VOLUME XXXIII NUMBER ONE

# THE NATIONAL GEOGRAPHIC MAGAZINE

JANUARY, 1918

## CONTENTS



PUBLISHED BY THE
NATIONAL GEOGRAPHIC SOCIETY
HUBBARD MEMORIAL HALL
WASHINGTON, D.C.

$2.50 A YEAR

# NATIONAL GEOGRAPHIC SOCIETY

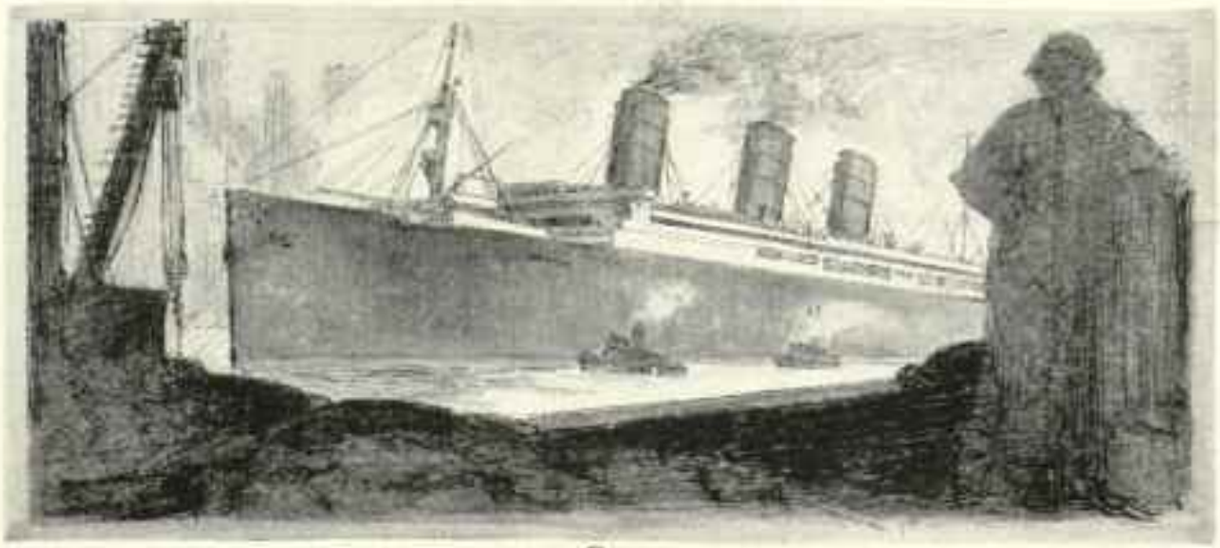
HUBBARD MEMORIAL HALL

SIXTEENTH AND M STREETS, WASHINGTON, D. C.



To carry out the purpose for which it was founded twenty-eight years ago, namely, "the increase and diffusion of geographic knowledge," the National Geographic Society publishes this Magazine. All receipts from the publication are invested in the Magazine itself or expended directly to promote geographic knowledge and the study of geography. Articles or photographs from members of the Society, or other friends, are desired. For material that the Society can use, adequate remuneration is made. Contributions should be accompanied by an addressed return envelope and postage, and be addressed:

GILBERT H. GROSVENOR, EDITOR



# The Watch at Sea

Around the world in thirty days, New York to London in five, Vancouver to Yokohama in nine. You take your ease amid the magnificent comforts of deck and cabin—home-tied securely to mid-ocean by the Gordian knot of wireless. You are superbly modern when you globe-trot. But are you as modern in the watch that times the voyage of your life? One celebrated timepiece holds fast to the highest standards of modern proficiency—

# Hamilton Watch

## "The Watch of Railroad Accuracy"

Masters of liners and dreadnoughts, like the masters of the most celebrated limited trains, pay highest tribute to the absolute uniformity of Hamilton accuracy. For remember that the most difficult train schedules are safeguarded by the unfailing perfection of this great timepiece.

The modernization of timekeeping comes to you in every Hamilton—the watch of the minute—right every minute.

There are 32 Hamilton models to choose from, ranging in style from rugged utility to captivating beauty. Each a marvel of accuracy. Each a life-long memento.

Prices, $27.50 to $150; movements, $14 ($15.25 in Canada) and up.

Send Today for "The Timekeeper"—
the story of Hamilton supremacy

Hamilton Watch Company, Dept. 35, Lancaster, Pennsylvania

# LEE

*regular fabric* **WHITE** *Tires*

*There is a* **LEE** *Distributor in Your Town*

## OVERSIZE

Here is a tire that is built for GREATER MILEAGE from the foundation up.

You can SEE that it will wear longer.

Measure it with a rule. It has a larger girth than ANY other tire of the same rating.

No tire user need be told that such a tire will give greater mileage.

Note that THIS tire is pure white—a fact that proves that these tires are built of tough, strong, long-wearing rubber. THIS is another reason why LEE White Oversize Tires give greater mileage.

The dealer who sells LEE Puncture-Proof Tires and LEE Multiple Cord Tires also sells LEE White Oversize Tires.

