be conforming with W.P.B. policy as outlined under the "Spot Authorization Plan." Such a company would have available excess capacity *not required in war production.* They would have *labor available,* the use of which would not interfere with labor requirements for war production in that area. They would furthermore be producing a scarce and essential civilian item—a fact that the O.P.A. has recognized for over a year, as proved by its distribution of stoves under a rationing program. Thus when Amendment 1 to MPR 64 was issued on August 11, 1944, the O.P.A. must have been fully aware that this was a pricing policy to be applied in an industry where an approved reconversion plan was in operation.

PROFITS

This must then be considered as a reconversion pricing policy and examined in the light of its probable effect in the stove industry. This industry has been largely engaged in war production. As war contracts terminate, each company must consider its re-entry into the stove business in the light of this price regulation. Unless established ceilings are high enough to provide a profit, the best the manufacturer can hope for is a break-even operation and that only if he can meet the prices of his lowest competitor. Two probabilities suggest themselves.

A large percentage of the average manufacturer's output is in "low cost" production of low-profit, large-volume items. These are in contrast to slower-selling, higher-priced, larger-profit models. Under stringent price control, the low-cost production would be discontinued and, as a severe consumer shortage exists, the higher priced models would be sold exclusively. The entire O.P.A. policy is thus circumvented as overall cost to the consumer is increased as a result of the attempt to control profits.

Not all manufacturers will be able to realize a profit even on their most profitable models. Such companies might, in view of this no-profit order, decide to enter an entirely new field. This would, in the first place, retard the manufacturer's reconversion, as presumably retooling, altered plant layout, engineering design, sales policies, and a host of incidental problems would prevent his speedy resumption of full-scale operations. Such a delay is generally considered to be the most likely cause of a serious unemployment problem following the war. In the second place, the loss of any considerable portion of the stove manufacturing capacity would prolong the present shortage, make normal competitive pricing more difficult to attain, and finally threaten a definite hardship to the civilian population, as cooking and heating equipment is essential to health and comfort.

Since a manufacturer faced with this specific problem would surely choose one of these two courses of action in preference to continued operations at a loss or at the best on a break-even basis, it is difficult to see how either O.P.A. or overall government policies can be realized through such pricing regulations. It is to be hoped that once again the experience gained in the operations of reconversion pricing in the stove industry will guide the way to a more effective and workable control to insure high levels of production and employment.

Human Blood

(Continued from Page 8)

Other products which have been obtained from human plasma and show real value include: (1) immune globulin used to control epidemics of measles and scarlet fever, and (2) thrombin used with foams prepared from human fibrin. These foams or sponge-like preparations, together with thrombin solutions, are of special value in brain surgery for the control of bleeding and may be left in place following the operation, since they are ultimately absorbed.

One of the most recent and important developments is found in the special anticoagulant solutions for preservation of whole blood. Solutions of this type have been prepared which now make it possible to send blood transfusions directly from this country to all the battle areas (thanks to modern air transportation). It is necessary, of course, to carefully type these whole blood preparations so that the patient is sure to receive the right kind of material. These whole blood units are of great value in the treatment of those casualties where extremely heavy losses of blood have occurred.

FIELD RESULTS

Reports from the South Pacific and other fighting fronts describe the use of plasma and albumin on the battlefields. Casualties are given transfusions at aid stations a few hundred yards from the firing line, some 10 to 30 minutes after being wounded (see *Fig. 5*). The process, taking from eight to 15 minutes, prepares the wounded men for transportation by litter back to the operating hospitals, by restoring the bulk and balance in the blood stream and counteracting the effects of shock. Navy Medical Corps men say that the tins of plasma are as easily handled and transported as cans of food, since they are protected from weather and breakage and are not affected by extreme temperatures. Some seriously wounded men receive as many as five or eight injections in a few days. Nearly half the injured soldiers need plasma injections, and most of these require more than one dose. The total number of plasma injections about equals the total number of wounded men, say doctors at the fighting front. In the South Pacific transfusions from fit men on the spot are risky because of the prevalence of malaria.

American military surgeons have emphasized the low mortality rate among wounded men in this war. One of the most important factors responsible for this fact undoubtedly is human plasma which has been made available through the voluntary blood donations of millions of patriotic Americans under the direction of the American Red Cross. Truly, human blood has been "Life Saver 1 in World War II."

