ALUMNI REVIEW

CALIFORNIA INSTITUTE OF TECHNOLOGY

Vol. VI No. 3 March, 1943

Third floor back...

● It's 4 p.m. on a quiet street.

A slip of a girl, with a suitcase a little too heavy for her, climbs the brownstone steps and rings the bell.

Her heart is beating fast, but it's not from the weight of the suitcase.

She's wondering what it will be like, in a furnished room, so far from home.

She's hoping she'll make good at her new job.

She's thinking that maybe now she understands a little bit of what Tom must have felt when he said goodbye and left for camp.

But she's not going back till it's over.

Millions of men and women today are finding themselves in strange surroundings—in situations they couldn't have imagined a few years ago. They are giving up their pleasures and comforts—and often much more—to bring future good to the whole world. And they don't mind—too much—because it will be worth it.

Industry, too, has put aside for the duration its never-ending job of supplying those pleasures and comforts which have helped to make life fuller and better in America than anywhere else in the world. Industry is working today with strange new materials, toward grimmer goals—but working with the *same ingenuity and skill, organization and experience, initiative and resourcefulness*. For these things are as much a part of American industry as they are of Americans.

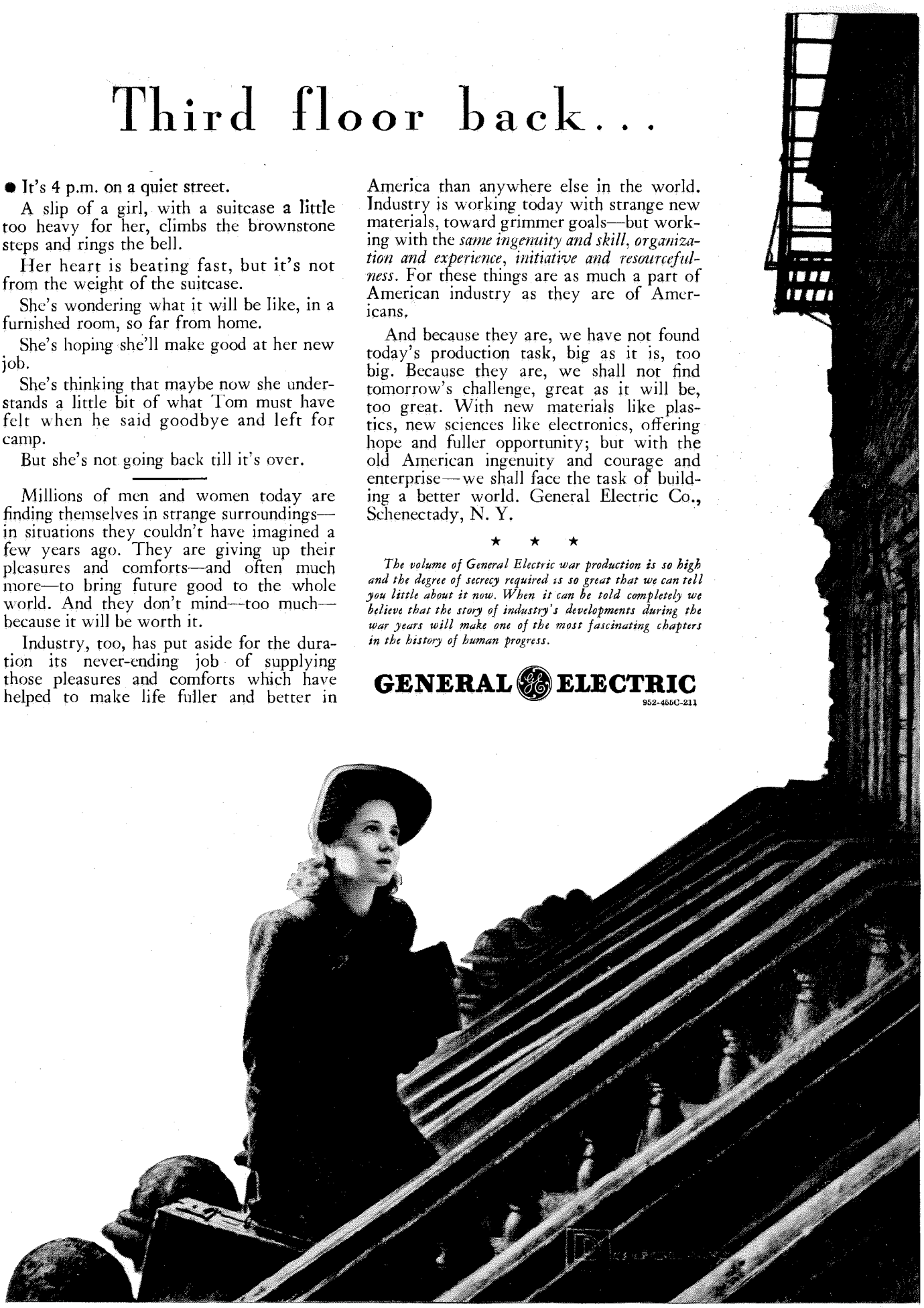
And because they are, we have not found today's production task, big as it is, too big. Because they are, we shall not find tomorrow's challenge, great as it will be, too great. With new materials like plastics, new sciences like electronics, offering hope and fuller opportunity; but with the old American ingenuity and courage and enterprise—we shall face the task of building a better world. General Electric Co., Schenectady, N. Y.

★ ★ ★

The volume of General Electric war production is so high and the degree of secrecy required is so great that we can tell you little about it now. When it can be told completely we believe that the story of industry's developments during the war years will make one of the most fascinating chapters in the history of human progress.

GENERAL ELECTRIC

952-465C-211



General Barrows

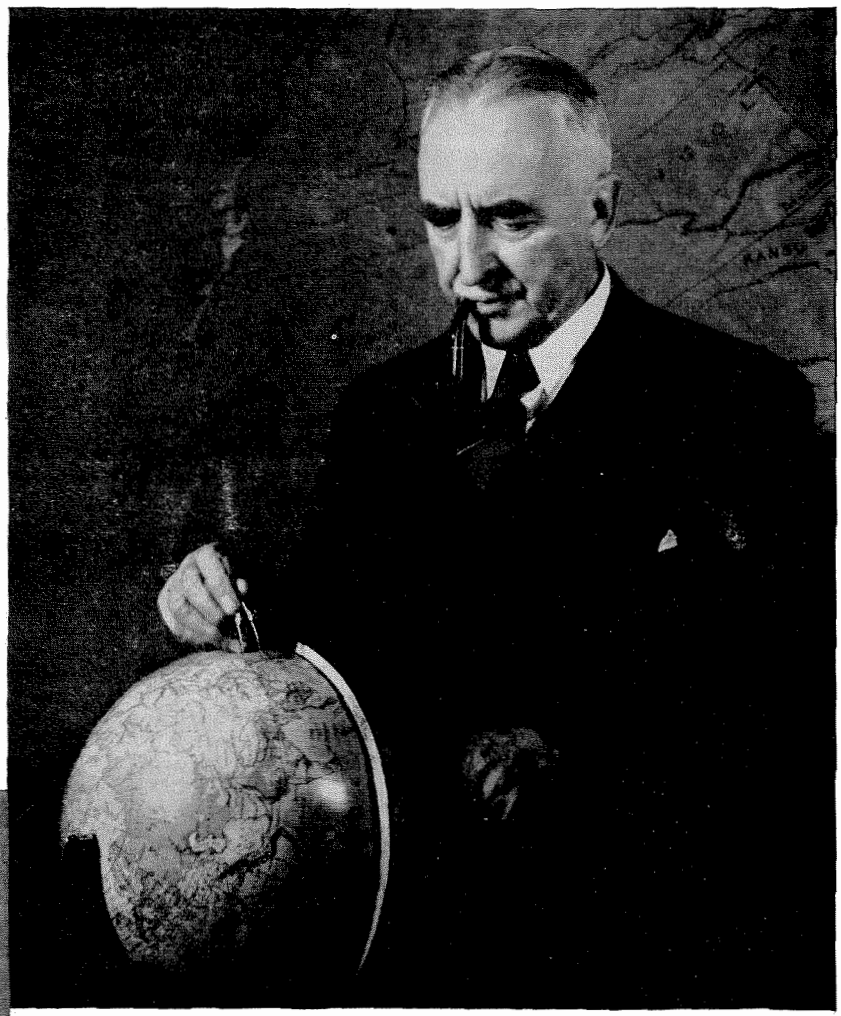
ON THE AIR!

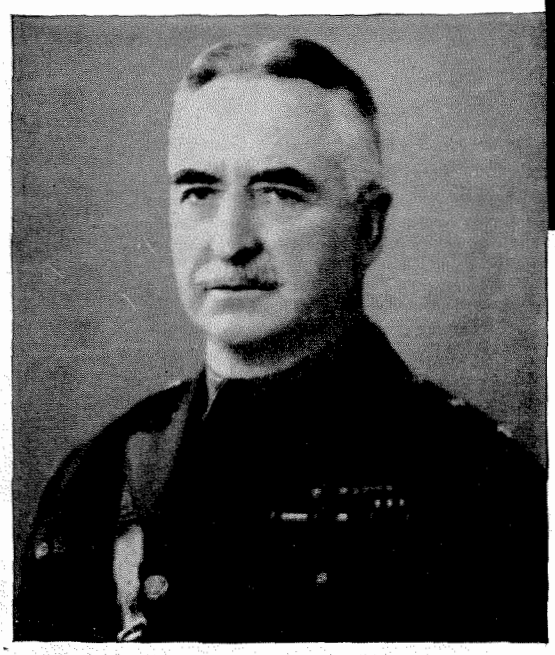
BEGINNING FEBRUARY 22, General David Prescott Barrows, noted educator, world traveler and authority on military and political affairs, will be broadcast every week night over the Don Lee Mutual Network at 9:30 p.m.

General Barrows, former President of the University of California (1919-1923) and Major General, Army of the U.S., Retired, will speak from his study in Berkeley.

He will draw upon his first-hand knowledge of people and places in Europe, the Americas, Africa, the Middle East, the Orient and the Pacific Islands, to bring you an intimate and colorful analysis on the course of the War.

General Barrows has served with the American armies in the Philippines, Manchuria and Siberia





DON LEE *Mutual*

KHJ *Los Angeles* · **KFRC** *San Francisco* · **KGB** *San Diego* · **KDB** *Santa Barbara*

KFRE *Fresno* · **KALE** *Portland* · **KMO** *Tacoma* · **KOL** *Seattle* · **KFIO** *Spokane*

9:30 P.M. MONDAY THROUGH FRIDAY

SPONSORED BY UNION OIL COMPANY

ALUMNI REVIEW

ALUMNI ASSOCIATION, INC. CALIFORNIA INSTITUTE OF TECHNOLOGY

VOL. VI No. 3 MARCH, 1943

CONTENTS

Cover photograph taken by the late Ferdinand Ellerman from the Echo Rock Trail looking towards Mt. Baldy.

EDITORIAL

Is the Army or the Navy going to take over the Institute for training men? This is a question that has been posed by students, faculty, alumni, and the public. The answer is that neither the Army nor the Navy expects to *take over* the Institute. If, when, and as men in the armed forces are trained at Caltech it will be on a contractual basis, acceptable to both the Institute and to that branch of service for which men are to be trained. While there has been no official notification, it was reported in the New York Times of February 7, 1943, that the California Institute of Technology had been designated as a possible training center for the Navy. On February 18 and 19 a board of Naval officers inspected the facilities of the Institute. On the basis of this board's report, the Navy, if it wishes to utilize Institute facilities, will offer a contract calling for the training of a specified number of men in prescribed courses of study. At the present writing (March 7, 1943), no such contract has been received.

It is with regret that your editor announces the resignation of Miss Bertha Lee, who has been Placement Secretary and Assistant Secretary of the Alumni Association for the past two and one-half years. Miss Lee left for St. Louis on February 29 to he married to Mr. Richard L. Auten. They will live in New Jersey where Mr. Auten is employed by the Curtiss-Wright Corporation. We are happy to offer her our best wishes. Her position has been filled by Mrs. Marion Gaugh.

The time has rolled around again for another Alumni Seminar, which is to be held on the campus on April 11. The committee has arranged an excellent program, not for entertainment, but for information. Many of us will not be able to attend because of war necessity, but those who can participate will find it as informative as ever. The faculty is glad to play a part in this event, and regrets that many of them cannot attend this year because of the war work in which they are engaged.

The editor has received no complaints on the Review; it must be that the magazine is not read. If you have time, send in your opinions and suggestions.

WARTIME JOURNEY

By W. A. FINDLAY

Geologist, Standard Oil Company of British Columbia

In the summer of 1939 the atmosphere was heavy with rumors of war to come; and we (my wife and I) started for India in the far-flung interests of foreign oil. We came home again in the spring of 1942. This is a rambling tale of our intermittent travels, largely to the exclusion of the brief intervening periods of comparatively sedentary existence.

We left Los Angeles for New York by train; thence aboard the S. S. NIEUW AMSTERDAM to Rotterdam. Tension ran high in Holland behind the casual expressions of faces. Distant explosions heard at night in Amsterdam might have been war, but they were not.

At Amsterdam we boarded a K. L. M. (Royal Dutch Airways) plane for India. The harvest was not yet in from the trim fields of Germany, far below. They looked very peaceful. War couldn't come yet because all authorities agreed that the harvest must be in first. Breakfast at the Leipzig airport was without incident. The military guards were very calm. They were too calm, but that was all. There hadn't been any Leipzig fair that summer.

Budapest at lunch time seemed nonchalant. The rough, barren Balkan mountains appeared to offer a great deal of vacant *lebensraum,* albeit of a rather forbidding type.

Athens, mildly giddy by nature, was comparatively unconscious of any impending doom. We stopped there for the night. The serene and ancient beauty of the Acropolis was deeply impressive at sunset.

The next day the very blue Mediterranean, Rhodes among many jewel-like islands, Alexandria, Palestine, vast stretches of lifeless desert, Bagdad and gray-green fertile Mesopotamia passed quickly beneath us; and evening found us in the ultra-modern, air-conditioned airport hotel of squalid Basra, at the head of the Persian Gulf.

The following day ended at our destination, Karachi, on the westernmost coast of time-worn India. Harsh, rocky, wind-swept stretches of coast line had alternated all day with monotonous expanses of the dull waters of the Persian Gulf.

Three days later war came to the peaceful landscape of Europe. Ours had been the last Royal Dutch Airways plane which would cross Germany in many years. An item probably trivial to those deciding the fate of Europe was that our baggage was still in Holland. The Mediterranean had instantly become as impassible to civilian shipping as though it had frozen solid overnight. Fortunately, it thawed presently. The coveted baggage arrived two months later.

British India dismissed the war with a gesture.

After six months in prosaic Karachi, we were again aboard a Douglas DC3 of the Royal Dutch Airways, retracing the airway by which we had arrived. At Alexandria we left the plane and took the Cairo train for a few hours across the Nile delta with its teeming canals, through the same lush fields which had soothed the eyes of Pharaohs dim centuries ago.

With the benevolence of the gods and through the good offices of friends who had not yet met us, we found ourselves in a few days at home in the very modern apartment of a couple of our wandering countrymen (serving the foreign ramifications of the rubber industry) who had returned home for long leave. Such incidents are the cream of such an existence as was ours.

Very shortly I left the fascination of Cairo for the trackless desolation of the Western Desert, with special permission of the military, to join a numerous camp of geophysicists and geologists.

Events in Europe progressed rapidly from the stage of tragedy toward that of calamity. At that time Mussolini's armies loomed huge and menacing to the eyes of Egypt. France was crumbling. Soon Mussolini, unable longer to resist the temptation of spoils and the pressure of the ally in whose tentacles he had become firmly entwined, ordered his armies to move. Overnight the Western Desert became no man's land. No man's land is a grim place even for a man bearing the weapons of war. For any civilian it is the wrong place to be, even though he is in search of that coveted commodity which is the life-blood of modern armies and over which, more than any other single item, the war is being fought.