LEE TIRE & RUBBER CO.

245 WEST 53rd STREET, NEW YORK CITY

Factories: Conshohocken, Pa.


MARMON
34
The roster of Marmon owners reads like a directory of distinguished and socially prominent Americans, with an intermingling of names famous overseas. View this Marmon Limousine at the motor shows.
136-Inch Wheelbase
4100 Pounds Lighter
NORDYKE & MARMON COMPANY
Established 1851
INDIANAPOLIS


## Memories Made Lasting

NOT the memories themselves, of course, but the *evidences* of sentimental regard for the departed. A duty for those now here is the duty of providing a suitable family or individual memorial. And there is no other material so appropriate as

# BARRE GRANITE

*The Rock Beautiful and Everlasting*

Its *permanent* quality—its freedom from flaws—its ability to resist the action of time and weather—these appeal to those in search of memorials of lasting character.

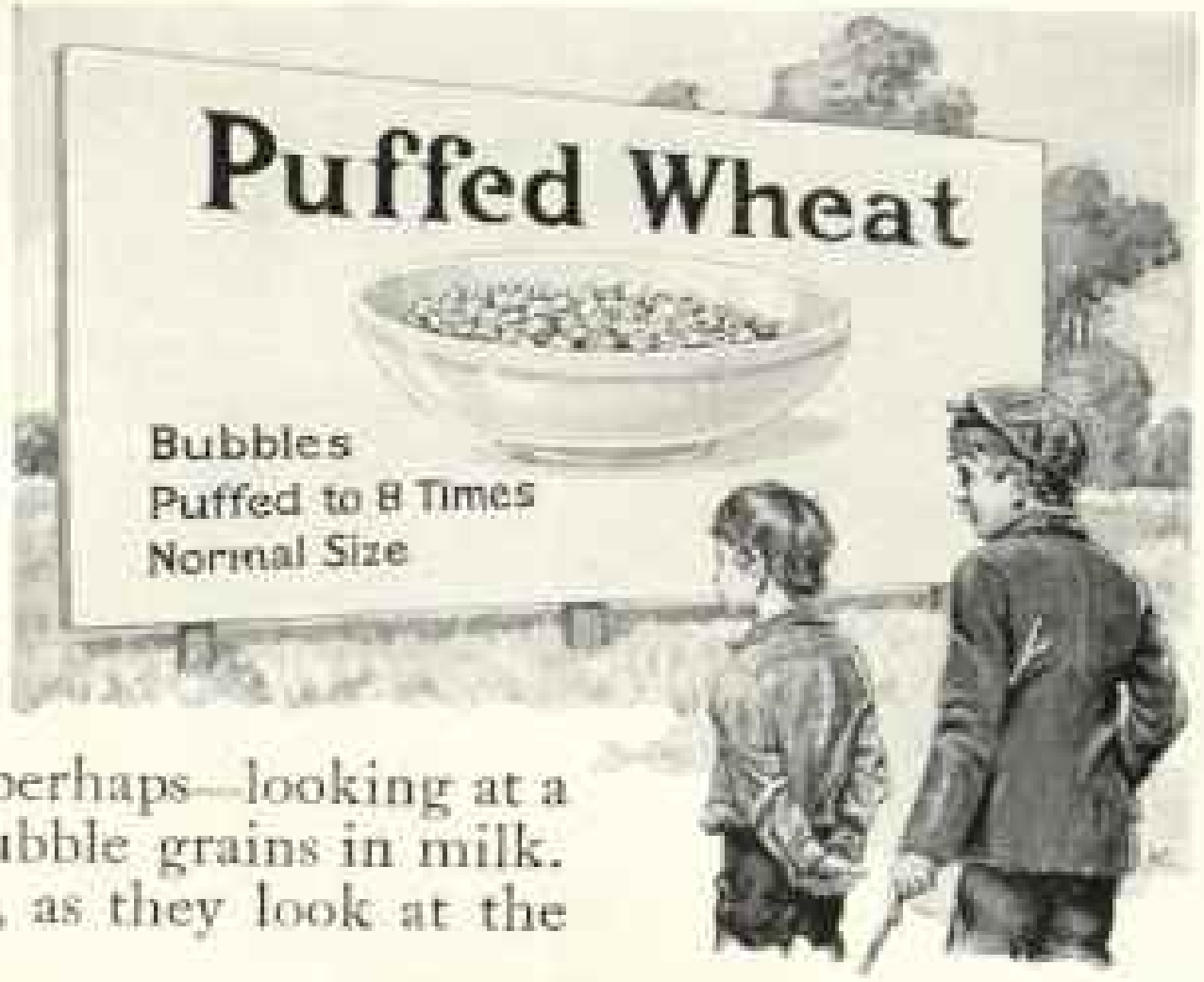
The Rockefeller, Fleischman, Heinz, Schley, Armour, Tarkington, Potter Palmer, Anheuser, Leland Stanford, and thousands of other memorials have been cut from Barre Granite. Specify that every part of your memorial, whether mausoleum or monument, whether inexpensive or costly, be made of genuine Barre Granite. Ask your dealer about Barre Granite, and write us for copy of "Memorial Masterpieces."