C. I. T. NEWS

ADMISSION OF VETERANS TO C.I.T.

THE policy of admission of veterans who wish to pursue courses of study at the California Institute of Technology has recently been established. This policy is directed principally to those who are seeking entrance for the degree of Bachelor of Science in Engineering or Science. Those who wish to continue their studies in pursuit of graduate degrees will be held to the usual requirements of the Graduate School. The details for the establishment of special refresher courses for men who have their B.S. degree have not been completed. Recently a questionnaire was sent to graduates of the Institute to determine how many were interested in such courses and the subject matter desired. The result of this questionnaire will assist in the formulation of a policy.

Two forms of leaves of absence have been granted to students. Those men whose education was interrupted because of induction into the armed services have been

given a leave of absence for the duration of the war or until discharged from the service. In some cases, special leaves of absence have been granted which require the passing of certain examinations to re-enter the Institute. Students who left the Institute to enter into an occupation have been granted a leave of absence for one year which must be renewed each year.

In order to offer assistance to veterans who decide to resume college work, the Institute will provide refresher courses in mathematics, physics and chemistry at the freshman and sophomore levels, if the demand warrants. Veterans who have not previously attended the Institute may take the transfer examinations before or after taking the refresher courses offered. If they choose to take the examination without taking the refresher course and fail, they may, if their record warrants it, be admitted to refresher courses and be given another opportunity to take the transfer examination. The refresher courses carry no academic credit, and while taking any refresher course, a student will be required to carry a load of at least 15 semester units unless permitted to do otherwise.

It is recognized that veterans transferring to the Institute at the sophomore or junior level may not have had all courses required of regular Institute freshmen or sophomores. Such veteran transfers will be governed by the following regulations: With the exception of requirements in mathematics, physics, and English composition, and in addition chemistry for science majors, the Institute curriculum requirements of the first two years will be waived provided that (a) the transfer student has 32 acceptable college credits if a sophomore, or 64 if a junior; the acceptability of such credits to be judged by the engineering or science course committees for engineers or scientists respectively; (b) he has satisfied all of the prerequisites of his option prior to the level at which he enters according to a list of such prerequisites selected from the curricula of the first two years at the Institute and certified to the Registrar by the head of each option; (c) if he is allowed credit for any courses of the year in which he enters or subsequent years, he may be required to complete his program by including such Institute courses of the year or years prior to his admission for which he may not have credit, as his adviser shall think wise. In any such requirement, courses prerequisite to the work in his option shall take precedence; (d) any department may prescribe the electives to be taken by the transfer student in its own department if it considers that his previous preparation has been lacking in a field under its jurisdiction. (For example, a transfer who had had no history might be required to take courses in history as his senior humanities elective.)

After the Institute returns to its normal schedule, examinations for freshman admission will be held in March. However, as a further accommodation to returning veterans who wish to enter the Institute 20 places in the first complete freshman class of 160 will be reserved for veterans for a period to be determined by the Admissions Committee, but not to extend beyond July 15. This is an extension of two months beyond the normal date of accepting applications for admission.

The Institute does not give correspondence courses. The courses given by the United States Armed Forces Institute at Madison, Wisconsin, are recommended for subjects at the high school level required for fulfillment of the Institute entrance requirements. Any subject required for admission and satisfactorily completed through A.F.I. will be given entrance credit. In addition, an applicant must pass the entrance examinations in mathematics, physics, chemistry, and English.

Subjects at the college level taken to fulfill the requirements of the Institute first or second year, may be taken through any of the colleges cooperating with the A.F.I. providing the cooperating college will itself grant credit toward its own bachelor degree for such courses, and providing also that the subject does not involve laboratory work. The courses given by the University of California Extension Division, Berkeley, California, are recommended. To simplify selection, there are listed below the subjects of the first two years at the California Institute of Technology which it is believed can be adequately covered by the correspondence method, and the corresponding University of California Extension Division course number and title.

