DECEMBER, 1956

The journal of the Limb and Brace profession

Orthopedic and Prosthetic Appliance Journal

The UCLA School

Engineering Applied to Bracing

Amputations in Peripheral Vascular Disease

published jointly by
Orthopedic Appliance & Limb Mfrs. Association
American Board for Certification

DATES TO REMEMBER

1957

What • When • Where

JANUARY

26-31	AMERICAN ACADEMY OF ORTHOPAEDIC SURGEONS—Annual Convention. Certification Display in Scientific Exhibit Area	*Chicago, Ill. Palmer House*

FEBRUARY

15-17	REGION IV—OALMA Meeting (All other regions invited)	*Tampa, Fla. Hillsboro Hotel*

MARCH

16-18	REGION VIII—OALMA. The Southwestern Meeting	*Houston, Tex. Shamrock Hotel*

APRIL

13-14	REGION V—OALMA Meeting	*Cleveland, Ohio*
27	REGION VII—Meeting.	*Minneapolis, Minn.*

MAY

28	Applications to take the Certification Examinations given in September must be on file in the Washington, D. C. Certification Office by this date.	

JUNE

3-7	AMERICAN MEDICAL ASSOCIATION—Annual Meeting	*New York City*

JULY

22-27	INTERNATIONAL SOCIETY FOR THE WELFARE OF CRIPPLES—Seventh World Congress	*London, England*

SEPTEMBER

8-13	CONGRESS OF PHYSICAL MEDICINE AND REHABILITATION—AMERICAN ACADEMY OF PHYSICAL MEDICINE	*Los Angeles, Calif.*
28	CERTIFICATION EXAMINATION FOR ORTHOTISTS AND PROSTHETISTS	*Washington, D. C.*
29	NATIONAL ASSEMBLY OF THE LIMB AND BRACE PROFESSION—OALMA and Certification Meetings conclude October 2.	*Washington, D. C. Statler Hotel*

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Special Dispatch to Every Truform Dealer

Unique 3-point pressure of the Bell Posture Bridge eases facet impingement in the lumbo-sacral area . . . truly relieves low back pain, with or without sciatic involvement.

Only you, the Truform dealer, can offer this new principle of 3-point pressure relief . . . for only the Bell Posture Bridge

1) *Exerts Positive Forward Thrust* to tilt the pelvis.
2) *Corrects Posture Defect, even* excessive lordotic lumbar curvature.
3) *Applies Controlled Counter-Pressure* through the front apron, by tightening the pull-straps.

Patented

"Seeing Is Believing"
Do as other successful dealers do . . . demonstrate this new Bell Posture Bridge to your physicians so they can fully appreciate its perfect adaptability to the relief of low back pain. Take it to them . . . or invite them to your fitting room . . . once they've seen your demonstration, your profitable prescription business will start coming in.

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TRUFORM

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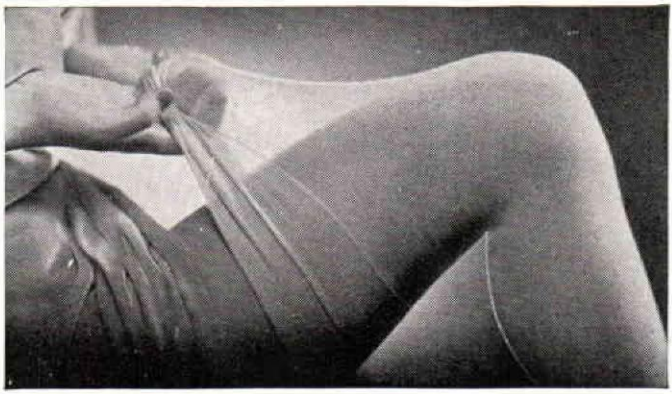
ANNOUNCING THE NEW SUPER EXTRA-SHEER ELASTIC STOCKING BY BELL-HORN



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- **The Sheerest Elastic Stocking to reach the market incorporating all the style features so important to the women of today who are conscious of the value of full fashioned hosiery.**

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Hinged Knee Cap
With Straps

Wm. H. Horn & Bro., Inc.
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Philadelphia 23, Penna.

#213—S STUMP SHRINKER
Eight Stock Sizes Each for
Amputations Above and
Below the Knee

#607 Hoffman Scrotal Truss. Also available with double front strap. For the Double Truss order "608".

For the hard-to-hold HERNIA . . .

Mild cases . . . severe cases . . . no single truss is correct for all. That's why the Kendrick line is so complete . . . to help you to fit every hernia case correctly. For example, the #607 Hoffman Scrotal Truss is especially designed for the unusually hard-to-hold hernia. Its wide, extended-top, flat pad distributes pressure evenly over a greater area. It easily covers the opening towards the center that is often just beyond the ordinary pad.

An all leather truss, the "607" features a hand-sewn pad of soft kid, held by an extra strong spring. Scientifically designed, the Kendrick #607 Hoffman offers your patient greater security and self-confidence through additional strength.

The "607" is one of many Kendrick truss designs, in stock and custom made, that have increased living pleasure for thousands of customers for over 100 years . . . to the pleasant jangle of dealers' cash registers. If you are not a Kendrick dealer now send for the general catalog that illustrates and details our *complete* line of surgical garments, trusses and appliances.

Be prepared for any order . . . have the complete Kendrick Catalog on hand.

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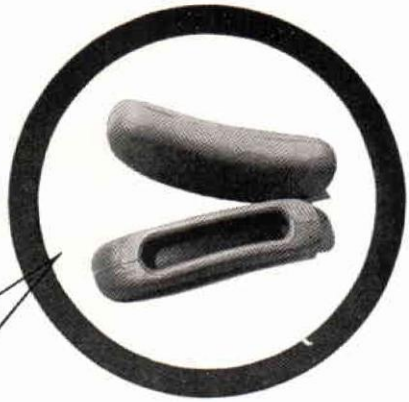
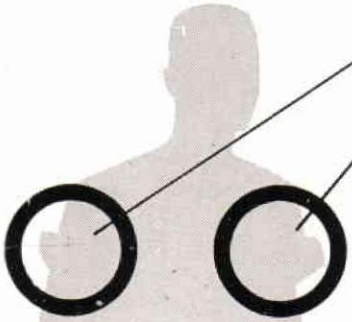
Completely New! Completely Different

Royal Crutch-Eze Cushions





Start giving comfort where ordinary cushions stop

The premium quality crutch cushion for the large ready made market which demands "nothing but the best."

Royal Crutch-Eze Cushions provide maximum under arm comfort and wear under continual hard use. Ideal for hospital and institutional equipment, rental, permanent and temporary crutch users.

Extra-thick, scientifically proportioned and full-molded Neoprene sponge gives positive resistance to oxidation, perspiration, body oil and abrasion... halts end checks and splits. Assures pillow-soft armrest comfort... absorbs crutch shock... reduces under arm pressure and prevents crutch paralysis.

Exclusive Guardian internal fabric reinforcement guarantees longer wear. Exclusive deeper end cavities and full width sides form-fit entire crutch arm piece...prevents slipping even under hardest use.

The many functional features of Royal Crutch-Eze Cushions, backed by professional acceptance of the complete Guardian prestige crutch accessory line, assure you of new sales and new profits. Order your stock now from your nearest factory distributor listed below. Write factory for illustrated literature.

Packaged in 3-color display carton to help you complete more sales.

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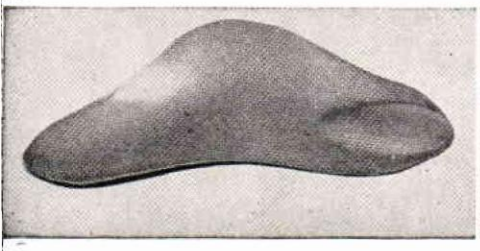
MIDWESTERN
Professional Specialties, Inc.
1330 Dolman Street
St. Louis 4, Missouri

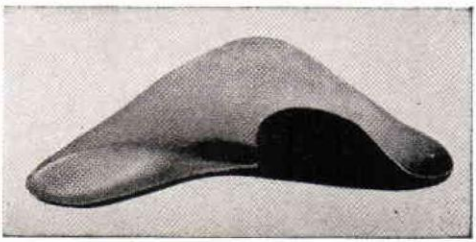
PACIFIC COAST
Guardian Latex Products Co.
3030 East Olympic Blvd.
Los Angeles 23, Calif.

Please Order from Your Factory Distributor



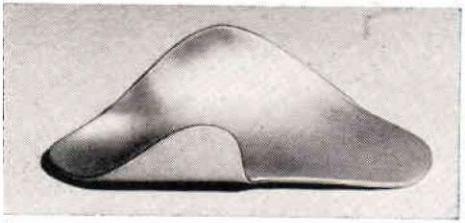
Style 600S (Schaeffer)

Combination longitudial and metatarsal arch support. Flexible with a sponge rubber metatarsal pad and a concealed highly tempered spring. Base of support is constructed of a high grade sole leather, moulded on individual lasts, the top finished with a fine calfskin and the bottom a high grade suede. Available with 1, 2, 3 or 4 springs.



Style 903 Leather (Whitman)

A combination support with both inner and outer flanges designed especially to hold the heel firmly in position. In addition provides support for both inner and outer longitudial arch. Made with one or more springs. Used in cases where a metal Whitman would be too rigid as this support is flexible and light in weight.



Style No. 900

Most popular metal Whitman—stainless steel scientifically designed and precision made to give you a perfect product. Stock sizes: Children 4 to 3 medium; Women's 4 to 10 wide and narrow; Men's 6 to 13 wide and narrow. Also made after cast or print. The above style also available in Anodized Dural.

Stainless Steel, Dural Support No. 803

Stainless steel support with moderate inner flange to assure the utmost comfort, Metatarsal and cupped heel, made in sock sizes, after cast or print. Women 3 to 10, wide-narrow. Men's 6 to 12, wide-narrow. Children 6 to 2, meduim. This support is available in both Stainless steel and Dural. This is one of the most popular supports in the Surgical field. All supports made from plaster cast, foot prints or stock sizes. Also made in Anodized Dural.

MOULDED LEATHER SHELLS STYLE A
FOR WOMEN, MEN AND CHILDREN

MOULDED LEATHER SHELLS STYLE B WITH MET
FOR WOMEN AND MEN

MOULDED LEATHER SHELLS STYLE D (WHITMAN)
FOR WOMEN, MEN AND CHILDREN

All Leather Shells Can Be Had with One or More Attached Steel Springs

RUBBER SHELLS WITH OR WITHOUT MET
WOMENS AND MENS SIZES

PEDIC SPONGE RUBBER
IN THICKNESS OF 1/16" TO 1/2" MEDIUM AND FIRM DENSITY

ORTHOP. AIR-FOAM HI-TEST
1/8" TO 1" SOFT, MEDIUM, FIRM AND EXTRA FIRM

FOAM ON COTTON
1/8" 3/16" 1/4"

RUBBER-CORK
1/16" TO 1/2"

ORTHOPEDIC CORK
1/16" TO 1/2"

CORK BLOCKS FOR ELEATIONS
12x4" 1/8 TO 4"

RUBBER-SCAPHOIDS
SMALL, MEDIUM, LARGE AND EXTRA LARGE

RUBBER METATARSAL PADS

CELASTIC MOULDING FABRIC
No. 45 No. 75 No. 115 No. 125

VINYL LEATHERETTE
IN WHITE AND NATURAL COLORS

HERSCO Arch Products Corp.
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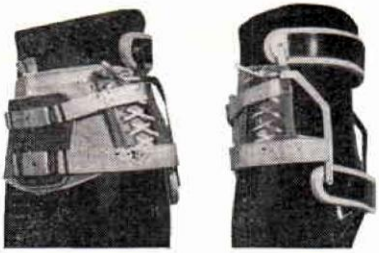
137 East 25th St., New York 10, N. Y.

NOW AVAILABLE!



FRONT VIEW BACK VIEW

Available in Hip Sizes: S 32-34; M 36-38; M-L 40-42; L 44-46

No. 250, Williams Brace

completed, ready to fit

our price $22.50

Williams Brace

AND

Hyperextension

SET-UP KITS

That's right. All metal parts necessary to make your own Williams and hyperextension braces. *

BIG SAVINGS IN

ASSEMBLY TIME=MONEY!

Williams Kit *(not ill.)* includes:

- Top and bottom bands of highly polished aluminum. Shaped and cut to size, with holes drilled.
- Side bars and slotted pull bars. All holes drilled. Bars shaped and highly polished.
- No plating needed. Slotted pull bars are stainless steel. Side bars are bright nickel plated steel.
- Necessary steel burrs and 5/32" Monel rivets for assembly included.

$10.50 Set

Specify #150 and give desired size: small, medium, medium large or large

Hyperextension Kit *(not ill.)* includes:

- Chest, side and abdominal plates. shaped, drilled and tapped.
- Four side bands, two top and two bottom. Shaped drilled and countersunk.
- All necessary screws for assembly.
- Fitting instructions.
- All exposed metal is polished to a high professional finish.

Specify #99

$10.95 Set

No. 299 Hyperextension

complete, ready to fit

our price $22.50

* Buckles, truss, hooks, etc., not included.

PRIES F.O.B. LOS ANGELES—IMMEDIATE DELIVERY

Abbott Orthopedic Supply

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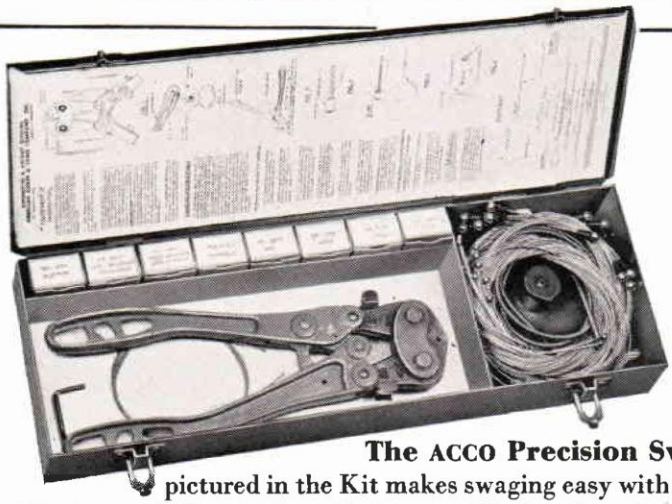
ACCO TRU-LOC Prosthetics Kit

Makes Swaging Easy... Saves Time... Eliminates Soldering... Permits Re-Use of most ACCO Tru-Loc Terminals and Fittings without the Fuss and Muss of Unsoldering!



The ACCO Precision Swaging Tool pictured in the Kit makes swaging easy with ACCO Tru-Loc Fittings and Terminals... eliminates soldering. Swaging is unquestionably best... provides 100 per cent bond between cable and terminals... and there is no acid to corrode the cable... no heat to weaken it.

This Kit contains a full range of the Finest Stainless Steel ACCO Tru-Loc Terminals, Fittings, Assemblies, Cable and Housings. Everything has been carefully designed to permit maximum re-use of Fittings *...without the fuss and muss of unsoldering.*

All of the parts, and the Precision Swaging Tool supplied in this ACCO Tru-Loc Prosthetic Kit, have been tested, approved *and adopted* by the Army Prosthetic Research Laboratory at Walter Reed Hospital and by Government Hospitals and Centers throughout the U. S. For further details see the following pages.

Portable Swaging Tool

The suction cup mounting pictured here makes ACCO's Precision Swaging Tool portable. It can be used on any flat surface.

for complete information write to—

ACCO

Automotive and Aircraft Division
AMERICAN CHAIN & CABLE

601 Stephenson Bldg., Detroit 2
2216 South Garfield Ave., Los Angeles 22 • Bridgeport 2, Conn.

Shown Here are the Stainless Steel Terminals, Fittings, Assemblies, Cable and Housings furnished to Limb Shop Operators in

ACCO's TRU-LOC Prosthetics Kit

• Quantities of parts or assemblies furnished with each kit are shown with each set of drawings. And, of course, each kit also contains the ACCO Precision Swaging Tool and Suction Cup Mounting shown in the pictures on the preceding page.

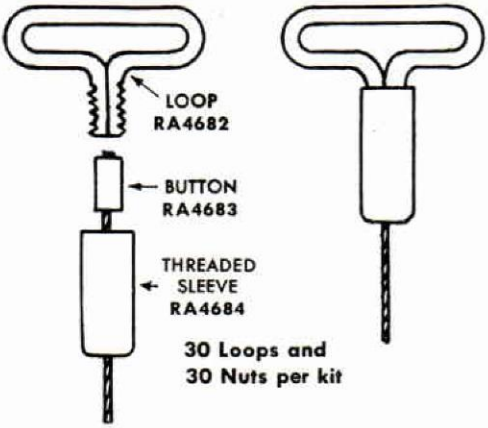
ACCO BUTTON

100 Buttons per kit

To assemble—
Insert Cable and Swage

ACCO STRAP "T" HANGER

All drawings approximately actual size

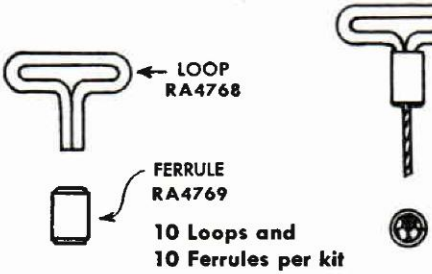


30 Loops and
30 Nuts per kit

To assemble—
Thread Cable thru Nut—
Swage Button to Cable—
Screw Loop into Nut

***NOTE** • Loop and Nut can be re-used*
No unsoldering involved

ACCO ELBOW "T" HANGER



10 Loops and
10 Ferrules per kit

To assemble—
Insert Cable and Loop
into Ferrule—then Swage

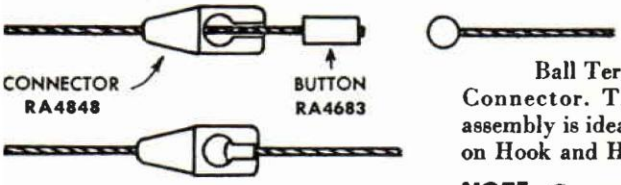
ACCO BALL-AND-CABLE ASSEMBLY

SA-6007-A64

15 assemblies 64″ long per kit

Stainless Steel Balls are on each end of these 64″ assemblies. Cut in half, each of these 64″ assemblies makes two full length 32″ cable assemblies. The Balls fit ACCO Connectors and other devices. Cut ends can be connected to ACCO Strap, Connector or similar devices.

ACCO CONNECTOR

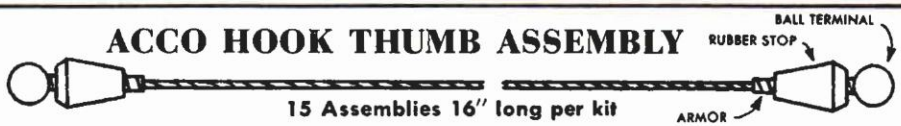


65 Connectors per kit

Ball Terminal drops easily into Connector. This Button and Ball assembly is ideal for quick disconnects on Hook and Hand exchanges.

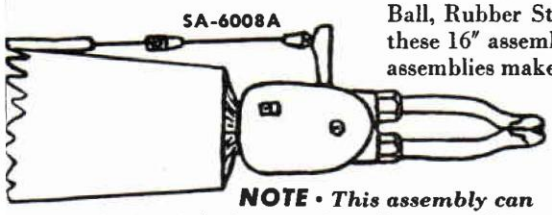
***NOTE** • Connector can be re-used There is no unsoldering*

ACCO HOOK THUMB ASSEMBLY



15 Assemblies 16″ long per kit

SA-6008A



Ball, Rubber Stop and Armor are on each end of these 16″ assemblies. Cut in half, each of these 16″ assemblies makes two Thumb Assembly units. Ball end is designed to fit thumb of a hook. Rubber stop holds Ball in position. Armor prevents Cable wear and reduces Cable fatigue.

***NOTE** • This assembly can be furnished to any length required for other types of installations*

ACCO CABLE HOUSING

5 lengths of 10 feet each per kit **RA4806**

Stainless Steel—Designed for use with Standard Retainers

SPECIAL **ACCO Lubricating Stick... will not soil clothing... lubricates Cable sliding through Housings... eliminates grunts and operating noises... insures smooth operation**

for complete information on ACCO TRU-LOC Prosthetic Kit and equipment, write to

Automotive and Aircraft Division
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Orthopedic and Prosthetic Appliance Journal

(Title registered U. S. Patent Office)

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VOLUME 10 • December, 1956 • NO. 4

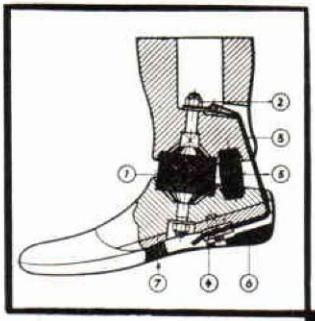
CONTENTS

S.H.K. the natural aligning ankle

Transverse and lateral
ANKLE MOTION
For the AMPUTEE . . .

Satisfied Customers, Increased Profits!

This revolutionary new ankle joint climaxes years of research and testing by the German Limb Industry. This multi-functional ankle assembly, with it's ingenious construction, gives the amputee a noiseless, shock-absorbing, natural gliding motion, which has never before been attained. Old AND new amputees will enjoy increased comfort and activity—and, the complete foot and ankle assembly is priced low so you may enjoy a greater margin of profit.



TRANSVERSE ROTATION
prevents skin abrasion caused by twisting the stump in the socket.

BLOCK RUBBER MOUNTS
provide noiseless, gliding motion with no lubrication necessary.

FULL SOFT RUBBER SOLES
reduces sock wear to a minimum.

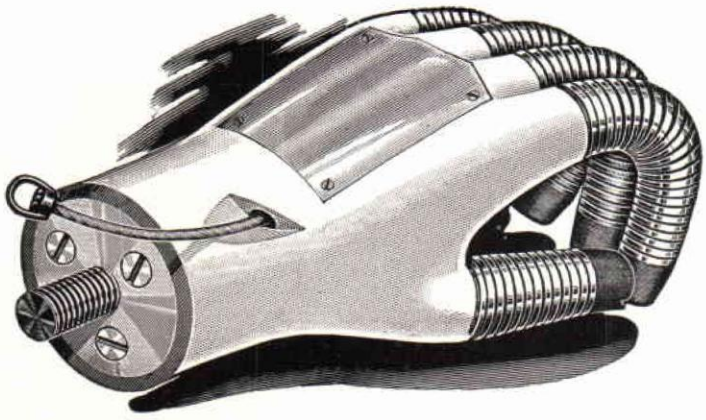
ENTIRE ANKLE IS CONSTRUCTED
to decrease shock, give cushioned weight bearing, which is important to wearer's comfort and activity.

1. Flexible Angle Joint
2. Stop Nut
3. Nylon Strap
4. Pinch Fitting
5. Rubber Damper
6. Foam Latex Rubber Sole
7. Hardwood Base

Fidelity Orthopedic

FIDELITY BLDG., DAYTON, OHIO

SEE THE NEW LOCKGRIP HANDS



WITH improved finger lineup, enabling the thumb to grasp between 1st and 2nd fingers.

WITH naturally shaped and molded rubber finger tips.

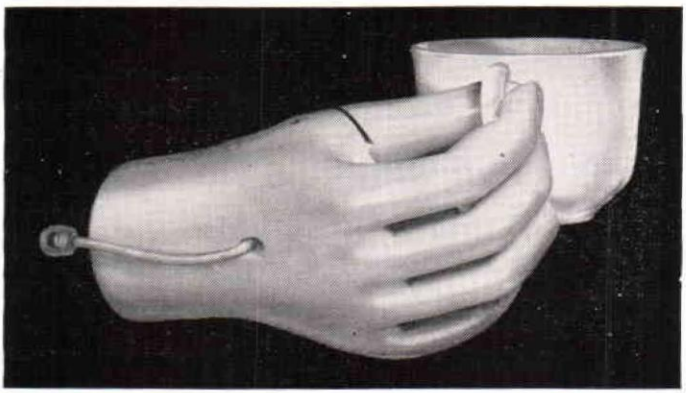
WITH Finer gauged and stronger flat finger spring wire, adding to the jointed fingers flexibility.

NEW Realistic cosmetic gloves exceedingly lifelike in sizes 7½—8—8½.

A lighter, stronger and the most useful of all mechanical hands, in sizes from 6 to 10, all wrist styles.

