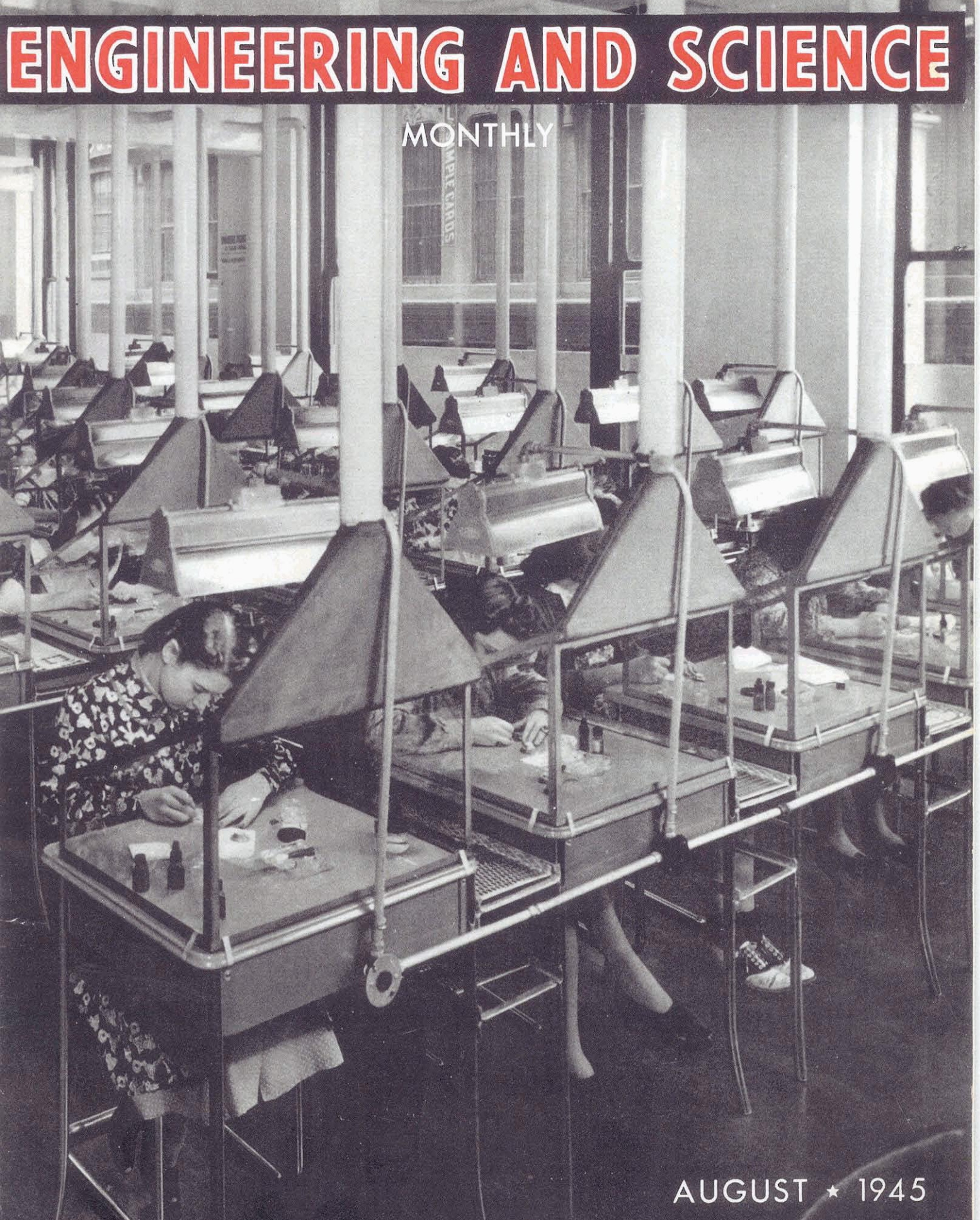
ENGINEERING AND SCIENCE

MONTHLY



AUGUST ★ 1945

PUBLISHED BY CALIFORNIA INSTITUTE OF TECHNOLOGY ALUMNI ASSOCIATION

This attractive, modern dry cleaning sales office has walls and ceilings of beautiful Douglas fir plywood. Curved counter treatment is accomplished with plywood, too, for this versatile "miracle wood" can be easily bent to simple curves without steaming and without the use of special tools.

No. 9 of a Series

Versatility is the Keynote when Walls are Finished with Douglas Fir Plywood

The design possibilities of Douglas fir plywood are almost endless. The illustration above suggests one use of the "miracle wood" — for walls, ceiling and fixtures in a modern dry cleaning sales office. The walls feature a two-panel treatment, arranged horizontally.

When planning walls of Douglas fir plywood, follow these basic principles: (1) start at the openings with vertical joints and divide the plain wall spaces in an orderly pattern for the most pleasing effect; (2) use vertical joints at top and bottom of windows and at top of doors as shown in figures A, C and G; (3) when width of door or window is over four feet, do not hesitate to place the panels horizontally as in figures B and E, for combinations are successfully used in the same room; for special patterns or patterns made up of small panels, sheath with 5/16" or 3/8" Plyscord and apply the finish panels as desired.

For additional technical data, see Sweet's File for Architects or write the Douglas Fir Plywood Association.

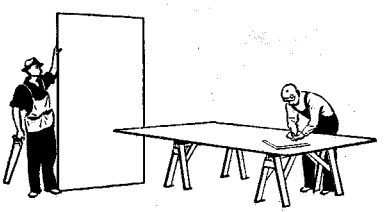
CAN PLYWOOD BE SPECIFIED NOW FOR POSTWAR USES?

The increased capacity of the industry will make MORE Douglas fir plywood available for civilian consumption THAN EVER BEFORE, as soon as the needs of the armed services lessen or war restrictions are lifted. There will be no reconversion delays; the same types and grades of Douglas fir plywood that are now being made can flow immediately into peacetime building and construction.

DOUGLAS FIR PLYWOOD
LARGE. LIGHT. STRONG.
Real Wood PANELS

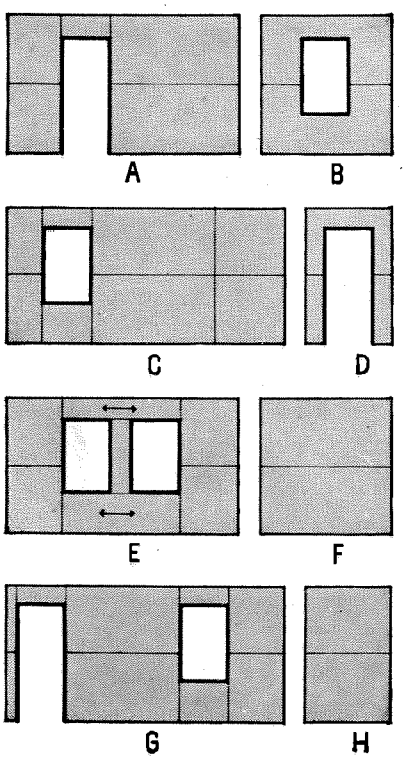
DOUGLAS FIR PLYWOOD ASSOCIATION

Tacoma 2, Washington



There are three grades of Douglas fir plywood panels made especially for various phases of wall construction. PLYWALL is made especially for standard wallboard use; PLYPANEL is a premium panel used for quality interior work; PLYSCORD is a utility panel made for wall and roof sheathing.

Simple Suggestions For An Attractive Wall Design With Plywood



BY-LINES

HORACE N. GILBERT

Professor Gilbert was graduated from the University of Washington with an A.B. degree in 1923. He also attended Harvard School of Business where he received his M.B.A. in 1926, remaining to teach for two years. Professor Gilbert joined the faculty of the California Institute of Technology in 1929, taking leave in 1942 to go to Wright Field as a civilian in the capacity of production supervisor. As associate professor of business economics, Professor Gilbert is at present on leave from the Institute on special survey work for the Government in Europe.

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Since graduation from California Institute of Technology in 1928 where he received his B. S. degree in chemical engineering, Major Ficklen has held executive positions with firms in the East and South. Since 1944, Major Ficklen has been an engineer in the United States Public Health Service, on loan to the Los Angeles County Health Department. Major Ficklen has authored, contributed and translated several articles on the subject of science.

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Professor Watson received his Ph.B. degree from Lafayette College, Easton, Pa., in 1914, and was associated with the University of Chicago in the physics department prior to coming to the California Institute of Technology in 1919. Professor Watson is now professor of physics at the Institute.

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Caption for Cover Illustration: Illustration showing ideal layout for radium painting laboratory. (See article by Joseph D. Ficklen III, pages 7-10.)

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Monthly
The Truth Shall Make You Free

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The Month in Focus

Technical Employment

WITH the surrender of the Japanese there are likely to be many employment changes among technically trained men. Those who have been on war research and production activities of known temporary character may well be wondering what the future has in store for them. While a crystal ball has not been developed by which such a question can be answered, an estimate of the situation may be of some value.

During the past four years there has been a constantly decreasing supply of technically trained men with a constantly increasing demand. At the time hostilities ended in Europe, some of the technical personnel began to inquire about changes of position in the hope of lining up work that would provide postwar employment. A rather small number of these individuals were successful, but on the whole regulations prohibited such transfers. With the cancellations of contracts, the situation is changed markedly. The staffs of industrial concerns are reduced somewhat in proportion to the decreased business. In many cases the men with the most experience and possibly efficiency are retained to carry the burden of reconversion or the development of new designs. Those who have been on war research projects will in the very near future be seeking new and permanent employment since their work was known at the beginning to be for the duration of the war. Men who have served under these conditions deserve honor.

At present and probably for several months to come, industrial and research organizations will be very busy in reestablishing themselves on a peacetime basis. During this period the demand for technically trained people will undoubtedly continue. The supply will be somewhat greater than heretofore and the demand may be somewhat less. However, there will probably not be enough personnel to fill all of the requests. Those who are picayunish may require a lengthy period before finding the type of position they are especially looking for. The salary situation may not be quite as attractive as it has been in the past few years and some may be very much disappointed in the result of their search for the ideal position.

After the period of early readjustment, the men of more recent technical training will be available. Those returning from service either will have completed their college training or will have completed some further training for the purpose of getting back into the technical field. It would appear that positions will be available for these men whose places will have been taken temporarily by older men who should be doing more advanced work. A recent survey made by the California Institute of Technology seems to indicate that a rather good proportion of the men who have been in service will go further with their formal education before returning to normal employment. A very large portion of those service men whose technical education was halted by their entry into the armed services are planning to continue with their college training. This all seems to give further strength to a moderately optimistic view of the employment situation for technically trained men.

Possibly what has been said here is too optimistic because the greatest demand seems to be for younger men. In view of the immediate unavailability of men less than 26 years of age, these positions must be filled by older men having more experience than the job may require. This situation may cause considerable difficulty for men who are in the age bracket of 26 to 30. Naturally, the whole situation will depend upon the character of the recovery to peacetime business. Let us hope that the experts are correct when they say that business will not be poorer than in 1939.

Technical or Vocational?

Many who have been and are actively participating in military operations have become for the first time more closely associated with activities involving technical skill. For many men, these associations have provided a real aptitude test whereby they have found that they do or do not possess a natural ability and liking for some technical skill. Previously, some of these men did not have the opportunity of testing their technical ability. Because of circumstances, they were forced into training along certain lines. Some were not adapted to certain fields and were transferred into other lines. Probably the largest number of these men possessed a high-school education upon entering military service;

(Continued on Page 16)

Prospects for Postwar Industry In Southern California*

By HORACE N. GILBERT

WHAT is to become of the greatly expanded war industries of southern California? Will they collapse and leave industrial wreckage in the form of serious unemployment, empty factories and corporate bankruptcies? Or will these enterprises convert to peacetime production and consolidate an important economic advance for southern California?