Courses which may be taken under the University of California Extension Division with California Institute equivalents:

Title	*U.C. No.*	*Semester Hours*	*C.I.T. Equivalent*
FRESHMAN YEAR			
Plane Analytical Geometry	XB 3a	3	Ma 1 a, b
Differential Calculus	XB 3b	3	
First Year Reading and Composition	XB 1a	3	
First Year Reading and Composition	XB 1b	3	En 1 a, b
History of Western Europe to 1500 A.D.	XB 4a	3	
History of Western Europe 1500-1933	XB 4b	3	H 1 a, b
Machine Drawing	XB 6	3	D 1 a, b
SOPHOMORE YEAR			
Integral Calculus	XB 4a	3	
Solid Analytical Geometry and Integral Calculus (Cond.)	XB 4b	3	Ma 2 a, b
Descriptive Geometry (Not required for science majors)	XB 2	3	D 2
Elements of Economics	XB 1a	3	Ec 2
History of the United States to 1920 (As this course is only 3 units, credit can be given for H 2a only.)	X17 a, b	3	H 2a

Application for Extension Division courses should be made directly to the A.F.I. at Madison, Wisconsin. Credit for freshman and sophomore mathematics courses is further tested by a California Institute of Technology examination taken at the time the applicant is ready to enter.

Applicants planning to enter the Electrical or Mechanical Engineering option may take in addition "Differential Equations" *XB 110b* to fulfill the California Institute requirement *Ma 11*. All California Institute students are required to take third year English, *En 7ab* and a senior humanities elective. Credit for the former may be gained by taking "History of English Literature" *XB 47a* and *XB 47b;* and for the latter by taking "The English Bible as Literature" *XB 116*, "Shakespeare" *XB 117E*, "History of Philosophy" *XB 10a* and *XB 10b* for a total of six semester hours.

It is not possible for an applicant to gain sophomore or junior standing by taking correspondence courses alone. There is, however, a very real advantage in securing credit for some of the subjects of the first two years. A veteran may benefit from the lighter academic load he is thereby enabled to carry until such time as he may have readjusted himself to academic work. On the other hand, if he substitutes courses of the upperclass years, he will, in his senior year, have a place in his schedule for certain valuable courses of the first graduate year provided he can meet the prerequisites.

Credit is allowed for courses satisfactorily completed at any accredited college or junior college providing satisfactory grades have been earned and provided also that the subject matter sufficiently parallels the work given at the California Institute. No definite statement

can be made concerning credit for college work until a transcript of record has been submitted to the Institute for evaluation. Credit for courses in mathematics, physics—and in chemistry for science majors—is further tested by an examination taken at the time the applicant wishes to enter.

The fact that the curriculum of the California Institute of Technology is concentrated on technical and scientific material for which there is no substitute does not make it possible to grant credit for military experience. Such experience together with most service courses, has been along very practical and specialized lines and for the most part is not the equivalent of the fundamental theory taught by the Institute or other technical institutions. However, each case will be considered on its own merits and credit will be allowed wherever it can be shown that an applicant can go on to more advanced work successfully.

INDIAN SCIENTISTS VISIT INSTITUTE

SIX distinguished Indian scientists making a six weeks' tour of the United States and Canada visited the Institute late in December. Their tour was for the purpose of acquainting themselves with the organization of science and technology in the United States to the end that they might better plan the future of India in the interests of its people. They were accompanied to Pasadena by a representative of the State Department, Frank S. Coan.

While quartered in Pasadena, they visited the Huntington Memorial Library and Art Gallery, the 200-inch telescope installation on Palomar, and the Mount Wilson Observatory, and devoted one entire day to inspecting the laboratories on the campus under guidance of Doctor Millikan.

One of the scientists, Professor S. K. Mitro, delivered a talk at the Institute's Physics Seminar on "Active Nitrogen."

Members of the party were:

Dr. Nazir Ahmad, O.B.E., M.Sc., Ph.D., Director, Indian Central Cotton Committee.

Sir Shanti Swarup Bhatnagar, Kt., O.B.E., D.Sc., F.R.S., Director, Scientific and Industrial Research, Government of India.

Sir Jnan Chandra Ghosh, Kt., M.Sc., D.Sc., Director, Indian Institute of Science, Bangalore.

Professor S. K. Mitra, D.Sc., M.B.E., Professor of Physics, Calcutta University.

Professor Meghnad Saha, D.Sc., F.R.S., Professor of Physics, Calcutta University.

Professor J. N. Mukherje, C.B.E., D.Sc., Professor of Chemistry, University College of Science, Calcutta.

AMERICAN PHYSICAL SOCIETY

THE regional meeting of the American Physical Society was held in Room 201, Bridge Laboratory, in an all-day session on Saturday, December 16. The morning session was devoted to a symposium on various aspects of the quantum theory, with invited papers from Paul S. Epstein, Hans Reichenbach and Raymond T. Birge.

