transmitted power must be increased 16 times. The implication is that a successful radar set must use every possible artifice to increase its sensitivity. The transmitted power must be very large, the antenna system must be large and efficient, the receiver must be very sensitive.

Military Applications of Radar

A wide variety of radar sets was developed during the war. This was partly because of the rapid development of the art, but principally because of the diverse uses to which radar was put. To sum these in broad outline, we have the following:

Search radars — designed to locate ships or airplanes at large distances. The range accuracy will probably be good, the bearing accuracy not very good, because if too sharp a beam is employed, the distant object may be overlooked.

Fire control radars — designed to give the highest possible precision of both range and bearing. If these are used for aircraft targets, tracking of the target may be at least partially automatic. Information from these sets will be fed into a computing mechanism which operates the artillery weapons.

Airborne radars — designed to be as light and compact as possible, used for surface or aircraft search.

Bombing radars — designed to give a map of the terrain below the plane in order to assist the bombardier in locating his target.

Each of these categories may be subdivided into a number of types, depending upon the particular use for which the radar is designed. Thus we have land based and ship based radars, we have several different methods of presenting the radar data, we have long range and short range sets, air search and surface search, all adding to the multiplicity of types.

In addition to the applications named above, the radar principle has been applied to a number of other devices, such as:

Absolute altimeter — a means for determining the altitude of an airplane above the ground by determining the time taken for a radio signal to travel from plane to ground and return.

Radar beacon — a transmitter which will return a coded signal when properly interrogated by a radar transmitter. In this way an airplane with a radar set can, for example, obtain the bearing and distance to some known point on the map at which the beacon is located.

Ground Control Approach (GCA) — a means by which an officer at an airport is able to "talk down" an airplane landing blind. The airport is provided with a radar set giving an accurate picture of all traffic in the vicinity. By watching the plane on the radar receivers the officer can instruct the pilot as to the correct maneuvers to make a landing.

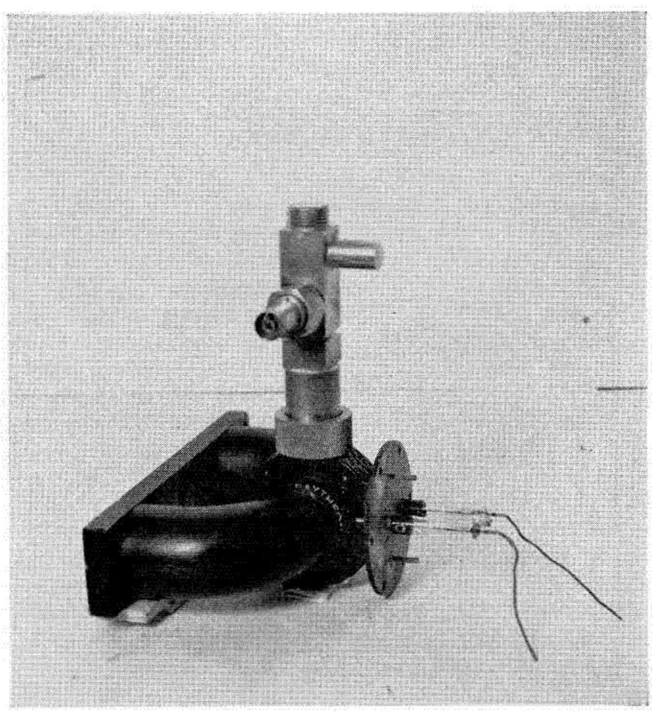
Loran — a technique for long range navigation which uses a measurement of the time difference required for radio signals to come from two known transmitting staions. The locus of points having a constant time difference, or path difference, is a hyperbola with the two transmitters at the foci. By observing such time differences from two pairs of stations, the receiver can be located at the intersection of two hyperbolas. A chart provided with the two families of hyperbolas will then give the position of the receiver. This technique has been found to give rapid and reliable "fixes" out to ranges of several hundred miles.

Shoran — a short range navigation scheme of the same nature as Loran, except that the transmitter is on the ship or plane and two fixed receivers at known locations repeat the signal back to the sending point. . Accuracies of the order of 50 feet are attainable to distances of better than 100 miles.

Peacetime Radar

It is apparent from this list of radar devices that the peacetime applications of radar will be in the field of navigation. Radar can be used to solve almost every navigational problem. Ships and planes over the ocean several hundred miles from land can obtain their position from Loran with a precision and speed rarely attainable by celestial observations, and in weather conditions that make celestial observations impossible. Ordinary radar will allow a ship to travel at full speed through fog, even in a crowded harbor. With radar the ship has eyes which penetrate fog and storm and night, albeit not with the detail seen by the human eye in clear weather, yet with sufficient clarity to locate and identify the surroundings. Similarly a plane equipped with radar can determine its position and altitude, and thus fly through fog and darkness to its destination.

It must be conceded that radar is more satisfactory when used over sea than over land. At sea there are no targets to give reflections except the ships or planes or icebergs which the radar operator is seeking. Therefore, his screen is clear of extraneous information and he can see the desired picture sharply and unambiguously. On the other hand, a radar signal travelling over land may be reflected by hills or trees or buildings, so that the radar picture is cluttered up with a great many reflections which fre-

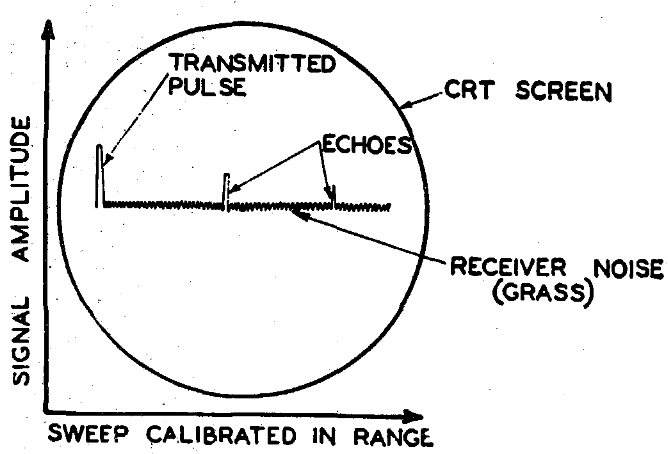


A magnetron tube to produce about 30 KW of peak power at a wave length of about 10 cm. The permanent magnet which supplies the field is shown in place.

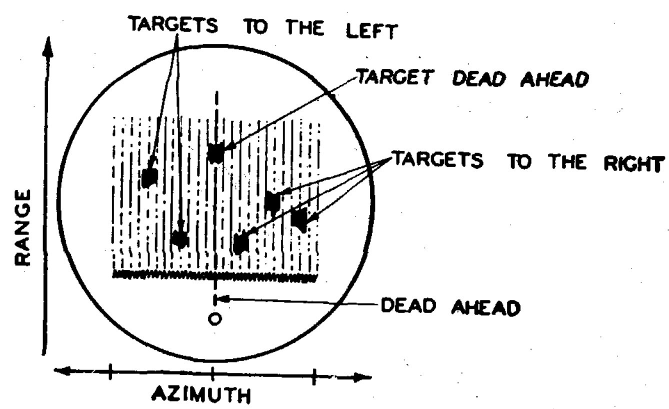
quently make it very difficult to interpret. However, water, and such demarcations usually serve to identify and orient the picture. In passing we may note that water does not give a reflection on the radar screen, because it acts like a horizontal mirror and the signals from the transmitter are reflected away from it. No energy is reflected back to the receiver unless the water is directly beneath the radar set.

For this reason it is probable that the first peacetime applications of radar will be for marine use. We can visualize ships equipped with relatively simple, short range radar sets, navigating safely through crowded waters in spite of fog or darkness. We can also visualize aircraft on long overwater flights, using Loran to navigate to their destination. With Loran the speed and accuracy with which a location can be calculated are such that even in a plane flying at four or five miles a minute the navigator can always find his exact position. Loran signals can now be heard over large portions of the Atlantic and Pacific oceans, and it is probable that within a few years all points on the earth's surface will be in the range of Loran transmitters. These signals, of course, can be used for the precision navigation of surface vessels also; however, because of the slow speed of ships, not so much importance is attached to obtaining the frequent and accurate fixes necessary for aerial navigation and obtained from Loran. This does not mean that Loran will not be used for surface navigation. It has definite advantages of simplicity in operation over conventional celestial navigation, and of operation in weather which can keep the celestial navigator blind for days on end. It is not too much to hope that someday the system will be completely automatic, so that, by simply tuning in a particular set of transmitting stations, the navigator may cause the co-ordinates of the ship's position to appear on two dials before him. Even before this day arrives, Loran will almost certainly see extensive use on shipboard. Recently the first commercial Loran installation for maritime use was publicly demonstrated in New York.

The radar applications so far discussed are sufficient to solve the navigational problems of a ship. An airplane, however, has a more complicated problem to solve. It needs an accurate navigational aid for landing, which must operate over land rather than sea, and it needs a third dimension, namely altitude, at all times, and during landing this third dimension must be exceedingly accurate. Although military radars were used for blind bombing operations, it is unlikely that such equipment will be used in everyday commercial operations. It is expensive and heavy, and the problem is better solved in other



Type A-scan presentation



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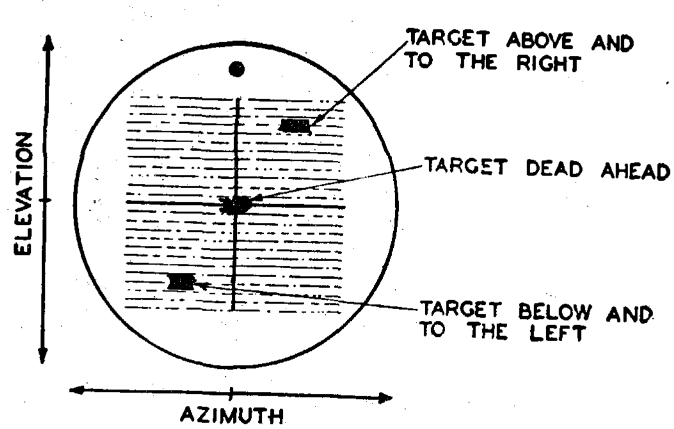

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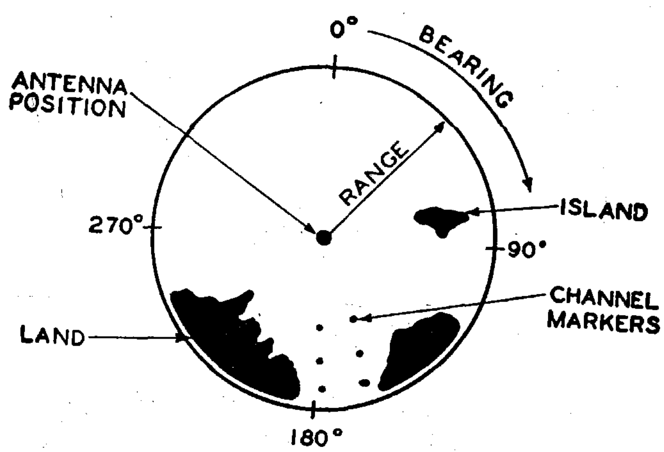


Type PPI-scan presentation

Four of the principal methods of target indication on cathode ray tube screens used in conventional radar sets.

ways. Existing radio beams and beacons will bring an airplane safely to the vicinity of an airport, so that it only remains to get it safely on the ground. The Army development of GCA or ground control approach would appear to be the best solution to the problem. It requires an elaborate radar installation at the airport, but only the usual radio receiver in the plane. By watching the plane on the radar screens the traffic controller on the ground can give the proper instructions on the radio to bring him in to a safe landing. The system requires, of course, considerable confidence on the part of the pilot in the ability and judgment of the man on the ground.