I had been racing against time and Mussolini for three months to complete my own assignment in the Western Desert. Two days later I finished my field work; and along with all others of the numerous party, who were already on their way, left our camp-site, on a low barren knoll under the shadow of a 400-foot-high sand dune, to the fortunes of war.

A week later we were refugees from Egypt, along with some fifty other Americans of our organization. Regular air transport had been grounded in the crisis. We traveled by train to the Suez Canal and again by train to Jerusalem. After breakfast at the King David Hotel, a fleet of taxis carried our grim, resigned party over the dusty highways of Palestine and Syria toward Damascus.

France had fallen. The firm anchor of Syria's stability had given way. Damascus was confused and dazed. What might befall its people now they hardly dared guess.

The huge, air-conditioned, dust-proof, tractor-drawn trailer busses of the Nairn transportation system still ran from Damascus to Bagdad. The next morning our party fully occupied two of these units, From the clear, cool inside air, through momentary breaks in dense clouds of dust from the long, straight stretches of desert road, we watched rough, naked mountain country pass rapidly into limitless vistas of flat barrenness in the blistering heat outside.

The night spent hurtling across the desert was exhausting. We tumbled out onto the gravel of the desert floor to learn that the Euphrates was in flood and that the busses could not reach Bagdad, some 25 miles away. About an hour later dust clouds on the horizon resolved themselves into large numbers of small, ancient, battered taxis, careening wildly over the desert under the dubious control of their native drivers. We entered these with grave misgivings, subsequently fully justified. Eventually, however, after hours of apparently aimless wanderings about

the now burning desert, detouring the flood waters, we entered the cool date groves of Mesopotamia. Then soon we were among the narrow, fetid streets and shimmering, golden, pre-byzantine domes of ancient Bagdad.

We rested, but not for long. By pre-arrangement, a chartered Douglas plane of the omnipresent Royal Dutch Airways met us at Bagdad; and ferried the party, in two groups, on successive days, to Karachi. The exigencies of wartime continued to control our destinies. Most of the party returned to New York by boat from Bombay. We stayed on in Karachi for some months.

British India found the war no longer dismissable with a wave of the hand. These people had very suddenly been aroused to find it a matter of grave concern.

We left Karachi for Bombay en route home; but a sudden reversal of plans resulted in our proceeding instead to Calcutta from Bombay. We went on from Calcutta up into Assam, in extreme northeastern India. I spent sufficient time in the dense Assamese jungles to experience two or three midnight alarms (but no casualties) occasioned by intruding elephants—about three weeks. This was all too insufficient time in which to even begin to realize my cherished ambition to bag a tiger or two in India. An old female and two cubs had killed cattle on the great tea estate where we had our field headquarters, a few days before my arrival. Assam is the best remaining hunting ground in the world for the huge Bengal tigers.

From Assam we went on to Australia. However, during an enforced wait of a few days for passage reservations on an Imperial Airways flying boat (British Overseas Airways Corporation), we took leave to visit those seats of power of the ancient Mogul Dynasties: Agra and Delhi, in the broad valley of the Ganges. The indelible marks of those early men of power are still strong upon their chosen lands, out of the slavery of which rose the massive or exquisite monuments to that power. To experience that sense of immense serenity and involuntary awe which must be the reaction of any thinking individual in the presence of the intricate loveliness of the Taj Mahal is to question, in a most un-Christian way, whether the slavery out of which it came into being was not fully justified by the more fundamental laws of God and man.

We were back in Calcutta, that seething, age-old cauldron of human existence and its accumulated offal, where the presently-reigning huge, placid, humpshouldered, sacred Brahma bull accepts, unquestioningly and unquestioned, his sovereign right to the cool marbled main lobby of the head office of the Bank of India as the site of his mid-day siesta in the stifling heat of summer. Here the item most captivating to my own imagination was the concentrated horror of the highly publicized Black Hole of Calcutta. All that remains of this is a black marble pavement of actual floor dimensions (about 14 feet by 18 feet), surrounded by a low iron picket fence. A portion of this pavement is buried beneath an encroaching government building, on the wall of which, above the marble pavement, appears a plaque bearing the following inscription: "The marble pavement below this spot was placed by Lord Curzon, Viceroy and Governor General of India, in 1901, to mark the site of the prison in old Fort William known as the Black Hole in which 146 British inhabitants of Calcutta were confined on the night of 20th of June 1756 and from which only 23 came out alive." That was on a summer night in Calcutta.

We went aboard the Imperial Airways flying boat at Calcutta. None of the superfluous services and fripperies incidental to tourist travel hy flying boat in days of peace were left. War had become a stark matter of life or death of an empire.

The first day's flight took us across the Bay of Bengal and down its rough and verdant eastern shore, broken by another of the world's great, humanity-infested deltas, that of the Irrawaddy. There the bright gold pagodas of now-ravaged Rangoon careened in splendor among the luxuriant foliage and contrasting square-cut buildings of the city as the plane banked and circled to a landing.

We spent that night in the sultry heat of Bangkok. A faint but distinct flavor of surly belligerence was noticeable in the attitude of the Siamese toward Occidentals. They had just savored victory, what with timely Japanese cooperation, in armed operations against Indochina. Vivid impressions of the indescribably rank and penerating odor, undiagnosed at the time, of far-famed *durian fruit,* mingled with those of numberberless glimpses of the elaborate ornateness and high color of temples enclosed by high walls remain from a brief ride through the city at dusk.

Stretches of sea alternated next day with the dense tropical luxuriance of the Malay peninsula. The day ended at Singapore and the rambling sophistication of the Raffles Hotel, the same which were destined within the year to swell the gloating pride of the Jap in victory. Central Singapore is reported to have survived Japanese occupation largely intact.

At Singapore we changed planes: the British Overseas Airways flying boat for a Quantas (Australian) one of the same type. The Quantas plane was completely equipped, as in the years of peace, with a full complement of immaculately uniformed stewards and all the elaborate service, guide maps and travel-literature of tourist days; which was all very pleasant. The Australians did not know that there was desperate war in Europe and Africa. They recognized no premonition of imminent disaster in the lands and seas over which we flew. One evident concession only was made to the hazy, uncomprehended fact that the world was openly or otherwise engulfed in a struggle involving the fundamentals of its various ways of life: civilian passengers, in order of the recency of their passage bookings, must relinquish their seats in favor of military travelers and use makeshift seating facilities in what had recently been the mail compartment of the plane. This latter was devoid of that sound and vibration insulation which was so miraculously effective in the regular passenger accommodations. This one concession was undoubtedly made at the instance of military authorities much closer to the scenes of battle than Australia.

Flying on, the northeastern coasts of Sumatra and Java passed in review below. Southeastern Sumatra was a dense carpet of green; thickly interlaced with a filigree of thread-like veins of silvery water instantaneously flashing back the direct

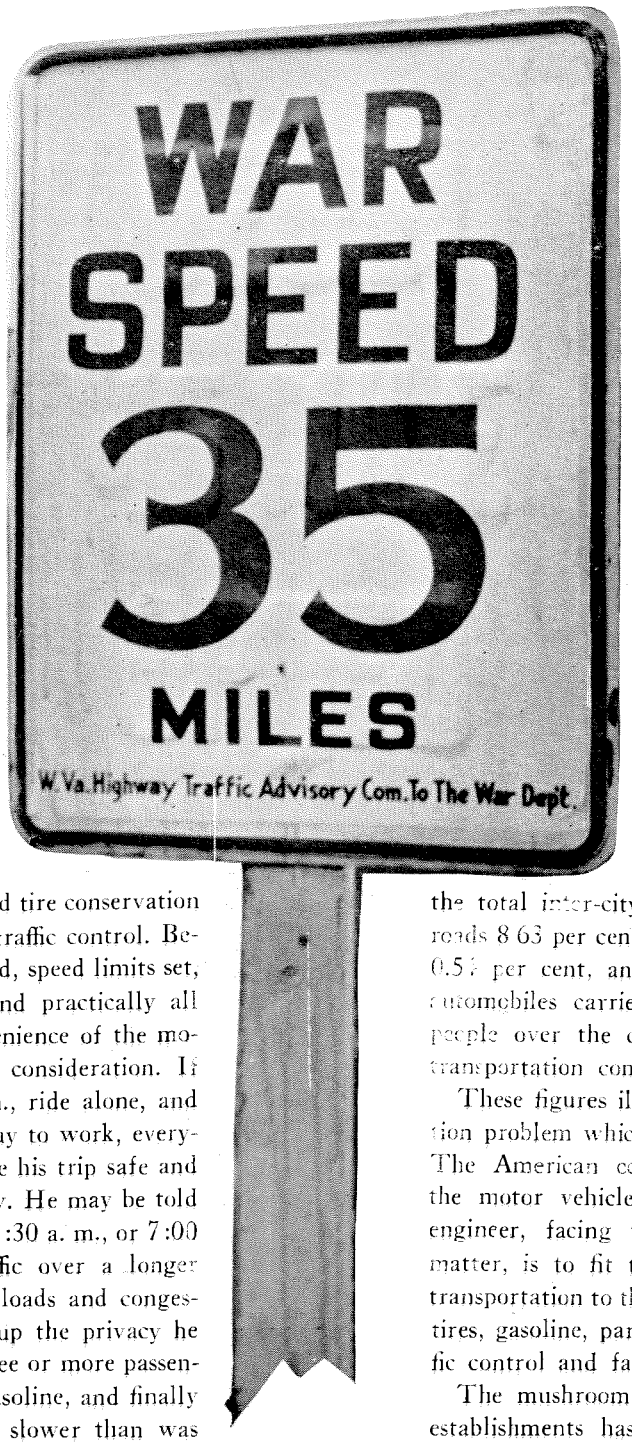
(Continued on page 12)

THE TRAFFIC ENGINEER AND WAR PRODUCTION TRANSPORTATION

By HENRY K. EVANS

National Conservation Bureau, New York City

The entry of the United States into World War II has presented traffic engineers with the greatest challenge in the history of their profession. This war is basically a struggle to keep transportation lanes open and functioning efficiently, so that our army and our allies will be kept supplied with the vital essentials of war. To enable our forces to get there "the fustest with the mostest", they must have adequate and swift transportation in the theater of war operations, but must be supplied regularly and speedily from the home base also. Raw materials must be carried to the factories without delay, and the finished products must be transported away without delay. War workers must get to work safely and on time. It is the traffic engineers' job in this country to see that we do not fail on this end, that war production is not hampered by inefficiencies and congestion in our transportation system.



The traffic engineer is faced with new problems. Since 95 per cent of the world's crude rubber supply is in the hands of the Axis, steps have been taken toward tire conservation that have revised many concepts of traffic control. Before Pearl Harbor, signals were timed, speed limits set, hours of work and shopping set, and practically all traffic controls adjusted to the convenience of the motorist. His desires were given first consideration. If he wanted to go to work at 8 a. m., ride alone, and drive at 50 miles per hour on the way to work, everything was done to suit him and make his trip safe and convenient. All this has changed now. He may be told now that he must report to work at 7:30 a. m., or 7:00 a. m., in order to spread the traffic over a longer period and thus cut down on peak loads and congestion; he is told that he must give up the privacy he has been accustomed to, and find three or more passengers, or else OPA won't give him gasoline, and finally he's told that he must drive much slower than was the custom previously. In the eastern states he can't drive at all for pleasure.

The motorist's convenience is no longer a factor. Today the traffic engineer works on the basis of economy of operation of essential transportation and elimination of all non-essential transportation. During the past thirty years, the American people have built their way of life around the private automobile. Today we possess 29,000,000 passenger autos, 4,900,000 trucks and nearly 146,000 buses of all types, plus nearly 29,000 surface trolley cars. Forty-three per cent of our population living in rural areas is almost entirely dependent on private automobiles for transportation. Over 54,0000 communities are without railroad service, and some 2,300 towns do not have any means of mass transportation whatever. Each year we traveled an estimated 500 billion passenger miles by all forms of common carrier. The private automobile has become the most important means of moving about in cities.

Between cities, the private auto has carried most of the load too. A study of the Interstate Commerce Commission made in 1939 showed that private cars account for 85.44 per cent of the total inter-city travel in the United States, railroads 8.63 per cent, buses 5.15 per cent, water carriers 0.53 per cent, and air carriers 0.25 per cent. Thus automobiles carried five and a half times as many people over the country as all the other means of transportation combined.

These figures illustrate the share of the transportation problem which must be accorded the private car. The American economic system is dependent upon the motor vehicle. The challenge facing the traffic engineer, facing the whole United States for that matter, is to fit the rapidly increasing demands for transportation to the diminishing supply of automobiles, tires, gasoline, parts, and men and materials for traffic control and facilities.

The mushroom growth of industrial and military establishments has produced marked changes in the traffic patterns, which had been more or less stable in the past, both as to space and time distributions. The traffic engineer has been faced with a mighty task of re-adjust-

ing traffic control, construction, and maintenance of facilities to the new conditions. In some areas this has been done by making studies to determine the 10 per cent of the total road system which is carrying the largest percentage of war production traffic, and concentrating available funds and manpower on this important 10 per cent. The increase in twenty-four hour operation of industries has caused traffic to flow at times never before experienced, requiring additional controls and safeguards. These changes have occurred in the face of shortages of signs, signals, construction materials, and manpower; consequently the traffic engineer has found it necessary to resurvey all existing traffic control facilities and manpower allocations on traffic control and enforcement to make transfers of these materials and men to places where they are more essential. This has not meant undertaking extensive area-wide traffic surveys, the "shotgun" approach. Time is short and manpower too scarce for such grandiose treatment. Rather it has meant the "rifle" approach; selecting the war production routes, and concentrating attention on these vital arterials, pulling signals and other equipment off other routes to be used where they will aid war traffic the best.

Passenger transportation may be divided into two main categories, private and public. Let us first examine the new problems affecting private passenger transportation.

The sudden growth of great war production plants and military installations has created access road problems of unprecedented magnitude. Countless industries already situated in urban or business districts, having secured war contracts, have expanded employment, drawing thousands of pedestrians and automobiles where there were only hundreds formerly, imposing heavy loads and congestion on city streets unable to accommodate the increased demand. Also there has been the access road problems brought about by the construction of giant plants in outlying districts, though here there has been the chance to design and construct adequate facilities to accommodate the expected loads. Realizing the great importance of keeping war traffic rolling on these routes, Congress has appropriated $150,000,000 for the construction and improvement of access roads to military and naval reservations; to defense industries and defense industry sites, and to sources of raw materials.

Working on these problems have been local city and state traffic engineers, assisting the plants and the communities in their joint interests. Several larger plants, such as the Glenn L. Martin bomber plant in Baltimore, employ their own traffic engineers. An idea of the size of this industry may be illustrated by the fact that today the company has some 44 acres of parking lots.

Where a factory is situated in a built-up area, there are generally only one or two main routes carrying the war worker traffic. Therefore, the sudden expansion generally congests the existing routes at the times of shift changes, and steps must be taken to increase the capacity of these or to provide alternate routes to carry the added traffic.

One of the major causes of congestion is frequently found to he curb parking. On a 40-foot roadway, for instance, the elimination of parking would just double the capacity. By making a traffic check of the existing volume and estimating the probable increase due to war worker traffic, (or the actual demand, if the route is now congested and unable to carry the load) the engineer judges whether it is possible to increase the capacity of the route to a point where it will carry the demand, or expected load. With well regulated cross-traffic, at intervals of a mile or so apart, a route should carry about 1,000 vehicles per lane per hour.

Other methods of improving the capacity of the access route which are usually employed include provision of a traffic signal system, timed for progressive flow, installation of special turning restrictions to reduce delay from left-hand turns, use of lane markings to reduce "weaving" and turning from the wrong lane, or physical changes such as the widening or inter-connecting of certain street lengths to form a continuous through route.