OPTIMISTIC APPRAISAL

The author's summary conclusion is an optimistic one. There is no doubt but that the effect of the war will have been to stimulate industry in southern California in a permanent way. In quantitative respects there will be a tremendous contraction, both in number of enterprises and in number of workers. Some contraction is desirable, if only to relieve the critical shortages in the area, especially as to manpower. In qualitative respects the effect of the quantitative contraction will be highly beneficial. The more poorly managed enterprises and the less productive workers can very well be dispensed with. What a wonderful feeling it will be for employers to be able to fire unsatisfactory workers again! We may look for the continued profitable existence of practically all well-managed concerns, although most will be substantially smaller than at their wartime peaks.

The key to the postwar situation is the competency of the management of the enterprises that must make the transition from war work. In recent years of experience in production work for the Army Air Forces, especially intensive in the case of southern California, the author has observed the operations of a large number of these enterprises. The war has lasted so long that most of these concerns have had a thorough education in production management. They started as war babies, but they have grown up to be "plenty smart." There is no doubt but that many of them will survive and make an important contribution to the industrial economy of southern California.

So much for the conclusion. What is the reasoning that has led to this optimistic appraisal?

RESIDENTIAL OR INDUSTRIAL AREA?

Before World War II southern California was preeminently a great residential area. The city of Los Angeles was one of the largest retail distribution centers of the United States. Its relative position in wholesale trade and in manufacturing was far less important than in retailing. Oil was the basis for most heavy manufacturing industry; motion picture production had been centered here ever since the industry began; aircraft manufacturing was becoming established as a major industry; the design and production of women's clothing was gaining national prominence; there was the long established complex of diversified industry based on the rich agricultural resources of the area. But southern California has been and probably will continue to be one of the preferred places in the United States for people to live in. This fact is basic in projecting the industrial pattern that is most likely to emerge. As yet, there has not appeared in this great residential population a distinctive industrial working class. In this regard Los Angeles differs from most large cities. This means that the industrial development of the area thus far has been in proper proportion to the broader development of the community. We may look for a continuation of such a desirable situation.

World War II superimposed an industrial distortion on southern California. German successes in 1939-40 in Poland, Norway, Holland, Belgium and France resulted in war orders which began to change the industrial balance of the local area. The Navy and the Maritime Commission made plans to build ships at Los Angeles Harbor, and the aircraft companies started on their remarkable expansion. The shipbuilding effort expanded from most modest beginnings, but Los Angeles was already the leading aircraft production center of the United States. Since the war began, several cities on both coasts have equalled or exceeded Los Angeles in shipbuilding, but no other community has approached it in the production of aircraft.

The aircraft and shipbuilding companies are the more apparent industrial activities so greatly expanded by war demands, but an area of expansion of especially great significance to postwar industry in southern California was that having to do with the hundreds and thousands of accessory enterprises. These concerns, large and small, supplied the complex needs for parts, materials, subassemblies, and services required by aircraft and shipbuilding companies. After the war, these companies cannot depend primarily on the aircraft and shipbuilding industries for their continued existence. Units of this group are ideally suited, however, to convert to peacetime operations serving the southern California economy.

But before giving special attention to this significant group of subcontractors, vendors, and accessory enterprises, let us look for a few minutes at the aircraft and shipbuilding industries themselves, to note their postwar prospects.

AIRCRAFT AND SHIPBUILDING

First, shipbuilding. The program in this industry already is being brought to a greatly reduced volume. The war effort has demanded an excessive overproduction of ships, measured in the light of peacetime needs. After the war it is probable that only a restricted and select list of yards will be kept in operation on the construction of new ships. The shipyards of Los Angeles may not be included on this select list, because of the possible relative advantage of other shipbuilding areas. Ship repair is another matter, however, and already shipbuilding facilities are being utilized increasingly for this purpose. In this regard Los Angeles undoubtedly has an important and secure future. The tremendous

*Presented at the Alumni Seminar, California Institute of Technology, 1945.

immediate flow of goods through Los Angeles Harbor will result in the use of a part of local shipbuilding facilities for ship maintenance and repair, and the continued employment of many of the more highly skilled shipyard workers. The long run prospects for this ship repair industry also are good. It is probable that the United States will maintain a merchant marine after this war at least double what it was before the war. The number of people required by the ship repair activities at Los Angeles Harbor will be only a fraction, perhaps 10 per cent, of peak wartime requirements, but they will include the skilled nucleus of craft and engineering specialists.

Second, aircraft. Southern California will remain the leading center of aircraft production in the United States for at least several years after the war. During each year of the war, approximately two-thirds of the total aircraft production has been directed by West Coast managements, although half of this amount was produced in Mid-West branches of West Coast concerns. At present the relative position of western concerns over eastern concerns in the national picture has increased. This concentration of an industry vital to the national defense in a geographically small and exposed location is, from a security standpoint, admittedly undesirable. Efforts will be made to secure greater dispersal. It is difficult to see a practical way to bring about such a relocation. The present tendency is, in fact, to return aircraft production to the mother plants, as war demands taper off.

The aircraft industry undoubtedly will contract severely, but there will be a continuation of substantial, balanced design, development and production organizations at each of the mother plants here in southern California. It is probable that local concerns will get more than their proportionate share of postwar business, at least in the immediate postwar years. Other factors which will cushion the shock of contraction after the war will be, first, the fact that work now subcontracted in the East to such companies as Briggs, Murray, Goodyear, Pullman and Hudson eventually will be returned to the mother plants, and, second, that production methods will be adjusted so that they will be economical for smaller output, with the result that more workers will be required to produce each plane that is built.

In spite of this substantial prospect for the mother plants of the local aircraft industry, tens of thousands of workers now employed will no longer be required. This group of displaced war workers probably will be less of a problem than laid-off shipyard workers. About half of the aircraft group will be women, many of whom will leave the industrial labor market.

ACCESSORY INDUSTRIES

Now let us consider the case of the large number of concerns which have grown up during the war to serve the aircraft and shipbuilding industries. The situation which brought them into existence—to increase the productive capacity of those holding direct contracts for airplanes and ships—will be reversed. Much work now subcontracted will be pulled back. In rare cases only, during the extensive war experience, did subcontractors prove to be as low cost in their operations as the airplane companies themselves.

The thousands of large and small concerns which have been active in war work in southern California fall into several groups:

1. Prewar companies which converted to war work. When the war is over these companies may be expected to return to their former line of operations. In some cases this may mean a severe reduction in size. Many of these concerns will be tempted to retain the large scale of operations to which the war has accustomed them. They may use their normal civilian work to hold their organization together while they experiment with new work.

2. Prewar and new wartime companies whose line of operations during the war can be expected to continue, on a curtailed basis, after the war. This will be the case of a considerable number of manufacturers of aircraft fittings, for example. Los Angeles has become such a center for the aircraft industry that manufacturers all over the United States may be expected to place orders with specialty manufacturers here.

3. Wartime companies whose entire business will disappear after the war. This group constitutes the heart of the problem. It includes sheet metal fabricating and assembling enterprises and many machine shops. The shortage of facilities to do machining became so critical in 1942 that a tremendous expansion was undertaken. In 1944 a condition of excess capacity existed, and some of the less successful enterprises went out of business. The prospect for many more of these machine shops after the war is not good. In few cases are they capable of manufacturing a complete article; so they must depend upon job contracts from others.

With this quick view of the wartime expansion of industry in southern California in mind, let us now turn to the industrial opportunities that will exist in peacetime lines after the war.

OPPORTUNITIES

It must be remembered that the local metropolitan area is one of the densest and richest retail markets in the United States. After the war there will be a tremendous pent-up demand for a large assortment of the articles that are familiar to every household. Professor Slichter of Harvard University has estimated that there is an accumulated need for 3,500,000 vacuum cleaners, 7,200,000 electric clocks, 23,000,000 radios, 5,000,000 refrigerators, 10,300,000 electric irons, 3,000,000 washing machines, 1,500,000 waffle irons, 1,800,000 heating pads, 3,700,000 percolators, 4,500,000 toasters, and he has noted that there are now 7,000,000 fewer automobiles in the country than there were before the war.

Southern California's share of these accumulated needs would make an impressive volume of business. Some lines, such as automobiles, probably could not be developed profitably on a local basis, but others present genuine opportunities. Eventually, nationally known trademarks probably will regain much of their former market, but for at least three years the prospect is that demand will surpass supply, and well-managed local enterprises might enjoy considerable success. The shelves of stores are bare, customers are now not as discriminating as they will be and normally are, and the great manufacturers for the national market will find it difficult to move fast in accomplishing the transition to full peacetime operations.

In addition to the manufacture of established types of articles, the door will be wide open after the war to exploit commercially the many techniques and situations that have been developed during the war, some of them revolutionary. Among these are cheap and plentiful aluminum and magnesium, improved and plentiful alloy steels, tremendous quantities of cheap electric power, high octane fuels, rapid advances in petroleum chemistry, especially in relation to such applications as synthetic rubber, rapid advances in the field of plastics, marked steps forward in radio, especially radar and

television, jet and rocket propulsion and the gas turbine. Professor Slichter has referred to this war as the most remarkable of all time for the number and the significance of the technical developments, taking place while it was being fought, which have peacetime applications.

With such a variety of industrial opportunities on every hand, why should any competent war enterprise have to fold up? What is necessary to make the transition to peacetime work? The answer, simply stated, is good management; management with foresight and management with breadth of understanding of all of the factors involved. There will be two special problems which are probably new to most war industries: product design and sales management. During the war there has been but one customer, the government, and normally it or the prime contractor provided the detailed specifications for the product. These two functions, product design and sales, must he recognized by the war industry with peacetime ambitions.

Let us turn for a moment to an aspect of the general problem of conversion to civilian production. Much will depend on the time that is afforded to make the shift. A good start already has been made. Last summer and fall, spot authorizations to make certain civilian goods were granted by the W.P.B. The declaration by the Navy that shipbuilding was to be curtailed meant that the labor market would ease. The announcement that B-17 production at Lockheed and at Douglas Long Beach was to be reduced 50 per cent removed pressure from a large number of subcontractors and gave them more time to work out alternate plans. If Japan had held out for any considerable time, there would have been a minimum of shock to war industries and a maximum of opportunity to make an orderly transition to civilian goods production. The war in the Pacific exerts a tonic effect on all West Coast cities because of the tremendous volume of war goods that flows through them.

PROSPECTS FOR LOS ANGELES

We have been told that Los Angeles will play an important role in the promising future of the Pacific area. This opportunity is great indeed, both in manufacturing and in trade, but there is a big "if" as to its fulfillment. If the world has really learned how to live together in peace as the result of this horrible war, then world reconstruction can be accomplished rapidly. Los Angeles will need all of its industrial resources to serve not only the rising standard of living in the Pacific area, but all over the world. It remains to be seen whether the political climate of the world is ready for this constructive possibility. Unless thinking on international matters hecomes much sounder than it was before the war, the future of Los Angeles in so far as foreign trade activity is concerned will be modest indeed.

It may be disappointing to some that the author has not spoken of the possihility of the aircraft companies' taking up some line of activity other than the manufacture of aircraft. Such a step would be unwise. The aircraft manufacturers have excellent productive talents and some of the production techniques are readily applicahle to other lines of goods. With the war at an end, however, competition will not he largely on a production basis. It will shift to product design and to sales. If some of the great national concerns with established distribution organizations were to arrange with aircraft manufacturers for the production of articles consisting largely of sheet metal, especially aluminum, it would make sense. This would be the case in such lines as metal furniture, bus and trailer bodies, and display equipment. It is probable, however, that non-aircraft companies will be as well or better situated to take on this kind of work. There does not seem to be much possibility for any substantial development along this line. One may rightly hope that the aircraft companies will stick to their field. The aircraft industry itself has tremendous peacetime potentialities; there are probably no pastures greener than those of the aircraft industry during the next few years.