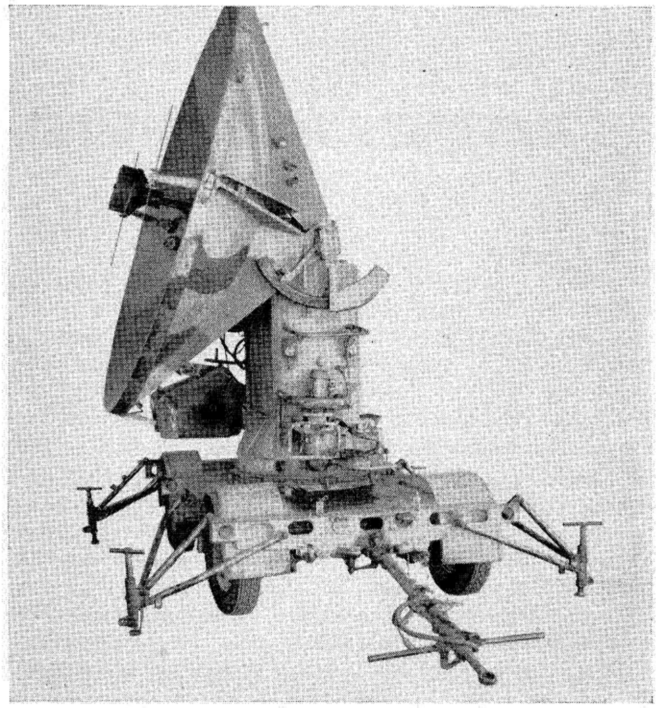
An alternative scheme has been recently proposed to give the pilot greater freedom of choice in his movements and to solve the problems which very heavy traffic would impose on the voice radio circuit.* This, known as "Teleran", consists of adding a television transmitter to the ground installation and a television receiver to the plane. The pilot would then see the radar information for himself, and furthermore additional factors, such as weather, etc., could be added as a simple printed sheet televised over the same circuit. Such a system will probably not be necessary for some years, but is an interesting example of what is technically possible even at this time.

The problem of determining the altitude of a plane is intimately connected with that of avoiding collisions with other planes. The radar altimeter mentioned above is obviously adaptable to peacetime use. However, it would be desirable if its use could be extended to give some sort of automatic warning of an impending collision. Technically this is possible, and, if increasing air traffic justifies its use, we may expect to see such an automatic collision indicator developed.

The Radar Picture

In considering the peacetime applications of radar, the question of the form of the presentation of the data is of great importance. For military uses, several different systems have been employed. Unfortunately there is no system which is exactly the ideal, namely, a picture equivalent to that obtained by looking through a telescope on an unusually clear day; however, there is one which comes close to this. It is the so-called plan-position-indicator PPI. An operator using a PPI scope sees a circular picture which is actually a radar map of his surroundings out to a radius of say 50 miles, with the radar set at the center of the picture. Any ships or airplanes within this range will appear as bright dots at the proper points on the map. Land will appear as a conglomeration of bright spots, showing a more or less sharp outline of the shore. The interpretation of such a map-like picture is very simple so that it can be quickly learned by relatively unskilled personnel. It is to be expected that the PPI will be almost universally used on peacetime, navigational radars. It will be provided with a range switch to change the scale of the map, and possibly with an arrangement to show only one sector of the map and to enlarge that sector. Indicated on the map will be geographic north and the direction in which the ship is travelling. There will also be range markers, consisting of circles at say five mile intervals. With this map, and a little training, it is obvious that radar navigation is almost as satisfactory as navigating from the bridge on a clear day. As radar techniques improve, the sharpness and detail of the PPI picture will improve and even the untrained novice will be able to distinguish between the tug boats and the Queen Mary.

*"The Teleran Proposal", P. J. Herbst, I. Wolff, D. Ewing and L. F. Jones, **Electronics,** February, 1946.



View of the German Wurzburg radar.

The other systems of data presentation have been designed primarily for obtaining great accuracy in range. Although this is of prime military importance, it is not very significant for navigational radar. Two peacetime applications requiring range accuracy would be airport traffic control and the radar altimeter. The first will of necessity be an elaborate and expensive installation, requiring highly trained personnel. The second must present data to untrained personnel and provide an easy interpretation.

The principle of radar ranging is of course the timing of the arrival of the radar echo. In the simplest form, a spot starts moving across a cathode ray oscilloscope tube at the instant at which the pulse is transmitted. The returning echo shows as a "pip" on the trace, and the distance between the pip and the start of the trace, together with a knowledge of the velocity of the spot, enables one to calculate the time, and hence the distance to the target. For good accuracy the length of the trace should be as great as possible. One method of utilizing the oscilloscope screen to a greater extent is to have a circular trace with radial deflections. The length of such a trace is about three times that of a single straight trace on the same tube. Such a circular trace is very convenient for an altimeter indicator, since it shows a pip which moves around the screen in much the same way as a pointer on a conventional instrument. With a suitable scale the altitude can be read directly.

(Continued on page 11)

PATENTS AND THE FEDERAL INCOME TAX LAWS

By MARTIN H. WEBSTER

THE maxim has often been repeated, with more enthusiasm for publicity than precision, that while one cannot "evade" taxes, one may adopt any device to "avoid" taxes which lies within the Congressional mandate. Many words have been written about the nebulous line between "evasion" and 'avoidance";[1]* yet all tax authorities agree that tax saving as such is a legitimate object of endeavor.

In the field of patents, there are several places where tax savings may be effected. This article will endeavor to point these out, and fit them within a general discussion of the Federal income tax laws as they affect patents.

There is a usual chronological pattern that business dealings with patents assume: first, the acquisition or development of the patent; then a holding period during which certain expenses are incurred; and finally the disposition of the patent either by sale or through the economic processes which completely destroy its value. The article will discuss the tax consequences of each step in the order given.

I. Acquisition or development

If a taxpayer purchases an already issued patent from some third person, the purchase price is, of course, not deductible in the year in which the purchase is made, any more than would the purchase price paid for a business or shares of stock be deductible. Such expenditures are capital investments, and form the cost, or, in the technical language of the income tax laws, the "basis", of the object purchased. Then, later, when the object is sold, the cost or "basis" is subtracted from the selling price, and the difference is taxable income. As we shall see, in the case of patents, provision is made for deducting as depreciation in each year during the remaining life of the patent a proportionate part of its costs of "basis" (see Section IIA below).

A similar result obtains if a taxpayer, by dint of his own efforts and ingenuity, actually develops a patentable invention himself. His cost of materials and labor, his expenses in clearing title and filing an application for a patent, his Government fees, his costs in any interference proceedings that may arise while his application is pending, are all part of his total cost.[2] The value of the individual's own time, however, is excluded. This total cost corresponds to his cost, or "basis", had he purchased an already issued patent from a third party. And the treatment thereof is the same: when the patent is sold, this cost, less depreciation, is subtracted from the selling price to ascertain the amount of taxable income.

Where, however, a corporation is formed to produce a patented article, the salary and organization expenses may not be considered as part of the cost, and must be treated as deductible expenses.[3]

*References are given at the end of the article.

If, in the case of the taxpayer who develops his own invention, his application for a patent eventually meets with failure, it seems safe to assume that the expenses incurred therewith may be deducted as a loss in the year in which the patent application is denied.[4]

II. The holding period

A. **Depreciation.** When a taxpayer is granted a patent, he is the recipient of an exclusive monopoly to exclude all others from the field covered by his patent for a period of seventeen years. At the end of this period, the patented invention is open to public use. Thus, to receive a patent is to secure a property right for a limited time only. In this respect, holding a patent corresponds to owning a building which has a useful life of only a limited number of years. In both cases, a deduction is allowed in each year the asset is held, in an amount representing the value of the asset which can be considered to have been lost during that year. This normal deduction for what might be called the exhaustion of the value of property is computed by taking the total cost of the property and spreading it out over its expected life. In the case of a patent, this means allocating 1/17 of the cost to each year, commencing with the year the patent is granted.[5]

In connection with this deduction for depreciation, there are several important points:

(1) The depreciation must be taken on the basis of the legal life of the patent, the full seventeen years, even though it is reasonably felt but not conclusively shown that the useful life of a patent may be for a shorter period.[6]

(2) The depreciation deduction is not allowed during the period when an application is pending, but commences only in the year when the patent is granted.[7]

(3) Where there are several patents dependent upon a basic patent, depreciation on these ancillary patents is allowed on the remaining life of the basic patent.[8]

(4) If depreciation is not taken in the early years of a patent, this will not be considered a binding election; depreciation may be taken later, but its annual amount will be computed as if the deduction been had taken over the entire life of the patent.[9]

(5) Where a patent is acquired by bequest, devise or inheritance, the depreciation deduction will be taken on the value of the patent as of the date of the decedent's death, and spread out over the remaining legal life of the patent.[10]

B. **Obsolescence.** As has been stated, depreciation is allowed as a deduction to the owner of a patent, based on its legal life of 17 years. If, however, unforeseen circumstances, such as scientific progress, changed economic conditions, legislation, or similar elements, make it apparent that the useful life of a patent will be cut short of its legal life, a deduction in addition to depreciation may be taken in order to accelerate the writing off of the cost of the patent.[11] This increased deduction is referred to as obsolescence. As an example, if after seven years it is discovered that a patent costing $17,000, for which an annual depreciation deduction of $1,000 is taken ($17,000 divided by 17 years), will have a remaining useful life of only five years, the remaining depreciated cost of $10,000 ($17,000 less $7,000) may be written off in the remaining five years by adding to the $1,000 depreciation deduction an annual deduction for obsolescence of an additional $1,000. Thus, in the given example, the result will be that at the end of 12 years the entire cost of the patent will have been written off, and this will coincide with the then zero value of the usefulness of the patent.

(This deduction for obsolescence is to be distinguished from the loss occasioned by complete and sudden abandonment of a patent, as to which see Section IIIB below).

C. **Infringement proceedings.** After a patent is issued, and articles have been manufactured, used, or sold thereunder, it may unfortunately develop that other persons than the owner feel that the patent infringes upon one already issued. Legal[12] and accounting[13] fees paid by a defendant in an infringement suit are generally deductible in the year paid,[14] although current authorities concede that no hard and fast rule may be made.[15] Damages paid pursuant to judgment are also deductible,[16] but only in the year when the judgment is rendered.[17] Amounts paid in settlement of an infringement suit, although not pursuant to judgment, are also deductible items.[18]

Where the patent owner is the plaintiff in an infringement suit, and claims that others are infringing on his patent, damages recovered by him are income when received,[19] against which of course he is allowed to deduct his legal and accounting costs. Where, however, the individual buys a patent and with it the right to damages in a suit then pending, the ultimate receipt of damages will not constitute income, since the right to damages was part of the purchase price.[20]

III Disposition

A. By sale

1. **Capital gain.** Where an individual is not an inventor by profession, and where sale of a patent can not be construed as disposition of "stock in trade", any income received as proceeds on the sale of a patent is a capital gain.[21] If the invention has been put into practice or the patent has been granted longer than six months prior to sale,[22] the gain will not be taxed, regardless of the income tax bracket of the individual as to his other income, at a higher rate than 25 per cent.