ALSO THE LAMINATED WOOD HAND WITH FIBRE CORED FINGERS **PLYLITE**

LOCKING



SNAP THUMB

D. B. BECKER CO.

152 WEST STEVENS STREET **ST. PAUL, MINNESOTA**

The Limb and Brace Profession Holds National Assembly at San Francisco Hennessy Picked for OALMA Presidency

"From President Harmon to President Hennessy—Good luck."

Shown above are the new officers of OALMA with Program Chairman Herbert Hart and Past President Harmon (picture taken at the Installation Ceremony, San Francisco Assembly). Left to right: Second Vice President Karl Buschenfeldt, First Vice President John McCann, President Charles Hennessy, Program Chairman Herbert Hart, Past President W. Frank Harmon and Secretary-Treasurer M. P. Cestaro.

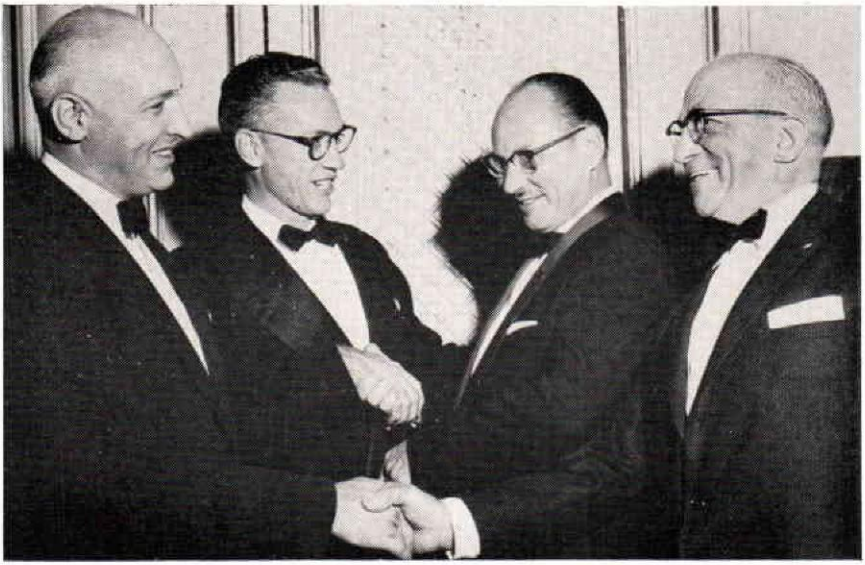
The 1956 National Assembly sponsored by the Orthopedic Appliance and Limb Manufacturers Association met in the Sheraton-Palace Hotel in San Francisco, October 21-22-23-24.

President Hennessy Takes Office

Charles A. Hennessy, President of the Peerless Artificial Limb Co. of Los Angeles, was installed as President for the year 1956-1957, of the Orthopedic Appliance and Limb Manufacturers Association. Mr. Hennessy has served as Vice President of OALMA for the past two years, and is a former President of the Society of Orthotists and Prosthetists. He is a member of the faculty of the Prosthetic School of the University of California, Los Angeles, with the rank of Assistant Research Prosthetist (equivalent to an Assistant Professorship).

John A. McCann, President of the John J. McCann Co. of Burlington, New Jersey, was promoted to First Vice-President after two years service as Second Vice-President. Mr. McCann has also served as President of the Metropolitan Orthopedic Appliance and Limb Manufacturers Association and as OALMA Regional Director for New York and New Jersey. Karl Buschenfeldt of Stoughton, Mass., who has just completed a three-year term on the American Board of Certification, was drafted for the office of Second Vice-President.

Members voiced their appreciation of the Treasurer's stewardship by unanimously re-electing M. P. Cestaro of Washington, D. C., as Secretary-Treasurer. Mr. Cestaro is President of the J. E. Hanger Co. of Washington, D. C. In addition, he has served for the past three years as Acting Secretary-Treasurer for the American Board for Certification.



The Past President Club Greets a New Member

Three Past Presidents of OALMA welcome a new member to their Club. Left to right: Lee Fawver, McCarthy Hanger, Jr., W. Frank Harmon and Clyde Aunger.

Treasurer Cestaro's report revealed that OALMA had again balanced the budget. Through careful husbanding of its limited resources, the Association has been able to accumulate a reserve of $15,153, which is invested in a building and loan association.

Economic Project Approved

Members voiced warm approval of the new OALMA Economic Project, which is now in operation and administered by the Department of Business Administration of the American University in Washington, D. C. Details of the Project and a review of the various operating ratios were described to members by Treasurer Cestaro, Robert Gruman of Minneapolis and Joseph Gitlin, Treasurer of the Minneapolis Artificial Limb Co.

OALMA officials emphasized these fundamental provisions:

(1) All records supplied by any firm are for the confidential use and analysis of the American University School of Business Administration. The individual returns are not revealed to any member or officer of OALMA.

(2) Expenses of the Project are paid for by direct grant from the OALMA treasury. There is no charge for any member of OALMA participating, and only members of OALMA are eligible for the service.

(3) The first analysis will cover figures for the year 1955. The sales to be included are of orthopedic and prosthetic appliances. The complete analysis of operating and financial ratios will be sent to firms enrolling in the Project.

Brace Dictionary Project

Chairman Matt Laurence presented a progress report on the OALMA Brace Dictionary. He requested the cooperation of members and urged that photographs and drawing showing the various types of braces made by member firms should be sent to his facility at Oakland for study and recording. Due credit will be given in the completed Dictionary to all cooperating firms.

The National Assembly unanimously approved the selection of Washington, D. C. as the site of the 1957 Assembly of the Limb and Brace Profession. Headquarters of the Assembly will be in the Statler Hotel in Washington, D. C. The dates: September 29-October 2.

Robert Gruman, C. P., Winkley Company, Minneapolis, Minnesota, has been named Program Chairman. Ralph Storrs, Pope Brace Division, Kankakee, Illinois, has been appointed Vice Chairman of the Program Committee and will also serve as Chairman of the Exhibits Committee. Readers of the *Journal* are invited to send suggestions as to the program and exhibits to Messrs. Gruman and Storrs.

Miles Anderson Honored

Shown above are: Dr. Miles Anderson showing the Citation awarded him at the National Assembly, Past President Harmon of OALMA and Past President Robert Mazet, of the Certification Board. The Citation paid tribute to Dr. Anderson for his services in developing the Education Program of OALMA and the Examination System of the Certification Board.

Instructional Courses Featured

Five seminars or instructional courses took up much of the time and attention of Assembly delegates. These included:

1. Appliances Used in Deformities and Functional Disorders of the Foot. The instructors: Paul W. Meyer, M.D., Dickson-Diveley Clinic, Kansas City; Ted R. Reynolds, C.O., W. E. Isle Co. Arrangements: David McGraw of Shreveport. Mr. McGraw reports that the instructors covered the entire subject of foot imbalance as thoroughly as the limited time permitted. A vigorous question and answer and discussion period followed the lecture and testified to the keen interest of the student body. The instructors have been invited to discuss the subject matter of this seminar in a future issue of the *Journal*.

2. Anatomy for the Limb and Brace Technician. Instructor: Charles G. Hutter, M.D. Arrangements: John Cranford, C.P. of Richmond, Va. Mr. Cranford reports that this seminar held two sessions and that the students benefitted greatly from the unusual teaching ability and apt descriptions of the instructor.

3. Cerebral Palsy Bracing. Instructors: Cedric D. Denison, C.P.&O. of Baltimore, Md.; Peter Cohen, M.D., Associate Professor of Pediatrics, School of Medicine, University of California, San Francisco; Donald B. Lucas, M.D., Assistant Professor of Orthopaedic Surgery, School of Medicine, University of California, San Francisco. Mr. Denison was in charge of arrangements for this seminar. Doctors Cohen and Lucas reviewed the medical background of cerebral palsy patients and pointed out how untreated patients may develop deformities, especially those which occur in abnormal conditions of the foot and ankle. Mr. Denison, using a variety of slides, illustrated exactly how the braces are made to become functional in order to avoid or reduce the development of these deformities.

4. Hand Splints. Faculty: Sterling Bunnell, M.D. and Henry Weniger, splintmaker. Arrangements: Herman Hittenberger. Dr. Bunnell reviewed the function and types of hand splints. Mr. Weniger demonstrated the splints and described their manufacture.

5. Harnessing. Instructors were Woodrow T. Yamaka, C.P. of Los Angeles and Jerry Leavy, San Jose, Calif. Arrangements: F. L. Lake of Oklahoma City. Mr. Lake reports that an overcrowded program cut short the time required for this session. Students, he reported, would gladly have sat for triple the alloted time to hear these renowned authorities.

Child Amputee Studies

The emphasis in recent years on the needs of the child amputee, arising out of the work of Michigan's famous Crippled Children Commission, led by Dr. Carlton Dean, lent special interest to two features of the Assembly program:

1. Problems Involved in Fitting the Child from One to Ten. Presented by Dr. Charles H. Frantz, M.D. and Dr. George T. Aitken, M.D., both of Grand Rapids, Mich. Dr. Frantz, in his illustrated lecture, covered the problems of the lower extremity and Dr. Aitken those of the upper extremity.

2. The Child Amputee Prosthetics Project. A report on the research underway at the University of California in Los Angeles. The findings of the first year's research on this project which have done so much to encourage fitting of children with appliances were reviewed by Dr. Robert Mazet, Jr., M.D., President of the American Board for Certification, Dr. Craig Taylor, Professor of Engineering and Dr. Milo B. Brooks, M.D., Clinical Professor of Pediatrics, all of the University of California, Los Angeles faculty. Arrangements for this session were in charge of Robert Gruman.

Other technical papers and demonstrations included:

Functional Arm Bracing. Dr. Edwin R. Schottstaedt of San Francisco and George B. Robinson of Vallejo, Calif., presented a number of patients in demonstration of problems and opportunities arising in Functional Arm Bracing. Arrangements: Ralph Storrs, Kankakee, Ill.

Cosmetic Appliances "A How to Do It" session was presented by C. O. Anderson, San Francisco; and Carl Nielson of Washington, D. C. Mr. Anderson is Founder of Prosthetic Services of San Francisco. Mr. Neilson is a plastic technologist on the staff of the Army Prosthetics Research Laboratory in Washington.

The Lower Extremity Amputee, A Clinical Picture as Revealed by Studies at the University of California, featured a number of eminent specialists engaged in prosthetics research under the leadership of Dr. Verne T. Inman, Professor of Orthopedic Surgery, School of Medicine, University of California. These included the following reports:

1. Dermatology. Presented by Dr. S. William Levy, Instructor in Dermatology.

2. Surgery of the Stump. Presented by Dr. Henry E. Loon, research orthopedist, Department of Orthopedic Surgery. Dr. Loon is also coordinator of the Medical Division of the Lower Extremity Amputee Research Project.

3. Neuroanatomy. Presented by Dr. Malcolm R. Miller, Associate Research Anatomist at the University of California School of Medicine.

4. Neurophysiology. Presented by Dr. Verne T. Inman.

5. Psychology. Presented by Dr. Henry F. Albronda, head of the Adult Psychiatry Clinic.

6. Energy. Dr. Henry J. Ralston, Professor of Physiology, College of Physicians and Surgeons, San Francisco.

Gen. Strong Honored by Certification Board National Meeting Held at San Francisco

General Strong Honored

Mrs. Frederick S. Strong examines the Testimonial Volume of Letters which has just been presented to her husband. Shown, left to right are: Dr. Robert Mazet, Jr., President of the Certification Board, Mrs. Strong, Gen. Frederick S. Strong, and W. Frank Harmon, President of OALMA, 1955-1956.

The 1956 Certification meeting was held at San Francisco October 22, at the Sheraton-Palace Hotel in conjunction with the National Assembly of the Limb and Brace Profession.

A feature of the annual Certification Luncheon on October 22 was the honor and recognition extended to General Frederick S. Strong, Jr., Chairman of the Prosthetics Research Board, on behalf of the Certified facilities of America. A handsomely bound Volume of Letters from members of the limb and brace profession, managers of Certified facilities, leading surgeons and others in a position to know about General Strong's contribution to prosthetic research leadership, was presented to Gen. Strong. Taking part in the presentation ceremony were Executive Director Glenn Jackson and Mrs. Chester C. Haddan of Denver, representing her husband. Mr. Haddan was Chairman of the Committee which arranged for the Testimonial Volume, but due to a temporary illness he was unable to be present for the ceremony. President Eisenhower sent a special letter of greeting which was added to the volume.

Dr. John B. de C. M. Saunders, delivered the annual Certification address. Dr. Saunders, who is Dean of the School of Medicine, University of California, made a strong plea for the support of pure research, as the necessary foundation for progress.

Other actions of the Certification sessions in San Francisco included:

1. Election to the Certification Board of Col. A. W. Spittler, Medical Corps, U. S. Army, and W. Frank Harmon of Atlanta, Ga. These elections fill the vacancies caused by the retirement from the Board of Dr.

Col. Spittler Welcomed to Board

Col. A. W. Spittler was elected to serve on the Certification Board at the National Assembly in San Francisco. Shown above are: Seated—Dr. Roy M. Hoover, Col. A. M. Spittler. Standing: Board member Edward W. Snygg, Treasurer M. P. Cestaro and Karl W. Buschenfeldt, Vice President of the Board, 1955-1956.

Robert Mazet, Jr., of Los Angeles and Karl W. Buschenfeldt of Boston.

Col. Spittler was born in 1902 and is a graduate of the School of Medicine of Washington University, St. Louis. He is now Chief of Orthopedic Surgery at Fitzsimmons Army Hospital, Denver, Colo., and has previously served at Walter Reed Hospital and with the Medical Department in Japan. Col. Spittler is a member of the American Medical Association, the Academy of Orthopaedic Surgeons and the American College of Surgeons.

Mr. Harmon, President of the Atlanta Brace Shop of Atlanta, Ga., comes to the Certification Board after completing his term as President of the Orthopedic Appliance and Limb Manufacturers Association. Mr. Harmon had previously served as Program Chairman of the 1952 National Assembly in Washington, and as Vice President of the Association.

2. Certificates of Appreciation were presented to Retiring Board members Robert Mazet, Jr., M. D. and Karl W. Buschenfeldt, C. O. of Boston.

3. A discussion period on how Certification works featured reports of Committee Chairmen on such subjects as: (1) "Investigation of Facilities Applying for Certification;" (2) "The Checking of Applications for Permission to Take Certification Examinations;" (3) "Function of the Judiciary Committee."

4. Officers for the years 1956-57 include Carlton Fillauer of Chattanooga, Tenn., President; Dr. Edward C. Holscher of St. Louis, Vice President and M. P. Cestaro, Secretary-Treasurer.

"Raising Our Professional Standards"

A Message from
CHARLES A. HENNESSY,
President of OALMA

Our 1956 Assembly in San Francisco was an outstanding success and I'm sure that those who were fortunate enough to be able to attend, returned to their homes fired with new enthusiasm and new ideas. First, I wish to express my gratitude for the honor of being chosen to serve as your president for the coming year, and to assure all of my fellow members of the OALMA that I will do my utmost to uphold the precepts and further the aims and ideals of our organization.

I am convinced that one of the most important goals of our organization is that of raising our professional standards and, having done so, to achieve recognition as such from those professions with whom we come in daily contact. The most potent tool with which we have to work in order to reach this goal is education. I have received a letter from Mr. M. L. Sturtz of the D. R. Coon Co., which illustrates my meaning far better than I could ever say it:

"October 26, 1956,
Detroit, Mich.

Mr. Coon and I had been planning to attend the OALMA Convention at San Francisco this year, but due to unforeseen events that have taken place during this past month, it was impossible for either of us to be there.

I was particularly anxious to put in my appearance and personally express my full appreciation to all of the members of the UCLA faculty regarding the course in Prosthetic Education.

This new method of using the "quadrilateral type" of suction socket, also the method of fitting, adjustable limbs, and the alignment jig, is about as close to perfection, anatomic and mechanical, as I have seen in all of my 28 years in the limb industry. In the past we have had remarkable success with the trial and error method, but have constantly wished for a better way to serve the handicapped. They depended solely on us for rehabilitation, with confident expectation of miraculous results. Many were fitted satisfactorily and comfortably, but all manufacturers have had difficult cases that failed to respond to the most diligent efforts.

Now, however, we are assured of more satisfied wearers of prostheses through the scientific approach taught at UCLA and NYU. The plastic arm has been a boon to the arm amputee and we are certain that your new method

(Continued on page 27)

(Continued from page 25)

will do much for the leg amputee. My training courses at both universities have convinced me that all prosthetists should avail themselves of the opportunity to learn the new methods which have been a wonderful revelation to me and the entire class of 1956." (signed) M. L. Sturtz.

There is an old saying that "you can't teach an old dog new tricks." I feel that I can speak with authority when I say that this is one old saying that simply "ain't" so. As an "old dog" I have learned quite a few new tricks with the wonderful help and cooperation of some of the best minds in our country in the fields of engineering, anatomy, medicine and related subjects. But the most important thing that I have learned is that we never know it all and there is always room for improvement. We have come a long way and we still have a long way to go. Our goal can be achieved in the not too distant future if we all keep in mind that our only reason for existence is to serve the handicapped.

CHARLES A. HENNESSY
President

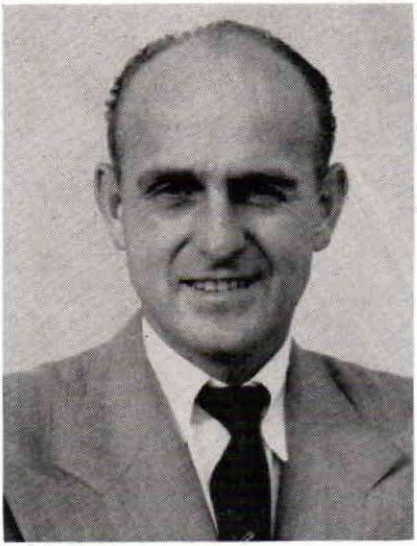
New OALMA Board Elected • Peters, Hanicke, Storrs and Dodd Join Governing Body

The governing body of OALMA is made up of eleven Regional Directors chosen by ballot from the Regions into which the United States is divided. These eleven directors, with the addition of the President, the two Vice Presidents and the Secretary-Treasurer, serve for a term of one year beginning with the closing day of the National Assembly.

In the elections for the term 1956-1957, OALMA members picked the following to represent the Regions and States listed:

Region I (New England states): Karl W. Buschenfeldt, Stoughton, Mass.
Region II (New York, New Jersey): John A. McCann, Burlington, N. J.
Region III (Pennsylvania, Delaware, Maryland, District of Columbia, Virginia): Basil Peters, Philadelphia, Pa.
Region IV (North Carolina, South Carolina, Tennessee, Kentucky, Mississippi, Alabama, Georgia and Florida): Bert R. Titus, Durham, N. C.
Region V (West Virginia, Ohio, Michigan): Paul E. Leimkuehler, Cleveland, Ohio.
Region VI (Eastern Missouri, Illinois, Indiana, Wisconsin): Ralph Storrs, Kankakee, Ill.
Region VII (Minnesota, North Dakota, South Dakota, Wyoming, Western Missouri, Nebraska, Iowa, Kansas, Colorado): Erich Hanicke, Kansas City.
Region VIII (Texas, Oklahoma, Western Louisiana, Arkansas, New Mexico): A. L. Muilenburg, Houston, Tex.
Region IX (Southern California, Arizona): Kenneth L. Dodd, Santa Monica, Calif.
Region X (Northern California, Nevada, Utah): Herbert J. Hart, Oakland, Calif.
Region XI (Washington, Oregon, Idaho, Montana): Lenart Ceder, Portland, Ore.

Directors serving on the Board for the first time include Basil Peters of Philadelphia, Erich Hanicke of Kansas City, Ralph Storrs of Kankakee, Ill., and Kenneth Dodd of Santa Monica.



KENNETH DODD
Director, Region IX

ERICH HANICKE
Director, Region VII

Basil Peters, better known as "Bill," is head of the B. Peters Co. in Philadelphia. He served in World War II as Lieutenant, U.S.N., in charge of the Limb Shop at Philadelphia Navy Hospital. Peters is now President of the Pennsylvania Orthopedic-Prosthetic Society.

Erich Hanicke, President of the P. W. Hanicke Manufacturing Co. of Kansas City, celebrates his 40th anniversary in the artificial limb and brace profession next April 10th. Mr. Hanicke received his training in Dresden, Germany, and came to Kansas City in 1921 to become associated with his uncle, the late P. W. Hanicke. His wife, Betty, is associated with him and with his brother Werner, in the management of the company. Mrs. Hanicke is a former President of the Ladies Auxiliary of OALMA. A special interest of Erich Hanicke is in the designing and building of appliances for the congenital and unusual case.

Kenneth L. Dodd, President of Modern Orthopedic Appliances of Santa Monica, Calif., is a native of St. Paul, Minn. He served in the Navy in the Second World War before entering the orthopedic appliance profession. His most recent activity is as Associate Instructor in basic principles of orthotics at the University of California, Los Angeles.

Biographical sketches of other directors will appear in the March issue of this *Journal*.

The Southeast (Region IV) Invites You: Tampa in February

OALMA members in the cold North and everywhere else are cordially invited to join their friends of Region IV at the spring meeting in Tampa, Fla. The hotel is the new Hillsboro (special rates). The dates are February 15, 16 and 17, 1957. Registration is Friday afternoon and evening, February 15. The program begins with a breakfast session the morning of February 16 and ends that evening. The business session of Region IV will be held the morning of February 17. Jack L. Caldwell, Manager of J. E. Hanger, Inc. of Tampa, is in charge of the program.

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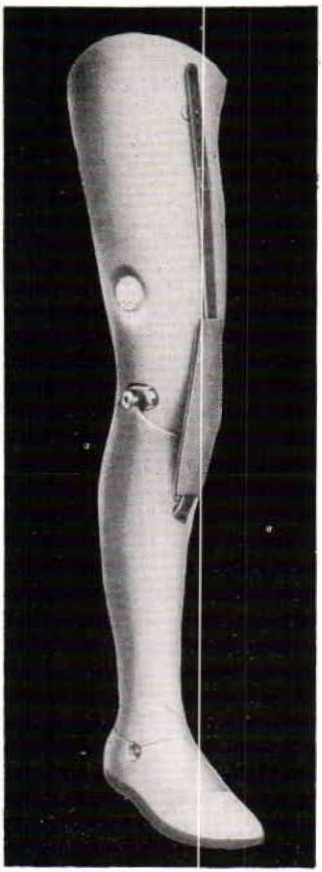

For the first time an above-the-knee amputee can have unbelievable safety and confidence.

Precision construction and unequalled German craftsmanship is the secret of this great achievement.

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when walking down stairs

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The UCLA Prosthetic School: A Progress Report
Classes Meet In Medical Center On Campus

Editor's Note: There are no geographical restrictions on applications for the UCLA Prosthetic School. Prosthetists, therapists and physicians from anywhere in the United States are eligible to apply for enrollment in these prosthetic courses presented at the University of California, Los Angeles.

At this writing, three courses in "Clinical Prosthetics: Above Knee Amputations" have been presented in the big new Medical Center of the University of California at Los Angeles. The first was held from May 28 to June 8, 1956, with an enrollment coming largely from the Southern California area. The second school was held from September 3 to 14, 1956, for enrollees from the Pacific Northwest area. The third school, for enrollees from the Midwest and Western areas, was held from October 29 to November 9, 1956.

The UCLA courses are presented in the Prosthetics Education Program facilities on the "B" level of the $21,000,000 UCLA Medical Center Building. The Prosthetics Education Classrooms, teaching laboratories and offices adjoin the Orthopedic Clinic of the hospital, and the examination rooms of the clinic are used by the students for physical examination and fitting of patients during the school. The operation rooms of the hospital, physical therapy facilities, and radiology department are on the same corridor. Supplementary classrooms, auditoria, and amphitheatres are utilized in addition to the space available in the Prosthetics Education facilities.

Each course lasts two weeks for the prosthetist students, and one week for the physicians and therapists. The prosthetists are alone during the first week, and are joined by the other two groups on Monday of the second week.

During the two weeks of the prosthetists' course, each student examines, measures, fits, and fabricates a prosthesis for three different patients. During the fitting of the first patient, each step is taken up in a lecture, demonstrated by the instructors, and then put into practice by the students. The second patient is fitted by the student, with the instructors standing by to answer questions or assist with problems. The third prosthesis, sometimes referred to by the students as the "test leg," is fitted and fabricated with a minimum of assistance from the instructors. Classroom sessions on principles, such as locomotion, anatomy, and the like, continue during the entire course.