We hear frequently of the possibility of the establishment of new industries here in southern California as the result of the war. This may be; the Kaiser steel plant at Fontana is an example. Judged on an economic basis, this venture may be regarded as a war industry. Its adaptation to the peacetime economy of the southern California area probably will be a political football for years to come, much as Muscle Shoals was after World War I. Mention has been made of the possibility of establishing completely integrated automobile manufacturing activities on the West Coast. This is not an impressive possibility. The prewar practice by Ford, General Motors, Chrysler and Studehaker of assembling automobiles on the West Coast may be carried a step or two further; a body manufacturing plant, for example, might be located here. The great automobile plants probably will decentralize operations away from their present Michigan centers and the West Coast may get a few additional subassembly operations. This is all that one may look for along the automobile line. During the war Pasadena has become a substantial center for the manufacture of scientific instruments and gauges. This industry has favorable peacetime possibilities.

THE LABOR SITUATION

An important factor in the conversion of wartime industries in southern California will be the attitude of organized labor. Los Angeles owes much of its progress and present superior economic status to the situation that has existed as to the non-militant policy of labor. Much of this growth has been at the expense of West Coast cities where labor attitudes have discouraged industrial location or expansion. The prospect of labor peace in southern California continues to be good. The labor movement locally has progressed during the war in a statesmanlike manner. As a result, it is in a position to deal constructively with the great problems that will be encountered in the conversion of war industries, not the least of which may be the reduction of labor costs through wage cuts. Los Angeles characteristically has heen a difficult labor market for unions to control. It is probable that this basic condition will continue. We need but look at the armed-camp situation between industries and unions in Detroit today, to appreciate how fortunate is Los Angeles in this respect.

ENGINEERS AND SCIENTISTS

In conclusion, a special point may be made of the role that engineers and scientists can play in this adjustment of southern California industry to postwar operations. They can take a leading part in solving the technical problems of product design and of engineering sales which companies will encounter when they take up the production of civilian goods. Whether in a laboratory or in an administrative capacity, one may hope that they will make the unique contribution to the solution of this critical industrial problem of which they, as engineers and scientists, are capable. There is an opportunity for them to profit in personal and professional ways, as well as to fight a significant battle to win the peace.

Safety Practices in Chemical Laboratories

By JOSEPH B. FICKLEN III

THE practice of safety in a chemical laboratory is not essentially different from that in an industrial plant. However, much has been overlooked in many chemical laboratories with regard to an adequate safety program. It is worth while to point out the following accident figures for chemical laboratories as reported by the National Safety Council for the period 1939 to 1942, inclusive. For every 89 injuries reported there was one fatality. Furthermore, for every six injuries reported there was one accident causing permanent partial disability. Also there was a 35 per cent increase in the total number of injuries during the year 1942 over the number of injuries reported in 1941. It is unfortunate that later accident figures are not now available; but if general accident trends in regard to both accident frequency* and accident severity** in the nation be any criterion, it is safe to say that there has been a substantial increase in both frequency and severity of accidents in chemical laboratories during 1943 and 1944 over 1942.

Generally speaking, the drive for increased production is associated with increased accident frequency and severity in normal industrial operations. On this score alone, it would appear that chemical laboratories should not have such an unfavorable accident record as that cited above, inasmuch as in many laboratories speed is not of the essence as in the manufacturing plant proper. It appears that the unfavorable experience in chemical laboratories is largely due to the lack of proper instruction and supervisory control over the laboratory worker. It has long been an established fact in accident prevention work that a guard placed in the worker's mind is worth many tangible protective devices. In other words, if the worker is taught to think safely so as normally to perform operations with care, the best accident prevention results are obtained. Obviously, proper instruction is essential to such a program.

There are many ways of providing and following up such instruction, some of which are not nearly as effective as others. This question of effectiveness, or whether a safety program, to use a slang phrase, "has teeth in it," is the crux of the more important portion of an entire safety program for a chemical laboratory.

MANAGEMENT'S ATTITUDE

The most effective and easiest way to achieve the desired result, whether it be from the professorial viewpoint in the case of high school, junior college, or seat of a higher education, or the directorial, as in a commercial plant laboratory or a consulting laboratory, is for top management to convince the student or the employee that management is definitely interested in safety and intends to see operations carried out in a reasonably careful manner. Some readers of this article may recall from student days, a certain incident wherein a professor brought home a definite point by individual instruction, and realize that this point is remembered through the years on account of that particular incident. Similar conditions apply to the instillation in the individual of safety practices. It is not enough for top management to sign a few notices to be placed on the bulletin board once in a while with regard to safety. This action may relieve management's conscience, but all too often the reader of the bulletins is making the mental reservation, "I don't believe the old man would do it that way himself, and why should I?" What does achieve results is top management's visiting the workers' table, and, if something is wrong or unsafe, calling attention to it and having it corrected then and there. Such incidents, even if infrequent, carry the most weight in driving home a safety program, and the news of their occurrence spreads rapidly among other workers. Workers begin to realize that safety practices in their laboratory are worth while and are not to be taken lightly. The following example will accent this important point.

A certain large company, which has had an enviable safety record, was called upon to operate a shell loading plant. The particular shell to be loaded was regarded as being in the more hazardous category. The operation

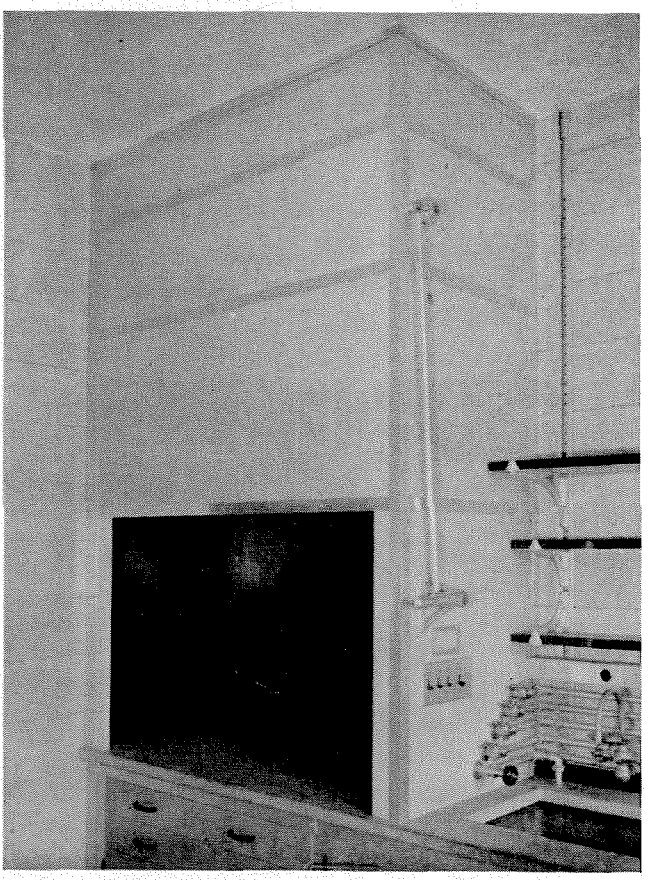


FIG. 1*. Hood provided with exhaust system. Note that water, gas, oxygen, air, and vacuum lines are aranged so that connections can all be made inside hood.

*(Illustrations courtesy National Safety Council.)

*Accident frequency: The accident frequency rate is the number of lost time injuries per one million man hours of exposure. A lost time injury is defined as occurring when an employee stays away from work on his next normal shift after the accident. Also, where a permanent partial disability is involved, even though no actual lost time occurs, this is counted as a lost time injury.

**Accident severity: Accident severity is defined as total lost time, including both actual lost time and also time charges, where death or permanent partial disability is involved, times one thousand divided by the number of man hours of exposure.

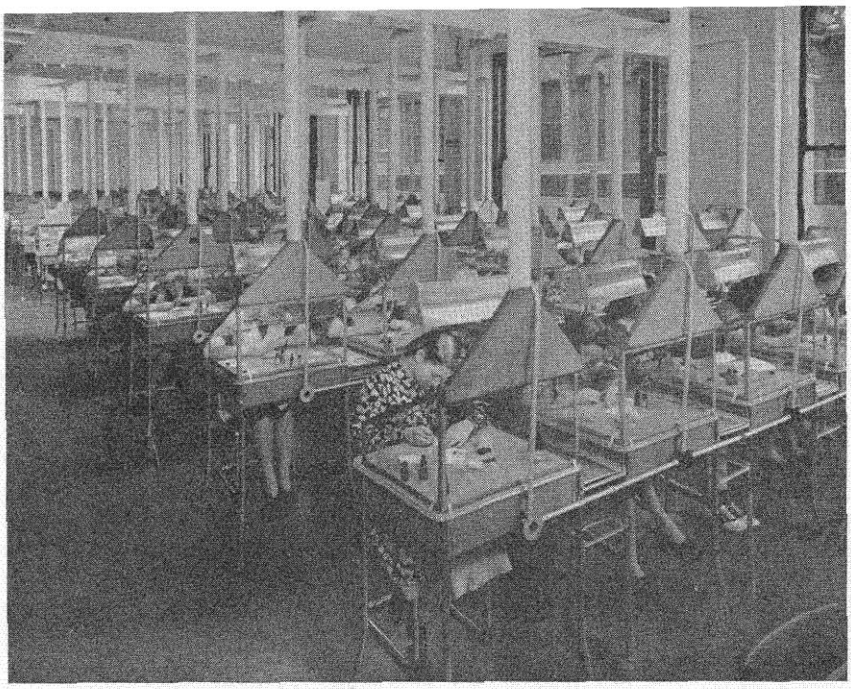


FIG. 2. Illustration of an ideal layout for a radium painting laboratory.

was new to this company. Although the company had operated other munition plants in a different manner, the lines of plant management at this location had been set up in such a way that the safety director had equal rank with the production manager, the chief engineer and the technical director. Furthermore, although the latter three were directly responsible to the factory manager, the safety director was not responsible entirely to the factory manager but more directly to his superior, the division manager. This was one of the numerous steps taken to see that the plant functioned in as safe a manner as possible.

Just after the plant had started, an incident happened which also had a great bearing on convincing all the workers in the plant that the management was sincerely interested, as it had often stated, first, in safety; second, in quality; and third, in quantity of production. The chairman of the Board of Directors of this company paid a visit to the plant. After the visit, he himself advised the safety director that he believed too much powder was being allowed in certain portions of the plant. Obviously, such a happening provided the safety department with the most potent means of convincing all employees in the plant of the sincerity of management's regard for their welfare, and, since this was so, of making it clear that they as employees must cooperate in every way possible to see that through no careless act any hazardous condition was allowed to exist.

As a result of this attitude, the Army and Navy Production "E" was obtained in relatively short order, and this was followed in another very short period by a second "E" award. Also, during 20 months of intensive operation no one was killed at the plant; whereas in another plant, making the same number of similar shells and employing approximately the same number of people over the same period of time, in the neighborhood of 40 persons were killed and many others were maimed.

Forgetting for the moment any humanitarian consideration, obviously the economic saving alone was well worth the effort involved.

Concomitant with top management's interest in safety in the laboratory must go its own example in safety matters. In other words if the laboratory director or supervisor conducts laboratory experiments, he "must practice what he preaches." Many seasoned safety engineers can estimate almost precisely just how carefully a plant will be run by observing the behavior of top management in regard to a safety program, and the conditions which management allows to exist in its own immediate office or laboratory.