2. **Installment sales.** Where the taxpayer is in the business of selling patents, or where the taxpayer makes a casual sale of a patent and (1) the price is more than $1,000 and (2) the initial payments do not exceed 30 per cent of the selling price, it may be profitable, under certain circumstances, to elect to treat income received on an installment sales basis.[23] On this basis, the profits from a sale may be taxed over the period of years covered by the installment payments based upon the amount of profit which is realized from each such payment. To illustrate, if the depreciated basis of a patent is $5,000 at the time of sale, and the selling price is $10,000, this means that for every dollar received by the seller, 50 cents or 50 per cent is profit. Accordingly, if the contract of sale provides that $2,000 will be paid immediately, and the balance of the purchase price will be paid in four equal annual installments of $2,000, and if the seller finds it advantageous to do so, he may elect to report this transaction on the installment sales basis. On this basis, of the $2,000 received in the year of sale and in each of the succeeding four years, only $1,000 will be reported as taxable income in each year. The tax saving can be made very substantial in appropriate cases by the use of this method, and contract terms should be carefully drawn to allow the method to become operative where desired.

3. **Compensation for work covering 36 months or more.** Until recent years, inventors who worked for long periods of time without pay and then received their full compensation upon the completion of their undertaking were taxed fully in the year in which payment was received. This resulted in two inequities: (1) only the deductions, credits and expenses of the final year were chargeable against the compensation for the full period, and (2), by reason of the graduated surtax, the taxpayer was subjected to a greater tax burden than he would have incurred had the compensation been spread out over a number of years. Accordingly, the 1942 Revenue Act sought to correct this situation for inventors, authors, composers and the like, by enactment of Section 107 (b) of the Internal Revenue Code, effective for taxable years beginning after December 31, 1941, which reads as follows:

> "(b) Patent, Copyright, Etc.—For the purposes of this subsection the term "artistic work or invention", in the case of an individual, means a literary, musical, or artistic composition of such individual or a patent or copyright covering an invention of or a literary, musical or artistic composition of such individual, the work on which by such individual covered a period of thirty-six calendar months or more from the beginning to the completion of such composition or invention. If, in the taxable year, the gross income of any individual from a particular artistic work or invention by him is not less than 80 per centum of the gross income in respect of such artistic work or invention in the taxable year plus the gross income therefrom in previous taxable years and the twelve months immediately succeeding the close of the taxable year, the tax attributable to the part of of such gross income of the taxable year which is not taxable as a gain from the sale or exchange of a capital asset held for more than six months shall not be greater than the aggregate of the taxes attributable to such part had it been received ratably over that part of the period preceding the close of the taxable year but not more than thirty-six calendar months."

Stripped of its legal phraseology, this Section is interpreted to mean that, in the case of work done by an individual on a patented invention covering a period of 36 months or more, the tax on income received in a given tax year from the invention shall not be more than the total taxes would have been, had the income been received ratably over (1) the period representing that part of the work which had been completed prior to the close of the taxable year, or (2) a period of 36 months, whichever of such periods is the shorter. This ceiling on the tax to be paid becomes effective only if the income received on an invention in the taxable year is 80 per cent or more of all amounts received in prior years, in the taxable year, and in the 12 months next succeeding the taxable year. This Section does not apply to income received as a long-term capital gain, which, as has been shown above, already has a 25 per cent ceiling.

A series of examples will illustrate the operation of this Section. In each example, it will be assumed that A is an individual who makes his returns on a calendar year basis, and on the basis of cash receipts and disbursements, and that he is not in the business of selling inventions (i.e., the long-term capital gains provisions do not apply).

(1) On October 1, 1942, A receives a down payment of $1,000 on the sale of a patent, the work on which was commenced on September 1, 1940, and will be completed on January 31, 1944. Further installments are due in equal amounts for the next five years following 1942. This is not the kind of case fitting within Section 107 (b), since less than 80 per cent of all amounts paid will have been received in any one taxable year.

(2) On November 30, 1943, A receives $36,000 in full payment for the sale of a patent the work on which was commenced on September 1, 1940, and will be completed on January 31, 1944. This is the kind of case covered by Section 107 (b), since in the taxable year 1943 A receives at least 80 per cent of the total payments to be made. Accordingly, the tax attributable to the $36,000 received in 1943 shall not be greater than the tax attributable to such an amount, had it been received ratably over the calendar months from September 1, 1940 to December 31, 1943 (the close of the taxable year in which work was performed). The specific allocation to each year of the $36,000 received will be as follows: The period of work covers 41 calendar months, but allocations can be made to only the last 36 calendar months which precede the close of the current taxable year. Therefore, $1,000 ($36,000 divided by 36) must be allocated to each of the calendar months preceding January 1, 1944. Accordingly, $12,000 is allocated to 1941, $12,000 to 1942, and $12,000 to 1943.

(3) Assume the same facts as in Illustration 2, except that work was commenced on July, 1942, and will be completed November 30, 1945. Although the period of work covers 41 calendar months, allocations may be made to only the 18 calendar months which are included within the part of the period of work which precedes the close of 1943 (the current taxable year). Therefore, $2,000 ($36,000 divided by 18) must be allocated to each of 18 calendar months preceding January 1, 1944. Accordingly, $12,000 is allocated to 1942, and $24,000 to 1943.

(4) On November 30, 1945, A receives the sum of $36,000 in full payment for the sale of a patented invention the work on which was commenced on September 1, 1942 and completed on October 1, 1945. Although the period of work covers 37 calendar months, allocations may be made to only the 36 calendar months preceding the date of completion of the work. Therefore, $1,000 ($36,000 divided by 36) must be allocated to each of the 36 calendar months preceding October 1, 1945. Accordingly, $3,000 is allocated to 1942, $12,000 to 1943, $12,000 to 1944, and $9,000 to 1945.

(5) Assume the same facts as in Illustration 4, except that payment was made on January 1, 1946. Here payment was made in a taxable year other than the one within which work was completed. This nonetheless appears to be the kind of case covered by Section 107 (b). Accordingly, the tax attributable to the $36,000 received in 1946 shall not be greater than the tax attributable to such an amount, had it been received ratably over the calendar months during which the work was performed, not to exceed 36 months. The specific allocation would therefore be as follows: $3,000 in 1942, $12,000 in 1943, $12,000 in 1944, and $9,000 in 1945.

Once specific allocation has been made, pursuant to Section 107 (b), it becomes necessary to determine the tax attributabe to the income in the year received; this tax cannot be greater than the total of the taxes which would have been paid on this income, had it been allocated over earlier years. This determination is made in the following manner:

	Total tax in current taxable year, including all income from invention
	Less: Tax in current taxable year, excluding income from invention
Line 1	
Line 2	Tax attributable in current taxable year to income from invention
	Total tax in current and prior year, including allocated income from invention
	Less: Tax in current and prior taxable years, excluding allocated income from invention
Line 3	Total tax payable, had income from invention been allocated

The tax payable in the current taxable year is the sum of Line 1 and the smaller of Lines 2 and 3.

A recent ruling[24] of the Income Tax Unit, Treasury Department, provides that Section 107 (b) contemplates that expenses incurred in earning income should be treated as if ratably paid over the same period as that in which the income was earned. This ruling will affect the computation given above.

B. **By Abandonment**

The Internal Revenue Code[25] makes certain distinctions based upon whether or not an asset is a "capital asset". One of these distinctions has already been noted, namely, the ceiling of 25 per cent on the tax accruing upon the sale at a gain of a capital asset held for longer than six months. Other distinctions are made where the capital asset is sold at a loss, one of which is that in the case of an individual, only 50 per cent of the loss can be deducted where the asset has been held for a period longer than six months.

Where, however, there is disposition not by sale but by abandonment, the Internal Revenue Code makes no distinctions as to whether the asset is or is not a capital asset. A deduction is allowed for the full loss.[26]

To constitute abandonment, there must be an intent to abandon, coupled with some decisive act evidencing this intent.[27] The cause of abandonment must be some sudden event which prematurely and unexpectedly terminates the useful life of the asset.[28] In the case of a patent, this could be caused by, for example, a war making it impossible to procure ingredients necessary to manufacture the patented article. This loss for abandonment is fully deductible only in the year of actual abandonment.[29] It is distinguishable from depreciation, in which it is considered that the asset gradually wastes away during its expected life, and from obsolescence, in which the expected life in shortened but not completely terminated.

It is settled that the deduction for loss by abandonment applies to both patents[30] and patent rights.[31] A question has arisen as to whether there may be some residual value to the abandoned patent, or whether there must be a complete uselessness before the loss may be allowed.[32] Early cases have expressed the view that there can be no residual value.[33] However, the present Treasury Department Regulations appear to contemplate an abandonment loss where there may yet be some salvage or scrap value to the patent abandoned.[34] The question becomes acute where a patent is "sold" for its scrap or salvage value. Is this a sale or exchange, such that, if appropriate, the capital loss limitations apply? Or is this an abandonment of all but the residual value, such that a full loss, less the salvage value recovered, is deductible? There is no clear-cut answer to this question, although it would appear to be a fully deductible loss where the taxpayer writes down the depreciated cost of the patent on his books to its present estimated salvage value, and in a separate—though almost simultaneous—transaction, sells it for its scrap or salvage value.[35]

IV Conclusion

Tax avoidance, which the author likes to refer to as tax "savings", is a legitimate realm within which the ingenuity of an individual may be translated into actual dollars. Particularly with respect to installment sales and compensation for work performed on an invention for a period of 36 months or more, a taxpayer has the opportunity to effect tax savings for himself which should not be overlooked.