Alvin Muilenburg, Houston, of the UCLA instructor staff, delivering a lecture on "Principles of Above Knee Fitting and Alignment" to a class of physicians and therapists during the course in "Clinical Prosthetics: Above Knee Amputations" at the UCLA Medical Center.

In addition to course material on fitting of the above knee amputee, the students are also given a survey of new and experimental devices and techniques, presented by Professor Charles Radcliffe of the School of Engineering, University of California at Berkeley, who is also in charge of prosthetic devices development in the Lower Extremity Amputee Research Project being carried on by the University of California on the Berkeley Campus and at the U. S. Naval Hospital in Oakland.

A complete instructional film on the fitting and fabrication of the new Canadian type hip disarticulation prosthesis is shown during the course, and each student is given a copy of the LEARP report on this prosthesis.

In the words of the University of California's catalogue description of the schools, "This is an intensive upgrading course for physicians and surgeons, therapists, and prosthetists, presenting comprehensive coverage of the prescription, fitting, alignment, fabrication and checkout of the above knee prosthesis, and gait analysis and training of the wearer."

A class banquet is held on the Thursday of the second week, usually at the Miramar Hotel in Santa Monica. The graduating class receives its certificates at this time. The students are not charged for tickets to the banquet. Guests other than the students pay four dollars per plate. Average attendance at these banquets has been 80 to 90, including the graduating class.

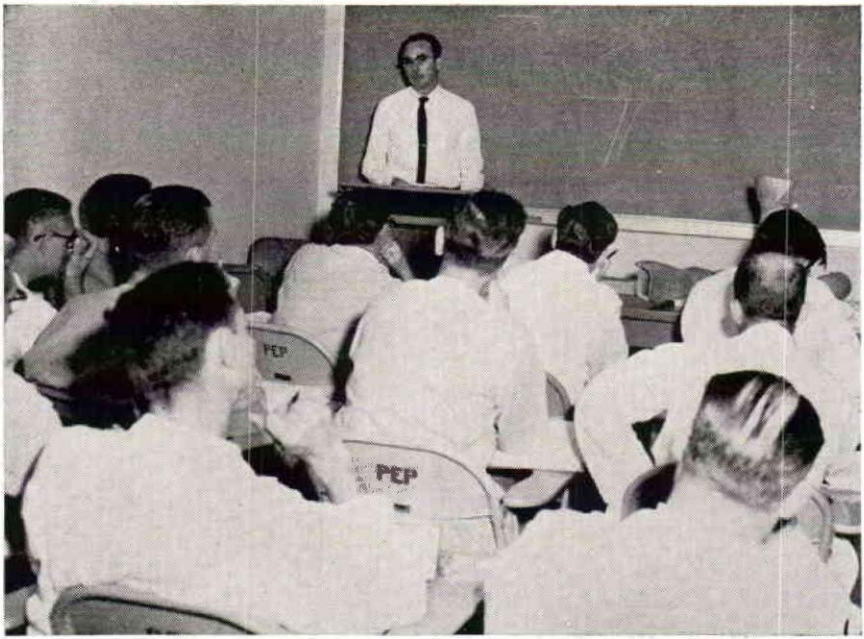
The fee for the two-week prosthetists' course is one hundred dollars. Shop smocks and laboratory coats are provided for each prosthetist. The students are asked to conform to the professional discipline of the hospital by wearing lab coats.

The Medical Center cafeteria is open to students enrolled in the prosthetics courses. Lodging is available at reasonable cost.

The faculty of the UCLA Prosthetics Schools in "Clinical Prosthetics; Above Knee Amputations" consists of:

Miles H. Anderson, Ed. D., Educational Director, Prosthetics Education Program, UCLA Medical Center; Virginia M. Badger, R. P. T., Physical Therapist in Charge of Rehabilitation, Orthopaedic Hospital, Los Angeles; Robert W. Bailey, M. D., Assistant Professor of Surgery (Orthopedics) and Chief of Orthopedics, University of California School of Medicine, Los Angeles; Charles O. Bechtol, M. D., Chief of Orthopedic Surgery, Yale University Medical School; John J. Bray, C. P. & O., Lanham Orthopedic Service, Los Angeles; Nancy Cake, R. P. T., Physical Therapy Supervisor, Wadsworth Veterans Administration Hospital, Los Angeles; Donald F. Colwell, C. P., Modern Prosthetic Appliances, Santa Monica; Clinton L. Compere, M. D., Assistant Professor of Orthopedic Surgery, Northwestern University Medical School, and Senior Consultant in Orthopedics to the V. A., also;

Cameron B. Hall, M. D., Clinical Instructor in Surgery (Orthopedics), University of California School of Medicine, Los Angeles; Charles A. Hennessy, C. P. & O., Assistant Research Prosthetist, UCLA School of Medicine: S. William Levy, M. D., Clinical Instructor in Dermatology, University of California Medical Center, San Francisco; Robert L. Mazet, Jr., M. D., Clinical Professor of Surgery (Orthopedics), University of Calif. Medical School, and chief of the Orthopedic Service, Wadsworth Veterans Administration Hospital, Los Angeles; Paul E. McMaster, M. D., Clinical Professor of Surgery (Orthopedics), University of California School of Medicine, Los Angeles, and Consultant in Orthopedics



John Bray of the instructor staff of the UCLA Prosthetics School, lecturing on "Functional Anatomy" during the course in "Clinical Prosthetics: Above Knee Amputations" held October 29 to November 9, 1956, in the big new Medical Center of the University of California at Los Angeles.

to the Veterans Administration; Alvin L. Muilenburg, C. P. & O., Muilenburg Artificial Limb Co., Houston, Tex.; H. Lorraine Ogg, R. P. T., Senior Physical Therapist, Medical Center, University of California at Los Angeles; Charles W. Radcliffe, M. S., Assistant Professor of Engineering Design, in Charge of Design and Development, Prosthetic Devices Research Study, University of California College of Engineering, Berkeley; Donald F. Slocum, M. D., Eugene, Ore., Branch Consultant in Orthopedic Surgery, Veterans Administration.

THE ALUMNI

Graduates of the first three schools were as follows:

May 28-June 8, 1956

CLASS ROSTER—PROSTHETISTS

Bill Hammon, Phoenix, Ariz., Edward L. Jachowski, Phoenix, Ariz., Guillermo Martinez, Zone No. 1, Guatemala, C. A., Charles David Neal, Los Angeles, Calif., William Peralta, Van Nuys, Calif., Carl Tamotsu Sumida, Honolulu, Hawaii, John J. Vollmer, Los Angeles, Calif.

June 4-June 8, 1956

CLASS ROSTER—PHYSICIANS

Dr. Warren A. Colton, Phoenix, Ariz., Dr. William A. Craig, Los Angeles, Calif., Dr. Richard H. Hall, Long Beach, Calif., Dr. Melvin M. Halpern, Tucson, Ariz., Dr. Charles G. Hutter, Los Angeles, Calif., Dr. Ivar J. Larsen, Honolulu, Hawaii, Dr. Lewis A. Leavitt, Bellaire, Tex., Dr. Joseph E. Maschmeyer, Los Angeles, Calif., Dr. Neil P. McCloy, San Francisco, Calif., Dr. Marvin T. Meyers, Los Angeles, Calif., Dr. John B. Milton, Phoenix, Ariz., Dr. Frederic W. S. Modern, Long Beach, Calif., Dr. Garth Mooney, Seattle, Wash., Dr. Fred Bennett Moor, Los Angeles, Calif., Dr. Vernon L. Nickel, Los Angeles, Calif., Dr. Robert L. Romano,

Seattle, Wash., Dr. Robert L. Smith, Belmont, Mass., Dr. Robert G. Thompson, Chicago, Ill., Dr. Walter L. Wood, Lynwood, Calif., Dr. Russell E. Youngberg, Los Angeles, Calif.

June 4-June 8, 1956

CLASS ROSTER—THERAPISTS

Ruth A. Aust, Honolulu, Hawaii, Margerie N. Allen, Phoenix, Ariz., George O. Belders, Prescott, Ariz., Carolyn Bowen, Seattle 4, Wash., Gerda Busck, San Pedro, Calif., Jeannine F. Dennis, Santa Monica, Calif., Elwin L. Edberg, Hondo, Calif., Mildred C. Galvin, Encino, Calif., Austine F. Grigsby, Los Angeles, Calif., Rudloph Jahn, North Hollywood, Calif., William Koos, Los Angeles, Calif., Irvin F. Travis, Granada Hills, Calif., Laurance W. Weeks, Tucson, Ariz.

September 3-14, 1956

CLASS ROSTER—PROSTHETISTS

William E. Brownfield, Boise, Idaho, Lenart C. Ceder, Tacoma, Wash., Clarence T. Cole, Portland, Ore., John J. Galdik, San Francisco, Calif., Robert V. Horne, Walla Walla, Wash., Paul D. McCullough, Springfield, Mo., Charles R. Newton, Portland, Ore., Willard L. Parlette, Portland, Ore., August W. Pruhsmeier, Portland, Ore., Alpha O. Rogers, Anchorage, Alaska, Marvin L. Sturtz, St. Clair Shores, Mich.

September 10-14, 1956

CLASS ROSTER—PHYSICIANS

Max J. Allen, M. D., Spokane, Wash., T. Allen Casey, M. D., Portland, Ore., Paul A. Grigorieff, M. D., Eureka, Calif., Bernard E. McConville, M. D., Seattle, Wash., Matthew Mendelsohn, M. D., Berkeley, Calif., Jean Michaels, M. D., Los Angeles, Calif., Clyde D. Platner, M. D., Walla Walla, Wash., Howard W. Rickett, M. D., Seattle, Wash., Manley B. Shaw, M. D., Boise, Idaho, Faulkner A. Short, M. D., Portland, Ore., John E. Stewart, M. D., Seattle, Wash., Lewis G. Wilson, M. D., Pasadena, Calif., Robert Kochsiek, M. D., Los Angeles, Calif.

September 10-14, 1956

CLASS ROSTER—THERAPISTS

Robert R. Gallucci, Tacoma, Wash., Thomas B. Irwin, Seattle, Wash., Mildred G. Jett, Tigard, Ore., Herbert C. Johnson, Oakland, Calif., James G. Julius, Boise, Idaho, Bernard F. Knapik, Mercer Island, Wash., Margaret V. Magee, Palo Alto, Calif., Eugene F. Northrop, College Place, Wash., Mildred A. Ramsey, Lanikai, Hawaii, Marten Schouten, Seattle, Wash., Mercedes Weiss, Portland, Ore.

October 9-November 9, 1956

CLASS ROSTER—PROSTHETISTS

Michael M. Amrich, Chicago, Ill., George H. Botko, Minneapolis, Minn., Barnie R. Buddin, Oklahoma City, Okla., Eugene Coleman, Seattle, Wash., John G. Cranford, Richmond, Va., Carl E. Gustavson, Seattle, Wash., Richard L. Kleiber, Denver, Colo., Flavel L. Lake, Oklahoma City, Okla., Frank Moos, Santa Clara, Calif., Alvin Norell, Salt Lake City, Utah, Bruce A. Scott, Denver, Colo., John S. Snyder, Tulsa, Okla.

November 5-9, 1956

CLASS ROSTER—PHYSICIANS

Donald R. Adams, M. D., Muskogee, Okla., Elizabeth S. Austin, M. D., Los Angeles, Calif., Ernest M. Burgess, M. D., Seattle, Wash., Edward T. Evans, M. D., St. Paul. Minn., Calvin E. Gantenbein, M. D., Portland, Ore., Ella M. George, M. D., Oklahoma City, Okla., Thomas M. Hamilton, M. D., Charlottesville, Va., Cline D. Hensley, Jr., M. D., Wichita, Kans., Carl C. Hoffman, M. D., Denver, Colo., Roy M. Hoover, M. D., Roanoke, Va., Edward T. Kelley, Jr., M. D., Malibu, Calif., Robert H. Lamb, M. D., Salt Lake City, Utah, Harold Rosenberg, M. D., Salt Lake City, Utah, Edwin R. Schottstaedt, M. D., San Francisco, Calif., Atha Thomas, M. D., Denver, Colo., George C. Twombly, Jr., M. D., Englewood, Colo., David K. Webster, M. D., Charlottesville, Va.

November 5-9, 1956

CLASS ROSTER—THERAPISTS

Eleanor B. Barhaug, Lakewood, Colo., Margaret E. Bryce, Madison, Wis., Clyde R. Holway, Downey, Calif., James C. Hufsey, Bethany, Okla., Helen G. Loveless, Wichita, Kans., Frederick R. Murko, Fishersville, Va., Lorraine G. Paulson, Denver 20, Colo., Alvin G. Russell, Jr., Salt Lake City, Utah, Troy T. Scholl, Eufaula, Okla., Ozella L. Scruggs, Oklahoma City, Okla., Naomi Wesson, Wichita, Kans., Donnamae Winters, Sausalito, Calif.

Class Schedule

Courses scheduled for the remainder of fiscal year 1956-57, ending July 1, 1957, are as follows:

Section III—Clinical Prosthetics: Above-Knee Amputations: January 7 to January 18, 1957—Course X463, Prosthetists, January 7 to January 18, Course X464, Therapists, January 14 to January 18, Course X465, Physicians, January 14 to January 18.

V.A. personnel from New Orleans, San Antonio, and Dallas will be given priority in enrollments.

Section IV—Clinical Prosthetics: Above-Knee Amputations

February 25 to March 8, 1957—Course X463, Prosthetists, February 25 to March 8; Course X464, Therapists, March 4 to March 8; Course X465, Physicians, March 4 to March 8. No geographical priorities.

Section V—Clinical Prosthetics: Above-Knee Amputations

March 18 to March 29, 1957—Course X463, Prosthetists, March 18 to March 29; Course X464, Therapists, March 25 to March 29; Course X465, Physicians, March 25 to March 29. No geographical priorities.

Section VI—Clinical Prosthetics: Above-Knee Amputations

April 22 to May 3, 1957—Course X463, Prosthetists, April 22 to May 3; Course X464, Therapists, April 29 to May 3; Course X465, Physicians, April 29 to May 3. No geographical priorities.

Section VII—Clinical Prosthetics: Upper Extremities Amputations

June 3 to June 28, 1957—Course X463, Prosthetists, June 3 to June 28; Course X464, Therapists, June 17 to June 28; Course X465, Physicians, June 24 to June 28. No geographical priorities.

(Editor's Note: The Journal is indebted to Raymond E. Sollars, of the Prosthetics Education Program UCLA, for assistance in preparing this article.)

Pennsylvania State Society Meets

On September 21, 22, 23, 1956, the fall meeting of the *Pennsylvania Orthopedic and Prosthetic Society* was held at the Hotel Roosevelt, Pittsburgh, Pa.

Speakers at the meeting were Dr. Murray B. Ferderber, Associate Professor of Medicine, University of Pittsburgh and Consultant in Physical Medicine and Rehabilitation, Veterans Administration, Pittsburgh and Dr. Jesse Wright, Medical Director of D. T. Watson Home Affiliate, University of Pittsburgh.

Shop visits by members were made to the Medical Center Brace Company and the new shop and offices of the J. E. Hanger Co. where luncheon was served to all.

Election of officers was held at this meeting. The new officers are: Basil Peters, President; Nunzio Pulizzi, Vice President; Moritz Apitzsch, Secretary-Treasurer; S. M. Mazzy, Political Actions. The new Executive Committee Members are: John Cocco, Eugene Teufel, E. A. Warnick, B. F. Dillon and Andrew Pope.

—Basil Peters, *President*

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Record Group of Firms Join OALMA

●

Vice President McCann Welcomes New Members

●

John A. McCann, Vice President of OALMA and Chairman of the Membership Committee, announces the election to membership in OALMA of 16 establishments. The new members he said, represent leading establishments throughout the United States, from California to New York. Their addition to the Membership Roll of OALMA, he predicted, would strengthen the organization. As a result, OALMA, as it enters its 40th year, will be able to do more effective service for the members of the Limb and Brace Profession, and through them advance the standards of service to the handicapped.

Mr. McCann reported that another selected list of ethical and reputable establishments, which are not now members, will be offered the opportunity of affiliating before the 1957 Roster is printed.

The addresses, telephone numbers and Executive Officers of the new members are listed here for the convenience of other members. Brief sketches of the history of these establishments will be given in this and future issues of the *Journal.*

ADDITIONS TO THE ROSTER

Ace Orthopedic Appliances, Inc. John L. Piorkowski, Manager; 2005 S. Michigan Ave., Chicago, Ill. Phone: Danube 6-4050.

Allen Brace Co. A. J. Allen, Owner; 427 Andrews Highw'y, Midland, Tex.

Apex Foot Health Products Co. Charles and Paul Schwarts, Partners; 695 6th Ave., New York, N. Y. (Associate Membership).

Assistive Device Shop. Thorkild Engen, Partner; 1300 Kenwood Drive, Houston 6, Tex.

Cleveland Orthopedic Co. Samuel H. Bonchek, Secretary-Treasurer; 5904 Euclid Ave., Cleveland 3, Ohio. Phone: Henderson 1-8484. (This firm was organized in 1931 and is now celebrating its 25th anniversary. Scope includes braces, surgical supplies, canes, crutches and wheelchairs.)

Karg Prosthetics Co. Ferdinand J. Karg, Owner; 662 West Washington Blvd., Los Angeles 15, California. Phone: Richmond 9-4674. Scope includes limbs and braces. Mr. Karg, C.P.&O., is a member of the Society of Orthotists and Prosthetists. Although his firm is new, he is well known in the Los Angeles area.

Seelert Orthopedic Appliance Co. Arthur Seelert, President; 1112 Hennepin Ave., Minneapolis, Minn. Scope: Limbs and braces.

Form-Tru Orthopedic Specialties. Herbert J. Ludwig, President; 245 East 3rd St., Salt Lake City 2, Utah. Both limbs, braces & surgical supplies. Phone: Empire 3-3114. (9½ years in business.)

G. A. Guilford & Son. Orthopedic Center. Arthur W. Guilford, President; 5700 Thackery Ave., Cleveland 3, Ohio. Phone Henderson 1-1746, 1-1747. (47 years in business.)

Herman E. Kraus. 96a Hudson St., Boston 11, Mass. Phone Hancock 6-3060. (11 years in the field of braces.)

Lawrence K. Lambert. 116 S. Commercial St., Neenah, Wis. P.&O. (11 years in business.)

Orthopedic Service Co. of Raleigh. W. H. Wendt, President; 102 Glenwood Ave., Raleigh, N. C. Braces, canes, crutches, etc.

Thomas J. Philip Orthopedic Center. Tom Philip, Owner; 3122 State St., Erie, Pa. Phone: 4-3269. Orthopedic appliances. (10 years in business.)

Redding Orthopedic Supply Co. Virgil Meador, Owner; 1441 Tehama St., Redding, Calif.

Scott Surgical, Inc. Bruce Scott, President; 724 E. 17 South Ave., Denver, Colo. Limbs and Braces, Surgical Supplies.

Peter R. Sileikis Orthopedic & Prosthetic Laboratory. Peter R. Sileikis, Owner; 2850 W. 63rd St., Chicago 28, Ill. Phone: Liberty 2-4112.

Introducing Some Worthy New Members

W. H. Wendt, head of the Orthopedic Company of Raleigh, opened his establishment in November, 1954. He is a Certified Orthotist holding Certificate No. 413. His previous experience includes observation work at the Warm Springs Foundation, and over five years experience at leading Georgia establishments, including the Atlanta Brace Shop and the Orthopedic Service Company of Macon, Ga. Mr. Wendt attended the University of North Carolina before entering the brace field. A veteran of World War II with two years' overseas service, he reports that his hobby is fishing and hunting, and he would like to hear from other OALMA members interested in the same.

Thomas J. Philip received his training with Hans W. Christoph in Philadelphia. He opened his own establishment in 1947 and recently has moved to enlarged quarters at 3122 State St., Erie. Mr. Philip specializes in leg braces for cerebral palsy and other conditions. His staff includes Ernest Mackey, Certified Orthodist, and a fully licensed physical therapist. He became interested in the brace field after suffering injuries to his spine during the construction of a bridge in Ohio.

Herman E. Kraus has been active in the orthopedic appliance field since 1939. He served in the Army in the Second World War and was assigned to the Brace Shop at Walter Reed Hospital before going to North Africa and Italy as an orthopedic technician. He started his own facility in Boston in 1945 and manufactures all types of braces. Mr. Kraus has lectured on orthopedic appliances to students at Tufts Medical School and to physical therapy students in connection with rehabilitation training.

A. J. Allen, owner of the Allen Brace Company of Midland, Tex., is a veteran of World War II. He began his training in the orthopedic appliance field in 1951 with Fresno Artificial Arm Company. He later transferred his training to Abilene, Tex., where he was connected with the Miller Brace Co. He opened his own establishment in Midland, Tex., in July, 1954 and specializes in braces.

Control of Amputation Stump Infection with an Antiseptic Skin Detergent*

By EVERETT J. GORDON, M.D., F.A.C.S., CHARLES T. BUFALINO, R.P.T., NELSON MCFARLAND and EDWIN M. BROWN

AUTHOR'S NOTE: Minor skin irritations and infections are frequently encountered by the prosthetist in the fitting and maintenance of amputation prostheses. In many instances the final fitting must be delayed until such skin infections are controlled, causing further difficulty in the proper fitting of an otherwise prepared stump. The problem is especially important in the maintenance of the prosthesis, as proper skin care can prevent many recurrent cutaneous infections and thereby eliminate unnecessary visits to the limb shop, made in the erroneous belief that the skin infection was due to an improper fit of the prosthesis. This often results in a good deal of the prosthetist's time being consumed by a futile search for a pressure point in the socket, whereas proper skin hygiene is the correct solution of the problem.

Antiseptic skin detergents are readily available to amputees through their local pharmacy, without prescription, at nominal cost. Allergies to this product are rare, and it can be safely used by almost all amputees. It should be noted that there are actually more allergies to ordinary soaps than to this detergent.

Although I feel sure that regular and widespread use of an antiseptic skin detergent by amputees, particularly lower extremity amputees, will greatly reduce the incidence of amputation stump infection and resultant complications, it is again emphasized that such a routine is not a substitute for proper fitting and alignment of the prosthetic appliance. This still remains the primary responsibility of the prosthetist.

The continually recurring cutaneous infections at amputation sites which are frequently encountered in prosthetic appliance clinics constitute a serious obstacle to the adjustment and rehabilitaiton of the amputee. By virtue of their prevalence and persistence, such infections may restrict or completely prohibit the use of otherwise satisfactory, properly fitting prostheses. This, in turn, can induce profound psychic distress which, together with the delay in resumption of an active social and economic life, can convince an amputee that his disability will never allow him to become a happy and productive member of society.

Regular hygienic care of the amputation stump as a prophylactic approach to the problem of infection appeared promising in view of the availability of an antiseptic detergent with degerming properties of demonstrated value in reducing the cutaneous bacterial population.[1, 4] This study, for which 74 amputees invariably applied pHisoHex‡ each morning prior to adjusting their prosthetic device, was undertaken to determine whether an ensuing decrease in the incidence of infection would permit more constant and daily use of the appliance. The non-irritating and hypo-allergenic qualities of pHisoHex[5,6] render the preparation particularly suitable for use over prolonged periods of time.

* *The major part of this article is reprinted by permission from Medical Annals of the District of Columbia, Vol. XXV, No. 7, July, 1956. For this Journal, Dr. Gordon wrote the Author's Note which is given above.*

From the Orthopedic and Prosthetic Appliance Clinic of the Veterans Benefits Office, Washington.

This report is published with permission of the Chief Medical Director, Department of Medicine and Surgery, Veterans Administration, who assumes no responsibility for the opinions expressed or conclusions drawn by the authors.

‡ A product of Winthrop Laboratories, Inc., New York, N. Y.

Incidence and etiology of the infectious process. Fundamentally, staphylococci are responsible for most suppurative infections of the skin, associated with typical abscess formation. Together with streptococci and other potentially pathogenic resident microogranisms, they are ready to invade abrasions produced by devices so intrinsically frictional as prostheses. The resultant active infection may express its intensity as a small pustule or a furuncle, or may even progress to an actual cutaneous ulcer. Since elimination of local irritation is a major therapeutic measure in these conditions, the prosthetic appliance must be set aside during the healing process.