Contributed papers were given at the afternoon session.

Following were the contributed papers:

"A Possible Cause of the Variability with Time of the Incoming Cosmic Rays at High Latitudes," by Robert A. Millikan, H. Victor Neher and William H. Pickering, California Institute; "Some Recent Investigations on Hydrodynamic Stability," by C. C. Lin, Guggenheim Laboratory, California Institute; "Pressure Flow of a Turbulent Fluid Between Two Parallel Infinite Planes," by P. Y. Chou, Guggenheim Laboratory, California Institute; "Frequency Elimination in Spirotron Systems for Accelerating Ions and Electrons," by L. E. Dodd, University of California at Los Angeles; "Minimum Conditions Necessary to Achieve the Velocity of Escape," by H. S. Seifert, California Institute; "The Relativistic Increase in Ionization of Cosmic-Ray Electrons," by Wayne E. Hazen, University of California; "The Diffusion Problem of Connected Events," by Donald A. Darling, California Institute; "Magnesium Ion Source of High Intensity Mass Spectrograph," by T. H. Fi, California Institute; "The Movement of Red Particles in a Turbulent Stream," by Hans Albert Einstein, California Institute; "The Rydberg Constants and the Value of e/m," by Chao-Wang Hsueh, California Institute.

Two papers were contributed on the supplementary program. They were "The Turbulent Jet," by P. Y. Chou, California Institute, and "Radio Direction Finding at a Wave-Length of 1.8 Meters," by W. H. Pickering, J. David and W. F. Hornyak, California Institute.

Don't forget Alumni Seminar
Tentative date, April 22.

JET PROPULSION PLANE

CAPTAIN Brian Sparks, '32, and four other specially selected aircraft engineers, guided the new jet-propulsion airplane from the drafting board to the initial flight from a secret test base. In September, 1941, when Captain Sparks was assistant to the Chief Design Engineer at Bell Aircraft Corporation, Larry Bell, president of the Buffalo firm, called him into his office and asked him if he would like to work on a very secret project. After indicating his willingness, and being sworn to secrecy, Captain Sparks discovered that the Army had requested Bell Aircraft to undertake the design of a jet-propulsion airplane to be powered by the jet engine developed in England by R.A.F. Group Captain Frank Whittle.

Bell gave Captain Sparks an address where he reported along with the four other engineers. Three weeks were spent in merely sketching different designs before they finally decided on the present design and began preliminary layout of the airplane. One engineer became structural designer; two others took over the layout and mechanical design; Captain Sparks became aerodynamic designer and pilot adviser, and the fifth member of the group became project engineer.

Another month of preliminary design of the airplane brought the project to the point where draftsmen, loftsmen, detailers, structural computers, and other specialists began to enter the picture. An abandoned Ford assembly plant in Buffalo was leased and from there on the staff began to increase.

The airplane was ready to fly by September, 1942, a record for almost any airplane of conventional type, let alone such a highly unorthodox type of aircraft. The first

flight was made just a year after the design was begun.

One of the more serious difficulties in the design of the "squirt," as the plane is sometimes called, lay in the absence of propellers. The large amount of data whereby the control-surface design, stability and drag of the orthodox airplane are corrected for the effects of the propeller slipstream did not apply to the new plane, and Captain Sparks admits that much of the aerodynamics had to be based on theoretical considerations or simply the best guess which could be made. The extreme secrecy which surrounded the project permitted only the sketchiest of wind tunnel tests.

Early in the progress of the building of the airplane another Caltech alumnus, Robert M. Stanley, '35, chief test pilot of Bell Aircraft Corporation, was admitted to the secret factory and was instructed to set up a flight-test program. To maintain secrecy, the tests were to be conducted from an isolated spot in California. The test program called for the first flight on October 1, 1942. A group of Bell officials, Army Air Force officers, and aviation scientists and engineers had arrived to witness the test flight. The first flight lasted for 30 minutes, and reached an altitude of approximately 25 feet. Immediately after the first hop, Mr. Stanley took off again, going up 4000 feet, but because of the heat in the cockpit he landed to remove the hatch for better ventilation. On the third hop he reported that the speed was surprisingly high in level flight at 10,000 feet.