In some cases the engineer has had to attract motorists to alternate routes to spread the load by the simple expedient of making the extra routes more attractive than previously. In some cases, the alternate routes have been made "one-way"; one to, and another away from the plant. Or the answer may lie simply in making the extra routes "through streets" by providing stop signs on the side streets, and directing the traffic to use these newly-made thoroughfares. Some industries have distributed route maps to their employees, calling attention to available alternate routes which have been made more attractive.

With the provision of adequate access facilities, goes hand in hand the problem of terminal facilities. Too often, elaborate plans are made for getting the workers to the plant, and little thought is given to the proper design and location of storage space. One actual case in particular illustrates this point; where it was found that no time at all was wasted in driving to a plant employing 16,000, but each employee, on the average, consumed one half hour in getting into the parking lot and parking his car. This congestion at the lots represented a waste of thousands of manhours daily besides constituting a real danger in the event of an emergency, such as fire, sabotage, or air raid.

The error of putting the parking lot across an important street or road from the plant entrance should be avoided. If it is absolutely necessary to locate the lot in such a manner, it is to the factory's own advantage to see that overpasses or tunnels are provided for pedestrian traffic, safe-guarding their own employees, while not disrupting traffic flowing past the plant entrance. Modern principles of parking lot design incorporate the following elements:

1. Separate entrances and exits.
2. One-way flow within the lot.
3. No conflicts or crossing of paths at entrances or exits.
4. Drivers assigned to specific stalls, convenient to their entrances and exits.
5. Location of lots around the plant according to the origin of traffic, to prevent cross traffic congestion.

Of equal importance to the problems of design and construction of facilities to handle the great war production traffic loads, is the program of conservation of vital transportation facilities. The drastic shortages of critical materials, particularly the almost complete loss of our rubber supply, has made it necessary

(Continued on page 13)

COMMERCIAL BROADCASTING

By BEVERLY F. FREDENDALL
National Broadcasting Company

"One minute to go" and while the production man is trying to quiet those in the studio, the operator experiences once again that empty feeling in the pit of his stomach. Finally the cue is heard, signal lights flash, and the announcer swings into action. Once started, that "zero hour" feeling is safely past and the broadcast settles down to a perfect presentation of a well-rehearsed show.

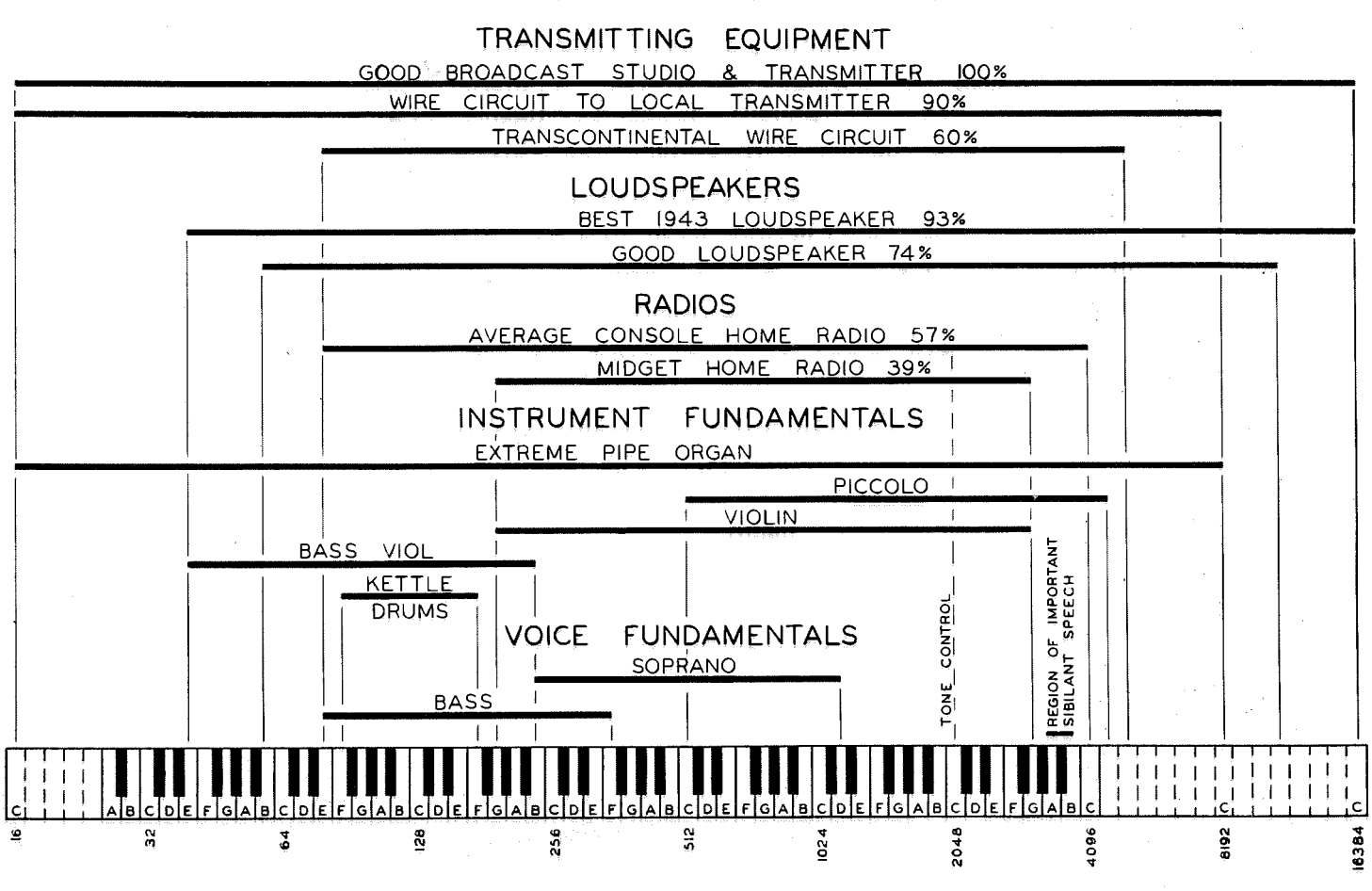
Few people listening to programs while in an easy chair in their own homes have an opportunity to witness behind-the-scenes activities in a broadcasting studio or to learn some of the technical aspects of network operation.

The term "radio network" has come to be increasingly familiar to all Americans. A network is composed of member stations in various parts of the country, which draw on programs originating by one of the major broadcasting companies. These programs fall into two classifications—sponsored and sustaining. Only 42% of the entire broadcast day is of the former type while the remainder is of the sustaining type. In the case of sponsored programs, member stations are paid to carry them, whereas the network principal originates and pays for the numerous sustaining programs. This latter type includes an increasing number of Public Service features, such as "The NBC Symphony" and "The Army Hour," which contribute greatly to the public welfare.

This network service is as flexible as that which the newspapers receive from the great news agencies. Member stations have the privilege of using or rejecting available programs. In addition to network features it is highly desirable that they also provide listeners with "local" interest and news programs which are important in maintaining a station's popularity.

Most people believe that not only does the program reach the listener by radio but that the transmission of network programs from one broadcast station to another is also done entirely by radio. Such is not the case. The Federal Communications Commission has long ago ruled that wire lines shall be used between stations whenever they are available. This means that the same type wires that carry telephone conversations are used to carry local and transcontinental programs from station to station. Radio is resorted to mainly on special events broadcasts when wire line service is not available. The reason for this order is to conserve the crowded short-wave radio spectrum for

(Continued on page 17)



THE CAMOUFLAGE PROGRAM OF SOUTHERN CALIFORNIA

By ERNST MAGG

Assistant Camouflage Chairman, County of Los Angeles

Military authorities have told us many times that we must expect at least a "token" raid in this area, or any other portion of the country for that matter, and we must be prepared for it. Such a raid would bring forth wide-spread demand for the camouflage of all vital industry and utilities, as it did in England after the first German bombs were dropped. It is, therefore, essential to have a complete plan ready in order that millions of dollars will not be wasted in needless ineffective camouflage.

In the year following Pearl Harbor, methods of industrial camouflage have been worked out to meet the local needs in all parts of the United States, and specific area plans are rapidly being developed to cover the most vital areas.

This article will deal only with the camouflage of industrial plants, utilities, and similar installations and will not attempt in any way to describe military camouflage or military installations.

CAMOUFLAGE OR PROTECTIVE CONCEALMENT

Camouflage, or protective concealment, as the Office of Civilian Defense prefers to call it, can be defined as the science or art of confusing the identity of an object for the purpose of deceiving or bewildering the observer.

Protective concealment of industry is interested primarily in the bewildering of the bombardier. At best, the bombardier has less than a minute to find his target, get set on it and discharge his bomb. It is not always essential under these circumstances that the target be entirely obscured from the sight of the bombardier.

It is anticipated that in this area we need expect only high-level, precision bombing. Therefore, we need only carry our camouflage plans far enough to deceive a bombardier flying at altitudes of twenty to thirty-thousand feet. This greatly simplifies our problem because from such altitudes colors are no longer discernible, but only the texture and depth of tone are apparent. Also, the height of objects cannot be easily estimated from such altitudes unless they throw distinct shadows.

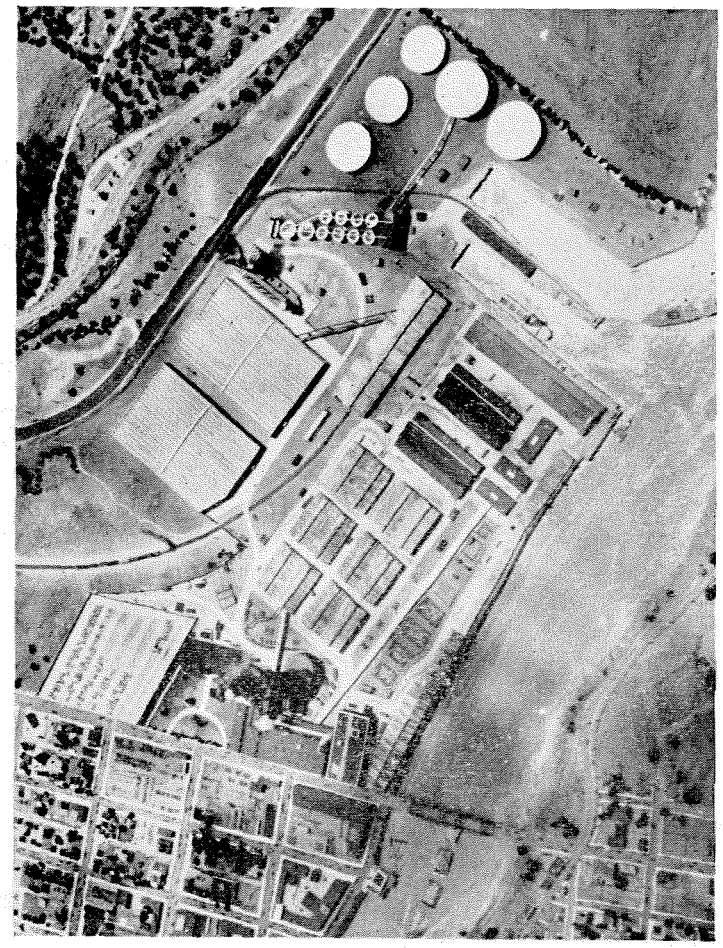
GENERAL PRINCIPLES OF CAMOUFLAGE DESIGN

As in any other field of design, there are certain general principles in camouflage or protective concealment that must be taken into consideration in order that the solution to the problem may be adequate. The more important of these are described below:

Camouflage is no protection against night bombing or area bombing—that is, mass bombing by large numbers of planes. However, it is a protection against precision bombing, which is our main concern in this area. Many targets may be naturally camouflaged because of their surroundings and should have nothing done to them. An industrial building in a built-up industrial area, if of the same general size and shape as the surrounding buildings, cannot be easily spotted from the air. Probably anything done to such a building would make it a better target.

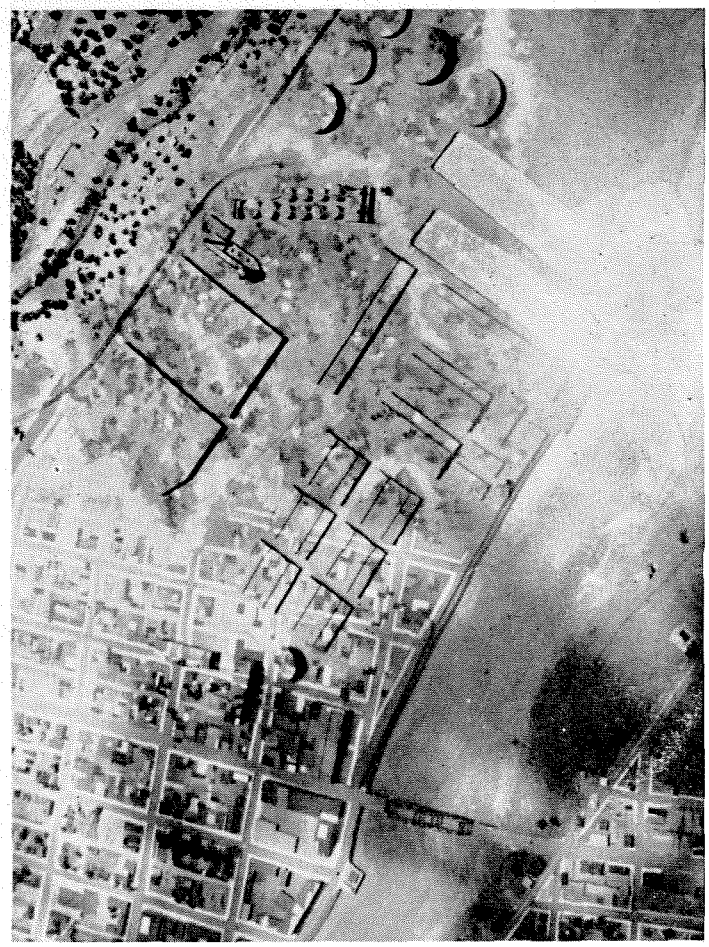
Landmarks that may lead the pilot to the target are as important to the camoufleur, if not more so, than the target itself. Bridges, highways, inersections, curves in river-beds are good examples of such landmarks. Many of these are extremely difficult to camouflage. In general, the best camouflage job is the simplest one. The more complicated the plan becomes, the more easily it is detected. It is also true the more complicated it becomes the more it will cost to build and maintain. Complicated methods of camouflage make the area camouflaged more difficult for industry to use and tend to increase the cost of production and also to retard it. Therefore, no more camouflage should he used on any project than is absolutely essential.

A poor job of camouflage is worse than none. To illustrate: A water company painted an elevated tank a dull color to match the surrounding area hoping to reduce its visibility from the air. The result was most unexpected. After painting, the tank was easily spotted in aerial photographs, while on earlier photographs it was difficult to locate because the dust of many years had given it not only the color but the tone and texture of the ground.



Photograph of model, courtesy of Premier Oil and Lead Works

Fig. 1. Industrial plant as seen by bombardier from about 5,000 feet elevation.



Photograph of model, courtesy of Premier Oil and Lead Works

Fig. 2. "Tone down" of same plant. Note shadows. Actual bombing would probably be from much higher altitudes.

From the air the shadow of an object may be many more times obvious than the object, itself. Saw-tooth roof construction, casting a series of shadows on the roof of the building, stands out like a house on fire and can be seen for many miles by the bombardier. It has also been found that streets that have been painted in order to camouflage them can be easily spotted by the shadows cast by the curbs. The subduing of shadows is the most difficult problem the camoufleur has.