A considerable portion of this article has been focused on the supervisory control of accidents, as experience has shown that most can be done from this angle with the least expenditure of effort. Many insurance men have stated that they would rather insure a plant where the executives are safety-minded, even if the plant processed hazardous materials with relatively poor physical safeguards, than a plant where the best physical protection was provided but where the executives, and naturally in turn the employees, were not safety-minded. However, in general what happens is that if safety-mindedness permeates top management, precautionary measures of a physical nature become apparent throughout the entire laboratory area, and the whole becomes cleaner and more businesslike, and hence the physical attributes which are guards from a safety point of view are obtained subconsciously.

SPECIFIC RECOMMENDATIONS

With regard to the betterment of these physical conditions, certain definite safety ideas have been developed in chemical laboratory buildings which are worth enumerating. The buildings in general should be of fire-resistant construction. Locations where flash fires or explosions are likely to occur preferably should be on the ground floor. Also, apparatus in connection with which such accidents are most likely to happen should

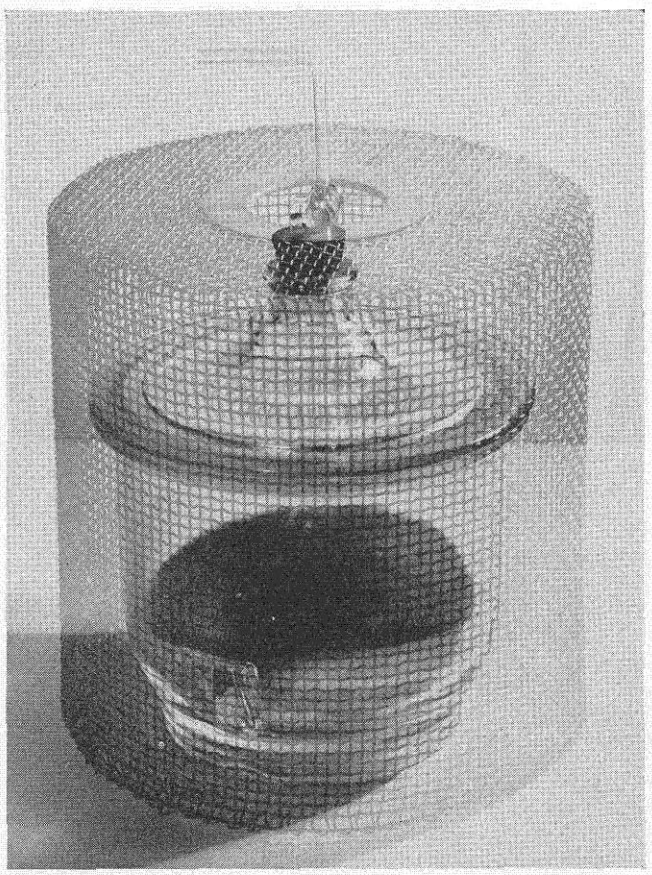


FIG. 3. Illustration of a vacuum desiccator, provided with an asbestos cushion for sulfuric acid as well as an over-all protective screen.

be placed as far as possible from exits. There should be two exits for each floor, located on opposite sides of the building. Exit doors should open outwardly and should be provided with a clear wire glass in the upper panel.

Laboratory exhaust ventilation system requirements may vary a great deal, dependent upon the use to which the laboratory is put. For example, small laboratories in which analyses of simple solutions are made may require exhaust ventilation only where hydrogen sulfide is handled; while in large industrial laboratories the complexity of the ventilation problem approaches that of a chemical manufacturing plant. Ventilation systems should meet local and state requirements. If there are no requirements, then those of the American Standards Association Code for ventilation, where they apply, should be followed. It is advisable to have inlets and outlets at both top and bottom of laboratory rooms, so as to take care of gases both heavier and lighter than air. A sufficient number of air changes per hour should be provided to hold any toxic air contaminants down below the generally accepted maximum permissible limits. Exhaust hoods should be arranged so that a face velocity of at least 60 linear feet per minute is available at all times. A well arranged hood is shown in *Fig. 1.*

All ventilating equipment should be arranged so that there is no possibility of the effluent air from one system contaminating the incoming air either in the same system or in other systems. Provision should be made for the periodic checking of systems to see that they are actually functioning as designed. One interesting case of the improper use of adequate ventilation came to light recently in a laboratory in a synthetic rubber plant. Here titration work on synthetic rubber was conducted, using hot benzene as the medium. After titrating, the entire contents of the flasks was dumped into a metal garbage can, which was located in such a way that the fumes of the can were drawn by the suction of the exhaust hood in which the titration was conducted directly past the breathing zone of the titrator.

The bearing that correct illumination has on safety is important. Noteworthy is the fact that over the past 20 years the minimum standards in lighting have been raised continually and now levels higher than 50 foot candles are often recommended for laboratory work. The periodic cleaning of skylights, windows and artificial lighting units is a point which is too often overlooked in chemical laboratories.

GOOD HOUSEKEEPING

Under the heading of good housekeeping there are several important points. The first is that the laboratory should be kept clean. There is no reason why a chemical laboratory cannot be kept as clean as an ordinary office. Every collection of residues or other dirt which is allowed to remain at a chemical laboratory is a potential source of trouble.

A second requirement to observe is that operations be carried on with minimal amounts of material, and that other chemicals be not allowed to remain in the work place when they are not needed. Too often one sees in a chemical laboratory, for example, a can of ether which has been allowed to remain near the worker. Yet, from the deposit of dust on the cork of the ether can, it would appear doubtful whether that particular can has been used for months.

Another point is the disposal of waste materials, especially such items as volatile solvents and broken

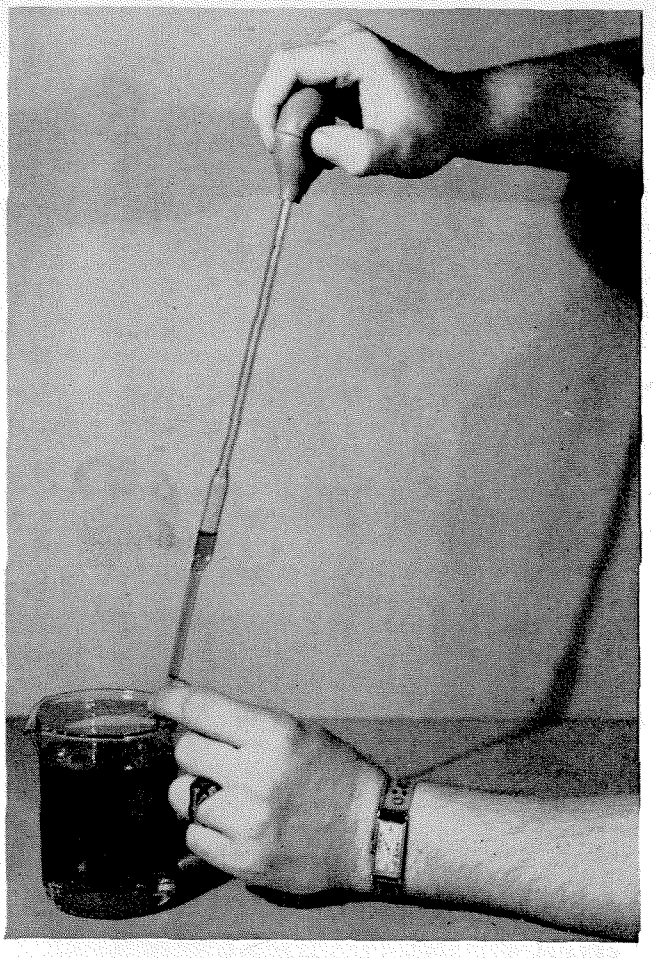


FIG. 4. A suction bulb used for the filling of a pipette.

glassware. The dumping of volatile solvent residues down usual drains cannot be condoned. There are too many cases where serious fires and accidents have occurred through such a practice. Separate closed containers should be provided for the disposal of this material. Where there is any extensive hazard involved in its disposition, the ordinary janitor service should not be relied upon but someone conversant with the hazard involved should be assigned to the handling of this material.

Fig. 2 shows a laboratory engaged in painting radium dials. Just recently such a laboratory was found upon inspection to conform satisfactorily to standard ventilation and illumination conditions, as shown in this picture. However, a wastepaper container, like the one shown in the picture, was used for the disposal of small pieces of wiping paper with which the employees cleaned traces of radium paint from objects. Readings taken on this wastepaper basket with a radium evaluation instrument showed an exposure equivalent to 250 micrograms of radium in the paint accumulations on the side of the basket. Furthermore, it was found that the contents of this basket was given from time to time to the ordinary janitor, and that he was permitted to dispose of this waste in a backyard incinerator. Such conditions as these bring out the great importance of following through on waste disposals from a chemical laboratory.

The segregation in the laboratory of broken glassware from other waste materials often will protect the janitors from needless cuts.

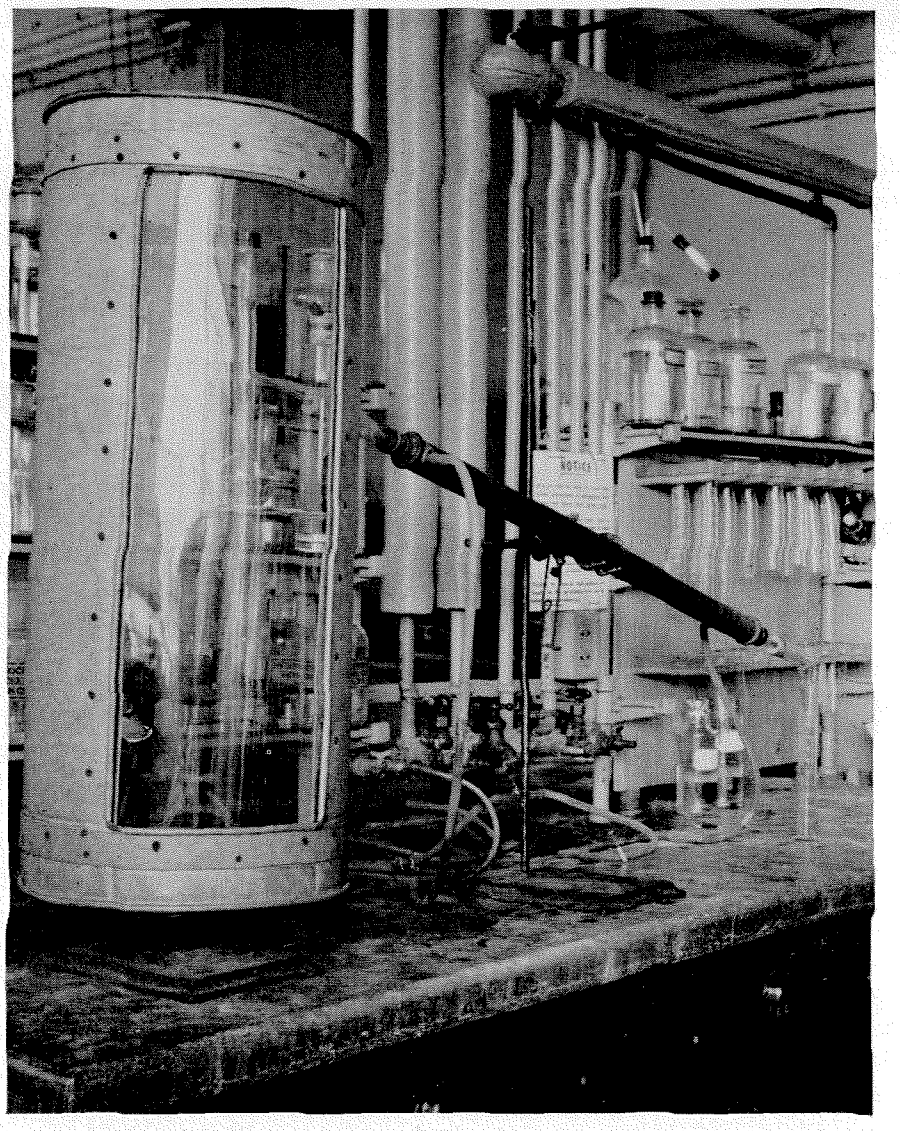


FIG. 5. A well-designed guard for a laboratory distillation process.