1. Buck, "Income Tax Evasion and Avoidance; Some General Considerations," 25 Georgetown, L. J. 863 (1937); Angell, "Tax Evasion and Tax Avoidance", 38 Co. L. R. 80 (1938)
2. Addressograph-Multigraph Corp., TC Memo Op., Dec. 14, 387 (M); Claude Neon Ligts, Ins., 35 BTA 424; Buffalo Forge Co., 5 BTA 947; Gillian Mfg. Co., 1 BTA 967
3. Globe Construction Co., 25 BTA 146.
4. Internal Revenue Code Sec. 23 (e) and (f).
5. Regulations 111, Sec. 29.23 (1)—7.
6. Hazeltine Corp. v. Com'r., 89 F. (2) 513 (CCA 3rd, 1937).
7. Twin Disc Clutch Co., 2 BTA 1327
8. National Piano Mfg. Co., 11 BTA 46
9. Deltox Grass Rug Co., 7 BTA 811; Burke Electric Co., 5 BTA 553.
10. Internal Revenue Code, Sec. 114 (a) and 113 (a) (5).
11. Regulations 111, Sec. 29.23 (1)—6; Hazeltine Corp v. Com'r., **supra** note 5; O'Neill Mach. Co., 9 BTA 567.
12. A.R.R. 98, 2 C.B. 105; cf Allen & Co., TC Memo Op., Dec. 13,216(M).
13. Meyer & Bros. Co., 4 BTA 481.
14. **supra**, Note. 13.
15. Addressograph-Multigraph Corp., **supra**, note 2.
16. Becker Bros. v US, 7 F. (2d) 3 (CCA 2nd, 1925).
17. Peck, Stow & Wilcox Co., 12 BTA 569; Safe Guard Check Writer Corp., 10 BTA 1262.
18. Ward v. US, 32 F. Suup. 743 (1940).
19. Triplex Safety Glass Co. of N. A. v. Latchum, 131 F. (2d) 1023 (CCA 3rd, 1943; W. W. Sly Mfg. Co., 24 BTA 65.
20. Hyatt Roller Bearing Co. v. US, 43 F (2d) 1008 (Ct. of Claims, 1930).
21. Internal Revenue Code, Sec. 117 (a).
22. Myers 6 T. C. No. 32; Diescher, 36 BTA 832; GMC 21507, 1939-2 CB 189; I. T. 3310, 1939-2 CB 190; Bureau Letter Jan. 6, 1944.
23. Internal Revenue Code, Sec. 44.
24. I. T. 3773, Int. Rev. Bull. No. 24 (Dec. 1945).
25. Internal Revenue Code, Sec. 117.
26. Regulations 111, Sec. 29.23 (e)-3.
27. Mertens, "Law of Federal Income Taxations," Sec. 28.19
28. Regulations 111, Sec. 29.23 (e)-3.
29. Liberty Baking Co. v. Heiner, 37 F. (2d) 703 (CCA 3rd, 1930).
30. Connecticut National Pavements, Inc., 3 BTA 1124.
31. **supra**, note 29.
32. See discussion Mertens, **supra**, note 26, Sec. 28.17; CCH Standard Federal Tax Reporter, Par. 197.01.
33. Consolidated Window Glass Co., 1 BTA 365.
34. Regulations 111, Sec. 29.23 (e)-3.
35. **supra**, note 31.

Radar--Military Weapon or Civilian Life Saver?

(Continued from page 7)

A radar installation used for airport traffic control must present the equivalent of a three-dimensional picture of the airport and its surroundings. This will obviously require at least two radar plots, one of which could be a PPI and the other a plot of height versus range for the planes in some given direction. The Teleran system mentioned above reduces the problem to a two-dimensional plot of the PPI type, but provides a separate plot for each altitude zone.

Commercial Radar

Peacetime radar sets will obviously be built to different specifications from those of military radar. In both cases reliability is certainly of prime importance, but cost, which is of negligible importance to the military, becomes vastly more significant in peace. Furthermore, if peacetime radar is to be widely used, the sets must be designed so that operation does not require a highly skilled technician, or frequent maintenance.

If radar is to be used at all it might justify itself economically. Equipment can be designed and built for the applications discussed above, and these should prove numerous enough and important enough to warrant the expense involved. For example, consider radar for ship navigation. A commercial version has already been demonstrated. Its use is justified for any ship where navigation in crowded waters is necessary, provided the value of the cargo is such as to put a premium on prompt delivery. With radar, collisions can be avoided and the ship go through on schedule, in spite of adverse conditions. One application already suggested is for shipping on the Great Lakes. It might be thought that tugboats and ferry boats in a harbor such as New York would be a fruitful market for radar. However, it is doubtful if the expense is warranted in these cases. On the other hand, overseas shipping, particularly express liners or freighters, could well use radar to advantage in navigating up the harbor.

Consider Loran designed for shipboard use. This is important as an adjunct to the conventional methods of navigation. It should not be considered as replacing them entirely, for the obvious reason that a failure of the electronic equipment would leave the ship completely blind. Shipping using the equipment would then consist of express liners and freighters, travelling in northern waters, for example, where storms and fog make celestial navigation difficult.

(Continued on page 12)

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As an example of a commercial search radar for ships, the following is a brief description of a General Electric design.* The set is in three units: antenna, console, and motor alternator. The antenna is a truncated paraboloid of revolution made up of parallel metal slats and rotated by a small motor at 10 rpm. It is about three and one-half feet wide and one and one-half feet high, and will normally be mounted as high as possible on the ship. The console contains the transmitter, receiver, cathode ray tube, and the auxiliary equipment. Seven controls are needed for normal operation. The cathode ray tube presents a PPI picture. A choice of three ranges, two, six, and 30 miles, is available. The console is designed for easy servicing, with the circuits on removable chassis. It will be located on the bridge or in the chart room. The motor-alternator provides the necessary AC power to the equipment.

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C. I. T. NEWS

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CARRYING on traditions of action to meet the situation, shown by its inauguration in 1935, the furnishing of a clubhouse in 1936, a consistent winning streak in intramural sports, and the maintenance of a haven for war-weary students during the Navy's invasion of C. I. T., Throop Club rose again to the occasion and incorporated a subsidiary organization, Throop Club Wives.

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The majority of the members now are either employed by the Institute or busy raising families. Meetings are held on Monday nights so that husbands can watch the children while the Throop Club Wives get together, transact organizational business, nibble at refreshments, and play bridge. The ends of meetings are usually spent in shooing away bachelor Throop Clubbers and husbands intent on dragging wives home or picking up an extra cup of coffee or a doughnut for themselves from the girls' refreshments.

Parties for mothers and children are planned for the organization, the feeling being that Throop Club Men, as the auxiliary members call the other half, are quite capable themselves of organizing mixed gatherings of adults.

A separate treasury is maintained by the women's club, or at least some listing of their financial state. As of the middle of September accounts were kept in red, the result of sending parcels of food and clothing to Europe at a total cost for postage of $15.67 at a time when club funds totaled $14.00.

Risen recently in Throop Club business is a question of membership. The men have passed an edict that a woman's husband must be a member of Throop Club before she can join Throop Club Wives. The wives consider this a convenience, but not a necessity. They point out that $90 a month does not in all cases permit the support of a family and Throop Club membership too. At the last women's meeting in September a poll was taken of opinions on the matter, followed by the collection of written statements. The difference of opinion will apparently be settled shortly after the beginning of the fall term.

Between the formal bi-monthly meetings of Throop Club Wives, the girls congregate to knit and discuss their respective husbands' grades. Usually members' record collections are played during these gatherings. Other informal meetings have been for the purpose of wrapping the previously mentioned bundles for Europe, and involve strewing the Throop Club Lounge with paper, paste pots, scissors, twine and the clothes and food to be sent.

The most direct contribution to Throop Club that the auxiliary has provided, is the offer of help in redecorating the lounge. Between terms the chairs and couches are to be mended and re-covered, and new drapes hung, while the men paint and polish the floor. Also planned is a kitchenette for the lounge to facilitate the production of coffee and other refreshments for evening meetings.

Apparently the offer of redecoration was a deciding factor in the struggle between the Throop Club Men and Wives. Never too strenuous, as over half of the officers of the men's division are married, it has been alleviated to the point where the membership committee letter sent to incoming men stresses the fact that Throop Club now offers benefits to the entire family.

NEW PROFESSOR IS DESIGNING CALCULATOR FOR INSTITUTE

GILBERT McCann '34 will assume his teaching duties as associate professor of Electrical Engineering at C. I. T. on October 28. Now working in Pittsburgh on an Analog Calculator for the Institute, McCann will have the necessary design and engineering data assembled some time next month.

Transferring to the Institute for his Junior year, McCann received his B.S. degree in 1934, his M.S. in 1935, and his Ph.D. magna cum laude in Electrical Engineering in 1939. As a graduate student, McCann worked summers for the Southern California Edison Company and Westinghouse Electric Corporation. At the Institute he demonstrated marked teaching and research ability, was twice given a best paper award by the American Institute of Electrical Engineers.

Dr. McCann has produced a great many research papers since 1940. Now consulting transmission engineer for Westinghouse, where he has been since receiving his Doctorate, he has lately been developing analog methods of calculation, involving the reduction of mechanical problems to electrical circuits.

Two Analog Calculators are being built by C. I. T. and Westinghouse. These machines will solve any linear differential equation, and some non-linear problems. Less accurate than the differential analyzer, the Analog Calculator is much faster, and in many ways better fitted for solving electrical engineering problems.

Installation of the Institute machine will be supervised by Dr. McCann, when it is completed and shipped to Pasadena.

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(continued from page 11)

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Parties for mothers and children are planned for the organization, the feeling being that Throop Club Men, as the auxiliary members call the other half, are quite capable themselves of organizing mixed gatherings of adults.

A separate treasury is maintained by the women's club, or at least some listing of their financial state. As of the middle of September accounts were kept in red, the result of sending parcels of food and clothing to Europe at a total cost for postage of $15.67 at a time when club funds totaled $14.00.

Risen recently in Throop Club business is a question of membership. The men have passed an edict that a woman's husband must be a member of Throop Club before she can join Throop Club Wives. The wives consider this a convenience, but not a necessity. They point out that $90 a month does not in all cases permit the support of a family and Throop Club membership too. At the last women's meeting in September a poll was taken of opinions on the matter, followed by the collection of written statements. The difference of opinion will apparently be settled shortly after the beginning of the fall term.

Between the formal bi-monthly meetings of Throop Club Wives, the girls congregate to knit and discuss their respective husbands' grades. Usually members' record collections are played during these gatherings. Other informal meetings have been for the purpose of wrapping the previously mentioned bundles for Europe, and involve strewing the Throop Club Lounge with paper, paste pots, scissors, twine and the clothes and food to be sent.

The most direct contribution to Throop Club that the auxiliary has provided, is the offer of help in redecorating the lounge. Between terms the chairs and couches are to be mended and re-covered, and new drapes hung, while the men paint and polish the floor. Also planned is a kitchenette for the lounge to facilitate the production of coffee and other refreshments for evening meetings.

Apparently the offer of redecoration was a deciding factor in the struggle between the Throop Club Men and Wives. Never too strenuous, as over half of the officers of the men's division are married, it has been alleviated to the point where the membership committee letter sent to incoming men stresses the fact that Throop Club now offers benefits to the entire family.

NEW PROFESSOR IS DESIGNING CALCULATOR FOR INSTITUTE

GILBERT McCann '34 will assume his teaching duties as associate professor of Electrical Engineering at C. I. T. on October 28. Now working in Pittsburgh on an Analog Calculator for the Institute, McCann will have the necessary design and engineering data assembled some time next month.

Transferring to the Institute for his Junior year, McCann received his B.S. degree in 1934, his M.S. in 1935, and his Ph.D. magna cum laude in Electrical Engineering in 1939. As a graduate student, McCann worked summers for the Southern California Edison Company and Westinghouse Electric Corporation. At the Institute he demonstrated marked teaching and research ability, was twice given a best paper award by the American Institute of Electrical Engineers.

Dr. McCann has produced a great many research papers since 1940. Now consulting transmission engineer for Westinghouse, where he has been since receiving his Doctorate, he has lately been developing analog methods of calculation, involving the reduction of mechanical problems to electrical circuits.

Two Analog Calculators are being built by C. I. T. and Westinghouse. These machines will solve any linear differential equation, and some non-linear problems. Less accurate than the differential analyzer, the Analog Calculator is much faster, and in many ways better fitted for solving electrical engineering problems.