All nations now use photography in reconnaisance work. To help deceive the camera, it is essential that infra-red reflecting paints be used when the foliage of the surrounding area is infra-red reflecting. It should be pointed out that in general it is impossible to deceive the camera and all camouflage can be broken down by the use of photography, although in many cases numerous shots will be needed. But this is not so serious as it sounds since it is still essential that the bombardier see the target in order to hit it with the bomb. So, if we can delay him even a few seconds in finding it—although he may know exactly how it looks when camouflaged from a study of the photograph, we have accomplished our purpose.

In camouflage work, it is not essential to pay attention to too much detail. Objects six feet or less in diameter as a rule do not show up with individual identities from 10,000 feet in the air. The camoufleur is wasting time to put small shrubs around the houses or to make little paths in the yards. What is essential is that the general background tone and texture are the same as that of the surrounding area including the effect of such objects.

THE THREE CLASSES OR STAGES OF CAMOUFLAGE

With the above basic principles in mind, we can divide protective concealment into three classes or stages depending upon the degree to which we carry out the work and the money spent thereon.

The first stage, or "minimum job", can be called the "tone down," and will be satisfactory for ninety per cent of the camouflage work done. It consists primarily of painting a building or structure so that it blends with the background by the use of dull paints with color and reflective capacities similar to the ground or shrubbery in the area. Informal and native landscape patterns may be used to help blend the area in with the surrounding territory. Reflective surfaces, such as skylights, windows, etc., may be painted or colored so that no light is reflected. The "minimum job" does not do away with the tell-tale shadows, although their effect may be somewhat hidden by planting.

The second stage, or "average job", carries the work of the camoufleur one step further and distorts the shape of the building or structure by the use of contrasting colors in the "tone down" and by the use of excrescences. Excrescences are shrubs, trees, or structures used to change the shape and appearances of buildings and the shadows they cast. The story is told

(Continued on page 15)

Photograph of model, courtesy of Premier Oil and Lead Works

Fig. 3. "Complete job" on same plant through use of many excrescences. In many cases more use could be made of nets.

THE LATIN AMERICAN POLICY OF THE UNITED STATES

By EDWARD O. GUERRANT

Instructor of History, California Institute of Technology

Shortly after the turn of the present century President Theodore Roosevelt made a statement that:

> Chronic wrongdoing . . . may in America, as elsewhere ultimately require intervention by some civilized nation, and in the Western Hemisphere the adherence of the United States to the Monroe Doctrine may force the United States, however reluctantly, in flagrant cases of such wrongdoing or impotence, to the exercise of an international police power.

Latin Americans objected strenuously to two features of this pronouncement. One concerned their state of civilization; the other was his reference to intervention. The Latin Americans look upon themselves as the inheritors of the real culture of Western Europe in contrast to the crass materialism of the United States. On the contrary, the United States, having risen almost Phoenix-like to the position of a world power following the Civil and the Spanish-American wars, viewed its neighbors to the south as peoples with a propensity for revolution and a singular disregard for financial obligations.

These conflicting philosophies naturally led to misunderstandings and ill feelings. The United States intervened with armed force at various times in the Caribbean area, in Central America, and in Mexico. This foreign policy was non-partisan. Woodrow Wilson applied it along with Republican administrations. Probably the most provoking aspect of this American policy to our neighbors was intervention by armed force for the collection of a pecuniary obligation.

During the administration of Herbert Hoover there were definite signs that this policy was being abandoned. The Marines were withdrawn from Nicaragua, and Mr. Hoover made a good will tour of Latin America.

However, it remained for Franklin D. Roosevelt to make a definite break with the past and coin a phrase to distinguish the new policy. In his inaugural address on March 4, 1933, Mr. Roosevelt dedicated this nation to the policy of the good neighbor. The United States, deep in the throes of economic chaos in 1933, gave little heed to those few words about foreign policy in that first inaugural address. However, that they were not the result of a random thought was proved later in 1933 when the United States failed to intervene in the Cuban revolution. This action of the United States was even more remarkable when it is remembered that the Platt Amendment gave us the treaty right to intervene. By failing to do so this nation won the admiration of every country from the Rio Grande to Buenos Aires.

Latin Americans were not at all convinced by this seeming alteration in American policy. At the Seventh Inter-American Conference which met in Montevideo in December, 1933, a convention was adopted which forbade the intervention of any state in the affairs of another for the collection of a pecuniary debt. The United States signed this agreement. But Latin Americans, still not too sanguine as to the future, contrived to have a smiliar agreement drafted at the Buenos Aires conference of 1936. The United States also affixed its signature to this.

Not until 1938 was there any opportunity to test the efficacy of these instruments. In March of that year President Cardenas of Mexico announced that the property of seventeen American, British, and Dutch petroleum companies had been expropriated by executive decree. The United States government did not question the right of Mexico to expropriate property. Any governmental entity has the right of eminent domain. However, as was pointed out by Secretary Hull to the Mexican ambassador, this government expected the compensation to be adequate and prompt. When it was known that the companies valued their properties at between one quarter and one half billion dollars and the Mexican government considered them worth about twenty million, it became apparent that the compensation would be neither prompt nor adequate. If there were no other reason, the Mexican government could not pay the former amount because it did not possess that much.

Before the State Department would intervene the American companies were advised to exhaust all their legal remedies in Mexico. By the end of 1939 the companies had taken their case to the Supreme Court in Mexico which had ruled against them as anticipated. Following this the State Department sent many vitriolic notes to Mexico, but no troops. Mr. Hull told the Mexicans that the good neighbor policy was supposed to be bilateral, not unilateral. If they expected us to be good neighbors to them they must reciprocate. The oil companies engaged Donald Richberg, former N.R.A. chief, as their counsel, to intercede with Mexico, but to no avail.

The incident was finally settled in the spring of 1942 on Mexico's terms. The basis of the settlement was the value of the pipes and other surface installations and not the oil or subsoil wealth as claimed by the companies. The Mexican contention was based on the Constitution of 1917 which vested subsoil wealth in the nation. However, in some cases the companies had had title in fee simple prior to that date, and the Mexican Government had at various times given assurance that the Constitution would not be retroactive. Quite naturally the companies involved did not favor the decision of the State Department. However, the results in the political field were remarkable. Not only the Mexican Government, but all of the other Latin American nations were agreeably surprised at the attitude of the United States. In previous times Marines had descended on their shores for lesser reasons. It seemed to them that at last a new era in Pan American relations was dawning.

While the settlement of the Mexican oil controversy was one of the most important events in Inter-American relations in the 1930's, the United States has taken certain positive steps worth noting. In the field of commerce and economics there have been three notable developments within the last ten years. These are the Reciprocal Trade Agreements, the Export-Import Bank, and the Lease-Lend Agreements.

In 1930 the very destructive Smoot-Hawley Tariff was passed placing the highest barrier on foreign goods in the history of this nation. It accentuated the downward spiral of international trade and effectively barred the way to any recovery in world commerce. In 1934 the Trade Agreements Act was passed allowing the President the right to conclude trade pacts with various nations without Senate approval. Twelve such agreements had been concluded with Latin American nations before Pearl Harbor. In some cases, notably that of Cuba, trade increased markedly as a result of this policy. In all cases trade was stimulated, and the pacts have been mutually beneficial. In most instances the tropical goods exported by the Latin Americans have not competed with our products, so any lowering of the tariff or granting of a larger quota did not affect any existing business in this country. On the other hand, this nation did gain certain trade concessions in Latin America. At the present time the State Department is negotiating agreements with various other Latin American nations hoping to conclude them before the Trade Agreement Act expires this coming summer. Because of the existing political structure of the House of Representatives there is some doubt as to whether this administration measure will pass. It is entirely probable that a sufficient number of dissident Democrats might vote with Republicans to defeat this bill when it comes up for reenactment. The administration hopes to have as many of the pacts as possible passed before the act is again voted upon, because when once signed they have the force of a treaty in international law and do not depend upon domestic legislation for validity or date of termination. They extend indefinitely into the future.

The second basic economic policy of the present administration, that of the Export-Import Bank, is also vitally important. This institution created and financed by the United States was designed to facilitate international trade as well as make direct loans to various governments—especially to those in Latin America. Brazil has received well over $100,000,000 from this bank, and other nations have obtained lesser amounts. In some cases the loans aid in strengthening their industrial structure. In others the currency is stabilized. Recently $28,000,000 has been loaned to Chile to allow her to build an industrial structure adequate enough to weather the anticipated post-war difficulties. That country, in the past, and to a marked degree at present, has depended upon two major products for its prosperity—nitrates and copper. Any nation with such a narrow economic base must inevitably face disaster when its produce is not in demand. There is evidence that the world will not depend on Chilean nitrates and copper after this war in which case the American loan to strengthen her industry is highly desirable.

The third basic economic policy of the United States toward the Latin American nations is Lease-Lend aid. This is purely a war time measure. The original act was passed in March, 1941, to aid Britain especially. The act has been amended and more funds have been appropriated. At present aid is being extended to over forty nations which in the opinion of the President of the United States are resisting the aggressor nations. They do not necessarily have to be at war to fall in this category. Some of these nations are situated in Latin America. Congress has recently exhibited an increased interest in where the aid is going and how much is being sent. The executive branch of government insists that its periodic statements are all that can be revealed now because of the war emergency. Any further revelation would be of aid to the enemy is the contention. Be that as it may, it is certain that the billions appropriated under the Lease-Lend Act are being widely distributed. There is little doubt that the political power of this nation is increasing internationally as a result of this policy. The question concerning the consideration for this aid has only been cursorily discussed. The wording of the agreements indicates that the nations receiving this aid may meet the obligations in various ways, either tangible or intangible. The question still remains unsettled. As the pacts denounce any method of payment which would burden commerce, we can be fairly certain that the repayment will not be in gold or kind, similar to post World War I arrangements.

Even a summary comparison of American policy in Latin America during the last decade with that of previous eras reveals that this country has made numerous economic and certain political concessions to gain political advantages. Hemispheric solidarity has been a cardinal point in the foreign policy of this government since 1933. Secretary Hull and Mr. Sumner Welles have made numerous concessions to gain unanimous votes in the six Pan-American conferences during the three Roosevelt administrations. Our adherence to the non-intervention pacts in the case of the Mexican oil expropriations, American loans to various nations, the Reciprocal Trade Agreements, and the Lease-Lend pacts have added greatly to the prestige of the United States in the eyes of the peoples south of the Rio Grande. In return for this the United States has secured certain diplomatic triumphs. The Lima Conference of 1938 adopted a unanimous declaration against the aggressor nations, which action was greatly desired by this government. Unanimity was again achieved in September, 1939, concerning the three hundred mile safety zones around the Western Hemisphere. In the summer of 1940 the United States won a political victory in receiving the approbation of all the Latin American countries to a pact allowing any one nation to take over the territory of any European colony in this hemisphere which was threatened by an aggressor. At the time the United States feared that Germany might acquire the French and Dutch colonies in the Carribean area. In January, 1942, the twenty-one American countries again lined up solidly in a recommendation that diplomatic and commercial relations with the Axis should be severed. At the time of the writing of this article only Argentina retains her normal relations with Germany, Italy, and Japan.

Whether the economic concessions granted the Latin Americans are justified by the various political achievements of the United States cannot be definitely decided now. There are still groups in Latin America who fear the "colossus of the north" and say that this is merely a pleasant interlude. There are those in this country who say that the generosity of the United States at various times has not brought commensurate results. Only the unfolding of the future will bring the answer to these questions. It can be stated, however, that never before in history has there existed such amity between the Anglo-Saxon and Latin peoples residing in the Western World. That it is beneficial to our present war effort should be obvious.

WARTIME JOURNEY

(Continued from page 4)

rays of the sun. Java, between intermittent cloud banks, was a flat plain, infinitely subdivided into the minute individual land-plots of its millions of inhabitants, all this sloping gently upward and backward from the low, gentle coast line toward the base of the island's rugged volcanic backbone with its high, jagged skyline.

We stopped that night at Sourabaya (Java) in a brief, cooling, drenching tropical rainstorm. Dutch customs authorities were tense, grimly thorough, unsmiling. The plane crew suggested to the present group of passengers that if we thought, by any chance, that we were being unduly manhandled by the Dutch authorities, we should have been present at the recent examination of a certain Japanese passenger.

The following day ended at Darwin, extreme northern Australia. To Dilli, Portuguese Timor Island, we flew over numerous, small, rough, thickly green-mantled islands, sometimes flying low, so that we could clearly see the few scattered bits of rock outcropping through the foliage. Before striking out over the many miles of open sea to Darwin, we skirted long stretches of wild, rocky, sparsely growth-covered Timor coast.

Darwin is one of those places commonly and aptly described as "the last place God made": a stifling, tropical land of tidal mudflats and mangrove swamps. The world contains a fair number of such places. The question of which one actually was last is probably of no great importance. Darwin must in any case have been relatively near the end of the sequence.

Within a few months Darwin was destined to quake, unprotected, under the impact of Japanese bombs. But now it was placid, undisturbed by serious thought of any violence to come. Desultory expansion of military facilities was in evidence from the air as we landed.

At Darwin we left the flying boat. Our schedule called for continuing down the west coast of Australia by a land plane taking off 36 hours after our arrival at Darwin. The day's rest was greatly appreciated, even in Darwin. Long trips by air are exhausting even in the comparative luxury of a big flying boat.

We hedge-hopped first westward along the north Australian coast, then far inland and again out to the coast, this time the west coast, stopping at small villages of a few inhabitants each or at headquarters of vast ranches or *stations*. At each stop all passengers were cordially served with sandwiches and tea—the eternal Australian tea, which incidentally is excellent. Between consecutive stops were long stretches of wild country unbroken by any sign of human habitation.

It was another world from that of which we had just had a true birdseye panorama, with its teeming human millions. This was a new, clean land, unsullied by countless centuries of human handling and desecration. It was indeed Australia, with its own marked individuality, which fact I am confident we would have recognized from previous acquaintance immediately upon landing even had we been carried there blindfolded and without knowledge of our destination. The land has its own unmistakable scent, from end to end—a fresh and faintly pungent, sage-like odor of some omnipresent plant, the identity of which defies definition, but which is probably either the acacia or eucalyptus or both.

Two days' flying brought us to Perth, Western Australia, far south on the western coast, our destination. We found Perth a pleasant place to live, in its quiet, comfortable setting along meandering curves of the Swan River, among congenial, gently rolling hills. However, most of my own time in Australia was spent in exploratory work far to the north in country which we had traversed by air in coming to Perth.

Within a year after our arrival at Perth, northwestern Australia had in its turn become truly no man's land, the chief variation on the theme being that this time the enemy was of the yellow races of the East. The Jap had bombed a west coast port of entry to the area of our explorations. Even to Australia, hitherto so remote from that dim panorama of events which had always seemed to have no reality, no real bearing on herself, war had grimly come.

The United States Army and Navy were moving in. They had known war only a few short weeks. In the desperate first moves to stem the Japanese tide confusion reigned, unavoidably.

Added to the consternation inherent in its own people and army and the confusion of the preliminary local United States naval and army mobilization moves was that incident to the flood of refugees from Malaya and the Indies. For a short period the more farsighted of these arrived in hordes at Perth, in every conceivable thing which would float on the seas. Foresight appears to have been a rare quality indeed, among these people. The more fortunate ones carried suitcases.

The most novel of the authentic refugee stories which I encountered was that of the little, flat-bottomed Yantze River cattle boat which had somehow got to Java and was lying in one of her ports when the Jap arrived in the Indies. She had accommodations for about a dozen persons. Some two hundred desperate souls crowded aboard. An officer of the late lamented prize battleship *Prince of Wales* took command and they put to sea with a page from an atlas by way of a sailing chart. Barely out of the harbor a Jap submarine surfaced nearby off their beam. They could clearly see the trace of the torpedo, aimed irrevocably amidships. All watched in dumb horror as the infernal thing slid under the ship's side. Dead silence continued—indefinitely. The ship drew only six of the ten feet or more of water for which the torpedo was set. The sub turned her disgruntled attention to bigger game.