It is often desirable, because of the importance of this general subject of housekeeping, to have work in the laboratory arranged so that the last 15 minutes of the day are available for each worker to clean up the area in which he has been working.

The storage of chemicals and apparatus in a separate storeroom should come in for close scrutiny. Heavy articles should be stored as near the floor as possible. Glass apparatus should be stored so that ends do not project beyond the shelves. Glass tubing should be stored horizontally and kept off the floors. Shelves should be provided with copings to prevent chemicals and apparatus from sliding or rolling off. Chemicals which might react together to give off dangerous fumes or cause fire or explosion or accidental breakage should be stored remote from one another. Many points regarding certain hazardous chemicals cannot be covered in this article. However, information on good practice in the storage of these materials can be obtained from such sources as the National Safety Council, Safe Practices Pamphlet No. 60, titled "Chemical Laboratories."

Fire protection requires that protective equipment be provided to meet the needs shown by an actual survey of the particular laboratory. In general, extinguishing equipment should be placed in the hall room. If placed in the laboratory proper, it should be near the door and away from the principal fire hazard. It is very important that employees be trained in the proper handling of fire extinguishing equipment. The proper handling of a fire extinguisher or fire hose has been found to be considerably different from the usual employee's conception of what he would do with it if he had to use it. Actual use of the equipment at periodic intervals by the workers is most desirable. All fire protection equipment should be examined at regular intervals to see that it is in good working order, and portable extinguishing equipment should bear tags showing inspection dates.

Close supervision to see that bottles are adequately labeled and that they are opened correctly will more than adequately pay for time spent. The fire polishing of glass tubing before use should be insisted upon as well as safe methods of inserting glass tubes in stoppers, as through the use of a cork borer.

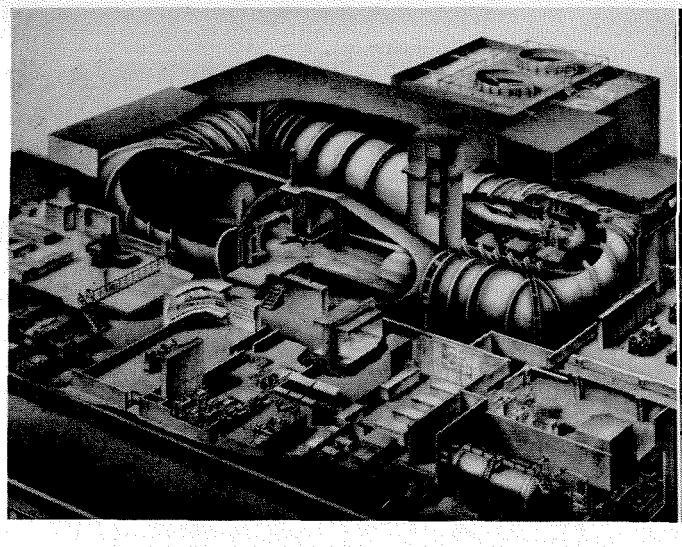
One or more drinking fountains should be installed. The practice of drinking from beakers is dangerous and has caused fatal accidents. The bubbler type of fountain, equipped with a control valve, is preferred because it has proved ideal for irrigating the eyes in case of burns from an acid splash.

Wells of desiccators may be more adequately protected by being incased in a metal guard. If sulfuric acid is used as a drying agent, an asbestos cushion in the well can be used to advantage. Vacuum desiccators, as well as other glassware in which a vacuum is created, should be tested for use under a higher vacuum than is normally used.

The customary use of pipettes is hazardous; most pipetting of common corrosive liquids is done by using the lips at the top of the pipette. *Fig. 4* shows one of the simplest substitute methods by which this operation may be freed from the principal risk. More aspirator lines provided with convenient taps may also be employed. Considerable attention can be given to designing protective equipment around distilling operations. A well-designed protective equipment for such an operation is shown in *Fig. 5*.

This article has sketched a rough outline of some of the more important ways of ameliorating the potential hazards in and around a chemical laboratory. However, after all is said and done, the over-all successful attack on the safety problem in the chemical laboratory depends largely upon the effective selling of the program by top management to the individual worker. Once this is done, then through cooperation there easily follows the adaptation and use of proper laboratory precautionary technics. Broadly speaking, the two most important elements involving these technics are:

1. Good housekeeping;
2. Cutting down to the minimum the amount of hazardous materials around the worker.



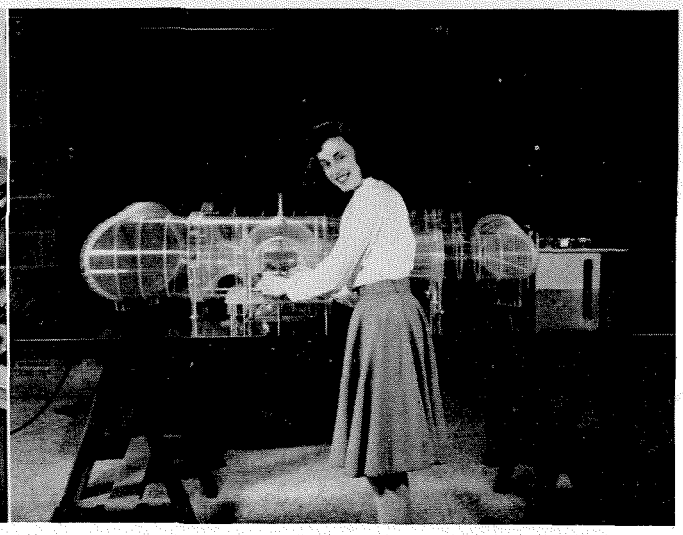


FIG. 1 (at left). Model of Curtiss-Wright Wind Tunnel, Buffalo, New York. FIG. 2 (at right). Working model, made of lucite, Curtiss-Wright Wind Tunnel (one-thirtieth scale).

THE CURTISS-WRIGHT WIND TUNNEL

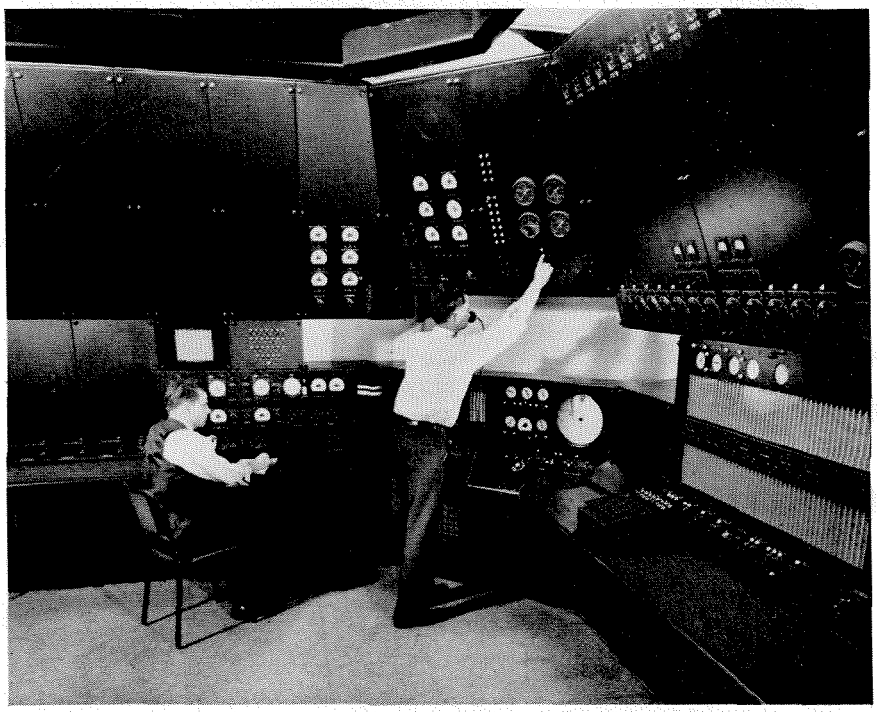
A NEW WIND TUNNEL, basically of the same design as that of the Southern California Cooperative Wind Tunnel, has been constructed at Buffalo, New York, by the Curtiss-Wright Corporation and is expected to be in operation soon. The design costs for this tunnel and the Southern California Tunnel were divided between the Curtiss-Wright Corporation and the Southern California group. In view of the similarity of the basic design, the two tunnels are essentially the same, differing in a few respects.

The arrangement of the Curtiss-Wright Tunnel is shown in *Fig. 1*. The model shop is shown at the left in the photograph. An exact working replica of the tunnel, made of lucite, is shown in *Fig. 2*. The model, built to one-thirtieth scale of the tunnel, duplicates in every detail the operation of its prototype, even to the operation of the air locks. The console from which the Curtiss-Wright Tunnel is controlled is shown in *Fig. 3*.

The new tunnel is housed in the Research Laboratory with complete facilities for aeronautical research. The laboratory also houses altitude chambers which make it possible to simulate the pressure and temperatures encountered at any altitude. In order to care for the many problems associated with aeronautical research, there are wood and machine shops, a hydraulic laboratory, a metallurgical laboratory complete with controlled-atmosphere furnaces, a physics laboratory, a completely equipped chemical laboratory, wood and plastics laboratories, as well as a technical library.

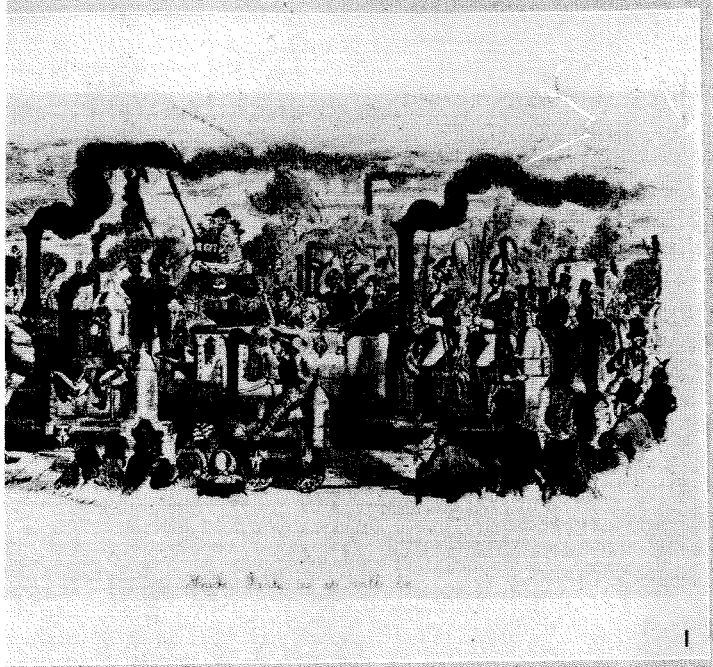
This laboratory is under the direction of Dr. C. C. Furnas, formerly associate professor of chemical engineering at Yale University. The testing and initial operation of the new wind tunnel are under the direction of Marc A. de Ferranti, formerly associated with the General Electric Company at Schenectady.