Installation of the Institute machine will be supervised by Dr. McCann, when it is completed and shipped to Pasadena.

ATHLETIC TROPHY CASE INSTALLED IN LOWER THROOP

GIFT of the class of '45, a trophy case has now been installed in lower Throop Hall. Reported to be the idea of Don Tillman, 1945 student body prexy, the case was under construction for a considerable time after its inception. Institute cabinetmakers finally obtained the wood, built the frame, waited. Further waiting seemed impractical after delivery was at last made on the glass, so the case was installed without lighting fixtures. Eventually the cups and other trophies which have been gradually crowding Coach Musselman out of his office will be illuminated by a built-in lighting system.

Also destined to go in the hall soon is the collection of footballs representing championship teams that were moved a few years ago from the second floor of Throop to the athletic office. With that room no longer partitioned by rows of silver and gold cups, the Coach is now in the process of obtaining privacy through having the north end walled off into a private office.

FOOTBALL PROSPECTS

STARTING with first practice on September 30, the C. I. T. intercollegiate football program will get under way with a few scrimmages with Pasadena Junior College and practice games with La Verne College and Muir Junior College, former West Campus of P. J. C., now a separate school, early in October.

Since the Navy V-12 men who composed the great majority of the highly successful teams of 1944 and 1945 completed their college work before leaving, comparatively few lettermen will return. Expected a few weeks prior to the first practice were Don Hibbard, end; Denis Long, tackle; Norman Lee and George Lyons, guards; and Stan Mendes, fullback: all members of the better-than-average 1945 team.

Football was played during the past two years by special permission of the Institute. This season, however, it is a regular intercollegiate sport, and an integral part of Tech activities.

Coaching the squad will be former chief specialist (A) Mason Anderson, who coached the unbeaten, untied, unscored-upon 1944 eleven.

The first game of the season will be the homecoming game with Occidental, to be played Friday night, October 25 in the Rose Bowl. All games this season will be played within a few miles of the Institute, the greatest distance fans will have to travel being to Inglewood for the Pepperdine game, which on November 23 will mark the last of the 1946 Institute football.

FOOTBALL SCHEDULE 1946

October 25	*Occidental	at Rose Bowl
November 2	*Whittier	at Whittier
November 8	*Redlands	at Rose Bowl
November 16	Pomona	at Claremont
November 23	*Pepperdine	at Inglewood

*Night Games

AS ELSEWHERE FALL REGISTRATION LARGEST

PRE-registration figures indicate that the 1946-1947 undergraduate enrollment will be the largest group ever to attend the Institute. Although registration will not be until October 4 for freshmen and October 7 for upperclassmen, the actual enrollment is expected to closely follow the estimates based on pre-registration. The undergraduate student body, comprising 816, with 248 in the science course, 388 in the engineering course, and 180 freshmen, of whom 20 are returning from a leave of absence, will see the resumption of the three-term system, undergraduate housing on campus, and occasional vacations. The graduate student body is expected to reach a total of 662, making the entire enrollment approximately 1478 against the 900 of previous years.

Most disproportionate classes are the sophomore and junior, with 261 and 220 men respectively. As a result of this large number of returnees, no transfers to the third year level in electrical engineering, mechanical engineering, or chemistry will be permitted in 1947-1948.

Because the summer just ended permitted most students to make up an odd semester, almost all undergraduates will be commencing a year's work, with no mid-year class changes or graduations. A few men are repeating a term's work, and some, notably those who left in the spring of 1943 with the A. S. T. P., are skipping a term.

Expansion of the undergraduate faculty has been undertaken to the point where the 20-man limit on sections will be maintained. Every C. I. T. facility is to be expanded to the utmost to permit the training of the returning men and those admitted to the freshmen year following graduation from high school.

Of these returnees, three-fourths are former Institute students, the rest mostly freshmen with a few transfers to advanced standing.

An interesting change in the undergraduate engineering curricula is the remodeling of mechanical and electrical engineering courses to the point where both options take the same course through the junior year.

FORMER GRADUATE FELLOW APPOINTED HEAD OF BIOLOGY

CHAIRMAN of the Division of Biology is G. W. Beadle, who did research at C. I. T. during the period that the late Thomas Hunt Morgan was expanding the department to its present degree of excellence. Coming to the Institute first in 1931 as a National Research fellow, Beadle remained for two years on that grant, and three more as a research fellow. From C. I. T. he went first to Harvard as an assistant professor of genetics, then to Stanford University as a professor of biology. Remaining at Stanford for nine years, Dr. Beadle was called last spring to head the Institute biological division. With him came a number of fellow researchers, all working with a form of bread mold called Neurospora. Installed in Kerckhoff, this group, including Professor Beadle, is now commencing the study of Neurospora growth.

AIRCRAFT COMPANIES OFFER SCHOLARSHIPS

THE Douglas Aircraft Company and the Consolidated Vultee Aircraft Corporation have recently provided funds for Institute students doing undergraduate and graduate work.

Douglas is awarding two scholarships, one for $500 to a "highly recommended Student in Aeronautical or Mechanical Engineering who has completed his Junior year at the California Institute of Technology," and another for $1,000 to "a highly recommended Graduate Student in Aeronautical Engineering."

All Scholarships will be awarded for one year. The recipients of these grants will be selected by C. I. T. with Douglas reserving the right to approve the selections.

Consolidated Vultee has provided funds for graduate fellowships in the fields of engineering, including aeronautics, metallurgy, chemistry, physics, and mathematics. These fellowships carry a grant of $750 per year for the time necessary to obtain the degree approved by the Institute and Convair.

The student at the time of acceptance of the Fellowship agrees (the agreement being between the student and Convair) to work at Convair for a total period of 37 weeks. Part of this time may be put in during summer vacations, the remainder to be put in after the student receives his degree. Pay will be at the current base starting rate.

At the conclusion of the scholastic work and the 37 week training period, the student will be offered an employment contract at the discretion of Convair. The student is not under obligation to accept this offer.

APPOINTMENT TO MATH DEPARTMENT MADE

NEW in the mathematics department of the Institute is Dr. H. F. Bohnenblust, recently appointed a full professor. A native of Switzerland, Professor Bohnenblust took his undergraduate work at the University of Zurich. Coming to the United States in 1928 as an exchange student, Dr. Bohnenblust studied at Princeton, received his Ph.D. there in 1931. His thesis dealt with the application of abstract methods to the Dirichlet series.

Remaining on the Princeton staff until 1945, the professor during the war used his New Jersey position as a base, making journeys to the west coast, where he collaborated with Drs. Theodore von Karman and D. S. Clark at the Institute on metallurgical problems; for the National Defense Research Council, to Washington, D. C.; and to England, where he studied effects of bombing.

Modern methods of analysis is Dr. Bohnenblust's favorite field of mathematics. At the Institute he will take charge of the sophomore mathematics course for the coming year, teach a graduate course in functions of real variables, and assist in a seminar on non-linear mechanics.

ENGLISH PRIZE ESTABLISHED

A YEARLY prize for the greatest proficiency and improvement in English by a Junior student has been promised the C.I.T. humanities department by Samuel A. McKinney of Los Angeles, an 1884 graduate in Civil Engineering of Rensselaer Polytechnic Institute. The award will be made in the name of Mary A. Earl McKinney.

Two awards, consisting of trophies and money prizes from the income on $3500 will be made each year. The first McKinney prize was awarded in June of this year on the basis of an essay contest with "The Making of an American" as topic.

A committee headed by Professor George R. MacMinn of the humanities department required contestants to read Lincoln Steffen's **Autobiography** and **From Immigrant to Inventor,** by Michael Pupin, as background for their essays.

First prize of $80 was awarded this year to John William Harrison '47 for an essay entitled "First the World", and a second prize of $60 to George Austin '47 for "The Making of an American".

NUCLEAR PHYSICIST ADDED TO DEPARTMENT

ONE of the young men who worked on the Atomic Bomb, new associate professor of physics, Robert F. Christy will specialize in nuclear physics at the Institute. Receiving his Ph.D. in 1941 from the University of California for a thesis comparing properties of the mesotron with the results of cosmic ray bursts, Christy remained at Berkeley for a year, working in the metallurgical laboratories, then moved to the University of Chicago where the first uranium piles were developed. For two years he was at Los Alamos, New Mexico.

During the last year Dr. Christy taught at Illinois Institute of Technology and the University of Chicago. Coming to the Institute recently, he will teach an introduction to quantum mechanics, nuclear and theoretical physics courses, and will assist in a seminar with Dr. Epstein and other Institute physicists on theoretical physics.

Now an American citizen, Dr. Christy is a native of British Columbia, and received his bachelor's and master's degrees from the University of British Columbia, winning the Governor General's Medal for the excellence of his work there.

C. I. T. COACHING STAFF ENLARGED

IN CHARGE of physical education and intramural athletics will be a new man on the C. I. T. coaching staff, James H. Nerrie, former lieutenant in the Naval Reserve. A Rutgers graduate, Nerrie took his first three years of undergraduate work at the Savage School of Physical Education. Joining the Navy after coaching in the Valley Stream School System of Long Island, Nerrie was first a chief specialist (A), then commissioned in February 1943. Most of his work in the service consisted of being physical training officer for the Naval Armed Guard in Brooklyn.

ALUMNI NEWS

ALUMNI CHAPTER OFFICERS

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San Francisco Chapter:

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SECRETARY-TREASURER..........Robert P. Jones '35
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The San Francisco Chapter meets weekly for lunch at the Fraternity Club, 345 Bush Street, on Mondays.

WILLIAM LEWIS NOW DEAN OF ILLINOIS TECH GRAD SCHOOL

DR. WILLIAM A. Lewis Jr. '26, former research professor of electrical engineering at Illinois Institute of Technology and consultant to Illinois Tech's Armour Research Foundation, became dean of the Institute's Graduate School on September 1.

Dr. Lewis holds three degrees from C. I. T., having been granted the Doctor of Philosophy degree in 1929 summa cum laude.

Going to Illinois Tech in April 1944 from his previous position as director of the School of Electrical Engineering at Cornell University, Ithaca, New York, Dr. Lewis has continued his notable contributions in the fields of electric power transmission, power system relaying, the analysis of system stability, the derivation of transformer equivalent circuits, and network calculator studies.

Previous to his appointment at Cornell in 1939, Dr. Lewis served for 10 years as central station engineer with the Westinghouse Electric Corporation in East Pittsburgh, Pennsylvania.

At Illinois Tech he has been in charge of the $90,000 A-C Network Calculator which was installed cooperatively by a number of utility companies a year ago.

A fellow of the American Institute of Electrical Engineers and a member of the American Society for Engineering Education, Dr. Lewis has been teaching graduate courses in electrical engineering at Illinois Tech.

REPORT ON SAN FRANCISCO ALUMNI SWIMMING PARTY

A REPORT from Robert P. Jones '35, secretary-treasurer of the San Francisco Alumni Chapter, lists the activities of the Chapter's fourth swimming party.

"Bob and Betty Bowman's Rancho was the scene of an alumni swimming, barbecue, and card party. Although scheduled to begin at 1:30 P. M. Saturday, August 31, some alumni began arriving at 11:00 A.M.