Again it was clearly a situation of having to leave the field to the armies. Our organization decided to do this, and we were instructed to return home.

About a week previously I had put my wife on a train out

of Perth, with the family of the local American consul, also bound for home. It proved impossible for me to reach the eastern Australian coast in time to sail with them, by returning army transport.

By now rail passenger traffic was congested beyond hope. After numerous frustrated attempts to obtain passage by ship to eastern Australian ports, another of our staff and I succeeded in arranging for passage with the captain of a freighter under charter to the U. S. Army. With little faith in her scheduled sailing, we climbed aboard. If she failed to sail, well, we could always go ashore again.

To our amazement, within 24 hours we cleared the harbor and joined a convoy with about eight other transport vessels and an escort of a half dozen small naval vessels. The second day out the convoy suddenly began to zigzag more violently in its course and two of the escort vessels instantly became involved in a frantic search for some mysterious undersea creature, raising huge geysers with their depth charges. At length they rejoined the convoy. No report was ever heard as to the success or failure of their hunt. The third day out our ship pulled out ahead of the convoy, limited in speed to the 8-knot pace of its slowest vessel. Our ship reached Melbourne four days later, alone.

There we beheld, with great relief, signs of mobilized order. Comparative calm and grim determination were beginning to grip the Australian effort. We booked passage on a returning U. S. Army transport due to sail for home about four days after our arrival. She sailed exactly on the hour announced something over 24 hours in advance.

We sailed a course obviously designed to circumvent the farthest wanderings of the Jap submarines, far, far off the normal steamer track. The ship was designed for 21 knots maximum speed. We averaged nearly 25 knots, making the trip to San Francisco in 19 days. Speed is the essence of safety from submarine attack; our peace was undisturbed.

My wife had arrived without mishap a month earlier. San Francisco seemed a very excellent place to be.

THE TRAFFIC ENGINEER . . . .

(Continued from page 6)

to take extreme conservation measures to avoid an absolute breakdown in our transportation system. Mileage is now rationed by gasoline restrictions, and the nation-wide top speed limit set at 35 m.p.h., while in the 17 eastern states, all pleasure driving is prohibited.

Normally we in this country used about 650,000 tons of rubber per year; 220,000 tons for auto tires, 240,000 tons for truck and bus tires, and the remainder for other purposes. Thus we consumed about 460,000 tons per year for tires. At the turn of the year, we had 578,000 tons of crude rubber on hand, according to the Baruch Committee report. We could expect only about 53,000 tons more from other sources until 1944, making a total of 631,000 tons available till that date. But the expected military demand alone is 842,000 tons! Before we start we are confronted by a shortage of 211,000 tons by January 1, 1944. This shortage will have to be met before any synthetic stock can be made available for civilian use. It appears that if the scheduled construction of synthetic rubber plants is attained, some relief will be felt by the middle of 1944, but under no circumstances will there be sufficient rubber available before that time to meet the demand.

It is evident that strict conservation of tires is the only means of preventing a collapse in our transportation system. President Franklin D. Roosevelt informs us, "The demands of war on our national resources make it imperative that unessential travel be eliminated for the duration."

In every industry over 100 employees, OPA has made it mandatory that a labor-management transportation committee be set up, to promote group riding among the employees, and to certify to certain requirements which an applicant for supplemental gasoline rations must meet. If an employee needs additional gasoline (above the "A" allotment) or tires, to allow him to drive his car to and from work, he must carry 3 or more passengers regularly, or prove that it is impossible to carry passengers because of irregular hours of work, or absence of fellow employees living near him. His plant transportation committee

certifies to the local rationing board as to the accuracy of his statements, and that there is no alternative transportation available, such as bus or rail, if the car-owner cannot obtain a car-load of employees. Most plant transportation committees carry out an organized transportation plan, whereby all employees are registered by zone of residence (using a zoned map) and efforts are made to teams of employees, assigned to one car, or perhaps to several alternately used cars.

By means of car-occupancy counts at the times of major shift change, the average number of persons per-car is obtained, which serves as a guide to the effectiveness of the local ride-sharing program. Before Pearl Harbor, the usual count showed an average occupancy of 1.5 to 2.0 persons per-car. Today, many plants have raised their average to above 4, through systematic effort. Many times employees are switched from one shift to another in order to team them up with others.

Realizing that the program of conservation of private automobiles should include non-war workers, many cities have set up central "ride-sharing bureaus" where business district employees can team up in ride-sharing groups, or swap rides to and from work. The OCD has been responsible for similar set-ups in residential areas for teaming up the housewives and others going to town for shopping. Other organizations have set up similar plans for salesmen and church goers.

Naturally, the element of traffic safety is a major factor in the transportation conservation program. Organizations like the National Safety Council and the National Conservation Bureau are devoting their resources toward "off-the-job" accident prevention, which in 1942 took a toll of 29,000 workers' lives in the U. S., 16,000 of which were a result of traffic accidents. Not only are war workers laid up or lost for good, but the loss of automobiles, tires and parts cannot he replaced. The manpower needed to mend broken automobiles is really manpower diverted from vital war production, and should better be expended on building airplanes and guns.

Traffic accidents not only affect the participants, but many times slow up production on a large scale. Last winter a collision between two cars killed two war production workers, injured two others, and obstructed traffic so seriously that some 5,000 men were late for work at a munitions plant that day. In another part of the country, accidents on a steep, narrow approach to a bridge blocked traffic several times during the winter, causing thousands of lost hours by employees in a munitions plant. These are only two examples of accidents that are slowing up production everyday, that are sabotaging the war effort just as unnecessary usage of transportation equipment and unnecessary traffic delays are doing.

Public mass transportation (buses and street cars) is the second major division of passenger transport that the traffic engineer must assist. In normal times, mass transportation has tried to meet the customer's every desire, within reason, literally picking him up at his door step and depositing him at his convenience wherever he desires to be let off. In conforming to the average American's daily habits, in order to be on hand when and where he desired transportation, bus and street car companies have had to maintain large fleets of vehicles to carry the heavy morning loads and peak afternoon loads, while during the remainder of the day operating less than half the equipment.

The average curve of passenger load before Pearl Harbor would reach peaks between 7:30 and 8:30 a. m. and between 4 and 5 p. m. three times as high as during the other (off-peak) hours, resulting in a tremendous inefficiency in operation, caused by the necessity of maintaining the great overhead to meet the sudden peak demands for 2 or 3 hours a day where less than half the equipment was needed during the remaining 21 or 22 hours.

The mass transportation shortage problem is even more critical than that of the private car, and with the rationing of gasoline, wearing out of tires, and inability to buy new cars, many new customers are crowding the buses and street cars. Many lines show increases of 50 to 200 per cent over the load a year ago, and yet they are unable to secure additional vehicles. The office of Defense Transportation requested that 5,000 be manufactured for 1943, as the minimum necessary for meeting the expected demands. Yet the War Production Board has set the 1943 production of buses at only 1,500 for civilian use. So it is obvious that drastic measures must be taken in 1943 and 1944 to permit the existing equipment to carry the loads that must be accommodated. It is interesting to note that the 1942 output of local transit buses alone was 9,200 vehicles. In 1943 only 1,500 buses will be manufactured for all types of civilian uses.

During 1942, 1,000 war plants and 260 cities in this country staggered their working hours in order to spread the demand more evenly on mass transportation, and by spreading the demand over a longer period, automatically lower the peak loads, making it possible for existing facilities to carry greatly increased loads. "Staggered Hours" is the term applied to the process of changing the hours of starting and terminating a work shift, or an office, school, or store day, so as to reduce peak movements. Generally in cities, this has been accomplished by having retail stores close at 6 or 6:30 p. m. instead of the usual 5:30 p. m. Schools open at 9:00 a. m. instead of 8:30 a. m., and offices change according to the existing transportation demand fluctuation, to offset the peaks. Generally plants have had to start and stop earlier in the day, at say 6:30 or 7:00 a. m., and different plants have often found it necessary to stagger their hours in relation to one another so that both will not discharge employees onto the streets at the same time, or so as to cause peak demands on the bus or street car lines.

In factories contributing the major proportion of travel to a mass transportation facility or traffic route, the staggering of hours of various departments or main units has often provided the required relief. Naturally this intra-plant staggering of hours tends to hamper the group-riding program at the plant,

since employees on different shifts cannot very well ride to and from work together, hence it is not so popular as inter-plant staggering, which would mean shifting the hours of every employee one way or the other at a plant.

The development of staggering hours plans has fallen into the hands of traffic engineers in most cases, and where a city or industry has not had such an engineer in their employ, state and national organizations have come to their assistance. The surveys of working hours and transportation load fluctuations requires the engineering approach to work out solutions. In most cases the engineer then has found it necessary to become a combination politician-salesman in order to secure the approval of the merchant groups, the school groups, and the industrial interests, in making the hours changes.

Elimination of 1/3 to 1/2 the usual number of bus and street car stops, shortening of lines, and elimination of jogs and detours in lines have been necessary to further conserve the mass carriers.

In regard to movement of buses and street cars, the office of Defense Transportation has issued the following: "Traffic regulations and controls have generally been operated to facilitate the movement of automobiles. During the present emergency the movement of mass transit vehicles should take precedence, and the efficient movement of such vehicles should be the major consideration in the timing of traffic control devices."

Thus traffic engineers are hard at work devising ways and means of curtailing service to the minimum essential, and speeding up the schedules through congested areas by giving the "breaks" to the mass carrier wherever possible.

Today, the bus rider finds that he has to walk a couple of blocks to the bus stop, where formerly he was picked up at his door step. His hours of work have probably been changed, to lessen the peak load on the buses, and yet today he probably has to stand up since the buses are filled to overflowing as never before. But the bus rider and the motorist today are finding out what a luxury transportation has been in the past, and they are beginning to be glad to find standing room in a bus or a seat in a car full of war workers.

What can the traffic engineer expect for the future?

There is the certainty of great increases in urban and suburban travel. Public and private aviation will mushroom almost unbelievably, probably superceding much of our pre-war long-distance motor vehicle and train trips, where time-saving is important and cost is not too much a factor. But the use of the motor vehicle for short trips will be an essential part of our transportation network. The average length of motor vehicle trips has been 15 miles, and will probably continue to be about that. It is generally agreed that planes will not supercede cars for short trips! So folks will still need cars.

Federal funds will aid construction of parkways and freeways, functioning as arteries for the great masses of motor traffic that will flow into and out of cities, and between cities not too far apart.

The traffic engineer will continue to function as a Highway Transport "Operations" Engineer, a field the importance of which has long been recognized by the railroads, and which is rapidly coming into its own in highway transportation. His field of operation will continue to cover the subject: (1) geometric highway design, (2) road surface characteristics, (3) terminals—their location, design and operation, (4) methods of securing efficient highway transportation, (including accident prevention and public education), (5) vehicle performance, (6) traffic capacity, speed, composition and other characteristics of the traffic stream, (7) driver characteristics and driver behavior, (8) methods of supervision and control of both vehicular and pedestrian traffic, (9) the use of relationships of metropolitan highway transportation systems to other transportation facilities and to city planning, and (10) highway transport economics.

The traffic engineering profession, in meeting the challenge offered by the war production transportation problem, is undergoing a broadening influence which cannot fail to benefit the engineer, as he works more closely with public groups in staggered hours and tire conservation programs and with industrial groups in solving their transportation problems.

THE CAMOUFLAGE PROGRAM

(Continued from page 9)

of a bombardier who had been ordered to bomb a large gas holder. After making a thorough study of the maps of the area, he and his pilot made their flight but could not find the target. They circled and tried again, but again were unable to find it. Then they returned to the base and new photographs were taken of the area. Minute study of these photographs finally indicated that a square platform had been erected on top of the tank, so that instead of a round object and its shadow for which the bombardier was looking, there now existed a square structure and its shadow. On the next trip the bombardier hit the target.

The painting of large, flat factory roofs or large ground areas such as landing fields to simulate the surrounding area, can be done with surprising success. Streets are continued, by painting, up the walls and over the roofs of structures or across the runways. Sometimes, in order to get the proper texture, it is essential that shavings or similar material be imbedded in the paint. This is especially true where simulated turf is painted on the runways. Houses or other small buildings are simulated by areas of light and dark, the dark portion acting as the shadow, painted directly on the "tone down" background color. They should be made to appear like other buildings in the neighborhood.

Because of the change in character of foliage with the seasons, it is essential that the backgrounds, or "tone down" color be changed with the seasons. Also, the paints used are generally somewhat darker than the colors in the surrounding territory because they tend to fade.

In this stage of camouflage, it is impossible to do much with the automobile parking lot. The protective concealment of parked cars is one of the most difficult problems we have because of the many reflective surfaces that a car presents. It has been suggested that cars could be painted a dull tone similar to that used in buildings, but as long as they have many glass surfaces present, this seems of little use. If room is available, cars can be dispersed; trees and shrubs planted to hide them, and the area painted to conform to the adjacent areas. This will usually double the area now used, but it is probably cheaper than using the third stage of camouflage. Perhaps the rubber

shortage will help considerably if people start going to work by means other than private automobiles.

The third stage, or the "complete job," is only used where neither the first nor the second stage is satisfactory and where the importance of the target warrants the spending of considerable money. It consists of all the work done under stages one and two, and in addition the removal of all shadow lines as far as possible. Parking areas used for both cars and planes, or areas used for the storage of material, must be covered instead of being painted in order that they may still be used. To eliminate the shadows and to hide the work going on adjacent to the buildings, a system of nets supported by cables which in turn are supported by other cables, poles, or buildings is used. The netting used in this locality is chicken fencing of light gauge wire. It is rather thinly covered (25% to 50% of the area) with some material such as feathers or glass wool, to give texture and a surface to paint. The method of fastening on the feathers is interesting. The netting is dipped in asphalt, or other adhesive material, and the feathers are then dropped on at a rate to give the correct texture as the netting is moved along under the feather bin. The netting and feathers are then passed in front of large fans in order that the feathers not well fastened to the netting will be removed. Millions of square yards of this material have been manufactured and used. This netting is then painted, a similar procedure to that outlined for buildings in the second stage heing used.

Painting of nets is usually done before they are installed. In laying out, on the netting, the colors for houses, streets, etc., care must be taken so that when these will match where the nets meet on erection. Of course, maintenance painting or change in the character of foliage must be done while the nets are suspended. These nets will weigh somewhat less than half a pound per square foot and can span up to fifteen feet. The structural design of the cable system and its supports presents a specific problem which will be discussed later.

Probably the simplest case of the use of nets is known as "flat topping,' and is nothing more than netting supported on light cables or wooden framing between the eaves of the roofs in saw-tooth or similar construction. After this has been installed, the problem of camouflage on this roof is identical with tbat of the flat roof building.

Sometimes, as a variant, portions of netting are left out and the saw-tooth built so as to look like a house or a garage. It will cast its own shadow, thereby heightening the camouflage effect. It also reduces the cost to some extent. This procedure and other similar variants are very helpful and effective on extremely large roof areas.

Usually the next area considered after a flat topping of the roof is the parking lot. Here, the netting and cables are carried on poles and the feathers are thinned out near edge of the nets until there is nothing left. By this process the shadow of the netting is gradually dispersed and cannot be picked up from the air. Generally, the poles are twelve to fourteen feet high and the netting may drop as low as eight feet above the ground between them.

In the "complete job" nets must be run out from all the buildings to hide the work going on between and around them as well as to cut out their shadows. Sometimes, these nets may be carried as much as four hundred feet away from the buildings. Usually, after the nets have been installed the problem is the same as in the second stage except over much wider areas. Many times, to make the camouflage more effective, excrescences made to resemble houses, trees, or other structures are erected directly on top of the nets, although their use is not absolutely essential for effective camouflage against high altitude bombing.