The new tunnel not only will serve as a "proving ground" for the Curtiss-Wright Corporation, but it will also be in a position to serve as a testing laboratory for other eastern airplane manufacturers.



AT RIGHT:

FIG. 3. Console of control room, Curtiss-Wright Wind Tunnel, Buffalo, New York.



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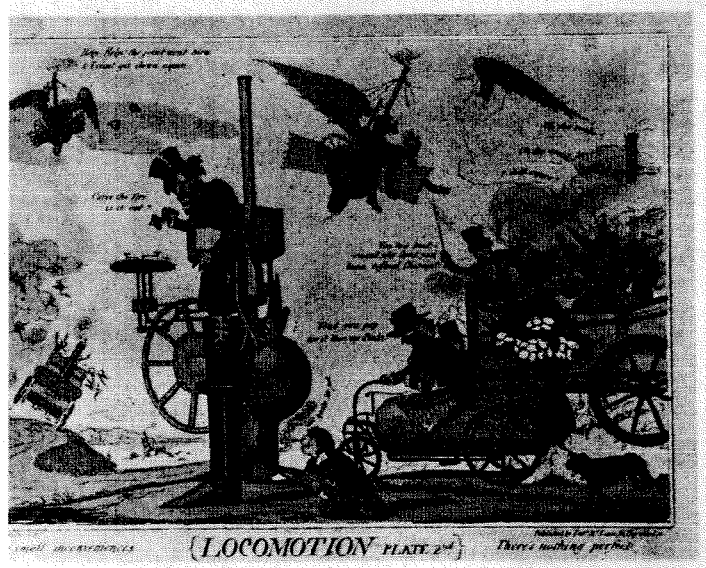


3

REPRODUCTIONS OF PRINTS, DRAWINGS AND PAINTINGS

3. Caricatures of Early Steam Coaches[1]

By E. C. WATSON

THE interest that developed in England about 1830 in steam vehicles is reflected in the many caricatures of steam cars which appeared at that time (11 of these are reproduced here). While it seems to be human nature to ridicule new inventions, it will be seen that the new steam carriages fared rather well in these caricatures, which are on the whole truly humorous and often prophetic, rather than merely truculent. Some of the coaches are, it is true, shown exploding violently, but actually boiler explosions were not infrequent, even if only one fatal accident is recorded.

[1]Reprinted with a few changes and additions from *The American Physics Teacher* 6, 260 (1938).

GOING IT BY STEAM.

6

SOMETHING WRONG.

8

Enough the filthy fellow my Dear, the Witch feeds his Horse with Common Coal.

THE PROGRESS OF STEAM.

9

In the early 1830's steam coaches operated successfully as public carriers in London and on some of the main coach roads of England. Public sentiment against them was aroused, however, by the stage owners and drivers who feared that they would be robbed of business and by the farmers who anticipated the loss of a market for their horses. The "steamers" were ridiculed and even stoned and trenches were dug across the roads to impede their progress. In 1836 the English Parliament passed a law requiring that a steam coach should be preceded by a man on foot with a red flag to warn people on the road, and also permitting such heavy tolls on steam vehicles that operation at a profit became impossible. At the same time the steam railways with their higher speed were taking more and more of the passenger traffic and proving so profitable that business enterprise turned to their development. As a consequence, by 1836 the mechanical road carriage was practically abandoned in England; its further exploitation has taken place mostly in America, France and Germany.

One of the caricatures here reproduced *(Fig. 1)* is by John Leech (1817-1864), best known for his woodcuts in *Punch*. Another *(Fig. 3)* is by Robert Seymour (1800-1836), the first illustrator of *Pickwick* and the creator of the types of Pickwick, Winkle and Tupman upon which no successor has contrived to improve. The series of four *(Figs. 8-11)* entitled "The Progress of Steam" was executed by Henry Alken (fl. 1816-1831), famous for his sporting prints. The artists who executed the rest are unknown as the signatures "Shortshanks," "Sharpshooter," etc., are obviously pseudonyms. The originals are colored, are approximately nine inches by 13 inches in size, and were published by Thomas McLean, 20 Haymarket Street, G. Humphrey, 24 St. James Street, and G. King, Chancery Lane, all of London.

C. I. T. NEWS

DOCTOR ROSCOE G. DICKINSON

DR. ROSCOE GILKEY DICKINSON, professor of physical chemistry, and acting dean of the graduate school at California Institute of Technology, died on July 13 after a brief illness. He was 51 years old.

Dr. Dickinson was an internationally known scientist. In America, as well as abroad, he was well known for his early work on the determination of the structure of complex crystals by use of X-ray and for his study in the field of photo-chemistry.

He received his bachelor degree from Massachusetts Institute of Technology in 1915, coming to California Institute of Technology in 1917 as instructor of chemistry, receiving his doctor's degree in 1920. This was the first Ph.D. degree conferred by the Institute. He was a National Research Fellow from 1920 to 1923.

Since outbreak of war, he devoted full time to war research problems in connection with the Office of Scientific Research and Development.

Dr. Dickinson, who made his home in Pasadena, is survived by his wife, a daughter, and a son who is a lieutenant in the Navy; also a granddaughter.

ADMINISTRATIVE REORGANIZATION

JAMES R. PAGE, president of the Board of Trustees of the California Institute of Technology, on August 20 announced a reorganization of the administration of the Institute.

Dr. Robert A. Millikan, who has been at the Institute since 1921, will retire as chairman of the Executive Council and become vice-president of the Board of Trustees.

Most of the administrative work of the Institute has been carried on by the Executive Council in the past. With this change in administration, the Executive Council is replaced by an Executive Committee which will be composed of members of the Board of Trustees and some staff members of the Institute. The staff members will consist of Dr. William V. Houston, Dr. Linus Pauling, Dr. J. E. Wallace Sterling, Dr. Clark B. Millikan and Dr. Richard C. Tolman.

The Board of Trustees is in process of selecting an administrative head for the Institute, who will be designated as president. Dr. William B. Monroe, who has been Edward S. Harkness Professor of History and Government and member of the Executive Council, will become Treasurer of the Institute. He will become emeritus professor to lecture on such subjects as he may desire. Dr. Max Mason, who has been chairman of the Observatory Council and a member of the Executive Council, will continue as chairman of the Observatory Council.

While Dr. Millikan will retire from the administration of detail matters, his continued association with the Institute as vice-president of the Board of Trustees will assure continuity and maintenance of high standards.

PRESIDENT'S REPORT YEAR 1944-45

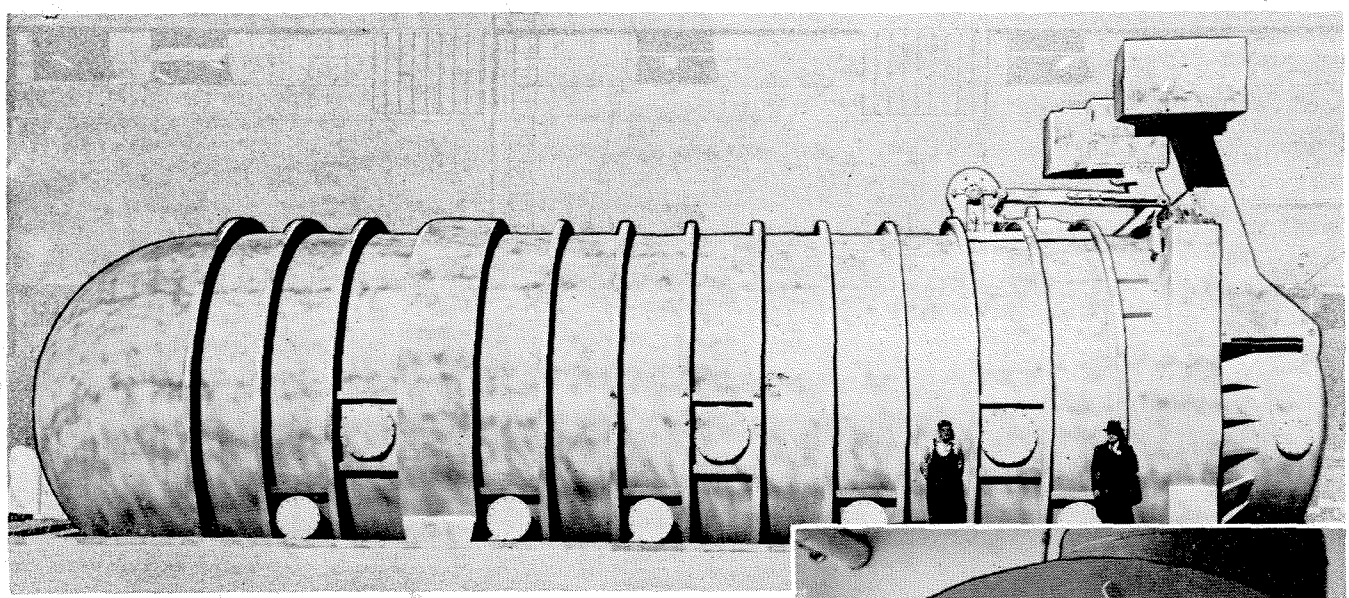
FIRST, regarding our program: Thanks to Ernie Maag, chairman of the program committee, Carl Friend, who handled the dinner dance, and Kenny Belknap, seminar chairman, and their committees. I believe our activities have entertained and provided engineering information to a larger number of alumni and guests this year than ever before. Attendance has ranged from 30 to well over 300, with the Walt Disney meeting attracting the most. Average attendance for the nine meetings preceding this was 135. I believe that bespeaks the enjoyment provided.

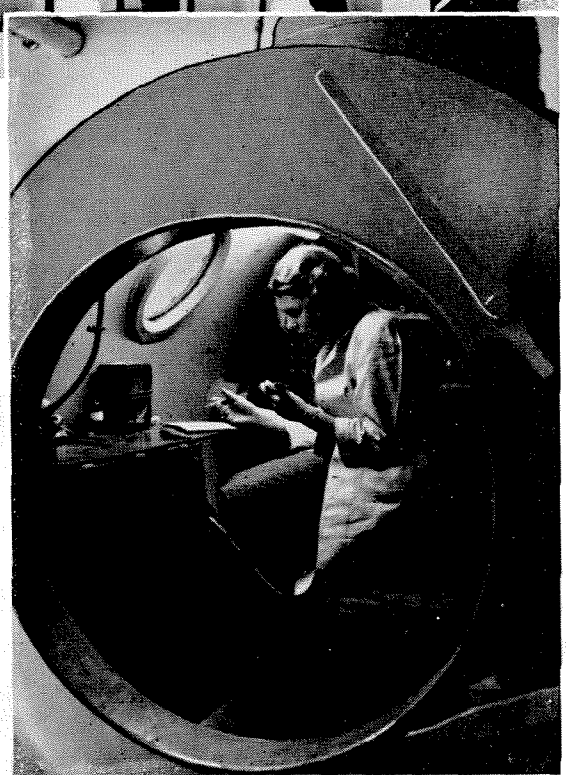
Second, *Engineering and Science Monthly*: Your Board of Directors feels that this is a great tangible product of our Association. We have, I believe, been successful in making this an interesting and valuable source of information for our members. Our success is attributable chiefly to our energetic and resourceful editor, Don Clark, and our capable and proficient publications chairman, Hugh Colvin. These men have been very generous of their time and effort in handling the interesting problems involved in publishing a periodical. We have been fortunate also in receiving regular and excellent editorial advice from Professor McMinn. Further generous advice and help has been received from Dr. Millikan, the Board of Trustees, the Faculty, and many of the Institute Associates. Members of the Alumni Association have responded promptly and efficiently wherever possible when asked to write articles for *Engineering and Science* and to aid in other Association work. One couldn't hope to find a more cooperative group.