The problem of infection most frequently arises with lower extremity amputees, sequent to the continuous firm pressure of the appliance against the skin, impairment or retardation of circulation, and the deterioration of local cutaneous resistance. Inasmuch as these factors prevail even with a well-fitting prosthesis, they are greatly exaggerated by further circulatory embarrassment when the stump is choked by an improper fit. Among the lower extremity amputees more pronounced pressure phenomena may be anticipated when the limb has been removed below the knee than with the more fleshy part above the knee stump. Due to a lower relative proportion of soft tissue to bone in a below-the-knee stump, the greater pressure per square inch exerted by prosthetic devices is responsible for th greater prevalence of cutaneous irritations and infections observed in these amputees.

In addition to the trauma which predisposes the weight-bearing stump to dermatologic difficulties, the presence of deep, depressed, indented scars or overhanging fleshy bundles in the adductor and gluteal folds, improper weight-bearing thrust in walking when the amputee has not adequately been trained in the use of his appliance, and, particularly, poorly fitting or outgrown prostheses have been found to increase the prevalence of infection. More recently, following widespread adoption of the suction socket for above-the-knee amputees, there has been a perceptible increase in the incidence of dermatologic disturbances in this group. The warm, moist, enclosed skin, principally with individuals prone to excessive perspiration but also with others during the summer months, provides an excellent culture medium for bacterial growth. Although the socket represents a mechanical advance, it presents the additional problem of an annoying, unpleasant odor in many cases as well as that of localized infection.

The question of maintaining healthy, intact skin is not, however, confined to weight-bearing stumps but is also of concern with upper-extremity stumps. In effect, wherever a prosthesis is used regularly in a working function the integrity of the cutaneous surface must be preserved to achieve maximum benefit from the artificial limb. It was our intent to do this through the daily cleansing and degerming of the skin in direct contact with the appliance.

Selection of a prophylactic agent. The prolonged antiseptic and non-irritating properties of pHisoHex, which have served to establish the antiseptic detergent as a routine preoperative preparation for the surgeon's hands and for the operative field, appeared well suited to the prophylaxis of cutaneous infections. Many clinical studies reported in the literature have demonstrated the efficacy of pHisoHex in reducing the bacterial population of the skin as well as the long duration of the resultant antisepsis.[5, 10] The prolonged antisepsis is further evidenced by the usual sign posted over the surgeon's scrub sink in most hospitals advising him that the scrub period can be shortened provided he is a constant and daily user of pHisoHex. The bacteriostatic and bactericidal action

of the preparation exceeds that of ordinary soap-hexachlorophene combinations, and it more successfully maintains the reduction in bacterial flora. Figure 1 presents a comparison of the antibacterial effects of a 3-minute pHisoHex scrub with those of a 10-minute soap scrub.[11]

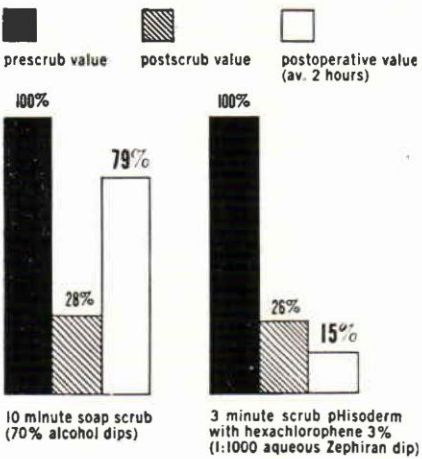

Fig. 1. Comparison of antibacterial effects of a 3-minute pHisoHex scrub with those of a ten-minute soap scrub.

The number of bacteria obtained on culture of the hands prior to scrubbing with either agent is represented by 100 per cent.

Confirmatory evidence that a 3-minute pHisoHex scrub was equal in antibacterial effect to a 10-minute scrub with green soap, alcohol, ether and tincture of Zephiran Chloride was obtained by another group of investigators in a series of several hundred subjects.[10] As part of the same study they were also able to demonstrate a reduction in resident bacteria on skin surrounding raw and denuded surfaces cleansed with pHisoHex.

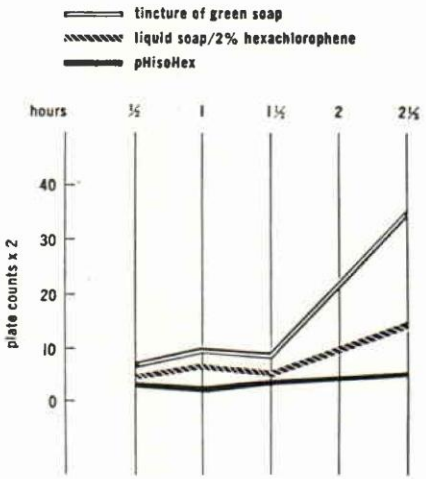

Fig. 2. Comparison of antibacterial activity of commonly used preoperative scrubbing agents.

A further comparison of the antibacterial activity of pHisoHex and 2 other commonly used preoperative scrubbing agents is presented in figure 2. Total bacterial counts of the hands were carried out at half-hour intervals following scrubbing with tincture of green soap, liquid soap containing hexachlorophene, and pHisoHex with the results shown.[12]

Prior to our study pHisoHex had successfully been applied as a prophylactic measure against cutaneous infection in another particularly susceptible group, the diabetics.[3, 13] Ritualized scrubbing of the feet and legs with the antiseptic detergent was found an effective control procedure and, when included as part of a routine method of treatment in one series, reduced the incidence of pyogenic infection by 90 per cent per patient per year.[3] This is of particular significance to the diabetic to whom acute infection frequently presents an actual threat to life.

A final property of pHisoHex which recommended it to us was its ability to abolish undesirable odors for as long as 18 hours in washed areas.[14] This was considered valuable in view of the fact that objectionable odors have been associated with the wearing of prostheses during the summer months and throughout the year in those individuals who perspire freely.

Procedure. Seventy-four amputees originally participated in our study. Of these, however, 12 failed to report regularly for observation and have not been included in our evaluation. The remaining 62 individuals comprised 25 above-the-knee amputees, 23 below-the-knee amputees, 9 suction-socket cases, 2 below-the-elbow amputees, 2 amputations referable to circulatory difficulties, and 1 hip disarticulation. Thirty-four had previously experienced cutaneous disorders, 10 exhibited severly scarred stumps, and 8 were bothered by unpleasant socket odor.

Each amputee received a plastic squeeze bottle containing pHisoHex for direct application of the antiseptic detergent. He was instructed to use only a few drops of pHisoHex, to add as much water as necessary to produce a thin lather, and to massage this lather well into the stump. The need for particular care in covering as thoroughly as possible depressed scars, crevices, and other areas likely to support bacterial growth was emphasized. The stump was then wiped dry without removing any remaining detergent so that a thin film of the material was left on the washed area to exert a persistent antibacterial action. This procedure was carried out each morning or just prior to adjustment of the prosthesis for the day. During the warm months the application of pHisoHex twice daily, in the morning and at night, was recommended to those individuals prone to excessive perspiration or with a history of recurrent skin infection. After several months of treatment or during the winter months a reduction in frequency to 3 times weekly was considered. Some amputees reported the accumulation of a sticky, scum-like secretion as a result of perspiration during the night, and they were advised to thoroughly remove this material by means of the pHisoHex wash prior to use of their appliance.

Results of treatment were evaluated in all cases 8 to 12 months after initiation of the regimen, while 11 amputees were followed for as long as 16 to 21 months.

Results. The results of our study are summarized in table 1. Improvement of the integrity of the cutaneous surface of amputation sites, expressed as a reduction in the incidence of infection, and adjudged by the more constant and daily use of prosthetic appliances, was manifested by all amputees in this series. Of the 33 individuals who adhered to a rigid pHisoHex schedule, 31, or 93.9 per cent, exhibited an excellent response to the hygienic regimen and 2 showed improvement over their pre-treatment state. Of the 29 individuals who applied pHisoHex irregularly, 21, or 72.4 per cent, were adjudged excellent, while the remaining 8 were considered improved. No allergic reactions were observed in any of our test group.

Some of the participating amputees reported their observations during the test period. One individual with severe chronic dermatitis of both legs was well controlled and manifested improvement on following a regular pHisoHex schedule. One case of recurrent furunculosis of the stump of long duration cleared with the regular use of pHisoHex, but the furunculosis recurred once more when the regimen was discontinued. One amputee who perspired excessively throughout the year and presented a socket odor problem was well controlled with the regular application of the antiseptic detergent. One instance of cutaneous difficulty, cleared

up by treatment, recurred within a week of cessation of the pHisoHex wash. One amputee who had no difficulty when using the detergent regularly, developed recurring furuncles on his extremely hairy stump 4 months after he had stopped using the recommended hygiene.

Of 3 individuals who might be considered less responsive to the pHisoHex treatment 2 persisted in using poorly fitting prostheses and the other had a sebaceous cyst which required surgical excision.

TABLE 1

Efficacy of pHisoHex in Controlling Amputation Stump Infection

Number of participating patients	74
Number failing to report regularly	12
Active participants	62
Classification of amputees	
Above the knee	25
Below the knee	23
Suction socket	9
Hip disarticulation	1
Below the elbow	2
Circulatory difficulties (Buerger's disease)	2
Number of amputees with severe scars	10
Number of amputees with previous cutaneous disorders	34
Number of amputees with socket odor problems	8
Duration of pHisoHex regimen	
First evaluation, 62 patients	8 to 12 mos.
Second evaluation, 11 patients	16 to 21 mos.
Results	
Number of patients using pHisoHex regularly	33
Excellent response	31
General improved	2
Number of patients using pHisoHex irregularly	29
Excellent response	21
Generally improved	8

CONCLUSIONS

1. pHisoHex is recommended for regular use in the hygienic care of amputation stumps. It is particularly valuable in maintaining cutaneous integrity and reducing the incidence of infection in below-the-knee amputations, stumps marred by severe or depressed scars, and stumps in contact with suction sockets.

2. A regular pHisoHex regimen will successfully control odor problems in individuals who perspire excessively throughout the year and in all amputees during the summer months.

3. pHisoHex should be applied daily for optimal results. A few drops should be worked into a lather with water and massaged into the stump. The stump should then be dried without rinsing so that a thin film remains on the surface to exert continued antibacterial activity.

4. As a direct result of the reduction in cutaneous infection effected by pHisoHex more regular and continued use of prosthetic appliances is possible.

5. When good stump hygiene is maintained the serviceability of prostheses is increased and the frequency of replacement is reduced.

6. The use of an antiseptic skin detergent is not a substitute for proper fitting and alignment of a prosthetic appliance. It will not correct skin conditions resulting from unbalanced pressure.

SUMMARY

A frequent difficulty incident to the continued use of a prosthetic appliance, regardless of maintenance or fit, is the recurrent cutaneous infection. Since this prevents the daily use of the prosthesis and delays complete rehabilitation, this study was undertaken to evaluate benefits to be derived from regular hygienic care of the amputation stump with an antiseptic skin detergent. pHisoHex was selected as the prophylactic agent on

the basis of the many published reports of its marked degerming properties and hypo-allergenicity.

Experience with 74 amputees, 62 of whom were observed over an 8- to 12-month period, has demonstrated the value of a regular pHisoHex wash schedule in reducing the occurrence of infection and in maintaining the integrity of the cutaneous surface. Referrals to both the dermatologic and surgical outpatient clinics has decreased remarkably since the institution of this pHisoHex routine. Surgical drainage of stump abscesses and furuncles is rare, effecting a considerable economy in amputee and hospital staff time. Many amputees, particularly those with below-the-knee stumps and those wearing suction sockets, are now able to use their appliances regularly and with greater comfort than ever before. The pHisoHex regimen also successfully controlled the odor problem during the summer months and throughout the year for those individuals who perspire excessively. The effective control of sweat and skin secretions considerably lengthens the serviceability of the prosthetic appliance by inhibiting deterioration of those parts which come in direct contact with the skin; this is especially true for suction sockets.

The cost of maintaining good stump hygiene, an important contributor to amputee morale and rehabilitation to an active social and economic life, is remarkably low. The investment in an 8-ounce bottle of pHisoHex, which lasts an average of four months, and the time required for the daily wash procedure afford the amputee an inestimable return in comfort and facility in the use of his prosthesis.

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Region VIII—The Southwest—March 16, 17, 18, 1957

"Everything is bigger and better in Texas." And Region VIII invites you all to come down and find out for yourself. This session will be at the fabulous Shamrock Hotel in Houston, Tex. President Hennessy is expected to attend. Al Muilenberg and Richard Terry of Houston, are in charge of planning the meeting.

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Engineering Applied to Orthopedic Bracing *

By AUGUSTUS THORNDIKE, M.D., EUGENE F. MURPHY, Ph.D. and ANTHONY STAROS, M.S.

Introduction

Several hundred thousand people in this country must wear orthopedic braces, many for the rest of their lives. Challenging problems of design and choice of materials confront the engineer, working closely with the doctor and the orthotist, and behind them the brace manufacturer, in the development of the most functional and yet, economical brace.

The systematic study of the loads and conditions to be met by available materials, leading to the most economic designs of rigid structures which are durable and functional yet light in weight, results from the application of engineering to orthopedic bracing. This type of study is necessarily based on fundamental engineering concepts. Other contributions to the handling of orthopedic bracing problems derive from engineering research, including testing, stress analysis, materials evaluations, and time and motion studies.

The engineer, in applying the basic concepts of his field, must be cautious lest false economies greatly decrease the happiness and productivity of the patient. Therefore, use of the essential principles of mechanical and industrial engineering must be tempered with a knowledge of the patient's limitations, desires and motivations as well as an appreciation of the much greater variability encountered in biology than in conventional engineering. Only thus may engineering efforts yield great returns coordinately in cash economies and in human welfare.

Some factors in brace design are common to most conditions. For instance, in braces for children, provision must be made for inexpensive increase in size, poor maintenance, and frequently rough usage.

As in the solution of any engineering problem, the concepts to be used depend to a great extent on the purposes which the appliance or device must serve. Therefore, discussions of the special requirements of orthopedic conditions and of the common problems reported by brace wearers seem warranted. Since so many areas of knowledge are involved, the well-known team approach is needed in design as well as in treatment of the individual patient.

Special Requirements of Orthopedic Conditions

Each of the various conditions requiring braces obviously imposes unique physiological and engineering requirements. As is illustrated in the *Atlas of Orthopaedic Appliances*,[2] a number of full-length leg and thigh braces made for different conditions may appear surprisingly different in design until one understands their separate purposes. Perhaps in the past most braces made by a given

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Reviewed in the Veterans Administration and published with the approval of the Chief Medical Director. The statements and conclusions published by the authors are the result of their own study and do not necessarily reflect the opinion or policy of the Veterans Administration.

brace maker tended to bear a great resemblance to each other regardless of the type of patient for whom they were intended. If the individual brace maker happened to specialize in polio, for instance, he tended to make light polio-type braces also for cerebral palsy, fractures, etc. Unfortunately, there was sometimes uniformity in the prescriptions from a busy medical practitioner who specialized in one condition and, under pressure for time, did not think carefully of the special requirements for conditions less frequently encountered.

In a *fracture* leg brace, body weight, in most cases, must be bypassed around the fracture. Stability against bending must also be provided. Adequate support is thus desirable from an ischial seat and probably from long moulded corsets with laces or broad straps. Rigidity of construction, secure attachment to the shoe, and precise alignment of joints (if indeed any are feasible) are obvious requirements. In some cases the brace is needed only for a matter of months so low cost may be more important than durability.

In *polio*, since any combination of muscles may be affected temporarily or permanently in the various individual patients, precise prescription is particularly important. Replacement of lost or damaged muscle function may be provided, with a particular choice at any given stage in the patient's recovery depending upon the function, his special needs, and the degree of activity which is believed possible with his remaining muscles while avoiding contractures due to muscle imbalances. Counterweighting springs might be considered, especially to assist weak muscles which would be sufficient to move the part if gravity were balanced, as in the swimming pool.

The increasing availability of cleverly designed spring mechanisms for other commercial purposes (e.g. "Neg'ator") opens a whole field for research and development in the application and development of neat and compact counterbalancing springs whose force may be gradually reduced as the affected muscle improves[8]. Physiological and mathematical analyses were offered in great detail after World War I by von Recklinghausen[14]. To replace a *nonfunctioning quadriceps* muscle group, it is customary to provide a knee lock, which can be manually released for sitting but locked during standing. Occasionally it is possible to use "alignment stability" of a mechanical knee joint which (as in an above-knee artificial leg) is free to flex during the swing phase of walking. Such a joint permits only that limited degree of hyperextension needed, in combination with limitation of dorsiflexion, to attain alignment stability during the stance phase. In this case the patient can walk with a much more normal gait than would be possible with a stiff knee.

Clearing the ground without flexing the knee would require one or more maneuvers: vaulting off the other foot, circumduction of the affected leg, excellent control of toe lift, excessive side sway, excessive lifting of the hip on the paralyzed side, or very short steps. Often most of these feats are precluded by concurrent paralysis of other muscles such as the abductors of the hip, the calf or pretibial groups,

The Authors

Dr. Augustus Thorndike was Director of the Prosthetic and Sensory Aids Service of the Veterans Administration. He resigned as of July 1, 1955, to accept appointment as Chief Surgeon of the Department of Hygiene of Harvard University. Dr. Eugene F. Murphy is Chief of the Research and Development Division of the Prosthetic and Sensory Aids Service, Veterans Administration. Mr. Anthony Staros is now Chief of the VA Prosthetics Center, New York City.

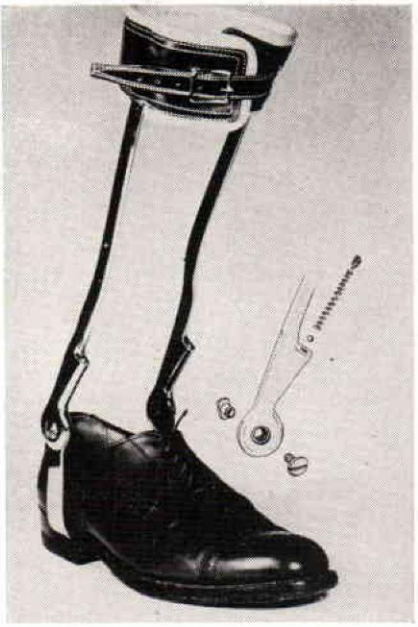


Fig. 1. Spring-Loaded, Equinus Control Leg Brace.

or the lateral muscles of the torso, so a free knee joint would be very welcome if it could be used safely. In contrast to the rubber or felt stops in artificial legs, present brace designs provide only small hyperextension stops of metal which click at every step and rapidly wear or permanently deform. Probably improved designs would greatly increase the use of such braces.

Very commonly, it is desirable to *block some motion* which is regarded as having relatively low priority while attempting to maintain motion on some single axis which is considered particularly important for function. An example is the short leg brace, (Fig. 1) intended to prevent inversion and eversion of the foot (in spite of the loss of muscles controlling these motions) and yet to permit plantar flexion and dorsiflexion of the ankle. If the muscles controlling plantar and dorsiflexion are also weakened or lost completely, stops may be provided to permit only the limited motion needed in walking. As in Fig. 1, springs may be used to permit the necessary limited motion against the spring action as well as resilient return. Reaction forces will result. For example, a stiff spring limiting plantar flexion at the ankle will cause pressure of the calf band against the calf and thus tend to buckle the knee. A certain amount of toe drop and a slapping sound as the toe strikes the ground after heel contact may be preferable to a long leg brace with locked knee joints, so stiffness of the spring limiting joint motion should be adjusted to the best compromise.

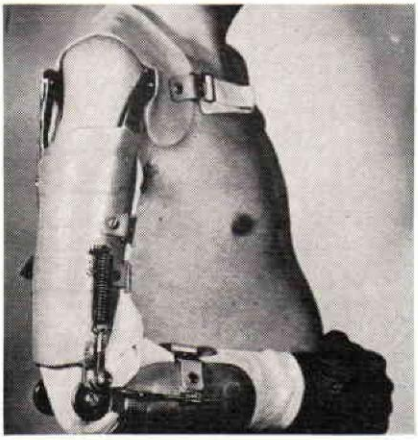


Fig. 2. Arm Brace Having Counterbalancing Springs and Elbow Lock for Control of Forearm Flexion.

Replacement of lost muscle power has been done in a limited way in the application of artificial arm principles to arm bracing through the introduction of force, movements, and control from other parts of the body. In the case of polio affecting the hands, for example, it has been possible to retain the valuable skin and proprioceptive senses by transmitting shoulder motion by a steel Bowden cable to ring-like or plastic splints driving the fingers against muscular or resilient return forces and thus to replace paralyzed finger flexor or extensor muscles. Elbow flexion can be assisted by springs (Fig. 2) or

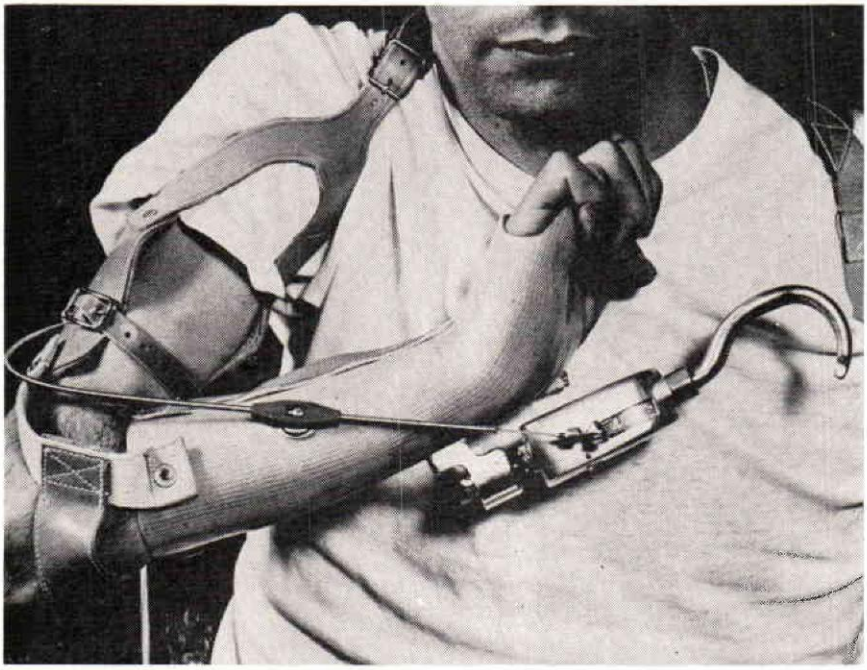


Fig. 3. Cock-up Splint with Prosthetic Hook for Paralyzed and Insensitive Hand.

elastic bands[15] or replaced by energy obtained from shoulder elevation, spreading of the shoulders, or even thigh motion[25]. In the case of a quadriplegic, it has been possible to use the remaining limited shoulder-spreading action to provide motive power for control of a type of hook used on artificial arms. This hook was mounted by a ball and socket joint on the volar aspect of a wrist cock-up splint, (Fig. 3) which kept the insensitive hand out of contact with objects to be held, and thus reduced the risk of burns or other injuries.

In *spastic conditions* due to paraplegia or cerebral palsy, it is generally necessary to prevent unwanted motion while encouraging those which are considered desirable. It is hoped that motion patterns which can thus be developed eventually will permit adequate voluntary function. Great rigidity, it has been pointed out,[12, 13] is thus necessary since springs or even a flexible brace merely serves as a "high resistance exercisor" which stimulates the stretch reflex, causes the muscle to contract involuntarily, and thus by repeated exercising strengthens rather than inhibits the unwanted muscular activity. For example, with spastic calf muscles the right-angle stop preventing plantar flexion must be extremely rigid, the sole of the shoe must be reinforced, and the side bars of the brace must be stiff. A cuff presenting adequate bearing area against the calf is essential to prevent skin damage due to the very high reaction forces.

Due to the difficulty in applying the shoe and brace in such spastic conditions, it is desirable to permit application first of the shoe alone and then addition of the brace, as by *calipers* or *detachable ankle joints*. It has been rightly objected that the ordinary caliper forming the L-shaped part of the side bar fitting into a tube under the heel places the mechanical joint *below* the anatomical ankle axis,

which is approximately parallel with the center of the lateral malleolus and the lower edge of the medial malleolus.

A stirrup type of brace with mechanical joint axis opposite the anatomical axis, plus L-shaped pieces fitting into a rectangular slot under the heel, has been used to retain an ankle joint at the anatomical level yet permit easy application, removal, and change of shoes[3]. With a patient having spastic calf muscles, a right angle stop typically is provided to prevent plantar flexion. On the other hand, due to the tightness of the calf muscles, no appreciable dorsiflexion occurs during walking. Since there is so little motion in either direction about the ankle joint, it hardly seems worthwhile to be concerned about the lack of coincidence of the mechanical and anatomical axes, as in a very simple, rugged, and inexpensive plain caliper joint.