Although not a problem of the camofleur, it should be noted that the problem of air conditioning in these buildings, painted dark colors with net stretched over and around them on all sides and with all windows closed because of the night blackout requirements, becomes difficult. This prohlem is being partially solved by the use of infra-red reflecting paint.

There are two types of protective concealment that have not heen mentioned in the preceding discussion because they do not fit into the particular patterns of camouflage, but are of a special nature. The first of these is the use of dummy targets. A dummy plant or structure is erected to look from the air exactly like the original. It is usually placed from one-half to one mile away. If the landmarks have been satisfactorily taken care of, the bomhardier will usually aim at the dummy target. There are instances in Europe where photographs definitely proved the existence of dummy targets and complete camouflage of the actual objective, and yet the bombardier with this knowledge can not resist the desire to homb the one he can see rather than the one he knows to be protected.

The use of dummy targets is extremely expensive because they must not only look like the actual plant hut must also appear to be in use; that is, the roads, parking lots, etc., must show signs of activity. Their use is not warranted in any protective concealment work except the camouflaging of the most vital industries.

The second special type of protective concealment is the use of smoke. This is a rather new development and there is not much information as yet available to the public, but all indications are that it may be used to great advantage for protection against both day and night attacks. Its primary purpose is to reduce visibility, cut out light penetration and hence obscure the target and reduce shadow lines.

Under tbe first stage, or "tone down," the use of planting was mentioned. This is a little used field which appears to have tremendous possibilities. If many of our industrial plants had not removed the natural growtb around them and had been more careful of the dispersion of buildings, probably very little money would now have to be spent on protective concealment. Much can still be done by the planting of proper trees and shrubs in the areas around many existing plants. With proper care and feeding, certain trees and shruhs will grow surprisingly fast and will before long not only offer considerable protective concealment but will help beautify our industrial areas.

STRUCTURAL CAMOUFLAGE

The almost universal method for supporting nets is by cables, although on some short spans wooden beams have been used. The loads generally used in design are very light: vertical loads, including both live and dead, one-half pound per square foot; horizontal loads due to drag effect of wind, one-half pound per square foot of netting surface on all surfaces; a

horizontal load on surfaces with a slope of 30° or more, of five pounds per square foot of vertical projection; a live load on main cables of 200 pounds concentrated to take care of a man working.

Some of the other limitations of design are that a net supported directly on a cable should produce maximum cable sag of not more than six per cent of the span with an average sag of all cables of not more than three per cent. This will keep the end slopes of the cables flat enough so that they will not cast shadows. Sloping cables supporting nets should be limited to a maximum slope of about 20° with the horizontal, except when facing the south.

Most of the buildings built in this area before 1933 do not have adequate strength to resist the pull of cables. If advantage is taken of earthquake bracing installed in buildings since 1933, they usually can be used to support and anchor the cables. However, special connections must be made in all cases, and in many cases some minor additional bracing is needed. When no building is available for anchorage, concrete "deadmen" weighing up to thirty tons are installed. When anchor cables are installed at steep angles, as they must be in some cases, the columns adjacent to "deadmen" carry extremely high loads and the design of footings may become quite serious.

DESIGN PROCEDURE

In designing the protective concealment for an industrial plant, the first step is to obtain complete photographs from the air of the area and enough information on the size, area, and roof construction of the building so that models of the entire area can be made.

After the models have been made, various camouflage schemes that blend in with the general camouflage plan in that area, as set up by the Office of Civilian Defense, are tried and photographs taken of the model. After one of these is chosen and developed to its final form, plans are made in order that this work can be carried on in the field.

OFFICE OF CIVILIAN DEFENSE SET-UP FOR PROTECTIVE CONCEALMENT

The Office of Civilian Defense has set up a standard procedure for the handling of all camouflage problems except those of the armed forces. Each city and county has appointed a camouflage officer whose duty is to act as liaison between the office of Civilian Defense, Protective Construction Division and industry in their respective areas. If any industrial firm desires information regarding the protective concealment of its plant, the Protective Concealment Division of the Office of Civilian Defense will make a complete study of it and report the results. The request is made through the local camouflage officer who obtains the necessary information and transmits it to the O. C. D. They then proceed with a complete design of the camouflage as outlined above and obtain the army's approval of the final layout. The approved plan is then transmitted to the plant by the local camouflage officer. If the officials of the plant wish to carry out this plan, an O. C. D. approved camoufleur is employed to prepare detailed plans of construction and to handle the work in the conventional manner. If the industrial firm does not wish to do the work at this time, at some later date the army may require the work to be done if it feels it is essential that this particular plant be camouflaged.

COMMERCIAL BROADCASTING

(Continued from page 7)

services, usually international in scope. In one sense this is a handicap to the broadcaster for it is felt that there are times when other means of transmission would be superior to existing wire line facilities. For example, one school of thought believes that with the increasing knowledge and improvement in the use of the ultra high frequency radio spectrum (above thirty megacycles) an improvement in program transmission would result with no increase in cost of service, and without congestion in the radio spectrum.

The actual path over which network programs reach all member stations is a vast system of wire lines leased for twenty hours a day from the telephones companies at an annual aggregate rental of over three million dollars. Between New York and Chicago there is a "round robin" circuit and from Chicago to the Pacific Coast a "reversible" circuit. Added to this basic pattern are several supplementary "legs" radiating to all parts of the country and via short wave radio to other countries. A "round robin" circuit is one in which a program is always transmitted in a given direction around a "loop", regardless of the point of origin. For example when New York originates a program it travels over the telephone wires to Chicago via Schenectady and Cleveland, enters the Chicago network control board and passes out again to New York via Pittsburgh and Washington.

It is dead-ended at New York. Should a switch in program origin from New York to Chricago be necessary, Chicago would open the loop and New York would connect the incoming and outgoing circuits. The program thus travels eastward over a southern route and back again over a northern route. The elapsed time for program to travel to New York and back to Chicago again is one fifth of a second. Each station along the line gets a "feed" as if it were listening in on a party line. The

exact instant when each switching point must perform its duty must be accurately timed. This is accomplished by "cues." The normal between-program switching cue is the now famous chimes, a trademark of NBC programs, of three musical notes. Following the chimes cue, each station is allowed twenty seconds, in order to make an identification announcement and return to the network for resumption of the program.

If, however, during a program an announcer in New York wishes to introduce a speaker in Chicago he will usually end his introduction with words like "Mr. John Doe will speak to you from Chicago." This constitutes a word cue, following which, both points must switch and continue program within one second. The National Farm and Home Hour is an example of this type of switching occurring between Washington and Chicago.

The circuit between Los Angeles and Chicago is "reversible." That is, the operators at the two ends of the circuit have control of the direction of program transmission. Their daily traffic schedules and cue sheets tell them exactly when to operate reversal keys associated with this line. Normally reversals take place between programs when the twenty second "local announce" period is available for switching. If, however, a fast switch is desired, as for example during a world news program when the New York announcer calls in his Australian associate, the Australian announcer delays his start six seconds, four of which are used in the actual reversal and two as a safety factor.

The operator at the transmitting end of the line has control over the direction of transmission by the fact that he has applied a control voltage to the same pair of wires that carry the program. This operation simultaneously connects an amplifier and sends an impulse on to the next section of line. A reversal takes place as the result of operating a turn key at each end of the line. First, voltage is removed from one end of the line and all the relays progressively drop out. Next, a control voltage is applied from the other end of the line and a new set of relays reverses the amplifier connections and sends an impulse on to each successive section. A complete reversal takes four seconds.

Let's take a look now at some of the behind-the-scenes activities which precede a sponsored program. Officially all contact between the client and broadcaster is through the sales department, but as soon as a commercial program has been planned the broadcaster assigns a "production man" to the show whose duty it is to set in motion all necessary parts of the broadcasting organization. He is, in a sense the stage manager.

Once the program has been written, "auditions" are held for the selection of all who are required to take part. That is, the announcer, actors and others are given a tryout in order that the ones best suited to the various parts may be selected and engaged. This means that a studio with "live-microphones" must be used so the producer calls the studio assignment desk, for a studio and technical operator. The assignment desk consults detailed charts covering all studios in the plant and, after picking an available one mutually agreeable to the production man, enter this new program rehearsal on the charts and upon the specific day's daily work schedule which in mimeographed form goes to all departments, and from which the engineering department schedules an operator.

Thus begins the first of a series of rehearsals totaling six to ten hours for a half hour show. First the rehearsals begin without the aid of a microphone or sound effects, with each part of the program rehearsing separately. That is, the acting and music is perfected separately until sound effects are added or when the time approaches for a dress rehearsal.

While the program is taking shape another department is busily engaged in lining up the proposed network. The traffic department, having received instructions from the sales department must now undertake the far reaching task of contacting each and every station the advertiser wants to engage for his program. Certain stations forming the basic network must usually be engaged as a unit while the supplementary groups and some individual stations may be added or omitted at the choice of the advertiser and in consideration of the availability of the stations.

An expensive-talent program must have a sufficient number of station outlets together with their listening audience to insure not only the start of the program series, but its continuation. Consequently, a mutually beneficial agreement between member stations and the network principal was evolved, whereby, during certain hours of the day, each station would be available for network programs. The traffic department contracts each station whenever a new program series is to begin. One program, for instance, may necessitate as many as 500 telegrams before the network for that particular program is established.

The Press department now begins the job of publicizing the new show, and including its listing in regular published network schedules. It is an interesting fact that these schedules must be made out three weeks in advance.

Every piece of music used on network programs must be cleared through a central New York office to insure that at least four hours will elapse before the same selection is repeated. Talks and all written material must be checked by the Program department before they are approved for release. In short, the sale of any time period is governed by acceptability of the product, the program, the continuity for the specific period in question, and its relationship to preceding and following programs.

Frequently recordings are made of a dress rehearsal. This recording never goes on-the-air, but is made in order that those taking part may study their presentation to further improve the show. It is called a transcription, and is a record 16 inches in diameter which runs for fifteen minutes when played at the speed of 33 1/3 revolutions per minute instead of at the usual home phonograph speed of 78 R.P.M.

Let's depart from program building activities and again consider technical aspects of the art of broadcasting. While it is recognized that there are technical problems associated with all forms of transmission, only the primary ones concerned with wire line circuits will be mentioned since this is the system in current use.

The human ear hears sound frequencies occupying a band 10 octaves wide, from 16 to approximately 17,000 cycles per second. A perfect system would pick up, transmit, and reproduce this entire band without distortion or impairment of any kind. In practice we know that each piece of equipment, from microphone to loud-speaker, in varying degrees contributes to a change in the original sound. A good studio plant will properly pick up and transmit electrically all 10 octaves and a good broadcast station can also function over the entire audio spectrum. The wire line from studio to local transmitter functions only 90% (i.e. 9 out of 10 octaves) from 16 to 8,000 cycles. Thus the highest quality from a broadcast transmitter takes place when that transmitter is being fed from its own local studios equal to 90% for a frequency band of 16 to 8,000 cycles. However, on a network program, where the transmitted frequency band is further limited both by technical and economic reasons to the narrower range from 80 to 5,000 cycles, the coverage is only 60%.

The reduced upper limit primarily is governed by the 10 kilocycle separation of channels of the present broadcast band. Since two adjacent stations, separated by only 10,000 cycles must share the frequency band lying between them, it is clear that those frequencies above 5000 cycles emmitted by one station will jointly occupy a part of the band normally thought of as being associated with the other station. Under local receiving conditions this does little harm, but for distant reception when the desired station is received with weak signal intensity, the resultant crossing of programs is objectionable. Because of this fact the average present day receiver is manufactured for good selectivity by cutting off the upper frequency response limit at something less than 5000 cycles per second.

So far we have spoken only of the pick up and transmission of sound frequencies. The loudspeaker is the weakest single link in the entire chain. Loudspeakers vary from 93% coverage (40 to 17,000 cycles) thru 74% (60 to 10,000 cycles), usually found in a good broadcast plant, to the poor midget radio receiver of say 39% (200-3,000 cycles) coverage.

Additional factors affecting the quality of transmission of wire line circuits are harmonic distortion, noise, and phase shift. Harmonic distortion is caused by the generation of spurious overtones which result in "mushy" rather than clear and distinct sounds. Background noise means that the full intensity range found in a symphony orchestra cannot be transmitted correctly. Instead, the range must be compressed somewhat to fit technical limitations. Phase shift is evidenced by a peculiar chirping sound which tags along after the main part of the sound has already arrived. This phenomenon is known in radio vernacular as "birdies" and is caused by the various speeds of travel of the frequencies making up the original sound.

The losses encountered as sound frequencies flow along a telephone wire are far greater than those which the commercial power engineer deals with at 60 cycles over the high tension lines radiating from Boulder Dam.

Suppose all sound frequencies entering a telephone cable to be at equal intensity. As this energy flows along the line it decreases at an uneven rate. The loss for high frequencies is greater than low frequencies. At some distance from the start an equalizer is placed across the line in order to reduce the energy of the low frequencies to a point of equality with the highest frequency. With the aid of the equalizer the energy is again on a par, but so low that noise from other nearby wire circuits become troublesome. An amplifier is therefore inserted to again bring the energy up to the original level. This continual loss and rebuilding process is repeated each 40 miles for a cable circuit and about every 150 miles for an open wire circuit.

To illustrate the losses encountered in the use of wire lines for transcontinental service compare a 50 kilowatt short wave radio transmitter, operating between New York and Los Angeles, with the hypothetical condition where the same power might be used at the entrance to a transcontinental wire circuit. The radio link, although suffering to a considerable degree from selective fading and noise, would at least be understandable at the receiving end. Whereas, if it were possible to utilize 50 KW at the imput to a bare telephone line, the small energy in watts delivered at the far end would be expressed by a decimal point followed by at least 35 zeros before the first significant figure, or, in terms of atomic physics, one electron every two seconds.

Now, you are invited to that easy chair near your radio. As you exercise your free choice with a careless turn of the wrist and bring your favorite program to life, may you enjoy it more for a wider knowledge of the processes which make such entertainment possible.

. . . . . OF INTEREST

ENSIGN EARL DONNELL KILLED IN ACTION

Ensign Earl Roe Donnell, Jr., who received his M.S. degree in Aeronautical Engineering from Caltech in 1940, was killed in action with the Navy in the Pacific. Ensign Donnell, a flyer, gained his commission at Pensacola, Florida, in 1941. Details are lacking, but it is understood that he was killed after the Pearl Harbor incident.

CAPT. INGERSOLL JAPANESE PRISONER

Captain Herbert V. Ingersoll is one of 132 American soldiers held prisoners by the Japanese in the Philippine Islands, the War Department announced in December. He had joined the Army Reserves shortly after his graduation from Caltech in 1926 and was called into active service early in 1941. During his service he was with the Engineering Corps of the Army Air Forces north of Manila, and was also on Bataan.

Mrs. Ingersoll is in Boston, Massachusetts, where she is secretary to the dean of the Harvard School of Business.

Any alumnus who wishes to write to Captain Ingersoll may address him as follows:

Captain Herbert Victor Ingersoll,
United States Army,
Prisoner of War, Interned by Japan,
c/o Japanese Red Cross,
Tokyo, Japan.
Via New York, New York.

Return name and address should be on the envelope. No postage is necessary; write "Free—Prisoner of War" in the upper right hand corner of the envelope.

REAR ADMIRAL HOLMES AT CALTECH

Rear Admiral Ralston S. Holmes, Commandant of the 11th Naval District since December 22, 1941, has been transferred to the Navy's retired list. However he was recalled to duty at once to serve as Navy Department liaison officer with the National Defense Research Committee at the California Institute of Technology.

The exact details of Admiral Holmes' work cannot be released. His esteem is very high for the scientist's ability, and he is at the Institute to present the Navy's problems. This work is extremely important now, and according to Admiral Holmes, military research and development should be carried on extensively during peace time whether a great army and navy is maintained or not.