"During the afternoon swimming, beer, coke, and 'bull sessions' were available, but about 5 o'clock everyone's interest turned to food. After a picnic supper under the arbor, everyone joined in an informal musical program of excellent solos and group singing. Various card games kept the Bowmans up till about 1:00 A. M.

"A record turn out of 62 alumni and family speaks well for the success of the party, and we sincerely extend our thanks to Bob and Betty Bowman.

"Alumni present were Ray Alderman, K. B. Anderson, Walter Danliker, Herb Deardorff, S. C. Dorman, Ed Dorresten, Manley Edwards, Louis Erb, E. H. Fisher, Dick Folsom, W. R. Frampton Jr., Ted Gilman, A. L. Grossberg, J. J. Halloran, H. P. Henderson, L. P. Henderson, M. T. Jones, R. P. Jones, Jerome Kohl, D. S. Nichols, J. W. Otvos, Newell Partch, Andor Polgar, W. C. Renshaw, W. B. Scarborough, Jack Tielrooy, Ted Vehmeulen, Howard Vesper, C. D. Wagner, H. B. Wellman, Walton Wickett, J. N. Wilson, Reuben Wood."

PIERRE HONNELL '40 CITED FOR LEGION OF MERIT

PIERRE M. Honnell '40, who served at West Point during the war, was awarded the following Citation for the Legion of Merit prior to the termination of his duties:

"Lieutenant Colonel Pierre M. Honnell, Signal Corps, Army of the United States, serving in the Department of Chemistry and Electricity, United States Military Academy, from May 1942 to December 1945, distinguished himself as an instructor and by his significant contribution to the planning and engineering supervision of the new Electronics Laboratory. His achievements reflect his unusual technical skill and untiring devotion to duty."

This Citation, an official recognition of his contriibution to the Academy, was awarded for his work as instructor, property officer of the department, and director of electronics.

Before going on terminal leave, Pierre was promoted to full colonel in the Signal Corps Reserve.

He is now an associate professor in the electrical engineering department of the University of Illinois.

PERSONALS

1922

DOCTOR EMIL D. RIES was appointed assistant general manager of the Du Pont Ammonia Department early in July. Dr. Ries was formerly director of sales of that department.

1925

CARL H. HEILBRON JR. left at the end of July for the island of Okinawa, to be gone a year. He is chief structural engineer for Holmes and Narver, who are designing permanent army bases on Okinawa.

FRANZ A. LARSON is employed by Preco Company, of Los Angeles.

1926

The class of 1926 held its 20th reunion at the Athenaeum, Friday, June 21. Present were: ALLAN LAWS, MANLEY EDWARDS, SEERLEY KNUPP, AL BYLER, HERMAN SCHOTT, STU SEYMOUR, DAN DINSMORE, ED VALBY, ALEX KRONEBERG, IRA TRIGGS, MARK SERRURIER, ERNST MAAG, ROSCOE HOWELL, DON MACFARLANE and H. P. HENDERSON, district engineer for Worthington Pump and Machinery Corporation, San Francisco, BERT BEVERLY JR., of the Arabian American Oil Company, Dhahran, Saudi Arabia—via Bahrein Island, Persian Gulf; and JAY VAN DEN AKKER, physicist of the Institute of Paper Chemistry, Appleton, Wisconsin. Bert and Jay were able to attend through the good fortune of being on vacations.

Word was received from many other members of the class who were unable to attend:

ARTHUR B. ALLYNE is in Panama for Ebasco Services Inc., New York.

C. H. BIDWELL, a high frequency transmission engineer for Bell Telephone Laboratories, helped develop the proximity fuse and radar bomb-sights during the war.

JAMES M. CARTER, vice president in charge of Chemical Engineering Development, of the Bone Engineering Corporation, Glendale, had a variety of jobs during the war, working on the atom bomb, jet motors, and radar.

HARRY E. CUNNINGHAM is an attorney, assistant chief of the Division of Contracts and Claims of the Virginia Public Roads Administration.

DOUGLAS W. KEECH owns his own business as an insurance broker. He served for over two years as a 1st lieutenant in the Coast Artillery Corps.

CLARENCE F. KIECH is a patent lawyer with Harris, Kiech, Foster, and Harris.

JOHN E. MICHELMORE is a division engineer for the Southern California Gas Co.

HAROLD W. LORD, staff member of the General Electric Research Laboratory, Schnectady. New York. was in Pasadena this summer. Harold is in the electronics section of the Laboratory. head of a group doing research work on electronic circuits and high-frequency iron-cored transformers.

ROBERT W. MOODIE, structural engineer of the William Porush Structural Engineering Office, did defense construction and design during the war. He has a son in the Navy.

W. HARVEY NEIL'S business, Neil Products Inc. was engaged in food research for the Quartermaster Corps, during the war; is doing food technology work now.

VITO A. VANONI is at C. I. T. doing research on fluid mechanics for the U. S. Department of Agriculture and the Institute.

1927

DOCTOR CARL ANDERSON was married recently in Santa Barbara to the former Mrs. Lorraine Burnett. Their wedding trip included Del Monte, Pacific Grove, and San Francisco.

ENGLE F. RANDOLPH is now connected with J. H. Dacies and Associates, Long Beach, California.

W. LAYTON STANTON JR. was transferred to Olympia, Washington, January 1, 1946 as division geologist for the Union Oil Company, in charge of exploration for Oregon and Washington.

1929

CLAUDE D. HAYWARD arrived in Southern California in late June on a three-week vacation trip. He is with the General Electric Company in their Philadelphia works, as development engineer, Circuit Breaker Division.

NICHOLAS M. OBOUKHOFF Ph.D., had an article published in the **Journal of Engineering Education** for April, 1946, entitled "Teaching and Practicing Electrical Design". Dr. Oboukhoff, research professor at the Oklahoma A. and M. College, also read two papers: "The Social Philosophy of Nieztsche", and "The Social Philosophv of Guyau", before the annual meeting of the Oklahoma Academy of Science in December, 1945.

FRED A. WHEELER is employed by Norris Stamping and Manufacturing Company in Los Angeles.

1930

ORIN ELLIOTT is working for the Sun Oil Company of Chester, Pennsylvania, on problems of feed and water treatment.

1931

CALVIN FRYE is an engineer with the Bureau of Ships, Washington, D. C. He reports that he has been with this department seven years; also that he is still single.

BERRY BOOTHE has accepted a commission as commander (C.E.C.) U.S.N.R. He has been assigned duty as contract superintendent in public works at the Puget Sound Naval Shipyard, Bremerton, Washington.

COLONEL BEN HOLZMAN has been in the Pacific in connection with the Atomic Bomb tests.

COMMANDER LAWRENCE E. KINSLER recently has returned to inactive status in the Naval Reserve. During the past year he has been head of the Physics Division at the U. S. Naval Academy. In July he raced the Naval Academy's 62-foot sloop, "Highland Light" into fourth place in the Newport-Bermuda Yacht Race. He now as assumed the position of associate professor of physics at the Naval Acedamy Postgraduate School, Annapolis, Maryland.

1933

JOHN R. PIERCE, Ph.D. '36, was cited in the July 8 issue of **Newsweek** for developing, with L. M. Field, a new traveling-wave vacuum tube. This new amplifier is claimed by the Bell Telephone Laboratories to speed the advancement of microwave radio-relay systems.

1934

JACK M. DESMOND is on terminal leave from the Army. He spent one year in Hawaii as a Signal Corps captain.

COLONEL JAMES W. MCRAE was awarded the Legion of Merit for outstanding service during World War II. The citation for the award reads as follows: "Colonel McRae, Signal Corps, Army of the United States, serving in several important capacities in the Office of the Chief Signal Officer from April 1942 to October 1945, demonstrated outstanding technical competence and executive ability which were beneficial in establishing programs in the field of electronics, particularly in the research and development of radar and radar countermeasures".

ROBERT SHARP is associate professor of geology and minerology at the University of Minnesota.

1935

BERNARD B. WATSON has recently received a three-year appointment as asstant professor of physics in the Randal Morgan Laboratory of Physics at the University of Philadelphia.

1936

HOLLEY B. DICKINSON, class secretary, has accumulated a number of facts about the class on the occasion of the tenth anniversary of their graduation. Holley is employed by Lockheed Aircraft, Burbank, as an engineer.

RAYMOND H. F. BOOTHE is now a structural designer for Don B. Parkinson, Architect, after three and a half years in the Navy. Ray was discharged as a lieutenant (C.E.C.) U.S.N.R.

WILSON H. BUCKNELL finds himself working for the Pioneer Electric Company as chief engineer, since that firm took over the manufacture and sale of synchronous generators, formerly produced by the O'Keefe & Merritt Company for the U. S. Armed Forces during the war. During that time he was chief electrical engineer with O'Keefe & Merritt. More than 35,000 power units were built at an approximate value of $25,000,000.

GLENN R. CARLEY transferred in August 1944 to the U. S. Naval Ordnance Test Station at Inyokern, California, from the Naval Air Experimental Station, Philadelphia. He reports: "We alumni take not a little pleasure and pride in having so vigorous an association, and I for one hope I can help strengthen the organization in future years. I thank you sincerely for the placement service you have extended to me from time to time during the past few years, and I am happy that I can forward my dues at this time for a Fully Paid Life Membership in the Association."

FRANK W. DAVIS is an engineer test pilot for Consolidated Vultee Aircraft Corporation. His service experience dated from graduation, as he was on active duty with the U.S.N.R. in 1936 and 1937, the regular U. S. Marine Corps from 1937 to 1940, and has since been on inactive duty with the U. S. Marine Corps Reserve.

JOHN I. GATES, now doing petroleum research for the Shell Oil Company, was at C. I. T. during the war doing rocket research in the Chemical Engineering Department.

CLARENCE F. GOODHEART is an ordnance engineer with the Naval Ordnance Laboratory, Washington, D. C.

RAY A. JENSEN has returned to his pre-war job as engineer with Hughes Aircraft Company after being released from Naval Reserve after 18 months' duty as an ensign in the Civil Engineering Corps.

ROBERT D. KENT was a TNT production supervisor during the war, and is now a chemical engineer for the Texas Company.

JOHN KLOCKSIEM is an engineering designer for Douglas Aircraft.

M. M. McMAHON, a Southern California Gas Company employee, is a production control engineer in the Synthetic Rubber Division.

HUGO MEMEGHELLI is very busy at the Naval Ordnance Test Station, Inyokern, as an ordnance engineer.

L. J. MILAN has been factory maintenance engineer for the Douglas Aircraft Company at Long Beach.

ROBERT M. NICHOLS was discharged this spring from the Army Air Force as a 1st lieutenant.

CHARLES A. MORSE is now with the Southern California Telephone Company in the Building Engineers' Office. Chuck spent five years in the Army, being discharged as a captain of Field Artillery Communications.

CONRAD R. MULLER, radio engineer with the Federal Telecommunications Laboratories, has been working on Government Development Contracts.

G. R. NANCE, now out of the Navy where he was a lieutenant commander, is sales engineer for the West Coast Industrial Supply Company.

JACK PALLER is still in the Navy. Now a lieutenant commander in the Civil Engineering Corps, Jack is in the Bureau of Yards and Docks.