In contrast, consider a polio case with a free ankle joint in a brace intended to prevent inversion and eversion, while permitting large amounts of both plantar flexion and dorsiflexsion. Obviously accurate coincidence of the mechanical and anatomical joint axes is essential to prevent chafing between the calf band and the skin.

In *some patients with cerebral palsy*, excessively strong adductor action leads to "scissoring" of the legs, so a pelvic band and hip joints are frequently prescribed. If, however, the pelvic band is relatively flexible and the hip joints are merely simple overlapped joints (which might be quite adequate for stabilization in flaccid conditions), the scissoring tendency will merely tilt the mechanical hip joints so that the upper and lower parts bind rather than permitting free flexion and extension which are so desirable to obtain a semblance of normal walking. Dr. John Young of Mellon Institute designed, for such a case, an extremely rigid thorax cage including both a pelvic band and lateral bars connected to another band about the rib cage.

Extremely sturdy ball bearings permitted free flexion and extension of rigid channel-shaped side bars even if a 100 lb. pull in the adduction direction were applied at the ankle joint. (Although the patient with cerebral palsy retains sensation, careful daily observation may be necessary to avoid pressure sores if there are difficulties in communications. Fortunately, the broad cuffs and the well-muscled, well-nourished limbs distribute even such extreme forces). While this type of rugged construction seldom needs to be carried to such an extent, particularly if the patient has been given proper control appliances while still a small child, the principles of rigidity against unwanted motion plus freedom to encourage desirable motion will apply generally in spastic and athetoid cases.

After a so-called "stroke," the *hemiplegic* patient may require a very light appliance providing only a minimum necessary function such as "toe lift" while causing minimum strain on the rest of the body. Any elderly individual who also has circulatory difficulties should not be burdened with heavy appliances for the same function which might be quite suitable for an adolescent spastic or athetoid individual with all-too-powerful but uncontrolled muscles and a robust heart.

In spinal *paraplegia* and *quadriplegia*, there is a definite pattern of flaccid paralysis and of spasticity depending upon the level of the injury, in marked contrast to the erratic pattern of involvement in polio, for example. Typically, complete spinal paraplegics have symmetrical involvement, somewhat simplifying standardization of components and construction of the appliance. On the other hand, the paraplegic, because of his loss of sensation, offers

a special challenge during both fitting and routine use to be sure that pressure sores and chafing do not escape undetected. Atrophy of flaccid muscles will also leave bony prominences and limited bearing area for cuffs, so broader, longer, and more carefully fitted cuffs may be necessary even at the expense of added inconveniences in donning and removing the braces.

Finally, *deformities may be corrected* or at least, increase of the deformity prevented. Quite often the skin cannot tolerate enough permanent counterpressure actually to reduce a deformity like scoliosis, but at least the back can be held in the most favorable position which can be obtained while lying supine, and thus the effect of gravity in constantly increasing the lever arm of the S-shaped curve can be eliminated. Examples are the Milwaukee and other back braces for scoliosis[18]. Tension applied vertically at the upper and lower termini of the curve and pressure applied horizontally to the apex of the curve will counteract the tendency for a progressive increase in the deformity. Increasing knowledge of the effects of pressure on circulation[11], of the pressure between the skin and an appliance[6], and possibly of means for supplying pulsating pressure should lead to better designs.

In the past, some experiments had been made toward the replacement of at least a limited sense of touch for artificial limbs. This area of *sensory feedback* of both pressure and sense of position is recognized as a long-time goal in artificial limb research[21]. It is to be hoped that, in years to come, findings in that field will also be applied to transmit to sensitive areas of the paraplegic's body some elementary information about the position and pressure upon the damaged portions.

Fundamental studies of *locomotion* have been conducted in the last decade at the University of California, Berkeley, primarily in connection with articial limbs but also with support from the National Foundation for Infantile Paralysis[7]. Comparable *motion studies* on the upper extremity have been made at the University of California at Los Angeles[17]. The studies at both Berkeley and Los Angeles greatly increased knowledge of forces and motions involved in common human activities and have led to a rational basis for assigning priority to the various possible motions. For example, in the upper extremity, prehension is most important. Elbow flexion and the possibility of stabilization of the elbow in any of a reasonable number of positions are next in importance, but passive adjustment of pronation and supination would often be adequate when voluntary control is impracticable. Wrist flexion was shown to be of very low priority, and if it is provided at all, a few positions of passive adjustment are entirely adequate.

These principles, and somewhat comparable information on the lower extremity, can guide in the selection of joints for braces and the use of an extremely limited number of auxiliary power sources from other parts of the body. Studies of the energy required and the role of the various joints in walking also provide a basis for long-term analysis of the importance of locks, counterweighing springs, or voluntary control of the various joints. These results of research, as well as humane and economic factors should guide consideration at any given stage of recovery of the relative importance of surgical stabilization, muscle transplant operations, or bracing.

Studies of *muscle activities* at both campuses of the University of California[7, 9, 17] have emphasized electromyographic measurement of muscle activity and have shown the importance of the force-length curve originally described by Blix[5] and its implications in connection with the importance of preventing contractures and of reducing the steepness of the "passive stretch curve" so as to increase the forces which are voluntarily available beyond the resting length of the muscle. These studies also have implications in connection with muscle and tendon transplants and tendon lengthening. A whole field of bioengineering development is available in the application of this type of quantitative information to orthopedic problems.

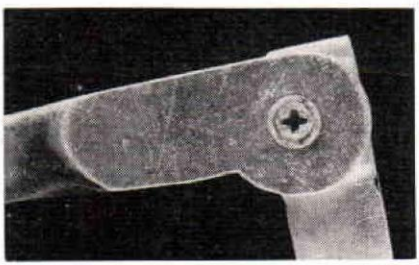


Fig. 4. Sharp Brace Joint Projection Which May Tear Clothing.

Problems of the Brace Wearer

In two separate surveys made of leg brace wearers[1, 20] reactions to their appliances were elicited. In both surveys certain complaints about the leg braces showed remarkable similarity:

1. The wearers would like *lighter, less bulky* appliances.
2. Braces cause excessive *clothing damage,* by lubricant staining and by actual tearing of clothing in the joint regions. (See Fig. 4 for an example of a brace joint having a sharp anterior projection which will tear clothing.)
3. Wear of joints (particularly those requiring lubrication which is avoided by the brace wearer because of clothing staining) causes *noise* and gradual *loss of stability* of the appliance.
4. *Breakage* of the brace is common.
5. Because of joint wear and structural failure, the *inconvenience* and *cost* of *repairs* are objectionable.

As a result of recent developments by many contributors, these complaints can now be very largely overcome. The rest of this paper will describe some possible improvements in materials, design and manufacture.

Elements of Materials and Design

Contrary to the common impression among many individuals practicing in the orthopedic appliance field, there is no single "magic material" which should be used under all conditions. Conditions requiring bracing vary sharply. When considering the appropriate brace for each of these conditions, however, common fundamental concepts about materials and design may be utilized. Each material should be selected based on its special physical, chemical, galvanic, mechanical, and economic properties. The design will be selected for its unique contribution toward remedying the orthopedic condition. Appearance and other factors affecting acceptance by the patient must be considered.

Table I, *Properties and Costs of Selected Metal Alloys,* shows the material characteristics which should be considered when developing brace designs or when prescribing an appliance. Properties may vary somewhat with heat treatment. Besides the properties shown, the design team must evaluate frictional characteristics of joint surfaces and abrasion resistance of all materials. Hardenability, effects of strain or "working" the material, and galvanic compatibility of the metals will be important. Certain plastics tend to creep or change shape slowly under high load even at body temperature. Materials

Table I
Properties and Costs of Selected Metal Alloys

Metal Alloy	T.S.	Y.S.	F.S.	E	D	Relative Notch Sensitivity	Relative Corr. Resistance	Cost per lb., Dollars
Aluminum Alloys:								
AA7075-T Heat treated	82,000	72,000	21,000 (50×10^7)	10.3×10^6	0.10	Fair to Good	Good	1.40
AA2024-T Heat treated	70,000	50,000	18,000 (50×10^7)	10.6×10^6	0.10	Fair to Good	Good	1.25
Carbon Steels:								
SAE 1020 Cold rolled	80,000	66,000	35,000 (10^7)	29.0×10^6	0.28	Good	Fair*	0.05
SAE 1060 Heat treated	120,000	80,000	57,000 (10^7)	28.2×10^6	0.28	Fair	Fair*	0.05
Stainless Steel:								
AISI 316	95,000	45,000	43,000 (10^7)	28.0×10^6	0.28	Good	Excellent	0.70
Alloy Steel:								
SAE 4130 Oil quenched and tempered	140,000	120,000	82,000 (10^7)	28.0×10^6	0.28	Good	Good	0.25
Titanium Alloys:								
TMCA Ti-150A	135,000	120,000	110,000 (10^7)	16.0×10^6	0.16	Good	Excellent	16.00
TMCA Ti-6Al-4V	130,000	120,000	83,000 (10^7)	16.0×10^6	0.16	Good	Excellent	16.00
Magnesium Alloy:								
ASTM AZ31X	37,000	21,000	12,000 (50×10^7)	6.5×10^6	0.06	Poor to Fair	Good**	0.70

T.S. - Ultimate Strength, psi
Y.S. - Yield Strength, psi
F.S. - Endurance Limit, psi; Smooth specimens, Number of cycles is indicated in parentheses.
E. - Modulus of Elasticity in tension, psi
D. - Density, lbs/in^3

* Normally plated, sometimes enamelled in orthopedic braces.
** Must have protective treatment when used in contact with salt water or perspiration.

like synthetic fabrics must not tear easily and must not cause allergic reactions.

Fatigue Properties

Fatigue strength as measured by the endurance limit of materials is especially important in brace applications. Brace parts normally do not fail by reaching the ultimate strength of the material used. The loading applied to a brace by the patient during use is cyclic in nature. Stress variations induced by this pattern of cyclic loading create a condition in which, even though the stress is low, early failure may result. The behavior of materials under these conditions is somewhat predictable from S-N (Stress vs. Number of cycles) curves commonly evolved from tests of the materials in reversed bending[4]. The maximum stress under which a material will safely endure a number of cycles greater than given on the S-N curve of fatigue characteristics can thus be determined for design data.

The effects of *corrosion* and *shape factors* on endurance limit or fatigue life must also be considered. Thus, badly shaped components, surface nicks, notches, and badly located rivet and tapped holes can produce early failure through fatigue. In design, it is necessary that a reasonable radius be allowed at all necessary re-entrant corners such as around the joint heads or at the points where the stirrup is bent to fit the shoe. In fabrication, accidental scratches or gouges should be avoided or at least polished.

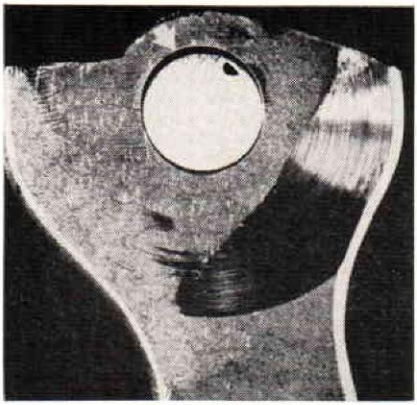


Fig. 5. Wear on Surface and in Bore of Brace Joint.

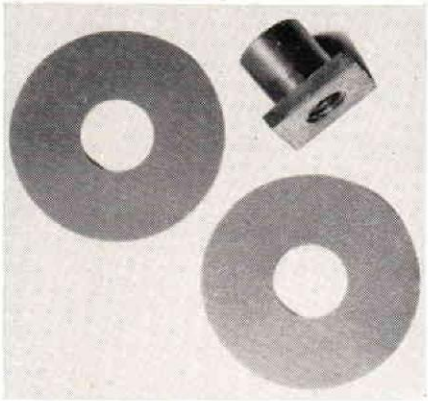


Fig. 6. Plastic Bushing and Liners for Brace Joint.

The tools used to bend the brace should be prepared so that surface defects will not result. The surfaces of all components should be highly finished since even microscopic surface defects cause stress concentration and early failure. If a notch is necessary, the fatigue strength can be increased by reshaping, if possible, to a greater radius.

Metals

Most commonly, *steels* are used in bracing. Many variation in heat treatment and fabrication methods are available depending on alloy. Table I shows that steels have a relatively high density, a high modulus of elasticity, high yield point, and an endurance limit of a high value. They therefore meet most specifications for brace applications. However, carbon steels must be protected against corrosion. Stainless steel, if given a passivation treatment, requires no further processing for protection against corrosion. Because much of the cost of an orthopedic appliance is for labor rather than for the few pounds of materials, the high cost of stainless steel is practically offset by the savings in first cost and in lower maintenance compared to carbon steel with plated finishes. Primarily because of its high modulus of elasticity, either type of steel is particularly desirable for spastic and athetoid conditions where great rigidity is necessary. The high hardenability of the steels with higher carbon content is particularly desirable in the races of ball bearing joints.

Aluminum alloys, as seen from Table I, have lower densities than steel but also have a lower modulus of elasticity. Therefore, they are relatively undesirable for braces to control spastic conditions although quite satisfactory for polio braces. The fatigue strength (endurance limit) of aluminum alloys is less than that of steel. Although some of the many available aluminum alloys have higher ultimate strengths than others, there is much less difference between the endurance limits. Because of greater costs and greater difficulty in forming, it does not seem worthwhile to use in most brace applications an alloy such as 7075-T in preference to 2024-T since fatigue is the usual cause of structural failure.

Aluminum is rather soft, scoring and abrading very easily (Fig. 5). However, recently developed hard oxide coatings help to increase abrasion resistance, and plastic or other bushings and liners (Fig. 6) will prevent serious wear of joints.

Table II

REPRESENTATIVE DATA ON BRACE JOINT WEAR
(All Joints are 2024-T Aluminum Alloy of the Same Design; No Lubrication Used)

	A Shop-Made Joint No Bushing No Liner Machine Tested 1,000,000 cycles	B Prefabricated Joint No Bushing No Liner Worn by Patient 180 Days	C Prefabricated Joint No Bushing No Liner Machine Tested 1,000,000 cycles	D "Mock-Up" Joint No Bushing Plastic Liner Machine Tested 300,000 cycles		E "Mock-Up" Joint Plastic* Bushing No Liner Machine Tested 1,000,000 cycles
				Nylon Liner	Teflon Liner	
Lateral Wear on Aluminum Joint Surfaces	0.090 in.	0.020 in.	0.020 in.	0**	0	-
Wear in Aluminum Joint Bore	0.020 in.	0.004 in.	0.006 in.	-	-	0
Wear on Liner	-	-	-	0**	0.001 in.	-
Wear on Bushing	-	-	-	-	-	0.005 in.

* Bushing was made from Teflon containing molybdenum powder

** Very fine particles of aluminum became embedded in the nylon and started to cause minute scoring of the Aluminum surfaces. The Teflon liner did not show this characteristic. The wear on the aluminum surfaces with both nylon and Teflon and the wear on the nylon liner were less than 0.0005 inches after 300,000 cycles.

Clinical and machine tests have been conducted by the Veterans Administration's Prosthetic Testing and Development Laboratory in which steel and aluminum joints have been analyzed for their *wear characteristics.* In Table II are shown some representative data from tests of aluminum joints. From columns A, B, and C of this tabulation, it can be seen that aluminum rubbing against aluminum can produce appreciable wear on the lateral joint surfaces and in the joint bores. These types of wear are illustrated by the machine-tested ankle joint of Fig. 5. Of special interest in the first three columns of Table II is the correlation of relative magnitudes of lateral and bore wear between clinical use for 180 days and machine tests over 1,000,000 cycles. Lateral wear is consistently from 3 to 5 times as great as wear in the bore. Once substantiated by this type of correlation, the use of controlled and continuous laboratory machine tests is more practical than the more expensive and variable clinical testing procedures.

Magnesium alloys, as seen from Table I, have a lower modulus of elasticity than aluminum alloys as well as a lower density. The special problems in fabricating magnesium, the considerable cross section necessary for adequate strength and stiffness, the relatively high notch sensitivity, and the difficulties in fastening, particularly by screw threads, have all combined with the relatively high cost to limit the use of magnesium in orthopedic appliances. It may, however, be desirable for special cases where a substantial thickness is required for other reasons or where extreme lightness at the expense of stiffness is desirable. Magnesium alloys, particularly those high in copper and nickel, are susceptible to rapid corrosion when immersed in salt water or perspiration. A protective coating must be used to increase the corrosion resistance in such atmospheres.

Titanium has been suggested, and has been used experimentally for a few braces and artificial limb components by the Navy, Army, and Veterans Administration. It is corrosion resistant and intermediate between steel and aluminum in strength, stiffness and weight. The rapidly increasing number of military applications and the research and development both in alloys and in techniques for manufacture and forming may make titanium more widely useful in the next few years as the result of rapid increase in mass production, decrease in cost, and widespread knowledge of fabricating techniques. The Prosthetic Testing and Development Laboratory has fabricated a knee

joint using titanium alloy ti-6A1-4V. No difficulty was encountered in machining and working the material with tools ordinarily used by the average orthopedic shop.

Plastics

Methyl methacrylates, such as Lucite or Plexiglas, have a very low modulus of elasticity, but have the advantage of transparency; they are easy to form if uniformly heated. Some of the failures of such appliances in service have undoubtedly been due to the relatively low strength of the material, but others are probably due to an attempt to form the material at too low a temperature or with only the surface sufficiently warmed while material inside still remained cool, leading to concentrated stresses locked in the cooled and completed appliance with consequent possibility of cracking. The considerable thickness of such appliances and the slow rate of heat transfer through the material would be factors in such conditions.

Recently, a Netherlands physician developed simple splints made of *methyl methacrylate* bonded to *polyurethane foam* plastic. The methyl methacrylate is easily heated with an infra-red lamp to a temperature of about 130°C. By using infra-red, to which the material is only partially transparent, it is claimed that absorption of the heat occurs throughout the thickness of the material, leading to rather uniform heating throughout the thickness contrasted to heating of the surface alone in the ordinary oven. The heated plastic can then be moulded directly upon the body of the patient since the foam plastic serves as a heat insulator to protect the patient. The appliance is held in place briefly with a wet plastic bandage, speeding its cooling and fitting in the desired shape. The expense and delays of a plaster cast and plaster model of the body part, necessary for most plastic splints, were thus eliminated.

Polyester laminates have been widely used in both orthopedic and prosthetic appliances, perhaps most effectively in the artificial arm field. Techniques for making plaster models, forming the plastic laminates, and harnessing the completed arms are described in detail in the University of California, Los Angeles, *Manual of Upper Extremity Prosthetics*[19]. It is possible to mix any desired proportions of stiff and flexible polyester resins so as to obtain various combinations of stiffness, strength, and impact resistance of the finished laminate. Strength and stiffness also depend a good deal upon the type of cloth used in the laminate, with glass fiber forming the stiffest and strongest but heaviest assemblage. For many purposes, nylon, Dacron, Fortisan, or cotton stockinette in several layers have been proven entirely satisfactory.

Resins of the *epoxy* type were introduced to the orthopedic field by the Sarah Mellon Scaife Foundation Fellowship on Orthopedic Appliances at the Mellon Institute. These were used with glass fiber fabrics, preferably somewhat loosely woven so that pressure points could be relieved by enough localized reheating to soften the resin, thus permitting deformation of the resin and distortion of the glass fabric. The resins were originally considered to have the advantage of being easy to work but the disadvantage of yielding only a stiff laminate. Recently, flexible varieties have been obtained by mixing flexible polysulphide resins such as Thiokol in the epoxy resin.

A *nylon coating for leather* developed by the Army Prosthetics Research Laboratory has removed the disadvantage of absorption of perspiration by leather[10]. This nylon coating, when properly applied, permits the slow transfusion of water vapor through the leather. Absorption of liquid perspiration with its organic materials by the leather is prohibited by the coating, so there is no longer the problem of breakdown of the organic materials and the consequent

development of odor and staining of clothing. In addition, the surface of the leather besides having an increased abrasion resistance remains smooth rather than damp and sticky, reducing the tendency to chafe the skin.

Plastic bushings and liners, as shown in Fig. 6, have been used very effectively in brace parts to meet some of the problems encountered by wearers. The use of these plastic components in joints eliminates wear between metallic surfaces, eliminates the need for lubrication while maintaining a squeak-free and click-free joint, and permits easy and inexpensive replacement of worn bushings and liners with a minimum of mechanical skill. Thus, the expensive metal parts which must be fitted to the individual do not wear, and the inexpensive standard bushings are easily replaced[20]. Standardization of joint design should permit the construction of a relatively inexpensive moulding die to make the bushings at very low cost, a few cents per piece.

In Table II, *Representative Data on Brace Joint Wear*, columns D and E show sample results of wear measurements on a 2024-T aluminum joint (or "mock-up") made especially for checking the effectiveness of plastic liners and bushings. This "mock-up" joint was a duplicate of the shop-made and prefabricated joints of columns A, B and C.

It is apparent from the wear data that plastic liners and bushings such as Teflon or nylon will significantly reduce the wear on the more permanent aluminum surfaces. Even when confined to the relatively soft liners and bushings, the magnitude of wear is not large. The self-lubricating properties of the plastics used probably account for the low values. Throughout 1,000,000 cycles the bushings of Teflon containing molybdenum powder took roughly the same wear which was absorbed by the aluminum joint bore over 180 days of use by a patient (column B). Nylon or Teflon liners, because of the minimal decrease in thickness after 300,000 cycles, would probably contribute significantly to preserving the lateral stability of joints. Other types of bushings and liners of nylon and Teflon with and without additives such as molybdenum powder are still being evaluated in this manner by the Veterans Administration.

Fabrics

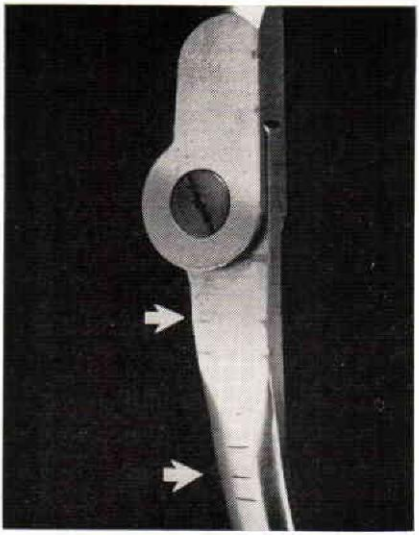
Webbing has usually been made of *cotton*, which was inexpensive and resistant to stretching but which dried so slowly that the patient was not likely to wash the harness frequently. Recently in the artificial arm field, *Vinyon*, "boiled off" *nylon*, and *Dacron* webbings have been used successfully. These synthetic webbings and some of the types of buckles and other hardware which are being introduced for artificial arm harnesses could be adapted to the brace field.

Various synthetic sheeting materials can replace leather for covering bands and cuffs. Some workers have successfully dipped bands in plastisol, to obtain a substitute for padding and covering.

Brace Fabrication and Manufacture

The careful anatomical *fitting* of the brace and the correct alignment of the mechanical axes are extremely important. The orthopedic brace must represent the highest quality of *workmanship.*

Surface nicks such as those caused by bending irons on the component illustrated in Fig. 7, sharp projecting corners, protruding rivet heads or screw heads, poor stitching and upsetting of rivets, defects in plating, malaligned mechanical joints, or excessive length of adjustment straps out of proportion to any reasonable need for future adjustment are indicative of poor or thoughtless workmanship. Fig. 8 illustrates a failure of a prosthetic pelvic joint caused by a name stamp. Another part of the name stamp of the same joint is shown in Fig. 9. Failure by cracking has started in this area also.



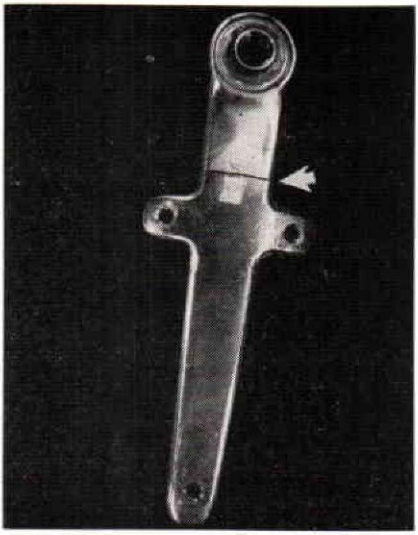


Fig. 7. Bending Iron Marks. Above (left).