The Placement Service has carried on a much more active program than would appear from a tabulation of men placed, because in these times every request filled represents many attempts before an available man is

Lacy Can Design and Build the Largest or the Smallest

ALTITUDE CHAMBERS





Lacy has designed and produced what are believed to be the largest and the smallest Altitude Chambers ever constructed, for testing both personnel and materials.

The Largest Chamber, shown above, is 17 feet inside diameter x 50 feet long. Here aviation personnel and the entire fuselage are tested for 60,000 feet altitude and 100 degrees below zero temperature.

At the right is a view of the smallest Altitude Chamber. It is 5½ feet diameter x 8 feet long, for testing personnel. Three pilots have been tested in this Chamber at one time.

The services of Lacy's Engineering Department are available to the Aviation Industry. Lacy is fully experienced in Altitude Chamber construction and has fabricated Heavy Plate and Sheet Steel for 57 years.

Lacy Manufacturing Co.

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LOS ANGELES 12
CALIFORNIA

☆

found. For example, 415 requests for full-time services were received, many of them for more than one man, but only 18 men were placed. This is a ratio of at least 25 positions per man placed. In addition, 89 men, mostly students, were placed in part-time jobs. You should have received a questionnaire recently, a copy of which was sent to all alumni and students on leave whose addresses we knew. It may interest you that about 1,000 of these have been returned, 300 by alumni in military services, 200 by students on leave from the Institute, and 500 from civilian alumni. These questionnaires were sent out to aid the Institute in better serving its students and graduates and to aid the Placement Service in being of maximum benefit to alumni.

You may recall that we said a year ago that the subject of the amount of annual dues and of Life Memberships would be studied with a view to increasing them if it appeared that doing so would benefit the members. The finance committee, consisting of our treasurer, Karl Hegardt, our vice-president, Earle Burt, and Henry Freeman and Al Hall studied this subject and found that our dues are lower than those of any other alumni association on which information was available. They recommended, however, and your Board approved, that dues not be raised this year. The chief reason for raising the dues is the expense of *Engineering and Science Monthly*. However, this expense has been kept within our budget, and we have some reason to believe that *Engineering and Science* will more nearly pay its way as it becomes more mature in its comparatively new form. We still have a job to do, however, to reach our goal of advertising income. From all of you who are in positions where you buy, specify, or recommend advertised goods or materials, we here and now solicit letters stating what your duties are and that you read *Engineering and Science* regularly. Such letters will help in getting more advertising and thus allow us to make the periodical larger and better. Will you please address such letters to *Engineering and Science* in care of the Institute.

Our membership now is about 1,485, including 227 Life Members, as compared with 1,396, including 154 Life Members, last year. Although this is a small increase, your Board of Directors feel that the increase would be greater if we would all help in getting new members. Our ratio of members to total eligible is almost 30 per cent which, so far as we know, is higher than in any other alumni association. Earle Burt, as membership chairman this year, has planned what we believe will be an effective campaign for members during the next year. We hope you will support it.

Receipts during the year closed are estimated at $4,250.00 and expenses at $4,200.00, compared with $3,855.15 receipts and $4,250.24 expenses for the preceding year.

Our Life Membership Funds in perpetual trust have grown more than $2,500 this year to a total of about $13,000. The interest from this fund represents annual dues from Life Members and is used in meeting our general expenses. From the growth of the number of Life Members and the size of the Life Member Fund, you can see that an increasing number of our members have decided that Life Membership at $50 is a bargain. We hope that such increase will continue.

In closing, I should like to ask you to interest inactive alumni in supporting and becoming active in the Association for, as you and other active members know, real pleasure is experienced in taking part in our activities where you have, as I have had, the companionship of and association with other Tech men. Furthermore, those who plan and carry out Association activities are encouraged and repaid by the appreciation expressed in your attendance at our functions, in your contribution of articles, letters, and news notes to *Engineering and Science*, and in your aid in carrying out the alumni program.

I thank you all for the opportunity to serve you. It has been a real pleasure.

Harry K. Farrar, President,
Alumni Association.

MONTH IN FOCUS

(Continued from Page 3)

however, quite a number had started college courses of non-technical character.

The G. I. Bill of Rights entitles veterans to a certain amount of education under certain conditions. Many have availed themselves of this opportunity to continue their education, and many more will follow. With a taste of training in a technical skill sometimes comes the belief that aptitude along these lines is ample evidence of engineering or scientific ability. In some cases this may be true, but in the majority it is only an indication that the individual has an inherent ability to coordinate his hands and to practice certain techniques in a skillful manner.

Already many of these men have applied to engineering and scientific schools for admission. The colleges and universities must exert every possible effort to clarify the character of these technical fields for the applicant so that he may have warning of the type of thing he is getting into. The engineering schools must not lower their requirements for entrance or their standards of instruction to permit men who are best qualified for employment in the crafts of industry to pass through such courses only to find that they are below average engineers. Such action is unfair to those students who have the ability to become engineers and to the men who do not make good. It is definitely not a disgrace to be a skilled technician and not to have a college education. Industry badly needs the skillful hands of young men; several years have passed without the usual recruiting of apprentice groups.

Where are these men to be trained for industry? Who will give them the instruction required to convert their skill from military activities to industrial activities? Vocational schools have been established for this type of training. There are many good ones and many inferior ones. The good ones may not guarantee each student who enrolls a high salaried job at the end of the training period. The success of the student is a function of his own ability and the quality of instruction. Industry can help in this problem by putting its house in order so that it may give council and employment to skilled labor of the younger group which has been absent for so long. Engineers and scientists can do well to assist in clarifying the work in engineering and science to their non-technical friends so that a minimum of errors will be made in the training of veterans for useful and enjoyable work by which they can earn a respectable living in the American way.

UNIDENTIFIED CHECK

A check, No. 1733 dated June 5, in the amount of $2.50 written on The Anglo California National Bank, Bakersfield, California, was sent to the Alumni office without signature. Will the alumnus who issued this check please contact the Alumni Office immediately?

PERSONALS

IT WILL be helpful if readers will send personal items concerning themselves and others to the Alumni Office. Great interest has been shown in these columns, but more information is required. Do not hesitate to send in facts about yourself, such as change of position or location, present job, technical accomplishments, etc. Please help.

—Editor.

1920

GEORGE SUMAN is chairman, Pacific Coast District, Division of Production, American Petroleum Institute.

MAJOR R. CARSON SMITH is chief of the M 74 manufacturing branch, (new incendiary) at Rocky Mountain Arsenal.

1922

COLONEL ALVIN G. VINEY, chief of staff, A.S.C.Z., received the Croix de Guerre from Colonel Louis Renouard, chief of the French Military Mission in London. An army engineer since 1929, Colonel Viney has been in charge of transportation in various European battle areas.

1924

DOCTOR REINHARDT SCHUHMANN, SR., since 1929 has been a professor of chemistry in Western State College of Colorado at Gunnison, Colo. His son, Doctor Reinhardt Schuhmann, Jr., who attended California Institute of Technology for two years, recently has received a promotion to the rank of associate professor in the department of metallurgy at Massachusetts Institute of Technology.

1926

LIEUTENANT COLONEL STUART SEYMOUR, formerly with the Coast Artillery, is now in the Infantry stationed at Fort Ord, following a training period at Fort Benning, Ga.

1927

COMMANDER ROBERT T. ROSS, U.S.N.R., formerly a professor at Stanford, is personnel director of the Pacific Fleet Schools at Pearl Harbor.

FLORENT H. BAILLY is consulting petroleum engineer and geologist for the Pantepec Oil Company of Venezuela with which he has been associated for some time. After a number of years in South America, Mr. Bailly is now living in Pasadena, Calif. He is married and has three children.

DAVID Z. GARDNER has been elected president of the Rotary Club at Winslow, Ariz.

1928

A. PERRY BANTA, assistant professor of sanitary engineering (on leave) with the Corps of Engineers, stationed at Honolulu, has been promoted to the rank of lieutenant colonel.

NICHOLAS D'ARCY, of Charles W. Carter Company, gave a talk on July 12 before the American Society of Mechanical Engineers at the Elks Club in Los Angeles.

CAPTAIN RICHARD C. ARMSTRONG, U. S. Army Medical Corps, is now stationed at Pyote, Texas.

DOUGLAS KINGMAN has recently been appointed superintendent of the San Joaquin division for the General Petroleum Corp.

DONALD McFADDIN has been transferred to Santa Maria by the Union Oil Co. Don was active in the design of the new plant at Orcutt and is now engaged in operation problems.

IRA C. BECHTOLD is chief research engineer with the Fluor Corporation in Los Angeles, Calif. He has four daughters, including twins a year old.

1929

DOCTOR FRANCIS E. TURNER is an instructor at Texas A.&M. College, College Station, Texas.

KENNETH KINGMAN is now manager of the Wilmington Refinery for Union Oil Company. He moved down from Oleum last May.

1930

J. CLARK SUTHERLAND is associated with Pacific Clay Products Company of Los Angeles, Calif., as a geologist.

RALPH S. McLEAN announced the opening of an engineering office at Long Beach, Calif., under the firm name of Van Alstine & McLean.

ROLLIN ECKIS is district geologist for the Richfield Oil Company at Bakersfield, Calif.

ROLAND F. HODDER, since 1943, has been a geologist for Standard Oil Company at Houston, Texas.

TRUMAN KUHN is on the staff of the geology department of the School of Mines at Golden, Colo.

1932

MAJOR JAMES R. BRADBURN has been in the army four and one-half years and is stationed at the Rochester Ordnance District Headquarters, where he is chief of the artillery branch. Last December he became father to a son, named James Henry.

1933

GEORGE H. ANDERSON is vice-president and general manager of the Lone Star Steel Company of Daingerfield, Texas, with headquarters in Dallas.

FRANK W. BELL is in charge of geological operations for Shell Company at Sacramento, Calif.

EVERETT C. EDWARDS is district geologist for General Petroleum Corporation, Los Angeles, Calif.

MERRILL BERKLEY is in business for himself as manufacturers' agent, sales, service and engineering, with an office in Los Angeles, Calif.

1934

ROBERT BROWN has returned from Tulsa, Okla., to become chief mechanical engineer of the International Derrick and Equipment Company of California. Boh is designing a complete new line of oil well drilling and servicing hoists.

JAMES GREGORY has returned to Long Beach as engineer in charge, for Shell Oil Company, Inc.

GARTH NICHOLSON, chief engineer of Byron Jackson, is perfecting several new and interesting oil field specialties, including electrical weight indicator and air actuated slips.

PAUL H. LEDYARD accepted a position in May as seismograph supervisor for Southern Geophysical Company, Inc., Ft. Worth, Texas.

1935

HUGO BENIOFF, associate professor of seismology, is on leave and engaged on research for Submarine Signal Corporation, dividing his time between Pasadena and the East coast.

JACK F. JUDSON is working for Socony Vacuum Oil Company in Colombia and Venezuela. In 1942 the company made him district superintendent and geophysical supervisor of his district in Venezuela.

LIEUTENANT FRED MALONEY, after 22 months in the South Pacific area, is now attending Massachusetts Institute of Technology.

1936

EUCLID V. WATTS, production engineer for General Petroleum Corporation, presented a paper to the American Institute of Mining Engineers on the "Selection of Oil Field Pumping Equipment."

DOCTOR SIMON RAMO of the General Electric Company is doing some special work on the Caltech campus.

1937

WALTER MOORE and Mrs. Moore are the proud parents of a baby girl, Claire Louise, born on April 7. Walter is a structures research engineer at Lockheed Aircraft Corporation.