GEOLOGY DEPARTMENT CURATOR PASSES AWAY

Mr. W. W. Eccles, curator and stock room manager for the Geology Division for the past six years, died on January 14, 1943. He will be missed greatly by his friends at the Institute, and for his long and faithful service.

ALUMNI ASSOCIATION PRESENTS ANNUAL DANCE

The seventh annual Alumni dance was held Saturday, February 13, at the Biltmore Hotel Rendezvous Room. The attendance surpassed any former event of this kind, there being five hundred and ninety persons present.

Grice Axtman, '41, former president of the Throop Club, and Joe Lewis, '41, former president of his senior class, were responsible for the planning of the dance. Door prizes, announced as being from Morgenthau, Firestone, and Maxwell House, proved to be a $25 war bond, which was won by Robert Bowlus, '41, a threadbare tire, and a jar containing coffee for two (2) cups.

SIXTH

ANNUAL

ALUMNI

SEMINAR

•

Sunday, April 11

TECH GROUP HOLDS DINNER DANCE IN WASHINGTON, D.C.

Saturday, January 23, a group of Caltech alumni assembled for a dinner dance in Washington, D.C., including the following: Lt. Col. Wm. R. Shuler, '32, Major Laurence E. Lynn, '29, Major Wayne V. Rodgers, '27, and Mrs. Rodgers, Major Robert A. Merrill, '25, Major J. E. Joujon-Roche, '28, Mr. and Mrs. L. A. Alden, '31, Mr. and Mrs. Fred J. Groat, '24, and Professor R. W. Sorensen. Messrs. Alden and Groat are employed by the War Production Board.

PROFESSOR SORENSEN ATTENDS CONFERENCES

Prof. Royal W. Sorensen represented the Institute at certain conferences in Washington during the early part of February. He attended a War Production Board advisory committee conference on the securing of adequate materials for scientific and industrial research at various institutions in the country, including Caltech. Assurances were given by WPB of a proper supply of materials for research, virtually all of which is now keyed to the war effort.

While in New York, Professor Sorensen attended meetings of the American Institute of Electrical Engineers. Among the Caltech men presenting and discussing papers at the convention were Dr. G. D. McCann '34, Dr. Victor Wouk '42, and Dr. J. A. Becker '22.

During the A.I.E.E. National Technical Meeting the following Tech graduates assembled for a luncheon in honor of Professor R. W. Sorensen: C. H. Bidwell '26, Robert O. Cox '40, Chester F. Carlson '30, E. L. Champion '21, Charles Elmendorf '36, Dr. Raymond Eger '22, Dr. J. E. Hobson '35, Dr. George T. Harness '28, Dr. S. B. Ingram '28, Clyde Keith '22, Dr. William A. Lewis '26, George Moore '27, Jack North '27, H. P. St. Clair '20, Bruce Webber '36, Dr. W. H. Wise '26, J. R. Wilson '20, Dr. Victor Wouk '42, J. A. Becker '22, and Professor R. W. Sorensen.

TECH ABANDONS ASSEMBLIES

Weekly assemblies at Caltech have been abandoned for the duration. These assemblies each Monday morning have constituted a fixed institution for years, and some of the most prominent public figures of the world have appeared on its programs. However, everyone at the Institute is now absorbed in contributing to the war effort, and Culbertson Hall is being used for the duration for war work.

BLUE-PRINT OF THE FUTURE

A review of the Beveridge Report by Graham A. Laing, Professor of Economics, California Institute of Technology.

There is a well known passage in Sartor Resartus in which Carlyle's hero, Herr Teufelsdrockh, raises his stein of beer in a toast "Die Sache der Armen in Gottes und Teufels Namen"—the cause of the poor in Heaven's name and ——'s. The learned professor of Things in General was content with a toast. Now comes another professor to implement the toast with a blue-print for its realization. In 1941 Sir William Beveridge was asked by the British Government, through Mr. Greenwood, to make an examination of the system or systems of social insurance and to make recommendations for their improvement. The usual manner in which such examinations are made in England is to appoint what is called a Royal Commission which conducts an investigation, receives and examines evidence and then submits a report. The report is then either filed, or forms a hasis upon which an Act is drawn up, discussed and amended in Parliament and finally appears upon the statute book more or less (perhaps principally less) following the spirit of the recommendation of the commission.

In the present case the proceedings were a little different. Sir William had the benefit of association in his investigation with a considerable number of civil servants who were familiar with the workings of the various schemes now in operation, but as the report was likely to contain a number of criticisms of the existing schemes, his associates acted only in an advisory capacity and the report is signed by Sir William alone, and no one knows the opinions of his colleagues.

Custom and tradition, or what Carlyle calls "use and want" are characteristic factors in British development. Innovations, when recognized as such, are usually resented, or if admitted, only subject to careful consideration and much criticism. However, as Sir William Beveridge says, "Revolutionary moments in history require revolutions, not patchwork" and it is in this spirit that the report has been written.

As in most other nations, the cause of the poor has been a constant problem in British history. The formal statutory provisions for the care of the poor may be dated roughly from the Poor Law of Queen Elizabeth's day in 1601. Elizabeth's methods had gone through three phases. The first was that of exhortation. Each parish was urged to provide for the care of its own poor. The second stage was a sort of quota system in which the individual well-to-do persons in each parish were assessed at the sum which it was believed they ought to contribute towards the support of their less well-off fellow citizens. Finally the quotas were made conpulsory. Followed a period of roughly three hundred years in which various amendments were made in the poor law acts, culminating in a Royal Commission to examine the whole system in 1909. This commission made two reports, a majority and a minority report, the latter written by Mr. and Mrs. Sidney Webb, and strangely enough it was the minority report that caused the greater amount of discussion and, on the whole, provided the greater contribution to the Acts which were passed. The year before, 1908, saw the passage of an Old Age Pension Act which provided for a rather meager pension for persons of seventy years or more. In 1911, however, a serious advance was made by the passage of Acts that were, for that time, revolutionary in character. One of these Acts provided for a form of unemployment insurance—restricted to employees in certain specified industries in which there was a more than usual amount of unemployment. The other instituted a contributory scheme of Health Insurance for the hulk of the working classes.

The contributions, or premiums, were made by a new method that has since become fairly common. Each workman had a card on which were spaces for the reception of stamps. The workman contributed twopence a week which was deducted by his employer from his wages. The employer contributed a like sum for each employee and with these sums bought stamps which were affixed to the card. The National Government contributed from general tax funds a further sum of fivepence, thus making a total premium of ninepence per week The unemployment payments were actually calculated on the basis of these premiums. A similar method was used for health insurance.

In the administration of the Acts, the Government made use of a great many existing institutions. Friendly Societies, Industrial Insurance Companies, Trade Unions, all of which had a certain amount of administrative machinery in operation, were allowed to carry on their work and to assist in the distribution of the various benefits.

The whole process was essentially new, and naturally the first forms of the Acts were not too satisfactory. However, in the course of the years that followed a great many amendments were made, partly to remedy faults in administrative machinery, and partly to provide for extension of benefits both in the number of insured participating and in the amounts of benefits provided. The whole series of amendments, however, resulted in a very mixed and uncoordinated mechanism. There was a great deal of overlapping of functions, and a considerable difference in efficiency of operations by the various institutions. Moreover, there were large gaps between the insured and uninsured. Because of this, and also because of the admitted necessity of a new attack on the problem of poverty, the Beveridge investigation was proposed.

The Beveridge Report runs to some two hundred thousand words of explanation, argument, criticism, history and statistical tables, and it is therefore impossible to do more than sketch briefly the essential ideas that form the conclusions and the scheme for a new treatment of the fundamental problem.

Three guiding principles are laid down in the report. First, that the experience of the past should be used and recognized, but that the proposals should not be tied down by past experience. Second, that "organization of social insurance should be treated as one part only of a comprehensive policy of social progress . . . it is an attack upon Want. But Want is only one of five giants on the road of reconstruction and in some ways the easiest to attack. The others are Disease, Ignorance, Squalor and Idleness." The third principle is that social security must be achieved by cooperation between the State and the individual. The whole plan is put forward as a limited contribution to a wider social policy, though as something that could be achieved now without waiting for the whole of that policy. "It is . . . a plan of insurance—of giving in return for contributions benefits up to a subsistence level, as of right and without means test, so that individuals may freely build upon it."

The plan provides for a single comprehensive premium to be paid by all persons in receipt of income, supplemented hy contributions from employers of labor and from the State. This premium is calculated to provide the funds from which a whole series of benefits are to be paid.

Unemployment benefits are to be paid at a figure which guarantees sufficient sums to provide the basic necessities of existence, food to the amount of the minima laid down by the British Medical Association, clothing, rent, and so forth. There is no time limit to the extent to which the unemployment benefits are to be restricted, as was the case in the older system. But after a certain maximum period of free benefits, the unemployed person must agree to attend a training center in order to qualify him for work where work is available. And he must

be willing to accept any suitable work which is offered.

A complete coverage of health protection and medical attention is to be provided for the whole community—home service, hospital treatment, medical and surgical appliances, and sufficient funds during convalescence to maintain the minima mentioned above. This is to be given as of right, and with no question of ability to pay for these services after premiums have been paid. Those who wish more personal treatment by their own physicians may obtain it, but all must contribute to the general health insurance.

Special care is given to women for childbirth, the whole costs being borne by the insurance scheme. These costs include payments to women who are employed, for a period of thirteen weeks before and after the birth of the child.

Special allowances are to be made for families, the allowances being based upon the number of children, except that the first child is not counted.

Old age pensions are a feature of the proposals, and these are to be given without any regard to the means of the persons who have reached the retirement age. However, the report suggests that it is advisable for people to keep on working as long as they can. The retirement age for men is 65 and for women 60, but if the old man or woman does not retire, then for each year of additional work done, he or she receives an increase over the minimum retirement pension. It is not proposed that this scheme go into operation completely at once, because the burden thrown upon the insurance funds would be too great. However, as the premiums build up the insurance reserve funds, the scheme is to be gradually introduced and will be in full operation by 1965, on the assumption that the whole system is adopted and in operation by 1945.

The administration of the plan is to be coordinated into a single control, headed by a cabinet Minister for Social Security. It is desired to eliminate the overlapping and unconnected agencies which operate at the present time. This involves taking away from the various Friendly Societies, Industrial Assurance companies, Trade Unions, and so on, many of the functions which they perform at present. The argument behind this proposal is that the expenses of operation, particularly with Industrial Assurance companies, are wastefully high.

Certain special problems are taken from their special positions and included in the general scheme. For example, the various schemes of workmen's compensation for industrial accidents and for diseases contracted in the course of working, are included in the general health organization. It is provided, however, that industries which have an unduly high proportion of industrial accidents—the coal mining industry for example—shall pay an additional levy in part, but only in part, to compensate for the extra expense involved.

In general the scheme has received favorable comment from sources as far apart as the London Times, and the Trade Union Congress. The interest is very widespread and the whole report has provided the basis for many articles, pamphlets, speeches and discussion groups. The opposition is likely to come very largely from the corporations which have vested interests in the present system, notably the Industrial Assurance Companies. An appendix in the Report itself deals with the wastes and profits of these companies.

Finally, there is always the problem of the productive capacity of the British Nation, especially at the close of the war and the establishment of a peaceful world. Britain cannot stand alone any more than other countries, and it may be that the whole scheme is conditional upon the development of a more coordinated and controlled international economic system. To discuss this possibility is beyond the scope of this article.

NEWS OF CLASSES

1917

Dr. Fred Poole is now teaching at Gonzaga University at Spokane, Washington.

1918

Colonel Carl Ridenour is with the Army Air Corps in Africa.

1924

L. Bentley Copeland is training Army and Navy enlisted personnel as field coordinator and chief ground school instructor in charge of operations at Las Vegas. This program comes under the War Training Service of the Civil Aeronautics Authority.

Fred Groat is with the War Production Board in Washington, D C. He and Mrs. Groat are the parents of a baby boy.

Al Gould is now with the Electrical Engineering Department at Caltech.

1926

Wallace Penfield recently was placed in charge of all flood control and water supply work in Santa Ana County.

Dr. William A. Lewis of Cornell University visited the Caltech campus in March.

W. S. Kingsbury, Jr., is now a captain in the Corps of Engineers, Camp Claiborne, Louisiana.

1927

W. A. Minkler became the father of a baby girl, Estelle, in December. Estelle has an eight-year-old brother. The family lives in Racine, Wisconsin, where Bill is with the Young Radiator Company.

Major M. Maxwell Bower further swells the ranks of Tech Washingtonians, where he is working in the office of the Chief Signal Officer. In December he got into a cab that already had a passenger in it, only to find that passenger was also a Techman —**Lieutenant James C Radford** of the Navy, formerly with the Union Oil Company, and a member of the class of 1934. They had never met before, and, to the editor's best knowledge, this is the first alumni meeting to be held in a cab.

Lt. Bill Aultman is now at Dutch Harbor with the CEC.

Captain Vincent Rodgers was married on December 1, 1942, to Miss Virginia Rose Buxton at Culver City, and they are now living in Washington, D. C., where he is with the General Staff of the War Department.

Lt. William W. Aultman, Water Purification Engineer of the Metropolitan Water District of Southern California, was granted military leave in November, when he was commissioned a Lieutenant in the Naval Reserve Construction Battalion. He was assigned to Camp Allen, Norfolk, Virginia, for a short training. He had been with the Water District since 1930. He was engaged in water softening and filtration studies and tests preliminary to the designing and building of the Softening and Filtration Plant, and had been in direct charge of the operation of the plant since its completion.

Ted Combs is now Lt. Colonel in charge of Headquarters, Engineer Unit Training Center, Camp Claiborne, Louisiana.

E. F. Randolph is an electrical engineer in the Navy Design Office of Atkinson and Pollock at Long Beach.

1928

Major E. H. Ross regrets that he is unable to attend the meetings of the Alumni Association, but finds he has little time and less transportation, as he is at present stationed in Africa.

Lt. Comm. Kenneth M. Fenwick, U.S.N.R., has been on active duty since May, 1941, and is now in Key West, Florida.

Major A. Perry Banta, with the Engineer Corps, writes that he is gaining valuable experience in water supply work in Alabama and Florida, but still prefers the climate of the southwest to that of the southeast.

1929

Ray Kircher announced the birth of a daughter, Katherine Reymond, on December 10, 1942.

George F. Taylor is a Captain in the Air Corps, and is the author of a widely adopted text-book, "Aeronautical Meteorology."

Walter Grimes who is on duty at Fort Belvoir, Virginia, has been promoted to Major in the Corps of Engineers.

Major Laurence Lynn is an instructor at Ft. Belvoir.

1930

Walter Wilkinson is now in India, where he is working as a metallurgist.

Lt. Peter Goff is with the Signal Corps at Camp Murphy, Florida.

1931

Charles Kircher became the father of a son, Christopher, last May.

Lt. Lawrence E. Kinsler, U.S.N.R., is an instructor in physics at the U. S. Naval Academy in Annapolis.

Lt. Walter Dickey of the CEC, who has been assistant resident officer in charge of construction on Midway Island is now located at Mare Island. He was on Midway on December 7, 1941.

Nathan Whitman is now an engineer with Avion, Inc., in Los Angeles.

Lt. Lawrence Ferguson is at the Diesel School at Penn State.

1932

Bill Shuler, now a lieutenant-colonel in the Army, is teaching engineering to Army men in the east, but he craves action.

Mr. and Mrs. **Donald B. Graff** are the parents of a girl born last September in Pasadena.

Grant Venerable is in the chemical division of the Hayward Lumber and Manufacturing Company. He is the father of a son, Grant II, born last August.

Edward C. Keachie, who was formerly in charge of finance and statistics for the California War Production Training Program at Sacramento, is now a First Lieutenant, Corps of Engineers, A.U.S., stationed at the Military Engineer Procurement Division in San Francisco. His present assignment is that of labor supply officer.