Fig. 8. Failure of Structural Component Due to Indentation of only 2% of Thickness by Name Stamp. Above (right).

Fig. 9. Cracking Beginning in Letter "E" of Name Stamp. This Crack would soon have caused failure. At right.

As in any other trade or profession, continuous *education* is essential. Since research and constant change are taking place in the field of brace technology, the brace fitter wishes to become acquainted with newer techniques and improved devices. Publications and formal schooling are media for transferring this information from the research organization to the manufacturer and fitter.

The Veterans Administration has given courses lasting five weeks to the supervisors of practically all the Veterans Administration Orthopedic Shops. These courses, besides offering fundamentals in anatomy, engineering, materials, and the mechanics of materials, provided the means for acquainting the supervisors with new developments in the brace field.

Certification Raises Standards

The American Board for Certification of the Prosthetic and Orthopedic Appliance Industry, Inc., has been an important factor in the constant raising of the professional level of limb and brace fitting. Both individual fitters and the shops or facilities may be certified if found qualified by a unique board composed both of surgeons and of fitters of artificial limbs and braces. The Board has set increasingly high standards for education and has for several years required both written and oral practical examinations for certification. It offers an arbitration system to settle any dispute which may arise.

Studies made by the Veterans Administration's Prosthetic Testing and Development Laboratory have considered the *manufacturing techniques and fabrication methods* in orthopedic bracing[16], [21]. As a result of these studies, use of *prefabricated parts* or parts produced by mass production in one or a very few sizes of standardized subassemblies has been found to yield braces which are more economical yet of superior quality to those made from hand made parts long used in the brace field[22], [23]. Columns A and C of Table II show representative data from machine tests of a shop-made (or hand made) joint and a prefabricated joint of the same design. Because of better tolerance control and smoother machining and finishing, the prefabricated joint showed appreciably less wear over the test period of 1,000,000 cycles.

The central manufacturer of prefabricated parts can afford an excellent design staff, accurate machining and modern equipment, and careful quality control. Provided with prefabricated parts, the orthotist can select and readily assemble a complete brace to meet the requirements of most orthopedic conditions. Finishing of such an assembled brace is, of course, necessary. Fitting the brace to the body contours, polishing (and plating if necessary), and leather work must be performed.

By more widespread use of prefabricated parts certain changes in fabrication techniques and in shop facilities and procedures will result. Eventually, interchangeability of components, even among those of different manufacturers, will result from the use of prefabricated parts. Interchangeability will simplify repairs, especially for itinerant patients. Also, the brace shop will be able to perform repair tasks more quickly and more economically. Since most of the work in producing the brace parts can be done in a factory, a local brace shop will need less space for equipment or may devote some of its space for other necessary services to the patient, such as training. As a result of saving time at the forge or the milling machine, the skilled orthotist or brace fitter will have more time available for self-education, clinic meetings, the more demanding steps of the fitting procedure, training and supervising less skilled workers, and for solving difficult "problem cases."

Following proper fabrication and fitting, *maintenance* of the brace is necessary, essentially to reduce the incidence of repairs and replacements. At home, the patient should periodically check his device and perform any simple repairs. The brace, effectively worn as a structural and functional supplement to his body, should receive similar care. Proper cleaning, even of stainless steel parts, is necessary to prevent material deterioration, both in appearance and in structural adequacy.

Economic Considerations

There has always been pressure to lower the *cost* of orthopedic braces. All too often the patient himself and his family are restricted in paying for braces because of the high costs associated with the prior illness or other condition requiring braces. Many public agencies responsible for supplying braces have tended to secure them from the low bidder, with inadequate specifications because of the difficulties in specifying such intangible factors as comfort for the patient and high skill on the part of the brace fitter. Nevertheless, better braces can be produced at less shop cost, more profit to the brace shop, and yet lower cost for both purchase and maintenance to the ultimate consumer.

The increasing use of *stainless, sanitary and abrasion resistant materials* should help to decrease maintenance. In fact, higher first cost for the small amounts of such materials

should prove a very good investment. In general, the cost of materials is only a small fraction of the total cost of the appliance, so the best materials are none too good.

Prefabricated, interchangeable and standardized parts, made in central factories in a limited number of sizes, have already been discussed because of their superiority to most self-produced hand made parts. In addition, however, study at the Prosthetic Testing and Development Laboratory on the cost of fabricating braces by different techniques has clearly shown the superiority of prefabricated parts to self-produced parts in lowering the total cost of the appliance at the shop level[16]. While the cost figures produced in that study do not represent the total cost of the appliance to the consumer since the usual overhead factors as power and light, shop rental, supervisory costs, sales costs, and profit have not been added, the ultimate sale price is usually in proportion to the direct shop cost for materials and labor. Clearly, the necessary unfinished prefabricated brace parts initially cost many times the value of raw materials for the self-produced brace. However, the study showed that because of the great saving in time for the brace maker, an appreciable *saving in total costs* results from the use of prefabricated parts.

The analysis of the present brace fabrication techniques by time study methods also demonstrated the economies of division of labor between a specialized and highly skilled fitter and a less skilled technician to do the more routine operations[21]. This principle is, of course, very widely used throughout all industry, both decreasing costs and increasing the enthusiasm and economically justifiable salary of the highly skilled man who is thus allowed to function at his highest level of capability for a higher fraction of his working day. It is suggested that application of these techniques and principles should help to decrease shop costs for braces as presently made while increasing their quality and the incomes of both fitter and facility. It should thus be possible to meet the problem of constantly rising general price levels and to permit a margin for the introduction of improved mechanisms to give the patient greater function.

Braces, of course, are only a small part of the total cost of care of the patient, and the materials and mechanisms used are even a minor part of the cost of the brace. Perhaps most important to consider is the improvement that can be made in the *comfort and earning power* of the patient, perhaps over many years of productivity by prescription of improvements now available. Elimination of premature and unexpected breakages, reduced wear on joints, more sanitary coating of the leather or replacement by plastics are readily possible. Improvements in the mechanisms so as to replace more nearly the lost functions of the body are steadily being developed. Much can be done with the present knowledge, but constant research and testing towards new designs should be a fine investment paying big dividends in human happiness, in contributions toward a better society, and incidentally in income tax returns.

Conclusions

Economies can be realized by applying engineering principles to orthopedic bracing. Reduction in first cost of the appliance will result from using *prefabricated parts* and a proper *division of labor* in the brace shop. The brace fitter or orthotist will thus be free to handle complex fitting problems and other services which will benefit patients, both economically and functionally. Both he and his facility will justify higher incomes without raising prices.

Careful selection of the proper *brace material* and *brace components* depends on the requirements of the orthopedic condition. A knowledge

TABLE III

Recommended Remedies for Common Problems of Brace Wearers

PROBLEMS	RECOMMENDED REMEDY
1. Desire lighter, less bulky appliances	a. Use of 2024-T aluminum alloy* in non-spastic conditions b. Improved joint design: use of forgings in prefabricated parts made with adequate quality control c. Careful fabrication and fitting
2. Clothing damage by lubricant staining	a. Plastic joint liners and bushings; no lubrication required
3. Clothing damage by joint projections	a. Use of properly designed lever locks whenever possible b. Improved joint design: reduce size of projections in drop-ring knee locks
4. Wear on joint surfaces	a. Use of plastic joint liners and bushings
5. Breakage	a. Use proper material for the orthopedic condition b. Improve workmanship: eliminate tool marks, and give proper consideration to locations of changes in section and holes
6. Inconvenience and cost of repairs	a. Care in machining, fabrication and fitting b. Use of prefabricated, interchangeable components c. Use of plastic joint liners and bushings which can be replaced by the brace wearer at home d. Where bushing is impractical in joint, make joint pivot slightly softer than more permanent component encompassing the joint bore. e. Nylon coating for leather; plastic substitutes for leather; washable straps

*** Titanium alloys, as seen from Table I, have physical, chemical, and mechanical properties which will contribute to lighter, less bulky braces. The use of titanium alloys, however, must await a decrease in their cost.**

of the properties of the materials and designs should lead to a rational prescription. A correct selection will yield benefits in function for the patient and in reducing the possibilities of structural failures or corrosion.

Workmanship must be of the highest quality both in manufacturing of parts and in fitting of the appliance. Care must be taken to avoid "stress-raisers" in component *design* and in fabrication.

Plastic *liners and bushings* such as nylon or Teflon should be used to eliminate the need for lubrication and to eliminate joint wear. The design of joints should permit the patient to replace worn bushings and liners at home with a simple tool such as a blade-type screwdriver.

Table III, *Recommended Remedies for Common Problems of Brace Wearers*, is a summary of answers for the difficulties commonly encountered by patients, as reported in the two surveys discussed above. Solution of these obvious surface problems, with the help of teams for prescription, check-out, and follow-up, should now permit attack on the basic problems of energy, control, and sensory feed-back, problems so inherent yet apparently insoluble that patients dare not even name them.

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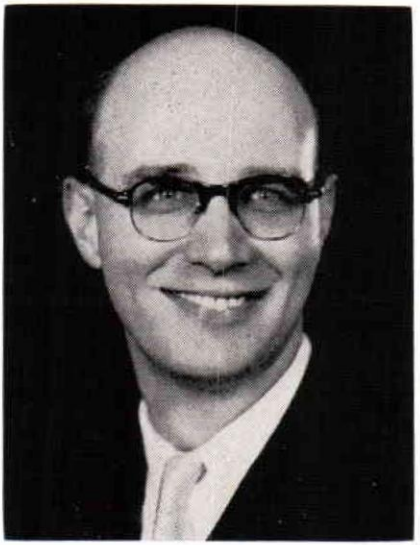

CARLTON E. FILLAUER

"The Patient Must Be The Ultimate Beneficiary"

A Message from

CARLTON E. FILLAUER

President of the Certification Board

Orthopedic and Prosthetic certifees of today are just now beginning to share in the real benefits derived from the labor, plans and dreams of those who conceived and launched our present movement. Amputees and other handicapped people are to be the ultimate recipients of all the advances made in our field, but nevertheless, there is the question asked by our members and certifees: *What do I get for my fees?*

Although some degree of recognition was evident in our first few years, today we see more tangible signs of these efforts. These signs are related to status—status of our facilities and status of our certifees. For example, I suggest you read the interesting but brief story "Buying Artificial Limbs" which appears on page 13 of the September-October issue of the *Journal of Rehabilitation*. It is pointed out in summary that "a significant portion of rehabilitation agencies required certification, used certified fitters in practice or were considering certification." The momentum has gathered rather slowly and may not dramatically speed up, however, it appears that soon we will see certification a requirement for all government and private agencies. No one can say that this trend is due to pressure from this organization, to the contrary, it is a result of recognition of our high level of standing in the medical field. Again, for example, just a few weeks ago, our Washington office was visited by Dr. Murray B. Ferderber, President of the Academy of Physical Medicine and Rehabilitation. He said that many members of the Academy expressed their desire for this cooperation and that they hoped that this would result in representation of their specialty of physical medicine on the American Board for Certification.

Your founders realized that to succeed, the program had to begin with a slow start and one which would gradually gather momentum and become

more and more restrictive but constructive. To be permanent, an organization must always develop and expand its efforts which is one of the fundamental requisites of a leading movement. And so your Certification Board operates to carry on its role as the Certifying agency of persons and facilities at an ever-increasing higher level. This requires judgment, experience, and constant planning carried on by committee action, since Board meetings are held twice a year. During the year 1957, the following committees are appointed:

I. **Committee on Credentials—To review and act upon all applications from persons desiring Certification. To advise the national office as to any further information desired on any candidate. The decisions of this committee determine who shall be eligible to take the examinations. Personnel: W. Frank Harmon, Chairman; Dr. Roy Michael Hoover, D. A. McKeever.**

II. **Committee on Facilities—To review and make decisions upon applications for Certification from facilities. To advise the national office as to any further information. The decisions of this committee as to approval or disapproval are final unless an appeal is requested for review by the entire Board. Personnel: McCarthy Hanger, Chairman; Dr. Edward Charles Holscher, Karl Buschenfeldt.**

III. **Committee on Examinations—To administer and conduct the examinations in such places and on such dates as the Board shall designate. Personnel: E. W. Snygg, Chairman; David E. Stolpe, Dr. Miles H. Anderson, Technical Consultant.**

IV. **Committee on Standards and Practices—This is a new committee which absorbs the functions of the Judiciary Committee. To recommend standards and ethics in the best interest of the patients, doctors and agencies served by Certified facilities and personnel. This committee will receive, consider and determine the appropriate disciplinary action in all cases of alleged infraction of established standards. Personnel: Chester C. Haddan, Chairman; Col. August W. Spittler.**

—CARLTON E. FILLAUER, C. O. & P.
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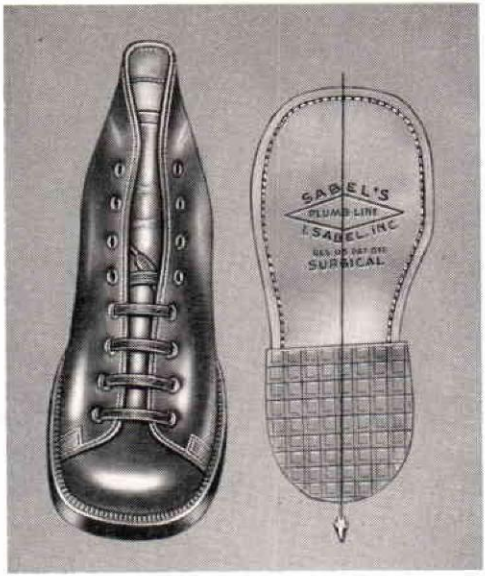

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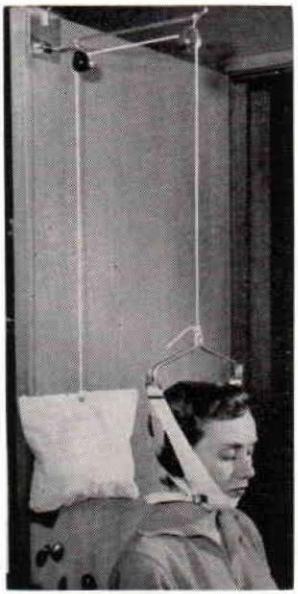

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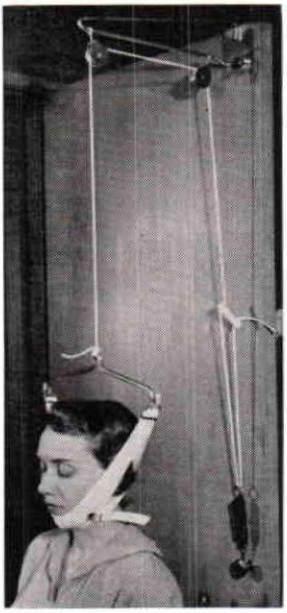

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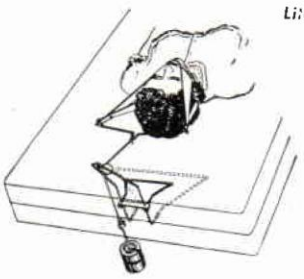

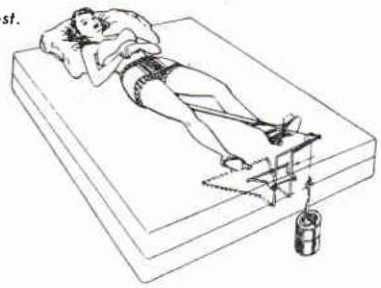

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Amputations in Peripheral Vascular Disease*

JACOB SCHMUKLER, M.D.
Newark, N. J.

(Editor's Note: The major part of this article is reprinted by permission from the Journal of the Medical Society of New Jersey. For this reprinting, Dr. Schmukler has expanded the section on "Prosthesis").

Until the cause of organic occlusive vascular diseases is definitely established, and prophylactic measures taken to prevent them; until lipid metabolism can be controlled to prevent atherosclerotic plaques from adhering to the intima of arteries; until thrombosis and embolism can be prevented and it will be routine to excise arterial segments and replace them with homografts or plastic tubular substitutes; until all this happens, peripheral vascular specialists will be continually confronted with the problem of rescuing "medical" therapeutic failures. These failures result in slow progressive ischemia and eventual death of tissues, with or without secondary infection intervening. Instances of sudden onset of gangrene of an extremity result from an acute occlusion, either thrombotic or embolic, in which embolectomy may sometimes, but not always, prevent mortification of the tissues.[1]

Whatever the cause, the development of gangrene in an extremity necessitates its removal, early or late, in part or in whole. Proper procedure in amputation surgery will spell the difference between success or failure in the treatment of these medical therapeutic inefficacies, and is the subject of this paper.

DIAGNOSIS

The various occlusive diseases associated with the occurrence of gangrene are:

1. Arteriosclerosis and atherosclerosis, with or without diabetes
2. Thrombo-angiitis obliterans
3. Embolism or thrombosis
4. Polycythemia vera

The gangrene which results from any of these causes may be slow or rapid, localized or extensive, with or without infection. The extent of gangrene encountered will influence the type of operative procedure.

Gangrene is most frequently associated with the metabolic diseases of arterio and atherosclerosis.[2] Both diabetics and non-diabetics survive to an age when they may develop occlusive vascular disease in which gangrene can occur, necessitating surgical intervention. Ischemia is the common denominator for all of these conditions. No single method of effective treatment for the occlusive vascular diseases has, as yet, been discovered and spontaneous complications are not controllable.[3] Two-thirds of all amputations are due to the progress of the disease itself. The other one-third can be ascribed to the neglect of the patient and the treating physician in equal measure.

* *Read by invitation before the American College of Surgeons, New Jersey Chapter, January 26, 1955 at Paterson, N. J.*

The patient is culpable when he disregards the importance of diabetic control, neglects the care of his feet, uses local escharotics, fails to wear properly fitted shoes, is derelict in the treatment of burns or minor accidents and ignores the warning symptoms of impending gangrene.[4] The physician errs when he fails to establish a diagnosis, tenders improper treatment and employs poor technic in doing minor amputations.

Arteriosclerosis is predominantly a disease of males. When, however, diabetes is associated with the arteriosclerosis, a higher proportion of patients will be found among females.

Patients who rarely develop gangrene will complain of symptoms for a longer period than those who are destined to develop gangrene with subsequent amputation. In these prospective amputees, gangrene occurs shortly after the onset of disease. This may be due to the fact that they suffer a more progressive form of the disease with a hastening and telescoping of the symptoms.[5]

Calcification of arteries does not necessarily bear any relation to the presence or location of an arterial occlusion. Seventy-five to ninety per cent of the blood supply to an extremity may be lost without impairment to normal activity because of the presence of adequate collateral circulation. It is only when there is greater need for an increased amount of blood that the diseased state of the extremity becomes evident.

Buerger's Disease is now more frequently found, both in males and females, due to the increased use of tobacco.[6] The gangrene of Buerger's Disease may involve the upper as well as the lower extremities. Major amputations of the upper extremities are rarely found necessary, though individual finger amputations frequently are. Because Buerger's Disease is essentially a disease of the comparatively young, conservative therapy is advisable, unless the physician encounters a fulminating gangrene with extremely severe pain.

Spontaneous acute thrombosis of a major artery is most commonly found as a complication of arteriosclerosis obliterans. This complication may be due to the rupture of an atheromatous abscess or a spontaneous subintimal hemorrhage. Onset is acute and may produce complete obstruction of a major arterial pathway. The extent of the resultant gangrene will depend on the presence of collateral circulation. Acute thrombosis of an artery may also be encountered in polycythemia vera due to the alteration in viscosity of the blood with increase of the cellular elements.

An acute arterial embolus produces the same clinical result, that is, gangrene. The source of the embolus is centrally located as in arteriosclerotic heart disease or mitral stenosis associated with auricular fibrillation. Emboli are always lodged at an arterial bifurcation, whereas thrombosis may occur in any portion of an artery. Correct diagnosis here is of primary importance because embolectomy is a surgical emergency in this type of occlusion.

PRE-OPERATIVE CARE

The greatest progress in the management of peripheral vascular problems can best be achieved by a group of physicians and surgeons who are essentially interested in this specialty.[7] They should work as a team and be willing to devote the required time and care to the treatment of their patient. Standardization of therapy would be advantageous both to the physician and to the patient. Though painstaking, without glamor and often frustrating, these problems must be an essential consideration of the medical profession because of the ever greater needs of an ageing population.

The prognosis of a patient suffering from gangrene associated with

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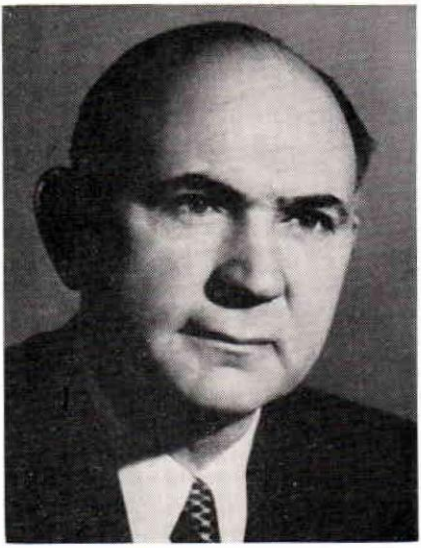

other debilitating diseases is, as a rule, not good. Associated diseases encountered in these patients of middle or old age are diabetes, heart disease, hypertension, cerebrovascular disease, cancer, polycythemia, malnutrition and anemia.

An attempt should be made by the internist of the team to correct, if possible, some of the associated maladies pre-operatively. With the use of antibiotics and anticoagulants, one can be more courageous in the surgical handling of these cases with a substantial reduction in the incidence of major amputations. Delay in possible and conservatism is indicated while the patient is being rehabilitated by transfusion and other necessary medications. Such a conservative course of action could not be advocated before the advent of antibiotics. Since these drugs have become available, the site of amputation and the mortality rate have both been lowered.

OPTIMUM TIME FOR OPERATION

The optimal amputation time varies in each individual and no hard and fast rules can be laid down. Factors, such as infection, vascular supply, age of patient and his response to therapy, are involved. The mortality rate is often lowered by a wise decision. Where infection is minimal and controllable, in Buerger's Disease, arteriosclerosis and in diabetes, ultra-conservatism is advocated. A necrotic toe should be permitted to demarcate. If infection spreads, then immediate amputation of an extremity may be a life-saving measure. In the embolic and thrombotic types of gangrene, amputation should be delayed from one to three weeks to allow time for demarcation and development of collateral circulation. Such a course of procedure is more feasible in cases of "dry gangrene". Amputation for pain can be performed at a time suitable to all concerned. Certainly no amputation should be performed due to the surgeon's impatience or the shortage of hospital beds. A patient's leg, on the scale of human values, will far outweigh a few extra days, weeks, or even months of conservative therapy.

Sympathectomy cannot affect the pathologic changes in the blood vessels nor the course of the underlying disease.[8] The increased blood flow in an extremity following the extirpation of the sympathetics is in the skin alone, and not in the muscles.[9] Sympathectomy is frequently done in the

hope that the results will have warranted the operation. I do not believe that sympathectomy, whether chemical or surgical, will ever hold an important place in the treatment of these conditions in view of the type of pathology present. However, if time should prove this operation effective, then it should be universally adopted. Its validity has not as yet been established.

AMPUTATION SITE

With antibiotics and with experience in treating peripheral vascular diseases, greater conservatism is exercised in choosing the site for amputation. In the lower extremity, the five suitable levels for amputation are: the individual toes, transmetatarsal area, supramalleolar area, below the knee and mid-thigh. The criteria for the choice will be the extent of gangrene or ulceration, the degree of infection, the condition of the adjacent areas, the measure of arterial impairment, the severity of the pain, and the general condition of the patient.[10]

1. *Single toe amputation* may be done for dry gangrene or an ulcer of the distal end with good demarcation. This is most suitable for 2nd, 3rd and 4th toes.

2. *Transmetatarsal amputation* with primary closure is indicated in gangrene limited to the toes. When infection is present, an open guillotine amputation at this level, may be attempted. If the gangrene spreads to the foot, a transmetatarsal operation is no longer feasible. This type of surgery should be performed whenever possible. The benefit to the patient, which should take precedence over all others is that the transmetatarsal amputee can walk comfortably without a prosthesis. This procedure is especially valuable in pathology affecting *both* lower extremities. It is the surgeon's responsibility to inform the patient before surgery that, should this operation fail because of insufficient blood supply, a below the knee amputation will be necessary.