Mr. Stanley and his crew spent many weeks on a long grind of test flights. At the close of a full year of tests, during which time there had been no accidents, and numerous improvements had been made on the airplane, Larry Bell reported to General Arnold that the JP was ready. On January 6, 1944, the United States Army Air Forces and the British Air Ministry made a joint public announcement of the jet-propelled combat airplane.

When the Army Air Forces jet-propelled fighter flies into combat for the first time, Captain Brian Sparks, now chief techincal pilot for the American Export Airlines, Inc., and Robert Stanley will await the results with considerably more than passing interest.

A TECH MAN'S PALACE

Lloyd Goodmanson, '40, together with a group of Boeing engineers, solved the housing problem in a most unusual manner. The housing shortage, which has necessitated living in barracks, tents, and the like, and the consequent trials and tribulations there, is common talk. Little has been said of living "contentedly" in a palace as an alternative.

In answer to their plea for a big house, none other than a palace was available. Each of its 30 rooms follows the style of a different period. The rooms are ornamented with Chinese dynasty vases, brocade, carved marble, oriental rugs, antiques, art treasures, and other fabulous bric-a-brac. The expenses of home and grounds, as well as the chores, are equally divided among the men.

The problems of living in such grandeur are those that anyone might have who went home every night to an art gallery. If accidentally a piece of ornamentation falls to the floor, broken in many pieces, the one responsible has a considerable dent in his budget. In order to avoid such catastrophes the men tiptoe cautiously through the halls of "china" and over the costly oriental rugs.

The men have a self-imposed ban on smoking in the drawing room. They stand in an ante-room or adjourn to the basement where they can recklessly smoke, relax, and dream of the distant day when they too will become opulent.

DR. LOMBARD RECEIVES EMBLEM

Dr. Albert E. Lombard, Jr., noted aeronautical engineer, on leave from California Institute of Technology, has been awarded the Army emblem for exceptional civil service "in recognition of his outstanding contribution to the nation's war effort by assisting in the development of aircraft resources."

Dr. Lombard, special assistant to the director of the Aircraft Resources Control Office in Washington, was given leave from Caltech nearly four years ago to take his present work with the Army. Before going East he served as assistant professor of aeronautics and mechanical engineering.

For eight years after graduating from Caltech in 1928, Dr. Lombard was with the Curtiss-Wright Corporation in Buffalo and St. Louis as research and consulting engineer. He was responsible for the aerodynamics work on the famous Curtiss-Wright Commando, the plane now carrying supplies over the Himalayas.

Upon returning to Caltech, Dr. Lombard became a teaching fellow in applied mechanics and aeronautics, receiving his Ph.D. degree *cum laude* in aeronautical engineering in 1939.

"FIVE YEARS OF INDUSTRIAL RELATIONS"

The Industrial Relations Section California Institute of Technology, founded in 1939, has recently published a bulletin covering its activities. The publication includes a report for the period 1939-1944 as well as outlining plans for the future of the Section. Alumni of California Institute of Technology may secure copies of the bulletin by writing to the Industrial Relations Section of the Institute.

ATHLETICS

By H. Z. MUSSELMAN,
Director of Physical Education

SINCE the previous story in this publication was written, Caltech's basketball team has won three and lost five, making the record to date five victories and eight defeats.

Early in the season, Coach Carl Shy named his starting lineup of Hugh West and Stuart Bates forwards, Bernie Wagner center, Paul Nieto and John Schimenz at guards. However, shortly after the holidays, wholesale troubles descended on the squad. Wagner was transferred to Great Lakes, Nieto was declared ineligible and West was forced out with a badly strained knee. Both Nieto and West, who were the key men on the team, are lost for the season.

The revised lineup now includes Larry Collins and Jerry Schneider forwards, Bates at center and Jack Cardall and John Pryor at guards. Collins and Pryor were brought up from the B-squad and currently are the leading scorers.

In the first game after the holidays, Tech defeated Los Alamitos Naval Training Station 55-54. With the lead changing hands twice in the last minute of play, Paul Nieto tossed the winning basket from mid-floor as the gun sounded. In another close battle, Oxy was trimmed 44-43, with neither team having more than a three point advantage any time in the second half. Redlands proved an easy victim, falling before the Tech attack by a 55-31 score.

Games were dropped to U.C.L.A. 42-37, March Field 57-44, Pepperdine 52-44 and 45-33, and U.S.C. 42-36. In practically all of these defeats, the lack of height on the Tech team enabled the victors to score repeatedly on tip-in and rebound shots.