MAURICE SKLAR does oil exploration work for the Shell Oil Company in New Mexico.

for completion of the project in 300 work days.

WALLY SWANSON was transferred on July 1 from Las Vegas, Nevada to Ogden, Utah to be in charge of construction of a section of State Highway for Gibbons & Reed Company. The project includes a bridge over the Weber River and an overpass over the main line tracks of the Union Pacific Railroad. The construction contract calls

TED VERMEULEN, a process engineer with the Shell Development Company, has been with this firm since 1941. His war work included Toluene and 100 Octane gasoline at Shell's Emeryville laboratories.

VICTOR VEYSEY was at the Institute with the Physics 3 and Industrial Relations War Projects; is now works manager of the General Tire and Rubber Company of Calif.

LARRY L. YOUNG, a physicist with Raymond N. Wilmotte Laboratories, New York, moved to Southern California with his wife and two year old son in July.

CHAUNCEY W. WATT JR. is now employed as senior radio engineer with Harvey-Wells Electronics at Southbridge, Massachusetts.

REUBEN E. WOOD is teaching at George Washington University, Washington, D. C.

1937

HOYT AUSTIN who has been with the Mine Grande Oil Company in Venezuela, is spending a three-month leave in the States this summer.

R. S. CAMPBELL has returned to the Southern California Edison Company, his former employer, following his discharge from service.

LEVAN GRIFFIS ,Ph.D., professor of mechanics at the Illinois Institute of Technology, and chairman of the Division of Solid Mechanics of the Armour Research Foundation, visited C. I. T. in July while in California on a business trip.

LIEUT. COMDR. JOHN CARY KINLEY, U.S.N.R., was married on June 22 to Miss Edith Helen Potter of Detroit, Michigan.

ERNEST MONCRIEF has been process engineer for the Fluor orporation Ltd. in their Kansas City plant since the fall of 1944. Beginning work with the Fluor Corporation a few hours after receiving his B.S. degree in engineering, Moncrief first worked on the engineering staff of the cooling tower department. After two and a half years he was transferred to the process department and later became job engineer on the Lake Creek contract.

Since going to Kansas City Montie has married Miss Bernice Harvey, receptionist at the Kansas City plant. They have one son.

RICHARD RIDGWAY and TED FAHRNER are working with the Stone and Webster Engineering Company on their Frequency Change Project for the Southern California Edison Company.

1938

CARL FRIEND and his wife, Jane, announced the birth of a daughter, Nancy Claire, in July. Carl is employed at Northrop Aircraft.

EDWARD FRISIUS has been in the hospital since February. His wife and two daughters are house-hunting in Pasadena.

EVAN JOHNSON also became a father. The May arrival was named Christina. Evan is employed by the Kellex Corporation in New York City.

JOHN G. MACLEAN, former student body prexy, is now teaching at the Harvard School of Business Administraiton.

WILLIAM B. VOSS is now on inactive status, after serving with the Army as a captain. He has recently returned from England where he was engaged in the disposal of ammunition.

1939

C. HOWARD CRAFT, now of the Menasco Manufacturing Company of Burbank, is a laboratory supervisor.

WILLIAM R. FRAMPTON JR., recently released from the Navy, is presently employed by the Shell Chemical Corporation at their Pittsburg, California, plant.

KEATS A. PULLEN received a Doctorate in Engineering from Johns Hopkins University this June. He will be teaching in the Electrical Engineering Department of Pratt Institute, Brooklyn, New York, next fall in addition to consulting engineering work. Keats is now father of a son, Peter, born last November.

1940

KIYO TOMIYASU is taking graduate work in Communications Engineering at Harvard University.

WILLIAM DENISTON is working with the Stone and Webster Engineering Company on their Frequency Change Project for Southern California Edison Company.

LIEUT. COL. ALFRED V. GUILLOU is retired to civilian life after three years overseas in the European Theater as staff officer with the United States Strategic Air Forces. Al is married and has a four-year-old daughter. The Guillous are now living in Sacramento.

JOHN M. WILD, supervisor of aerodynamics for Northrop Aircraft Inc., has been appointed associate professor in the Cornell Graduate School of Aeronautical Engineering. Professor Wild received his BS degree from Purdue in 1937. From 1937 to 1939 he was with Associated Electric Laboratories in Chicago, and in 1944-45 was a lecturer at the University of Southern California.

1941

KIRK ABBEY is a radio engineer with the Navy Electronics Laboratory, San Diego. During the war Kirk was a radar officer on the U. S. S. Hornet. He was discharged as a lieutenant U.S.N.R.

WAYNE GORDON ABRAHAM is taking graduate work at Stanford University. Formerly with the Sperry Gyroscope Company and the Naval Research Laboratory, he served as an ensign in the Naval Reserve.

LIEUTENANT (jg) ROY M. ACKER, is now on inactive status, spent 11 months at the Fleet Training Center, Oahu, T.H., as a fighter-director instructor. He also saw six months of sea duty as C.I.C. officer aboard the U. S. S. Vinton, AKA 83.

GRICE AXTMAN has returned to the Southern California Gas Company as industrial engineer after returning from Washington, D. C., where he was a naval photographic officer at the Taylor Model Basin.

NEWELL BALLREICH is now a chemist with the Shell Chemical Company at their Torrance Synthetic Rubber Division. Newell served with the Navy in both Atlantic and Pacific Theaters as a lieutenant (jg) in command of an LSM.

ROBERT R. BOWLES, who worked during the war with the operation of aviation gasoline and synthetic subber plants, is now a chemical engineer with the California Research Corporation.

ALEXANDER F. BREWER is employed by Hughes Aircraft Company at Culver City.

JOHN H. CARR worked on Underwater Ordnance at the Institute during the war, and remains as a mechanical engineer with the U.S.N.O.T.S. in Pasadena.

CARL A. CARLSON is a structural engineer with the Austin Company.

WILLIAM Z. DAVIS, instructor in the Mechanical Engineering Department at Gonzaga University, Spokane, Washington, spent the war as a mechanical engineer for the Aluminum Corporation of America.

QUENTIN ELLIOT is still working on rocket research at Inyokern, California.

MERRIT V. EUSEY JR., discharged from the Naval Reserve as a lieutenant in charge of airborne radio and radar, is now a sales engineer with the Minneapolis-Honeywell Regulator Company.

GRANT W. EWALD was employed at the West Virginia Ordnance Works TNT plant during the war, is now an engineer with the Shell Development Company in San Francisco.

WILLIAM F. CHAPIN was with Permanente Metals during the war, is now design engineer with the Fluor Corporation.

JOHN B. HIATT is just out of the service as a lieutenant (jg) U.S.N.R.

PAUL S. FARRINGTON is a graduate student at the Institute, where he was employed at a research assistant during the war.

PAUL H. FAUST, a chemical engineer with the General Petroleum Corporation, is engaged in process economics and estimating.

GLYN FRANK-JONES was discharged in April as a lieutenant in the Royal Navy Volunteer Reserve (Special Branch). He is now with the RCA Service Company doing electronics work.

FRANCIS GREENHALGH is with the Purchasing Department of the Caterpillar Tractor Company, after serving 30 months in the Naval Reserve. Francis was discharged as a lieutenant (jg).

G. B. HARR, a development engineer with the Firestone Tire and Rubber Company, is working with synthetic rubber; engineered fittings and self-sealing fuel cells in wartime.

WILLIAM B. HEBENSTREIT is doing electronic engineering with the Bell Telephone Laboratories.

JOHN W. JONES, now a chemist with the Andrew Brown Company, was previously employed as an engineer with Lockheed Aircraft Corporation.

R. CARROLL MANINGER did work at Columbia University and the University of California in the Division of War Research; is now a physicst with the Navy Electronics Laboratory in San Diego.

J. F. ROMINGER joined the United States Geological Survey after release from the Naval Reserve as a lieutenant (jg). His present work has taken him to Utah. In September he will attend Harvard.

STANLEY MITCHELL, discharged from the Air Corps as a 1st lieutenant, is now an engineer with the Domestic Thermostat Company, Los Angeles.

JOHN G. PARTLOW is working for the Westinghouse Electric Corporation in their East Pittsburgh Works as an electrical design engineer for turbo generators.

CHARLES B. ROEN, until recently associated with the Shell Chemical Corporation, for whom he worked at their plants at Dominguez and Torrance, California; Dumes and Houston, Texas, is now employed by the Monsanto Chemical Company at St. Louis, Missouri.

LIEUTENANT STAN RUPERT, USNR, was in the Pacific in connection with the Atomic Bomb tests this summer.

RICHARD F. SILBERSTEIN is an assistant engineer with G. E. Goodall, Consulting Civil and Structural Engineer. Dick spent three years in the Corps of Engineers.

JOHN D. SPIKES is now at the Institute working on his Ph.D. in Biology. John was a staff sergeant in the Army Medical corps for over two years.

EDMUND FORREST TYLER is a research engineer with the Douglas Aircraft Company.

WILLIAM J. WAGNER was with the C. I. T. Rocket Ordnance Project during the war, and is now an engineering trainee with the Shell Oil Company at Ventura.

L. C. WIDDOES, discharged after four years in the Naval Reserve as a lieutenant, is taking graduate work at the University of Michigan.

1942

ALDIN W. AYERS is employed by the Filtrol Corporation of Los Angeles.

ROGER BRANDT has started work at Harvard University leading to the Ph.D. degree in Philosophy.

STEWART DAVIS, lieutenant (jg) U.S.N., was married in July to Miss Jane Welliver Hooper at Kingston, Pennsylvania.

JOHN A. DRAKE is employed by Northrop-Hendy Company at Hawthorne, California, as a member of a Preliminary Design Group.

JOSEPH B. FRANZINI, now on terminal leave as a lieutenant (jg) U.S.N.R., will take graduate work in Civil Engineering at Stanford University. Joe was married in August to Miss Gloria Place of Pasadena.

WARREN GILLETTE is now studying medicine at the George Washington University in Washington, D. C.

SID GOLD, after spending the past few years with the Bahrein Petroleum Company along the Persian Gulf, has returned to the States.

FRANK GIVEN is employed by Bendix Aviation, and recently married.

ROBERT GREENWOOD is taking graduate work in Geology at Harvard University.

ROBERT F. HALL, former lieutenant USNR, served on the Aircraft Carrier U. S. S. Hancock. After being overseas two years, he was married a year ago to Miss Mary Martha Davies of Washington, D. C.

WENDELL HARTER and wife, Madelyn announce the birth of their first child, Lowell Wendell Harter, in June. Wendell is employed as a stress engineer at Northrop Aircraft, where he has been since graduation.

AL LANDON is now on inactive reserve status as an Army captain. Al was Depot Commander of general purpose vehicle pools in the area of Kitzinger, Germany for the last 10 of his 26 months overseas.

HARRISON PRICE, who is with Ingersoll-Rand, has just been transferred to Lima, Peru.

GEORGE P. SUTTON has been working with North American Aviation, Inc. as a research engineer since the middle of June. At present he is acing head of a small group of engineers working on certain special propulsion problems.

CAROL M. VERONDA reports the birth of a son, William Wayne Veronda, to his wife, June, in April. Carol is working for Philips Laboratories, Inc., in New York.