Howard W. Finney is now a licensed C.P.A. with Lybrand, Ross Bros. and Montgomery. He has been instructor at Caltech in "Cost Analysis and Control" under the Engineering War Training program.

Elbert N. Harshman and Mrs. Harshman are on the official list of those interned at Santo Tomas University in Manila.

Brian Sparks is now a technical pilot with the American Export Airlines in New York.

1933

Lt. (j. g.) Elmer E. Franklin, U.S.N.R., is an instructor in the General Ordnance School in the Navy Yard at Washington, D. C.

George H. Anderson is engineer in charge of raw materials and development for the Lone Star Steel Company, and is living in Dallas, Texas.

1934

Robert P. Sharp recently was promoted to Assistant Professor of Geology at the University of Illinois.

Jack F. Judson has been in geophysical work in Colombia and Venezuela for the past four years, and is at present Party Chief of a seismograph party for Socony Vacuum Oil Company. Jack describes as one of his most interesting experiences the occasion when he encountered a small motor launch on the Magdallena River and in it **Ygnacio Bonillas** '33, whom he had not seen for four years.

Major James W. McRae is with the Signal Corps in Arlington, Virginia.

1935

James N. Smith is now working for the Naval Research Laboratory in Washington.

1936

John P. Klocksiem was married to Miss Dorothea Wand on October 6, 1942. John is an engineer with Hughes Aircraft in Culver City.

Lt. Wasson Nestler is with the Signal Corps at Camp Murphy, Florida.

1937

Boyd Hopkins, now with the Waugh Laboratories in Pasadena, was married January 15 to Miss Robert Jean Hanson in Pasadena.

Peter Wykoff is a captain in the U. S. Army Signal Corps, stationed at Fort Monmouth.

Lt. Hugh F. Warner, U. S. Army, was married in November to Miss Mary Winifred Degen. They are making their home in Butler, Pennsylvania.

Harry Miller was graduated from the Harvard Medical School in 1941, and after a year and a half's internship in the Boston City Hospital, he was commissioned as 1st Lieutenant in the Medical Division of the U. S. Army Air Force. He is at present taking a short course of training at Santa Ana, and he and his wife are living in Balboa.

Ensign Robert M. Dreyer, who has been Assistant Professor at the University of Kansas, is now on leave of absence serving at the U. S. Naval Operating Base, Argentia, Newfoundland.

Hugh F. Warner, a 1st Lieutenant in the Ordnance Department of the U. S. Army, was married in November to Miss Mary Winifred Degen of Mifflintown, Pennsylvania. They are now living at Butler, Pensylvania, where Lt. Warner is Officer-in-charge of the Butler suboffice.

1938

Leverett Davis, instructor in physics at Tech, recently became engaged to Miss Victoria Merrill Stocker. They plan to be married this spring.

John R. Van Fleet was commissioned an ensign in the U .S. Naval Reserve at the Naval Air Training Center, Corpus Christi, Texas, on January 8. He volunteered for flight training last March and received preliminary flight instruction at the Dallas, Texas, reserve aviation base, afterwards being transferred to Corpus Christi for intermediate and advanced training.

Carlton Horine, who is a research assistant at Tech, became the father of a boy, Chris, on December 7.

James R. Balsley, Jr., is now an assistant geologist with the U.S.G.S., investigating vanadium content of titaniferous magnetite deposits of the United States. His engagement to Miss Jane Barry of Norwood, Massachusetts, has been announced.

Jack W. Knight is now a geologist with the Texas Company, working out of Bakersfield. He formerly had spent three years with the Superior Oil Company in New Zealand.

Clay T. Smith is now a Teaching Fellow at Caltech, and expects to complete his Ph.D. thesis for the 1943 Commencement.

Leroy B. Kelly, a radioman in the U. S. Naval Reserve, has been on active duty for the past 21 months. He returned recently from service in the South Pacific, and his engagement to Miss Betty Beale of Pasadena was announced.

Robert Custer is now at the New York office of the Texas Company.

Lt. Armand F. DuFresne is with the Signal Corps at Camp Murphy, Florida.

1939

Martin Eichelberger is with the United Geophysical Company, and for the past two years has been in Brazil where he is head computer for two large reflection seismograph companies.

James Eugene Stones and Mrs. Stones are the parents of a 9 lb. 10½ oz. son, James Eugene Stones Jr., who was born February 16. James Stones Sr. is with the Superior Oil Company in Bakersfield.

1940

Captain Walter R. Larson is now a squadron commander in the Army Air Force, now stationed at Bainbridge, Georgia. He has been in the service two years.

Robert A. Gewe recently was married to Miss Martha-Jane French in San Gabriel. **Paul Longwell** acted as best man for his classmate, and Joe Manildi served as an usher at the wedding.

Keith E. Anderson is with the Ground Water Division of the United States Geological Survey, and has been stationed in Iowa City for over a year.

John M. Holloway was married in December to Miss Dorothy Fowler of Sudbury, Ontario. He is employed by the International Nickel Co. at Copper Cliff, Ontario, Canada.

1941

R. C. Wilmoth died December 10, 1942, after an illness of fifteen weeks.

Joe Lewis was married February 27 to Miss Anne Caroline Beech. Joe is now with the Boyle Manufacturing Company in Los Angeles.

Reuben Snodgrass is now an aviation cadet in training at the U. S. Naval Air Station in Corpus Christi, Texas.

Hugh Bradner is now working at the Naval Ordnance Laboratory in Washington.

Robert B. Galeski is with the United Geophysical Company and is stationed at Stockton, California. He was married in November to Miss Mary Dippel.

Livingstone Porter is now with the United States Geological Survey, and is living in Santa Barbara.

Joseph Rominger is at Northwestern University working for his M.S. degree.

Clyde Wahrhaftig spent last summer in Alaska and is now at Harvard.

Dale Turner is a geophysical computer with the Superior Oil Company in Woodland, California.

Lt. Wm. Deniston is with the Signal Corps at Camp Murphy, Florida.

1942

Ensign William T. Holser, U.S.N.R., was married December 21, 1942, to Miss Mary Elizabeth Braddock in Los Angeles.

Ensign Layton True was married in New York City on October 26 to Miss Jean Powell of Los Angeles. He is working in the Naval Ordnance Laboratory in Washington, D. C.

Kenneth Beers was married December 20 to Miss Ethel Downs.

Frederick Bauer has achieved his ambition to become a member of the armed forces of the United States, and is now stated for training at Camp Santa Anita.

Bill Turner writes that **Alvin Piatt, Robert MacKenzie** and **Peter Kafitz** are with the Naval Ordnance Laboratory in Washingtcn, and that **Ensign Richard Latter** has been assigned by the Navy for work there. Bill finds Washington interesting, although a bit too crowded for complete comfort.

Ensign Robert E. Anderson, U.S.N.R., went immediately after graduation to indoctrination school at Fort Schuyler, New York, and then to the Photographic Interpretation School at Anacostia, D.C. He visited the campus in December, just before being assigned to active duty in the Pacific.

Pilot Officer P. N. Glover left Caltech in the spring of his junior year to enlist in the R.A.F., and is now a Technical Officer engaged in some "very interesting work."

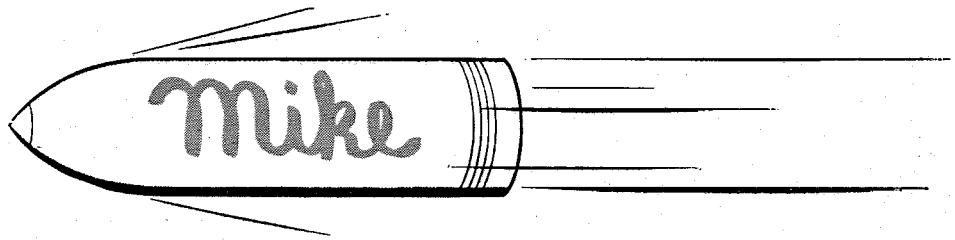
Benjamin F. Howell, Jr. is currently engaged on a wartime research project at the Naval Sound and Radio Station at San Diego.

Walter M. Tovell is now an Assistant Geologist with the Standard Oil Company, doing field work in Southern Alberta.

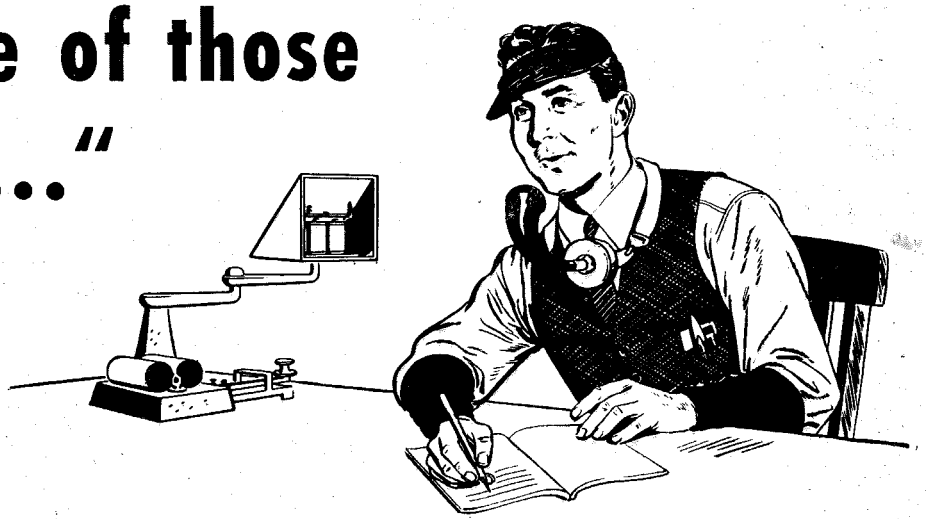
Harrison Price spent two weeks in California during the holidays. He and **Leroy Weller** are living in Phillipsburg, New Jersey, and are employed by Ingersoll-Rand Company.

Donald S. Clark . . *Editor* Hugh Colvin, George Langsner . . *Editorial Board* David Shonerd . . . *Business Manager*

Published four times a year—September, December, March and June by the Alumni Association, Inc., California Institute of Technology, 1201 East California Street, Pasadena, California. Annual Subscription $2.50, Single Copies $0.65. Entered as second class matter at the Post Office at Pasadena, California, on September 6, 1939, under the Act of March 3, 1879.



"Write my name on one of those shells..."



One evening not long ago, some cars loaded with munitions were at a distant division point, headed for a Pacific port. One of our freight officers at the port telephoned the division dispatcher and said, "Mike, the army needs those cars down here tomorrow morning at 7 o'clock. Can we do it?"

"You just write my name on one of those shells," said Mike, "and I'll have 'em there OK." And the cars were there — at 7 a.m.

This is a true story. It is typical of the fine spirit that is helping the American railroads do an outstanding war-time job.

Every second of the day and night, urgent messages flash over the wires along our tracks. "It has to be there tomorrow morning. Can we do it?" "Sure." "Give that trainload of tanks right of way over everything." "OK."

The men out on the line see what's rolling, and they know how important it is to keep it rolling — *fast.*

Thousands of us have sons in the service, and we wouldn't want our boys to lack equipment because the railroads let them down.

More than ten thousand Southern Pacific men have gone to war, and their friends who remain have a pretty personal reason for doing a job, too.

We need more men, more cars and more locomotives, but with what we have we are doing our best to serve our Country well.

The War Bonds you buy now will pay for vacations after the war

S·P

One $18.75 War Bond will buy a 75 mm. shell

The Friendly Southern Pacific

"Thanks for helping"

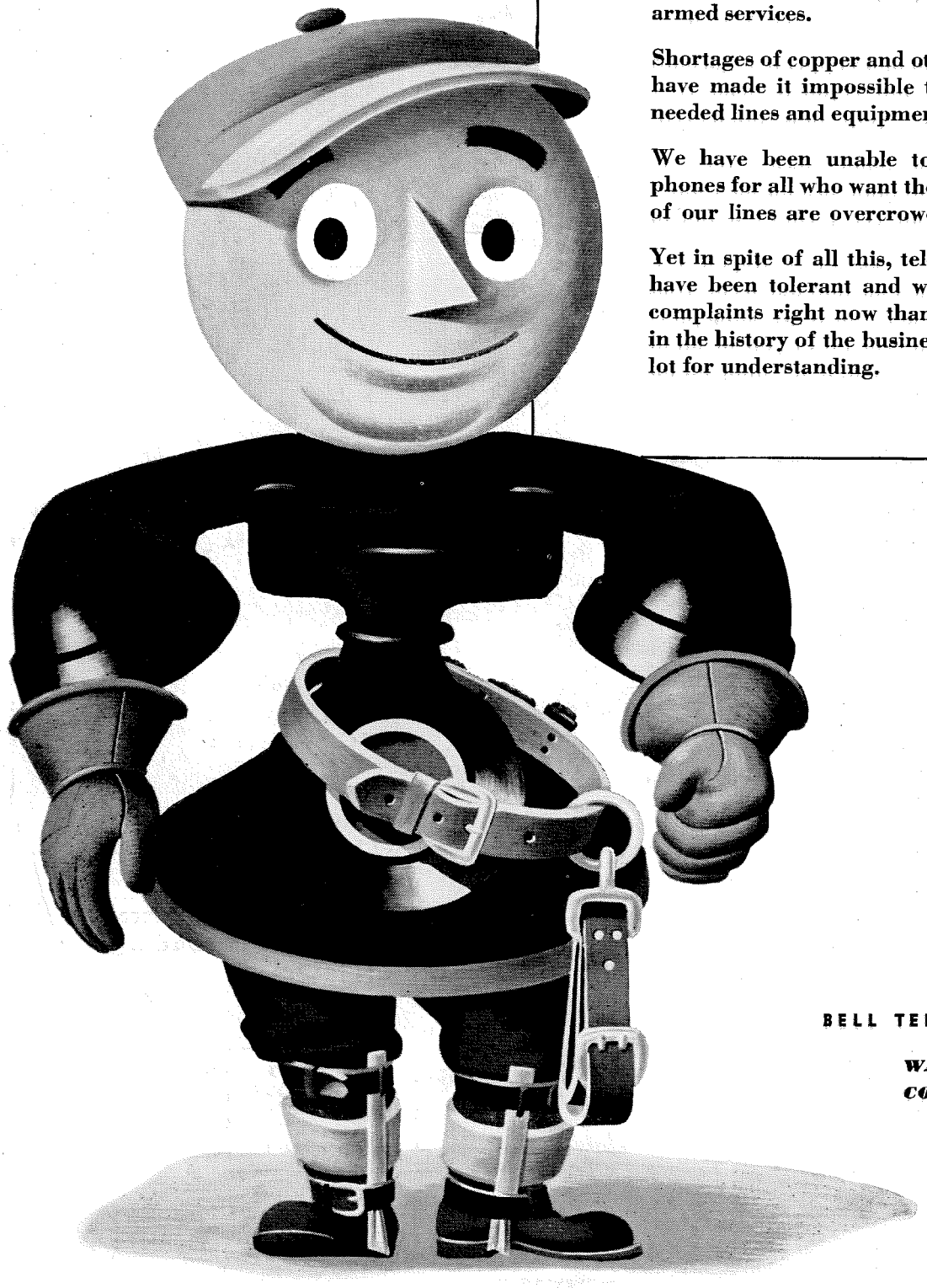
We are grateful for your help in difficult times.

Here in the Bell System we have seen some 43,000 of our people go into the armed services.

Shortages of copper and other materials have made it impossible to add much-needed lines and equipment.

We have been unable to install telephones for all who want them and many of our lines are overcrowded.

Yet in spite of all this, telephone users have been tolerant and we have fewer complaints right now than at any time in the history of the business. Thanks a lot for understanding.



BELL TELEPHONE SYSTEM

WAR CALLS COME FIRST