EDWARD WILEMAN is a processes engineer at the Lockheed Aircraft Corporation. He has a son, John Ross, now 1½ years old.

MAJOR RICHARD T. BRICE is at Manila on the staff of the Provost Marshal General of the Philippines. As engineer for the staff working on construction of prison camps, he is in constant touch with lieutenants Alfred Switzer, '34, and Fred Cline, '29, also assigned to this work.

LIEUTENANT RIDGELEY LEGGETT, U.S.N.R., came home to southern California on a 30-day leave. He will return to the Pacific area for submarine duty as radio material officer, being assigned to the Admiral Lockwood staff. Lieutenant Leggett became father of a new daughter Leslie Ann, born May 5.

1938

STANLEY WOLFBERG is senior industrial engineer, Pittsburgh Works of the Columbia Steel Company.

GARDNER WILSON, engineer for Western Electric Company, was at the Institute recently on business.

DOCTOR ROBERT McMASTER, formerly associated with the electrical engineering staff at California Institute of Technology, has been appointed to the staff of Battelle Memorial Institute, Columbus, Ohio, and assigned to its division of industrial physics.

MUNSON W. DOWD, JR., has been employed as a structural research engineer by Lockheed Aircraft for the past two years. Munson is the father of two young daughters.

1939

MAJOR LOUIS L. KOLB, former electrical operator for M.G.M. Studios in Culver City, has been assigned to Asheville, N. C., as technical advisor to the commanding officer of the A.A.F. Weather Wing, administrative clearing house for the Air Forces' far-flung Weather Service, after two and a half years as a weather officer in Alaska, Canada and Great Falls, Montana.

MAJOR ROBERT SMITH is in command of a marine engineering battalion from an advanced Pacific base. He was beach officer at the time of the Marine landing on Saipan. In this capacity, he directed all operations from the landing barges extending 300 yards inland.

1940

WILLIAM R. CLEVELAND, JR., is now a captain in the Air Forces Weather Wing, and was reported to be in Sardinia.

DOCTOR WILLARD A. FINDLAY, pursuing his meteoric globe-trotting career, has been in Ecuador, but has recently been seen in San Francisco. He can be reached in care of the Standard Oil Company of that city.

JACK M. HOLLOWAY is working with the geological department of International Nickel Company at Sudbury, Ontario.

WALTER M. MUNK has returned to civilian life from the Army but is actively engaged in the war effort as an oceanographer at the Scripps Institute in La Jolla, Calif.

ENSIGN DONALD H. KUPFER, after indoctrination at Tucson and sundry other training, is now receiving specialized work at the Amphibious Training Base at Coronado.

1941

FIRST LIEUTENANT REUBEN P. SNODGRASS, U.S.M.C., returned from overseas to San Diego, where he is working on aircraft maintenance and repair.

CHARLES MOORE, formerly employed in the personnel division of Lockheed Aircraft Corporation, entered the Navy as ensign about a year ago. At last reports, he was having his indoctrination at Tucson and serving as one of the editors of the students' paper.

JOHN J. RUPNIK, with the United Geophysical Corporation, has recently returned to Pasadena after several years in Stockton, Calif.

FRANK SKALECKY has recently been promoted to Lieutenant, U.S.N.R. He has been overseas in the Photo Interpretation Section for some time.

1942

LIEUTENANT CHARLES PEARSON, after 18 months on Pacific duty, was home on leave in July while his ship was being overhauled. As radar officer on an attack transport, he saw action in the Philippines, Iwo Jima and in several other engagements.

FIRST LIEUTENANT EDWARD NOVITSKI, now stationed in England, was one of the winners of 96 fellowships awarded by the John Simon Guggenheim Memorial Foundation. Lieutenant Novit-

ski, who received his doctorate from the Institute, will study genetic effects of ultra-high frequency irradiation under Dr. Curt Stern, head of the University of Rochester, at the eastern institution upon completion of his war duties.

EVERETT VAN NESS was united in marriage to Miss June Brown on the first day of May at Beverly Hills, Calif. They will make their home in Oakland where Mr. Van Ness is employed in the research and development section of Tidewater Associated Oil Company.

ALBERT ALBRECHT was a technical observer in England, France and Germany under the auspices of O.S.R.D. from September, 1944, to May, 1945. He has returned to the States and is now employed as chief of field engineering group with Gilfillan Brothers, Los Angeles, Calif.

ALAN E. BELL has recently received his M.D. degree and commission as lieutenant (j.g.) in the Navy Medical Corps. For the next year, he will be on the Wilmer House staff at Johns Hopkins Hospital.

FRANK A. FLECK, first lieutenant, U.S.A.F., and Miss Pauline Bushwick were united in marriage on April 25. Frank is now stationed on duty in the Pacific area.

1943

LIEUTENANT (j.g.) ROBERT BASHOR is assistant engineer on a converted destroyer minesweeper in the Pacific area.

DEANE MORRIS, private in the Marine Corps, is reported to have gone through the action at Iwo Jima successfully.

1944

JOHN NELSON is an engineer for the Honolulu Gas Company at Honolulu, Hawaii.

ENSIGN EDWARD GOLDSMITH, U.S.N.R., is assistant engineer on an attack transport in the Pacific area.

ENSIGN JAMES TUEDIO, U.S.N.R., is a communications officer with a staff unit in the Pacific area.

ENSIGN JOHN H. GARDNER, U.S.N.R., is at present stationed with the Office of Supervisor of Shipbuilding, Newport News Shipbuilding and Dry Dock Company at Newport News, Virginia. Ensign Gardner's duties are almost entirely liaison engineering in an inspection office.

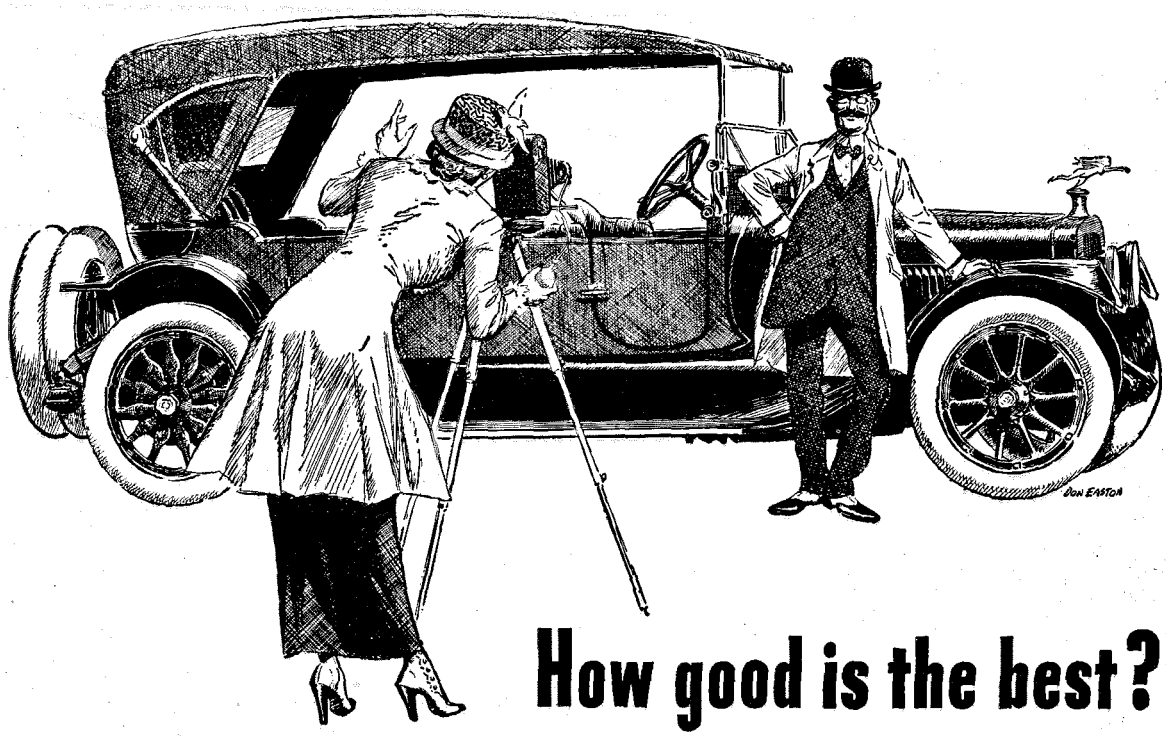
ENSIGN NEVILLE LONG, U.S.N.R., is now on Guam where he is adjutant of a Seabee Battalion.

RALPH PASTORIZA completed his midshipman's training and is now an ensign in the Navy, taking radar training in Maine.

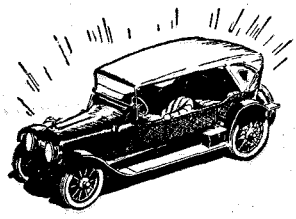
WILLIAM P. HARLAND and Miss Patricia Yancy were united in marriage on the eleventh of June at Alberta, Canada.

LIEUTENANT RICHARD H. GILLMAN, U.S.M.C.R., is with a marine engineering battalion out on a Pacific island which the marines had previously taken from the Japs and converted into a base. Lieutenant Gillman reports, "the island is beautiful—complete with all the coconuts, palms, full moon and sudden squalls which the Geographic and Hollywood led me to expect. However, the beautiful damsels are all out of bounds. The few isolated and disorganized remaining Japs are gradually being eliminated on days off by small hunting parties."

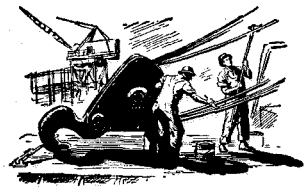
STANLEY S. DAY and Miss Evelyn M. Mead of Altadena were united in marriage in a formal ceremony in June. Mr. Day is a geologist for the government.



How good is the best?



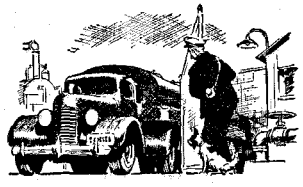
1. In 1915, this $4,850 touring car was a good automobile – one of the best money could buy. In 1915, Union Oil made a good line of greases – 8 different types "to meet every lubrication need." Today, the lowest-priced cars are far better than that 1915 car. **And they sell for about ¼ as much.**



2. Today, Union Oil makes 78 different greases for industry instead of 8! And their quality is equally superior. This doesn't mean the car manufacturers and ourselves weren't doing the best we knew how in 1915. But it does prove the value of *competition.*

3. After all, people were quite satisfied with 1915 automobiles and greases–in 1915. If no improvements had been introduced *we'd be satisfied with them today.* For we'd know of nothing better to compare them with. But fortunately the manufacturers weren't satisfied. Not that they were any more idealistic than the average citizen.

Number of different greases made by Union Oil	
1915	8
1930	49
1945	78



4. But each one knew that if he could put out a little bit better product than his competitors, he could *get more business.* So they all kept racking their brains for improvements. Progress, from year to year, was gradual – as it always is. But in 30 years, these combined improvements made a phenomenal total.

5. As a result, the American oil and automotive industries today have completely outstripped the rest of the world. No monopoly – private or governmental – could have accomplished as much. For there simply aren't the *incentives* to better your product when you already control all the trade.

6. So as long as there's still room for improvement in an industry, the only way to guarantee *maximum progress* is to have an economic system that guarantees *maximum incentives.* Our American system provides these to a degree no other system has ever approached.

UNION OIL COMPANY
OF CALIFORNIA

This series, sponsored by the people of Union Oil Company, is dedicated to a discussion of how and why American business functions. We hope you'll feel free to send in any suggestions or criticisms you have to offer. Write: The President, Union Oil Company, Union Oil Bldg., Los Angeles 14, Calif.

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