1943

ROBERT L. BENNETT was recently discharged from the Navy after two and a half years' service. Bob will be married in September to Miss Bobby Dehn of Oakland, following which the Bennetts plan to move to Pasadena.

MITCHELL H. DAZEY has been released from the service, and plans to take fifth year work in Engineering at Berkeley.

DAVID A. ELMER expected to be separated from the Navy in the first of August. His plans at that time included a brief vacation in Seattle and a return to his home in South Pasadena. He will enter the Institute in October for graduate work.

ED FLEISCHER is now on inactive status as a lieutenant (jg). Ed's ship, the Destroyer Cascade, recently returned from Japan.

LIEUTENANT BILL HALPENNY was in the Pacific in connection with the Atomic Bomb tests.

1944

E. M. ATCHISON is on terminal leave as an ensign.

WHEELER J. NORTH is now stationed in Osaka, Japan as a 1st lieutenant.

FREDERICK BEHRENS, lieutenant (jg) is now on inactive duty status after returning from Japan and Saipan on the YMS 407, which was decommissioned in Seattle.

WILLIS A. BUSSARD is employed by the Du Pont Company in Virginia.

FREDERICK B. ELY is working for Technicolor Company in Hollywood.

R. B. ESCUE received a special Grant-in-Aid this spring for the support of a research project on "Stereoisomerism of Synthetic and Natural Polyenes" at North Texas State College where he is on the staff of the Department of Chemistry. Before going to North Texas State, Dick was employed as a physicist for the Neches Butane Products Company.

DONALD A. KEATING has become associated with Turco Products as process engineer. Don is working in the Company's Chicago Office this summer, and will return to Los Angeles in the fall.

NEVILLE S. LONG will be a resident associate, instructor, and graduate student at the Institute, living in Fleming House, starting with the fall term. This summer he was an instructor in Surveying and Descriptive Geometry at U.C.L.A.

LIEUTENANT (J.G.) WARREN MARSHALL was discharged from the Navy in July. He planned to go to New England via the Grand Canyon and Yellowstone National Park.

THOMAS WILEY NORSWORTHY received his discharge from the Naval Reserve late in July.

RICHARD W. SEED is attending the University of Washington Law School in preparation for a career as a patent attorney. Dick was discharged from the Navy as a lieutenant (jg) in June.

DAVID R. SHEFCHIK is associated with T. J. Shefchik, Architect, as an assistant. Dave, formerly an assistant engineering officer in Destroyers, was discharged as an ensign in June.

PHILIP H. SMITH has recently taken a position as a design engineer with the Byron Jackson Company, Oil Tool Division in Los Angeles.

JOE SOLOMON received his discharge from the Navy early in July.

1945

MAX H. MOORE has received a position with the A. O. Smith Corporation in Los Angeles.

ENS. R. V. KNOX is an Airborne Radar Maintenance Officer with Airborne Early Warning Radar Detachment NAAS at Ream Field, San Ysidro, Calif. In the Fall of 1947, he plans to return to Tech for graduate work.

EDWARD R. ELKO is employed by the Johnson Foundry and Machine Company.

DON C. TILLMAN will be married in September, and plans to return to the Institute to work for his Master's degree.

BRUCE R. VERNIER is employed by Consolidated Vultee.

LAWRENCE HALL has accepted a position with Consolidated Engineering in Pasadena, Calif.

RALPH WINTER will enter the Theological Seminary at Princeton University this fall.

Discharged from the Naval Reserve this summer were ROBERT R. BENNETT, who plans to enroll for the fall term at C. I. T. after spending two months in Pomeroy, Washington; ENSIGN E. W. BOLSTER, who was stationed at Puerto Rico for seven months; NORM REUEL and BOB MORIN, who are working on propulsion problems at North American Aircraft; and JOHN M. SLYE, who is now in Cheyenne, Wyoming.

ROBERT D. MASON, who served as an ensign on the carrier Shangri-La, is now discharged and is living in San Jose. He was married in July to the former Miss Roe Ekstrand.

GARLAND S. TAYLOR, who served as public works officer at Guam and Okinawa, is now living in Pasadena.

RALPH S. WHITE, after seeing service in the Atlantic on an LSM, is now released from active duty and is working for Production Equipment Company of Los Angeles.

KENNETH STEVENSON, recently discharged from the Naval Reserve, has been employed by the General Electric Company at Schnecetady, New York.

DONALD BAKER DUNCAN was married this summer to Lavon Elaine Johnson of Whittier. They will live in Claremont while Mrs. Duncan completes her senior year at Pomona College.

1946

Members of the class of 1946 already finished with active duty are ensigns GEORGE W. BARTON JR., who plans to take further work in Chemistry; ELMORE BROLIN, who is planning to work for the Standard Oil Company of California in their Engineering Department; BERTRAM W. DOWNS JR., who will take graduate work in Electrical Engineering at Purdue; ROBERT FOOTE; HOWARD GREENFIELD; HAROLD L. SARMENTO, who started to work in July for Becktel Brothers and McCone Company in Huntington Park as a Survey Engineer; and TECK WILSON, who was married last February to Miss Elizabeth Morse of Pasadena.

GLYNN H. LOCKWOOD will be employed with Byron Jackson in Los Angeles.

HELIARC--

A "Bachelor" gas becomes a mighty tool of modern industry

Ingenuity is an important ingredient in any manufacturing formula.

Ingenuity gave the United States synthetic tires when chemists refused to be balked by the shortage of natural rubber. Ingenuity has replaced metal with plastics; has worked out natural substitutes for real silk and wool.

In many cases, the "make-do" substitutes have been rapidly improved until they are better than the original.

Welding engineers in the testing laboratories at Northrop Aircraft, Inc., applied ingenuity to a grave problem which faced the aircraft industry early in the war, when stocks of aluminum were running short. The result was Northrop's Heliarc welding process, which ultimately made possible the construction of all-welded, all-magnesium airplanes.

Magnesium, best available substitute for aluminum, was difficult to fabricate with a welding torch since it oxidized rapidly and flux was necessary for good weldability. Northrop technicians, seeking a simple method which could be adaptable to mass production, hit on the use of helium, the "bachelor" gas, so called because it does not readily "marry" with other gases. Helium will not support combustion.

Basic tool of the Heliarc process is a special welding torch. The torch tip is a tube, withe the carbon or tungsten electrode protruding from its center like the calyx of a lily. As the welder works, a constant flow of helium pours from the tube under pressure and bathes the weld, preventing oxidation.

Northrop, after developing this Heliarc process, licensed it to the Linde Air Products Co., a unit of Union Carbide and Carbon Corp., which since has sublicensed it to other manufacturers for peace-time use. During the war Northrop made full rights in the Heliarc process available to other war industries without fee.

Heliarc welding enabled Northrop engineers to pioneer in a new-type of aircraft. The XP-56 was built at Northrop entirely from magnesium, and was all welded. It performed satisfactority and proved the uses of magnesium in the aircraft industry as well as in other manufacturing.

Thus a process devised by Northrop engineers has made an abundant, light and strong metal available as a new source of supply for peace-time manufacturing.

Northrop Aircraft, Inc.

Builders of the BLACK WIDOW P-61 and Creators of the FLYING WING

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SEPTEMBER, 1946

This is the beginning of Indian Summer, which Webster defines as "A period of warm or mild weather late in autumn or in early winter."

In many parts of the Pacific Coast, this is the most delightful season for vacations. In San Francisco, for example, September and October are the nicest months of the year, the average temperatures over a seventy year period being 61.5° and 60.8° respectively.

Traditionally, the summer vacation season has always ended after the long Labor Day week-end, when the kids had to go back to school. But this vacation year is not normal.

If you were unable to take a vacation in the summer just past, remember that the long, lazy days of Indian Summer are yet to come. It is a season when trains and resorts are apt to be less crowded.

Think it over.

What's the Hurry?

All the publicity about faster and faster planes prompts us to ask, "What's the hurry?" Our ancestors, who were wise and able people, got their work done and settled the country with railroads. In some ways, it seems to us, they enjoyed life more because they never felt they had to split the seconds to get somewhere.

We believe there is a time and place for every form of transportation in America—plane, train, automobile, bus and steamship. But it seems to us that some are being over-emphasized in publicity at the expense of others.

The war demonstrated pretty conclusively that the railroads are the backbone of transportation in America. When the chips were down, only the railroads could handle the overwhelming volume of men and materials necessary to win the war.

Why?

The answer can be given in eight words: *You can pull more than you can carry.*

All other forms of transportation are, in effect, carrying their loads in their arms. Only the railroads pull theirs.

When it comes to freight, we can tie nearly a mile of cars to a single locomotive and roll 5,000 net tons at a crack. How many planes or trucks would it take to carry the same tonnage?

This basic advantage of the railroads in rolling tonnage is important to passengers, too. It means the safety and roominess of heavy steel cars.

Hotels on Wheels

After all, what *is* a train? Isn't it actually a hotel on wheels?

All long-distance Southern Pacific trains have a dining room (dining car) and a living room (lounge car). Our night trains have comfortable beds.

A train is the closest thing to hotel or home life that American overland transportation has yet achieved.

The train is safe, reliable, dependable—guided and guarded by thousands of vigilant men and women. It is protected by automatic block signals, and always linked with civilization by the telegraph wires along the tracks.

Best of all, the train clings to the good earth and shows you scenery in the proper perspective, at ground level.

New California Booklet

When winter comes, many residents of Oregon, Washington and British Columbia follow the birds to California and Arizona.

For Evergreen Playgrounders who feel this urge to go south, Southern Pacific has prepared a new booklet: "Next Time, Try the Train to California." It gives details about our faster, finer train service to California, and a few hints about things to see and do in the Golden State.

You can get a free copy of this booklet by writing Mr. J. A. Ormandy, 622 Pacific Building, Portland 4, Oregon.

New Streamliners Ordered

We are happy to tell you that orders have been placed with the Pullman-Standard Car Manufacturing Company for the first trains in Southern Pacific's post-war parade of streamliners:

1. The custom-built *Shasta Daylights*, two 14-car streamliners for daily daylight service between Portland and San Francisco, pulled by diesel-electric locomotives.

2. Twin custom-built streamliners for fast, extra-fare service between Los Angeles and Chicago. (Although the official name for this train has not yet been decided, it is already known throughout the Southern Pacific system as "The Superduper." Not a bad name, either!)

We've also ordered brand new three-car articulated lounge and diner units for the *Cascade* between San Francisco and Portland, like the ones on our streamlined *Lark* between San Francisco and Los Angeles.

Traveling with Children

Small children are so terribly alive and energetic that traveling with them can easily be a chore—unless you "try the train."

Children need lots of room to range around in, and trains have room in abundance. Also trains are safe, which is the primary consideration.

Your children are actually safer on the train than in their own home. Insurance statistics prove this.

Train travel is also economical for children. If they are under five years of age they ride free. From five to and including eleven, they ride for half fare.

There is ample room in a Pullman berth for parent and child, and no extra Pullman charge for the child.

Finally, Southern Pacific dining cars have special meals for children and a special, gaily illustrated Children's Menu, with amusing verses about the engineer, fireman, conductor and other men who operate the train.

We hope we never live to see the day when children fail to enjoy a train ride, or lose their interest in locomotives and trains. When that day comes something terribly important and fundamental will have departed from the American scene.

—H. K. Reynolds