3. *Supra-malleolar amputation* is done only as a life-saving measure in the presence of fulminating infection or severe associated diseases such as carcinoma. There is no shock. The operation time is short. A more definitive type of amputation can be performed later.

4. *Mid-leg amputation* should be done whenever possible if there seems a reasonable chance for healing. Age is no contra-indication. Mortality is considerably less than in mid-thigh amputation. A knee joint is a valuable possession. This operation should be attempted even with an absent popliteal pulse if there is good collateral circulation. Among older patients, many more can, and do, wear a "below-the-knee" prosthesis rather than an "above-the-knee" false leg. Mastery of such a prosthesis is easier and it weighs less. This is an important consideration with cardiac and hypertensive patients and in those with bilateral amputations, because it avoids total invalidism.

5. The three major indications for *thigh amputation* are (1) extensive gangrene plus infection of the leg with absent femoral pulse; (2) gangrene of the foot associated with the flexion contracture of the knee joint; and (3) recent thrombosis or embolism of the femoral or iliac artery with a high level of gangrene. Although primary closure with healing is better at this site, it carries a high mortality rate and should be avoided whenever possible.

PSYCHOLOGIC PRE-CONDITIONING

The average patient is apprehensive about surgical procedures in general. He faces the loss of limb with considerably more fear, grief, and anxiety. A common reaction is: "I would rather die than lose a leg." A patient chronically ill with this disease has already spent years trying to save his leg. By the time such surgery becomes necessary, his

morale has tail-spinned, his physical stamina is low, and his financial means and feeling of security have been considerably diminished. Such a patient fears to face the future socially and economically. He is in dread of becoming a burden to himself and his family. Reassurance is not enough. The patient must be given a clear picture of his disability and future adjustment. If presented properly, and if the occasion is provided to meet amputees who are not only ambulatory but useful, the surgeon is able to convince the patient and gain his cooperation. This is an unglamorous task, but it is a necessary one. Amputation should never be performed without the patient's knowledge, unless as an emergency life-saving measure. The emotional shock is of lesser magnitude when the patient has been properly prepared before, rather than after an amputation.

ANESTHESIA

Anesthesia plays a great role in the care of the emotionally shocked and physically degenerated patient with occlusive vascular disease. General anesthesia is not recommended in these patients because of its pulmonary and embolic complications. Local anesthesia constricts the small vessels when the tissues are infiltrated by the injection material. Refrigeration anesthesia is now used only in debilitated patients with severe sepsis, disorientation and lack of diabetic control, as an emergency measure. The perfected, one-leg, low spinal anesthesia is best for amputation.

TECHNIC

The classical amputations are not done in peripheral vascular disease because of the patient's age and physical condition and because of the underlying vascular deficiency of the extremities.

Healing depends on adequate circulation, so that whatever pre-operative diagnostic technics have been used to determine the adequacy of the circulation, the ultimate decision as to the site of operation, will be the presence of bleeding at the point of incision.[11] Bleeding is the best direct measure of collateral circulation. The normal pink appearance of the muscle is another indication of tissue viability. A greyish "cooked" appearance alerts the surgeon to the realization that there will be further spread of gangrene. Therefore, if a "below-the-knee" incision is made and there is insufficient evidence of bleeding, the surgeon must then go to a higher level below the knee or to the middle or upper third of the thigh. *Flaps should never be made.* The skin must not be separated from the underlying fascia. A circular guillotine incision has proved to be the best. Even "dog ears" should not be excised, for gangrene, of the skin may result at these points. The femur, tibia and fibula should be cut short enough to allow for subsequent soft tissue retraction. The sharp anterior surface of the tibia at its lower edge, being subcutaneous, must be roundly bevelled to avoid subsequent prosthesis pressure.[13] Large nerves, like the sciatic should be injected with 1 per cent procaine before high sharp sectioning to avoid shock to the patient. The retraction of the nerve end above the wound will help to prevent neuroma and phantom pain. This serious post-operative complication occurs more frequently in "above-the-knee" than in "below-the-knee" amputations. To close the wound edges, sew only the skin and fascia with thin black silk or stainless steel wire, gently approximating the edges without instruments and without tension. If in doubt as to healing by primary closure, the wound is best left open to heal by secondary granulation. A posterior splint is always necessary in "below-the-knee" amputations to prevent flexion contractures of the knee joint. For "below-the-knee" amputations, the best operation position is with the patient on his abdomen. Always expose and examine both legs before

beginning the operation, to avoid any tragic consequences.

"POSTOPERATIVE CARE"

The same teamwork which characterized the pre-operative care on the part of the internist and the surgeon, is necessary for the successful postoperative care of the patient. Immediate medical attention is necessary to avoid complications which may ensue as a result of the associated pathologic findings. Supportive therapy is essential for proper postoperative treatment.

Surgically, the wound is not disturbed for 7 to 10 days unless there is a systemic reaction. If Parresine® mesh is used directly on the wound, there will be no adherence of the dressing to the skin or the exposed muscles in an open guillotine operation. Sutures are removed a few at a time, and if no wound tension is present, may be permitted to stay in longer. The patient should be put in a wheel chair one day after the operation, and if there are no contra-indications, he should be exercised in a walker shortly afterwards. It is not wise to hasten stump revision in the presence of skin necrosis along the suture line. Given time it will heal.

Instructions should be given to the patient for active contraction of the quadriceps muscle in a "below-the-knee" amputation, and the side to side movement of an "above-the-knee" stump. The posterior splint in a "below-the-knee" amputation should be removed only when there is no longer any tendency for flexion contracture of the knee. When the stump is healed, shrinking and conditioning for fitting a prosthesis is to be begun by the proper use of ace bandages.

In the meticulous attention paid to the operation site, the other leg is frequently forgotten. The increased pressure exerted on the bed by the heel of the remaining foot can cause pressure necrosis which can spread rapidly, necessitating a second amputation. A foam rubber sheet placed under that heel will prevent such pressure necrosis. *A cut down on the remaining foot for transfusion or intravenous therapy should not be permitted.* Such procedures have often caused spreading gangrene at the site of the cut down incision, with dire consequences.

REHABILITATION

The surgeon's task is not completed with the healing of the stump. Rehabilitation is important and should not be overlooked.[13] The aid of the family and all persons who come in close contact with the patient should be enlisted. Rehabilitation will lighten the postoperative care of the amputee. The patient should be assured that he is not going to be helpless. He should be encouraged to use crutches and make his own toilet. The younger patient should be urged to return to his job, and hobbies offered to the man or woman who is too old to work. This will help neutralize the shame and depression which these patients feel because of their helplessness.

If family circumstances do not permit this type of rehabilitation at home, the amputee should then be sent to a rehabilitation center, where he will be cared for by professional personnel and will have the opportunity for group training.

PROSTHESIS

It behooves the surgeon to familiarize himself with the problems of prosthesis. The best way is to visit a limb manufacturing establishment and observe how the limbs are made and fitted. Limb makers should be cautioned about undue pressure during stump conditioning and subsequent weight bearing. Limbs are made of willow wood or light metal. In peripheral vascular disease, fit and the avoidance of pressure are the important things. In a "below-the-knee" prosthesis, fifty per cent of the weight is borne by the thigh lacer or corset. The other fifty percent of the weight

bearing is on the internal condyle of the tibia, the tibial tubercle and the head of the fibula. The skin over these bony prominences is not biologically fit for weight bearing and may break down. In all "above-the-knee" prosthesis, 75 per cent of the weight is borne by the ischium and 25 per cent on the circumferential skin and soft parts of the stump. Stump socks cushion the pressure also, as well as the shock of walking. In spite of these precautions, increased pressure and impaired circulation of the stump in these cases cause a breaking down of the tissues with a spread of gangrene, sometimes necessitating stump revisions.

The Middle-Aged or Aged Amputee

The importance of proper communication between surgeon and limb maker cannot be over estimated, especially since the number of amputations among the geriatric segment of the population has augmented itself and is on the increase with each passing year.

One rarely hears or reads a discussion of the needs of the middle-aged or aged amputee. This paper affords the opportunity of presenting the problems and suggesting treatment for this oft neglected part of our amputee population. The following observations have been gleaned from the experience of handling such patients over a period of many years.

The amputee population of the aged carries with it formidable social, medical, economic and rehabilitative difficulties for the family, the vascular surgeon and the limb maker which may be considerably eased if the attending surgeon and the limb maker understand each other's problems.

The limb maker must realize that he is dealing with a human being and not merely an amputation stump. Every individual reacts differently to a catastrophe and amputation of an extremity comes within this category. The type of patient reaction is influenced by hereditary and environmental factors as well as by the idiosyncracies of advancing age.

THE CERTIFICATION BOARD

The great number of military amputees resulting from the holocaust of World War II has done much to establish better rapport between the physician and the prosthesis agent, as did the establishment, in 1946, of a central body which represented the ethical artificial limb shops in the United States (the American Board for Certification). Before this time, the industry had no uniform standard of ethics and no training program. Its relation with medicine and the public was therefore haphazard. This chaotic condition was remedied by the formation of a recognized organization whose members are adequately trained and certified.

Such training and certification promises the amputee greater and more efficient service. The individual limb maker recognizes that his responsibility does not end with the fabrication and sale of the limb. His service must be coordinated with that of the surgeon before and after the operation. The task continues until the satisfied client is properly fitted, trained in the use of the limb, adjusted mentally through intelligent handling and advised about the new problems which face him.

In fairness to the conscientious limb maker of the past, all the faults were not his own. General surgeons were interested primarily in the operation and the physical recovery of the patient. Amputations were rarely performed with the prosthesis in mind, nor was any interest shown in the prosthesis which followed. Surgeons knew little or nothing of the method of fitting, the types of material used or the many other problems which faced the limb maker. Because of lack of cooperation between surgeon and limb maker and no "follow-up" to insure a successful physical and mental acceptance of the

problem, the patient was bound to be the sufferer.

With the development of Peripheral Vascular Disease as a specialty, the situation has been greatly improved. The vascular surgeon is now aware of the underlying pathology and the vascular status of the extremities. The stump is now fashioned with the prosthesis in mind in which length is considered and the resulting incisional scar is properly placed. The bones are not left too long and the sharp anterior edges of the tibia are roundly bevelled in a "below the knee" amputation. The surgeon's knowledge extends beyond the bounds of surgery and he interests himself in the after care of the stump, weight bearing, muscle exercises and the prevention of joint contractures. He is also concerned with the types of materials used in the manufacture of artificial limbs, the construction, component parts, various socket types, weight distribution, proper fit and principles of ambulation. This knowledge mediates toward mutual understanding and respect between surgeon and limb maker which results in the proper evaluation of problems of a particular patient while under treatment.

It should be noted that former principles and attitudes held by limb makers in the fitting of young amputees must be discarded in the handling of, and providing for geriatric peripheral vascular disease stumps. This large group of older patients is neither physically nor psychologically the same as the younger age group.

In these patients, the underlying diseases, such as arteriosclerotic peripheral vascular disease, diabetes, heart disease, etc., must be adequately controlled by the attending physician in order for the amputee to be able to use the prosthesis. One of the most important considerations should be the preservation of the remaining limb, which is usually involved in the arteriosclerotic process. This necessitates suggestions for intelligent foot hygiene as well as a properly fitted shoe made of soft leather.

Gentleness in handling tissues is of paramount consequence. Rough handling of a stump by massage should be avoided. Ace bandages must be gently applied to avoid embarrassing the local circulation. Exercising of the stump with weight lifting is almost always contra-indicated. The stump must not be exposed to extremes of heat or cold, and strong chemicals or medicaments.

Proper fit of a prosthesis is the major consideration. Height, weight, age and occupation of the patient must all be evaluated. Prosthesis should be cosmetically appealing to the female amputee. Knee lock is essential for "above the knee" prosthesis. An ischial bearing thigh corset is advised for short "below the knee" stumps. A rubber liner is best for sockets to avoid pressure over the unphysiologic weight bearing areas with resultant ulceration and necrosis. Pain in a stump may not always be due to socket fitting, but to vascular insufficiency.

The materials used in the construction of the prosthesis are of relatively small importance. The lightest material available is recommended. Because of age, general debility and altered physical activity, the strength and durability of the material are also of minor consequence.

The patient is more cooperative when the limb maker evinces an attitude of sympathetic understanding. It is the limb maker's responsibility to explain the simple mechanics of use and the ease of making simple repairs. Progressive stump shrinkage and the proper and hygienic use of stump socks should be described. The need for new sockets when chafing of tissues and instability occurs, should be advised. Servicing and repair of limbs is necessary and remunerative, and patients should be encouraged to seek the advice of the original limb

maker. Frequently, patients have been mistreated and are forced to seek services elsewhere. On occasion a second limb maker, by innuendo, infers that the limb needing adjustment has not been properly made and suggests a new one, when only a few minor repairs are necessary on the limb already owned by the patient. This does not lead to better understanding or respect for limb makers by patients or physicians.

Visual aid and demonstrations by limb makers themselves, if they are amputees, or by other clients is a good emotional support for a new amputee. The patient requires reassurance, encouragement and understanding. It should not be expected of a new amputee to learn the use of a limb without training. This is especially important in the aged, whose amputations are frequently associated with other medical and surgical ailments. The leg amputee must acquire reasonably good balance in both limbs before taking a step on the prosthesis. The final step is the training and use of the limb in the routine pursuits of life, which in the geriatric group is circumscribed, since even before amputation, there was a decrease and slowing down of life's activities.

Vascular surgeons have the responsibility of showing their ageing amputees the way to be useful members of society. The best way to achieve this goal is by cooperation between surgeon and limb maker.

PREVENTING AMPUTATION

The specialty is no longer limited to amputation but includes the following procedures:

1. Aortography and arteriography for diagnosis
2. Embolectomy in acute occlusions
3. Arteriectomy and thrombo-endarterectomy
4. Substitution surgery with homografts, veins and tubes made of plastic materials.

It may be within the realm of possibility substantially to reduce the number of major amputations because of the progress of both research and surgery in the peripheral vascular field.

100 AMPUTATIONS

Personal experience with one hundred amputations reveals the following statistics, which follow the pattern of those reported in the current literature. The age range was 36 to 84. Average age was 66. Of the 100 patients, 41 were female.

CAUSES

48 Arteriosclerosis
33 Arteriosclerosis with diabetes
3 Buerger's disease
8 Embolus
7 Thrombosis
1 Polycythemia

SURGERY

21 Mid-thigh
54 Mid-leg
11 Transmetatarsal
14 Individual toes
28 Open
72 Closed
10 Bilateral
6 Revisions

CONCLUSION

Amputation surgery in peripheral vascular disease is on the increase because the metabolic diseases have become more prevalent in an ageing population.[14] The very presence of gangrene and the necessity for amputation is an admission of defeat by the angiologist. Advances in vascular surgery, the use of antibiotics and anticoagulants have decreased the mortality and morbidity and have enabled the surgeon to be more conservative in his choice of incision site and the optimal time for operation.

Sympathectomy is not now the answer to the problem. Of much greater import is correct early diag-

nosis, proper pre- and post-operative care, psychologic preparation of the patient before operation as well as post-operative rehabilitation. Conservatism in treatment, and type of amputation depending on the condition of the patient, the extent of infection, and the reserve vascular supply, are the paramount considerations.

Vascular surgeons have the responsibility of showing their ageing amputees the way to be useful members of society. With a proper prosthesis, they need not exist as helpless maladjusted human beings. It is the hope of all vascular specialists that the progress in surgery and research in the field of peripheral vascular disease will lead to a reduction in the number of major amputations which are now memorials to "medical" therapeutic failures. It is also our hope that more physicians will devote themselves to the treatment of these diseases because, only if the number of specialists is augmented, can the increased number of patients involved, expect and receive, adequate medical and surgical help.

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WHAT'S NEW(S)

An Electric Cast Cutter, developed in England, has been introduced in this country by the *Orthopedic Equipment Company of Bourbon, Ind.* Paul Leimkuehler, who has used it, passes on the word that this cast cutter works very well in cutting fibreglass plastic such as used in artificial arms, and in some cases sockets and shins on artificial legs. Paul reports that in the past he has used saws of various types and none of them were nearly as fast or as easy as cutting the plastic with this cast cutter.

• JOSEPH E. TRAUB, C. P., has resigned as Chief of the Prosthetic and Orthopedic Service of the University of Buffalo's Chronic Disease Institute. He has accepted a position with the Lanham Limb and Brace Company of San Bernardino, Calif.

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Fig. 1. Shows depression left by surgery. Side was also deficient and there existed a most serious atrophy of the left breast.

Fig. 2. This is the same picture with the prosthesis held in place by the bra.→

You see above the result of a typical thoracoplasty with post operative tissue recession on the left side front and back, and misaligned torso caused in part by lack of support and in part no doubt due to the patient attempting to shield the areas. You will also see the special type prosthesis which has been made.

The young lady who has so graciously permitted us to bring these pictures to you in the hope that it may result in comfort and a more normal appearance for others, is twenty six years old. The thoracoplasty was performed eight years ago. She and her family had been searching for some years in the hope of finding a satisfactory cosmetic restoration. It was relatively easy to get a breast restoration, but there seemed to be no one who could or would attempt to make the complete prosthesis indicated.

Our method of procedure is first to determine and mark plainly on the skin the outer periphery of the agreed-on restoration. A comfortable brassiere is then put on and a line marked extending laterally around at supported nipple height, if necessary cutting through the bra at various places, being sure the line is quite straight. The bra is then removed and the atrophied breast held in place in line with the normal side, by criss-crossing Scotch tape over a square of gauze which has been placed over the breast. We then spiral plaster bandage over normal breast and atrophied supported one. Before this plaster sets the bra is replaced molding it to the bandage with a moistened sponge. Application of plaster bandage is resumed until the entire torso front and back, armpits to waist is securely covered. This requires about five or six rolls of 4" bandage depending on size of patient. After plaster is set, a line is made longitudinally and the bandage cut through from bottom to bra strap on the side nearest the normal breast.

Fig. 3. Front view illustrates the carefully sculptured restoration of the atrophied left breast.

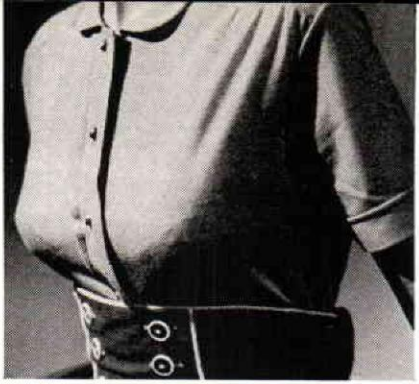

Fig. 4. The full effect of the prosthesis as seen under clothing.

The process of having the cast made is very tiring to the patient and the whole procedure requires the full cooperation of patient and prosthetist.

The laboratory part of the making of this item is the furnishing of the wax pattern for the try in and the molding of the copolymer foam. The manner in which the wax pattern is arrived at, is by sculpturing on to the plaster torso, a restoration of the depressed areas in water clay. Subsequently, a plaster template or negative is poured over the sculptured clay and then this latter removed, leaving the cavity. A hole is drilled into it to act as a sprue. The plaster mass of both positive and negative portions of the mold is soaked. A special hot wax formulation is then poured into the cavity which will need no separation other than the moist surface. When cooled the mold may be separated and any shrinkage compensated for. The wax pattern is then ready for try in.

The wax pattern is fitted to the patient, adding to or taking away as necessary to attain as nearly as possible the normal contour as well as the exact calipered thickness in the various areas to be restored. One of the great difficulties of course was the fact that the breast on the side of the operation had atrophied and needed to be very carefully built out as well as fitting perfectly the body area.

Following the adjustments to the wax pattern, a new positive and negative mold is made, this time in gypsum stone rather than plaster. Additional strength is given from the use of a seisel reinforcing. The mold is again sprued and cleaned and its surface treated with a separator. When the two halves are joined together and sealed, the foam is mixed according to the formula and injected into the cavity.

Steam curing is the best and a special pressure cooker was used for this prosthesis.

You will observe the brassiere strap incorporated in the copolymer holds the prosthesis in place, with a regular brassiere then worn as usual. The restoration extends somewhat below the brassiere which also aids in holding it in place. It is advisable to use small lingerie clips to hold the straps in line. This had not yet been done when these pictures were taken. In some circumstances it may be advisable to attach a ¾" web at the lower part extending around the body to keep the prosthesis more firmly in place.

This prosthesis is light in weight and cool yet durable and washable. It not only gives much needed support and comfort but also adds immeasurably to the poise and well-being of the patient by the natural appearance attained.

DVR Brace Clinic Praised

Sponsors and Personnel of The D.V.R. Brace Clinic

Personnel and friends of the Brace Clinic in New York City pause in their deliberations to have a picture taken for the Journal. Left to right: M. Fiedel, Konrad Hoehler, Frank Carey, Adolph Margoe, Harry Katz, Edward Gernannt, Thelma Murray, Richard Gottheimer, Dr. Samuel Sverdlik, Arthur Pomeroy, William Spiro, Miss Butler.

A unique brace clinic now in its first year at St. Vincent's Hospital, New York City, is the result of cooperation between the New York Division of Vocational Rehabilitation and MOALMA. Dr. Samuel S. Sverdlik is Medical Director of the Clinic.

The Clinic devotes special attention to patients for whom the proper bracing makes possible their effective rehabilitation and employment. Other problem cases may also be referred to the Clinic for the "team" consultation of physician, therapist and orthotist.

Milton Tenenbaum, president of MOALMA, paid tribute to the New York rehabilitation officials for their leadership and careful planning, which led to this new Brace Clinic. Among them are: Nelson Voorhees, Supervisor of the Division of Vocational Rehabilitation in New York City. Mr. Harry Katz, DVR official in charge of amputees and hospital outpatients and Miss Thelma Murray, Counsellor and liaison representative between the Clinic and the DVR. Adolph Margoe, Chairman and Vice President of MOALMA, has served as Chairman of the Brace Clinic Committee representing the orthopedic appliance facilities in New York City.

New York City Conference

The annual scientific "get-together" sponsored by MOALMA is one of the events of the year for many of our members throughout the United States. This year MOALMA has named Charles Goldstine, of the Institute for Crippled and Disabled as Program Chairman, and Mrs. Mary Dorsch is to be in charge of hotel arrangements.

The dates are May 3 and 4, 1957. The place: The Grand Ballroom of the Hotel Biltmore.

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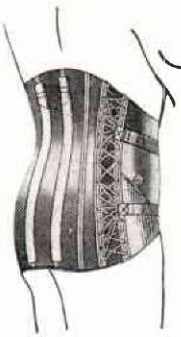

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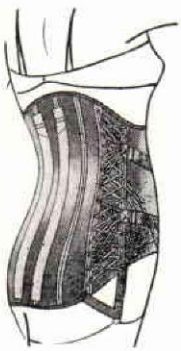

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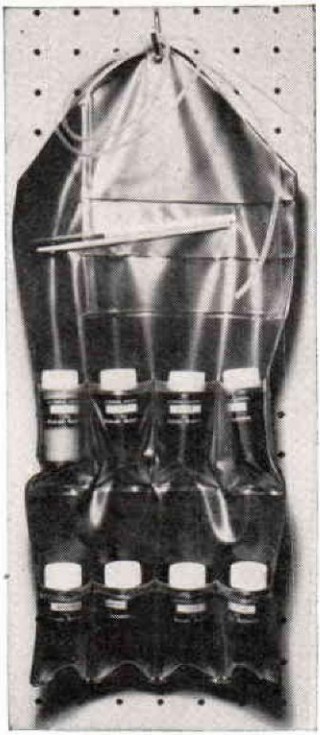

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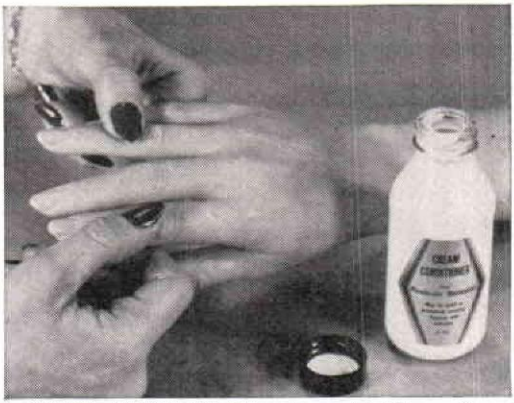
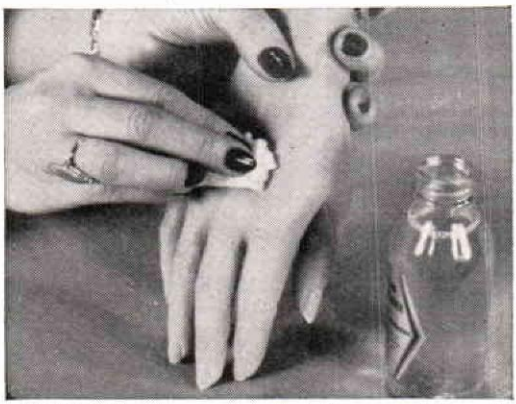


CREAM CONDITIONER — for maintaining softness and texture of plastic



CLEANSER — for spot and stain removal immediately on occurrence

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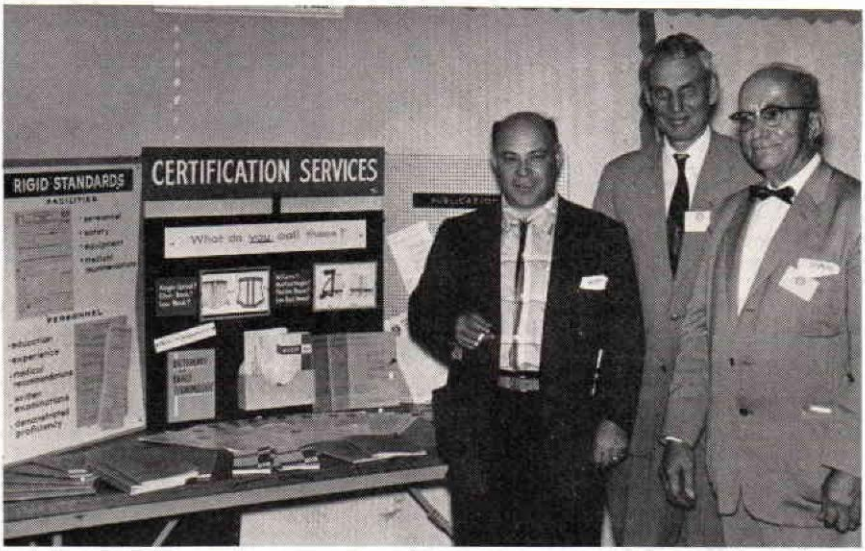
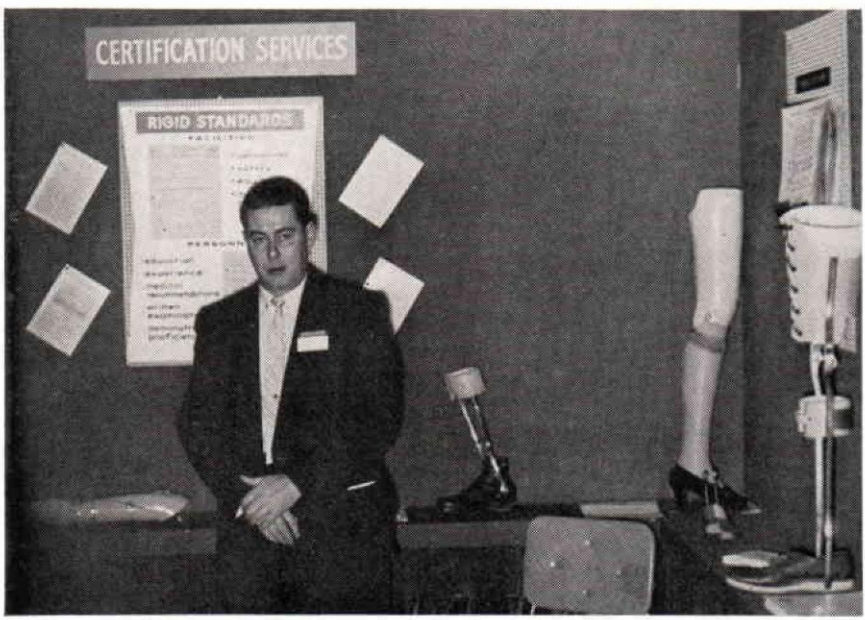


Western Orthopedic Exhibit

The Western Orthopedic Association held its Twentieth Annual Meeting at the Arizona Biltmore Hotel in Phoenix, October 31st to November 3rd. An Exhibit by the American Board for Certification was one of nine booths in the Scientific Exhibit Section. Shown above are: Walter J. Henzel of New York City, who visited the meeting on his way back to New York City from the San Francisco Assembly, Dr. Robert Mazet, Jr., a member of the Western Orthopedic Association and Past President of the Certification Board and Clyde Aunger, Past President of OALMA, who was in charge of the exhibit.



Certification services to the physician was the theme of this exhibit at the American Medical Association's meeting in Seattle in late November of 1956. Russell T. Brain, C.P., is shown above with part of the exhibit. Lenart Ceder, Charles Rice, Eric Gustavson and Vernon Allen were also on duty at the medical convention.

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TO THE LADIES:

from

OALMA's Woman's Auxiliary

San Francisco is now behind us. Soon it will be winter, then spring and before we know it, the 1957 National OALMA Assembly will be gathering in Washington, D. C.

Under Mrs. Kraft's able leadership, our few days in San Francisco will long be remembered. Chinatown, Fisherman's Wharf, the hills, cable cars, the bridges and the good old Palace Hotel can be listed in the growing group of "We were there" places.

As your new President, every effort will be made to develop a program for our Washington visit that will be equally worthwhile. Already being given consideration is a visit to a foreign Embassy and the White House. A committee is being set up to work out a program that we hope will be irresistible to every one of you.

Let us all set our sights on Washington and plan to make this the largest gathering of the Woman's Auxiliary of OALMA ever recorded. With the lure of our national capital to enthuse us, we can do it. Start laying the groundwork now to be sure you will be one of us at the OALMA National Assembly in 1957. The dates September 29-October 2. The place: The Statler Hotel.

Sincerely yours,

Ruth Brown
President

Three Hundred Years: Celebration of the Berlin Society of the Orthopedic and Prosthetic Industry

A Report from the OALMA Representative

GEORGE W. FILLAUER, SR.
Chattanooga, Tenn.

U. S. Leaders at International Session

The camera catches a happy reunion at the Berlin celebration. Left to right: W. Tosberg of New York City; Hugo Stortz, the Bundesinnungsmeister of Berlin; George W. Fillauer, Sr. of Chattanooga, OALMA representative; William Wagenseil of Brooklyn, and Romano Barberis of Italy.

The Annual Meeting of the Bundesinnungsverband of the Orthopedic and Prosthetic Industry of West Germany was held in Berlin the 18th to the 20th of June, 1956. This meeting celebrated also the Three Hundredth Anniversary of the founding of the Berlin Innung (the local organization of the orthopedic and appliance industry).

My fellow OALMA members at the 1955 Assembly in New Orleans had designated me as their representative at this important session. Also present were OALMA members William Wagenseil of Brooklyn and William Tosberg, (Institute of Physical Medicine and Rehabilitation).

A few days before this outstanding meeting, national publicity had been set in motion as the result of a conference between officials of the German society and the press and radio. This centered on the importance of the Anniversary (at the 1955 German meeting of the German Society held in Freiburg, it had been decided to hold the 1956 session in Berlin to celebrate the Anniversary. It also afforded an opportunity for the members in the Eastern Zone of Germany to participate).

The response to the call to meeting was gratifying. On the day before the meeting an unexpectedly large number of delegates and members from all parts of Germany and foreign countries met at the headquarters in the "Haus Wien." This is the most prominent and largest restaurant located on the Kurfurstendam (this large street is to Berlin what Broadway is to New York).

A hearty welcome awaited the visitors there with a glad handshake and the rubbing elbows with old friends. This was also evident the following morning at the opening of the meeting. Bruno Dittmer, President of the Berlin Innung, extended greetings. He assured the attending members that the Berlin Innung had left nothing undone to make their visit to Berlin both pleasant and profitable. The President of the Bundesinnung, Bundesinnungsmeister, Hugo Stortz, expressed in stirring words his appreication for the large attendance. Mr. Stortz paid special tribute to those who came from the U. S. A., Italy, France, Finland, Holland, Belgium and not less to those courageous members who had travelled from the Eastern Zone to meet their old colleagues to exchange thoughts on mutual problems. Their presence on this occasion, he declared, gave evidence of their loyalty to their Innung and profession. Next followed an address by Professor Dr. von Herrath. His topic was "The Static and Dynamic of Bone Structure."

Next on the program was a talk by superior medical councilor Dr. Rost on "Today's Position of the B. K. Prostheses Construction." This was followed by a joint luncheon. Several omnibuses awaited to take us to the "Oskar Helena Heim" in Berlin-Dahlem. Dr. Faubel, the head of the institute, spoke on the subject of "Rehabilitation of the Physically Handicapped." He went into detail about what was accomplished at this well-known rehabilitation center. From here we walked over to the *Anatomical Institute* of the Free University of Berlin. Here we enjoyed a most interesting demonstration by Professor Dr. von Herrath. The ladies who did not participate, enjoyed a round trip on Berlin's most beautiful lake "Wannsee." Coffee and pastries were served on the island of "Lindwerder."

The high point of the meeting was provided for Tuesday. In the auditorium of "Haus Wien" met some 1,200 participants. Senator Dr. Schmiltan, Commissioner of Berlin's Board of Health, referred to the 300th Anniversary celebration as a happy event and one which should receive public interest because of its importance to public health.

Dr. Schmiltan declared that recognition should be given to the Innung for its contribution to the public health and welfare. He pointed out that while now governments the world over are interested in rehabilitation, this is nothing new for Germany, where the Berlin Innung can point with pride to 300 years of accomplishments in this field.

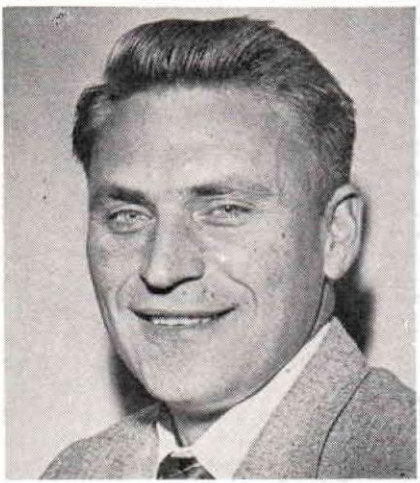
Hugo Stortz, the Bundesinnungsmeister, underlined the importance of the orthopedic and prosthetic field. He pointed out that there are more than 1,000 shops with 6,000 employees in Germany. He praised their untiring efforts during and following the war in providing for 450,000 amputees, despite the then existing shortages in men, material and machinery.

Mr. Bruno Dittmer took the chair and gave an interesting talk on the History and Development of their Organization covering the past 300 years. He pointed out the high standard of work in the profession as shown by the fact that today often times one does not recognize an amputee on the street. Next followed a delegation from the Eastern Zone of Germany who extended greetings. Delegates of other countries followed with good wishes and bearing gifts. The main address was delivered by Professor Dr. Witt, head of the Oskar Helena Heim. His subject was "Hand and Arm." He spoke on the necessity of an understanding cooperation between the physician and the orthopedic mechanic. Without this, the progress and the fine results of today would not have been possible; nor will future progress be possible without cooperative affiliation between ours and the profession of medicine and surgery. "They are interdependent."

There were no commercial exhibits in the meeting hall. However, every member of the OALMA would have shown deep interest in the comprehensive exhibits of handiwork by individual shops. In fact Bill Wagenseil and I were most astonished to see the craftmanship and original ideas in the prostheses and braces on exhibit. New cosmetic products as ears, noses and fingers were also shown. Much interest was given to new publications. One book by the well-known writer Fritz Puschel is entitled, "Kosmetische und Orthopadische Kunststofferzeugnisse." Another is a book in loose leaf form published by the Bundesinnungsverband entitled "Bau von Greifarmen." The officers of the organization and the delegates of foreign lands were guests of the Senate of the City of Berlin at a luncheon meeting. The afternoon was devoted to committees and various group meetings. The evening was set aside for a great social event at the "Pralat," the most pretentious meeting hall in Berlin. Few speeches but much good food and wine were enjoyed. The entertainment was staged by Berlin artists who furnished a first class cabaret program. I have been informed that dancing and frolicing lasted till dawn.

Wednesday morning brought an interesting address by Dr. Rogmuller, "Thoughts on Problems of Brace Construction." Dr. Schubje opened discussion on *Lower Extremity Prostheses.* This developed into a very lively discusison by Messrs. Pfau, Haberman, Sr. and Jr., and others. This meeting ended with a very comprehensive work program in the interest of the maimed and handicapped. Again and again the desire was expressed for a closer and stronger international cooperation in the field of orthopedic appliances. This interest is a recognition of the need for collecting technical experiences and exchange of ideas with other countries, those from the U. S. A. especially. It is the expressed desire of our German colleagues for this mutual understanding and cooperation to solve technical and scientific questions in our field. With this important recognition, the meeting came to an end. I will close my report with this one thought: The Berlin meeting has pointed the way for closer international ties of our profession. Let the OALMA lend its wholehearted support.

The next annual meeting of the German organization is scheduled to be held in Nurnberg, Bavaria, in the first week of June. Let us hope that the OALMA will again be represented.



ROY SNELSON

• ROY SNELSON, Certified Orthotist, formerly connected with Logan and Company of Los Angeles, has been appointed Director of the Brace Program (Respiratory Center for Poliomyelitis) at the *Rancho Los Amigos Hospital* at Hondo, Calif. The Hospital is connected with the County of Los Angeles. Its Director is Eugene R. Erickson.

The Brace Program which Mr. Snelson will direct will be one of basic research and training in upper extremity devices, which will include research, prescription, design, fitting, training and evaluation.

TRAINING OF THE LOWER EXTREMITY AMPUTEE

By Donald Kerr, Director of the National Institute for Amputee Rehabilitation, and Signe Brunnstrom, Consultant in Amputee Training, Institute of Physical Medicine and Rehabilitation.

Published by Charles C. Thomas, Springfield, Ill. 272 pages, illus.

Reviewed by Arthur L. Boland, C.P.&O., Paterson, N. J.

The adult who loses a leg usually goes through a series of emotional shocks which may carry him to the depths of frustration and sometimes despair. The first shock comes with the knowledge that the limb must go, or is already lost. The second is the realization that the artificial limb is a mechanism, not a replacement. A third follows as the limitations of the artificial leg inexorably impose themselves on the amputee.

Each of these shocks is worse for those who are ignorant of what to expect. Each may be mitigated by knowledge which can replace fear, anxiety and timidity with the confidence that helps an amputee to make the best of his problem.

"Training of the Lower Extremity Amputee" is a book of such knowledge, which should bring hope and confidence to any amputee who is determined that the loss of a leg shall not change his life, his associations or his activities any more than is absolutely necessary.

Nobody goes through life half expecting to lose a limb. When such a thing happens it is a devastating experience, whether the sacrifice is required on account of disease, with advance warning, or whether it results from an accident that turns a whole and healthy person into a permanently crippled one, in the space of a single tick of the clock.

In either case, the most helpful medicine for the victim's morale is the prospect of walking again. The despondency encountered by the amputee who undertakes to master an artificial limb is not as desperate as that that engulfs those who do not or cannot use artificial limbs. Too many people refuse to make the needed effort, or succumb to early discouragements, in the attempt to learn to walk on prosthetic limbs often because they lack the proper direction to get off to a good start. Some, after facing up to the initial shock of an amputation, expect immediate miracles from a prosthesis. When they discover that they cannot rise from a wheelchair and walk off on the artificial limb, they sink back into the despondency of their first shock. Others, finding themselves unsteady and awkward in their early attempts to walk, surrender to vanity or fear, and never achieve full use or benefit from a prosthesis.

This book, in the hands of any intelligent person who has lost a leg, or even both legs, should have the valuable effect of removing doubt and timidity. It should reassure such a patient of his eventual ability to resume a considerable degree of normal activity, and should help him to plan his immediate future to avoid setbacks and achieve success in the shortest possible time.

With the guidance offered by Mr. Kerr and Miss Brunnstrom, the amputee (who cannot have the advantages of prosthetics trainings in a rehabilitation center) should be able to accomplish a great deal of progress in his own home, with equipment improvised from household furniture.

For those who can spend some time in such a center, the book has much supplementary value. Its chapters on what to do in the hospital immediately after the amputation have practical usefulness not only for the patient, but for the nurse, the attending medical men, and the physical therapist, who work on amputation cases.

A successful system of training which is the basis of much of the work done in the rehabilitation of lower extremity amputees in recent years, is embodied in this book. Its authors have had incomparable experience during World War II, and before and since. Mr. Kerr, who lost his right leg above the knee in his youth, has originated and has mastered many techniques for participating in most normal and many super-normal activities. He can give proof to his readers that the recommendations in the text of the book actually produce results in practice. Miss Brunnstrom, as one of the world's outstanding teachers of ambulation for amputees, brings to the manual an expert teacher-therapist's keen analysis of technique and method, based on an extraordinarily wide range of experience and observation.

The two authors successfully combine their talents and knowledge in an integrated, well-illustrated manual which the layman can understand and which the professional people, including therapists, surgeons, orthopedists, and limb-makers, can respect. The book can eradicate groundless fears for people who lose one leg or both, and it can offer much useful help to hospital nurses and administrators, physical therapists, social workers, and medical men, who have any contact with people of any age at the time when they suffer lower extremity amputations, or when they tackle the problem of learning to use artificial limbs.

It is hardly necessary to add that the book also offers invaluable help to that limb-maker who is not satisfied only to make an artificial leg, but who wants to do all he can to make sure that the patient can wear and use it successfully. Many limb-wearers who failed in their attempts to walk, or who have not gained maximum mastery of their artificial legs, could have done much better if they had received a copy of such a book on the day they first tried to stand alone in a prosthesis.

KOSMETISCHE UND ORTHOPADISCHE KUNSTSTOFFERZEUGNISSE

By Fritz Pueschel

Reviewed by Laurence Porten, C. P. & O., Pittsburgh, Pa.

Fritz Pueschel, Berlin, Germany, is one of the most active writers in the orthopedic field of late, whether he writes articles in the two professional German magazines on the subject of educating the young trainees or by giving advise on matters concerning new materials and methods to be used in the shops.

He is the author of two books printed in 1955, the first one dealing with all of the materials used in the orthopedic shops in Germany, and the second one specializing on artificial hands and arms.

The third book deals mainly with cosmetic and orthopedic substitutions and materials.

This is a relatively new field in Germany and has not been as much explored as in America. However, Fritz Pueschel undertook the job with great vigor and diligence and came out with an astounding amount of basic knowledge and scientific data which should even be interesting to our professional plastic experts.

Chapter XIV is dedicated to the use of plastics for cosmetic and orthopedic purposes in America and describes the technic of manufacturing of cosmetic gloves and hands in detail.

He gives much credit to the American progress which has helped stim-

ulate the process of using plastics in the orthopedic field in Germany.

It is especially interesting to learn that in Germany experiments with plastic (Plexidure) stump sockets in Suction Socket legs have been conducted with very good results. The transparency of the material makes it possible to observe pressure spots immediately and corrections are easily carried out.

In his book Fritz Pueschel touches problems which are new today, but, will have future significance, and it should be worthwhile to keep an eye on developments in Germany.

In summarizing my review, I come to the conclusion that his book is an important milestone on the road to progress and achievement, and could be used as a textbook for theoretical and practical teaching at training schools, seminars or shops by instructors and apprentices as well as for clinics and orthopedic doctors.

I wish him success for this and his other books and hope that sometime in the near future we can have translations into English.

"Missing the Boat"

Your *Journal*, realizing the tremendous potential in traction business, have been kind enough to allot space for a "Question and Answer" column. This is meant to help place you in a position of valuable service to your clientele. Additional business and increased profits will reward the man or organization who becomes thoroughly familiar with the application of traction.

It is our sincere wish to furnish you with authentic information and to help you augment your services and profits to the fullest extent. To obviate delay, we suggest you forward your questions directly to us. An immediate answer will be forthcoming, then published anonymously later in the *Journal* so that others of your profession may benefit.

Traction is not new. It has been used for many years, yet it seems that recently it has reached an astounding growth. Why? Possibly because more general practitioners are realizing the benefits of traction in the home. Also there is a steady increase in physical therapists who often prescribe traction as adjunct treatment.

Even though home traction has "snow-balled," it is our opinion that the surface has barely been scratched. Selling on price is not a stable business. As you know there is always someone to beat your price. Quality and knowledge is power! Convince yourself that you are promoting first-rate equipment at a legitimate profit, sell your prescribing clientele on this fact and that you excel in the knowledge of traction application. A surprise is in store for you. Business will gravitate your way.

Our one purpose in mind is to help you build a sound and important basis of your business operations. The results of our efforts will be exhibited by your interest shown in this column and the number of questions submitted.—*Tru C. Wilhelm, President, Tru-Eze Mfg. Co., 436 Bethany Road, Burbank, Calif.*

In Memoriam

JOHN E. KLENZAK, former orthotist with the Pope Brace Division, died November 3 after a heart attack, at the age of 57. Mr. Klenzak served with the Bear Brand Hosiery Company and later the Paramount Textile Machinery Company for over forty years. When Mr. Henry Pope decided to have experimental work done to devise lighter, stronger and better parts for orthopedic braces, Mr. Klenzak was assigned to this project. From 1931 to 1942, Mr. Klenzak was connected with a Kankakee clinic, sponsored by the Pope Foundation, which tested brace part design.

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CODE OF ETHICS FOR THE ARTIFICIAL LIMB AND BRACE PROFESSION

The Federal Trade Commission has approved fair trade practices for the field of artificial limbs and for orthopedic appliances. Both codes have been adopted in their entirety by the American Board for Certification as a guide for the Certified Prosthetist and Orthotist. The full text of the Codes may be obtained by application to the American Board for Certification Headquarters.

The following digest of the rules is printed for ready reference.

It is an unfair trade practice:

(1) To deceive purchasers or prospective purchasers as to any of the qualities of a prosthetic or orthopedic appliance, or to mislead purchasers or prospective purchasers in respect to the service of such appliances.

(2) To infer an artificial limb is equivalent or nearly equivalent to the human limb, complies with any government specifications, or has the approval of a government agency unless such be wholly true or non-deceptive.

(3) To fail to disclose to a purchaser, prior to his purchase of a prosthetic appliance, that the degree of usefulness and benefit will be substantially dependent upon many factors, such as the character of the amputation, condition of the stump, state of health, and diligence in accustoming oneself to its use.

(4) To promise that any industry product will be made to fit unless such promise is made in good faith and industry member is possessed of the ability to fulfill such guarantee. A prosthetic device or an orthopedic appliance is not to be considered as fitting unless properly shaped for the body member to which it is applied, and in proper alignment and conformity with the physique of the person to wear such a product, and affords the optimum of comfort and use on the part of the wearer.

(5) To deceive anyone as to his authority to represent and make commitments in behalf of an industry member unless such be fully true.

(6) To use any testimonial or use any picture which is misleading or deceptive in any respect.

(7) To demonstrate any appliance in a manner having the tendency or effect of creating a false impression as to the actual benefits that may be reasonably expected from it.

(8) To use any guarantee which is false or misleading.

(9) To represent that any appliance conforms to a standard when such is not the fact.

(10) To publish any false statements as to financial conditions relative to contracts for purchase of appliances.

(11) To engage in any defamation of competitors or in any way to disparage competitors' products, prices, or services.

(12) To use the term "free" to describe or refer to any industry product which is not actually given to the purchaser without cost.

(13) To wilfully entice away employees of competitors, with the purpose of injuring, destroying or preventing competition.

(14) To take part in any concerted action with other members of the industry to wilfully fix prices.

(15) To promote the sale of any appliance to any person who can not be expected to obtain reasonable benefit from such appliance.

(16) To refrain from giving every assistance to doctors before and after amputation or crippling condition, or to fail to do everything possible to promote mutual trust and confidence between the industry and the members of the medical profession.

(17) To undertake to supply an artificial limb by mail-order specifications without personal fitting thereof unless conditions are such which make an exception desirable, and in any case, no misrepresentation shall be made as to fit.

(18) To unduly exploit features of appliances less important than proper fit and alignment.

(19) To fail to recognize that the interest of the amputee and the handicapped is the first concern of this craft and therefore any failure to make available to all of its members and the general public any improved technique that may be used as to making, fitting, aligning or servicing of industry products shall be an unfair trade practice.

(20) To pay anything of value to any doctor for the purpose of obtaining a referral of a patient by the doctor to the industry member.

Further, the industry desires to be an active and cooperative factor in all progressive developments of improved techniques that will contribute to the welfare and comfort of all who wear its products.