**Barre Quarriers and Manufacturers Association, Dept. B, Barre, Vt.**

"The Granite Center of the World"

# "I Wonder

## Do You Suppose That Puffed Wheat Is Half as Good as It Looks?"




It seems rather a pity to picture Puffed Wheat to boys who never get it.

You have seen them, perhaps—looking at a pictured dish of these bubble grains in milk. They gaze at it in envy, as they look at the window of a candy store.

## Few Boys Get Enough

But there are other boys who get Puffed Grains too rarely. They seem too good for every-day delights.

That results from a wrong idea of Puffed Grains. These are not mere tidbits—not mere garnish for a meal. They are whole-grain foods, prepared in Prof. Anderson's scientific way. After an hour of fearful heat, the grains are shot from guns. And a hundred million steam explosions are caused in every kernel.

Every food cell is blasted so it easily digests. Thus every atom of the whole grain feeds.

**Puffed Wheat**

**Puffed Rice**

**and Corn Puffs**

Each 15c Except in Far West

Every ounce of Puffed Wheat is an ounce of clear nutrition, supplying everything we need. The taste is like puffed nut-meats. The texture is so flimsy that the grains fairly melt away. Yet, as a food, Puffed Wheat excels any other whole-wheat product.

With cream and sugar, Puffed Grains seem almost too good to eat. Mixed with any fruit, they form a delightful blend. There is nothing like them for a bowl of milk.

Salted or doused with melted butter, they form an after-school confection. They take the place of sweets and cookies. And every serving means a perfect food made easy to digest. Keep all three kinds on hand.

(1742)

# Burpee's Seeds Grow


More seeds were planted last year than ever before and many thousands of families enjoyed fresh vegetables from the garden for the first time. The year 1918 will see a still greater number who will grow their own Flowers and Vegetables and will profit by their experience and plant only Quality Seeds.

## Burpee's Annual
### For 1918

**The Leading American Seed Catalog** contains the latest and most reliable information about the "Best Seeds that Grow." **216 pages,** with **103 colored illustrations** of the latest novelties and hundreds of illustrations of every variety of Vegetable and Flower Seeds. It is sent free to those who write for it. A post-card will do. Write for your copy today, and please mention this publication.

**W. ATLEE BURPEE & CO.** **Burpee Buildings, Philadelphia**

---

DEAF

## "I Now Hear Clearly"

### You, Too, Can Hear!

Inasmuch as 300,000 users of the "ACOUSTICON" have had the same results from it as Mr. Garrett Brown, whose photo appears above, we feel perfectly safe in urging every deaf person, without a penny of expense, solely and entirely at our risk, to accept the

## 1918 ACOUSTICON
### FOR TEN DAYS' FREE TRIAL
### NO DEPOSIT—NO EXPENSE

Since the perfecting of our new 1918 "ACOUSTICON," smaller, better, and just as strong as ever, it is no more noticeable than in the above picture.

All you need to do is to write, saying that you are hard of hearing and will try the "ACOUSTICON." The trial will not cost you one cent, for we even pay delivery charges.

**WARNING!** There is no good reason why every one should not make us this offer. We do not send money for any instrument for the deaf until you have tried it.

The "ACOUSTICON" has improvements and patented features which cannot be duplicated; so, no matter what you have tried in the past, send for your free trial of the "ACOUSTICON" today and convince yourself—you alone to decide. Address

**GENERAL ACOUSTIC CO., 1311 Candler Bldg., New York**
Canadian Office: 823 Nia Birks Bldg., Montreal

---

*"BEAUTIFUL BIRCH FOR BEAUTIFUL WOODWORK."*

Beautiful **birch**

# Read this Book
## by all means
## *before you start to build!*

The book tells why "Beautiful **birch**" is the first choice of most architects and builders for interior woodwork, veneer doors, hardwood floors, etc. We send this book *free*. And along with it will go a set of little panels showing how beautifully "Beautiful **birch**" takes the different finishes.

You will have to *live* with that woodwork—so—it's important that you choose it as carefully as you choose your other friends.

Will you begin the study of "Beautiful **birch**" TODAY?

NORTHERN HEMLOCK & HARDWOOD MFRS. ASSN.

214 F. R. A. BUILDING
OSHKOSH WISCONSIN

# "What! My Car?"

**"Yes! skidded—and it's up to you. You failed to provide the chauffeur with Tire Chains. Only good luck saved your wife from paying the supreme penalty for your negligence. She's on the way to the hospital painfully injured, but the doctor thinks she'll pull through. You'd better hurry to the hospital and then report to headquarters."**

How strange it is that disaster must come to some men before they realize that all makes and types of tires will skid on wet pavements and muddy roads when not equipped with Chains.

These men do not appreciate until too late, that by failing to provide Weed Anti-Skid Chains they expose their families to injury and death.

The time to provide against accidents is before they happen. Don't wait until after the first skid. Put Weed Chains on all four tires at the first indication of slippery going and you will have quadruple protection against injury, death, car damage and law suits.


*Weed Chains are Sold for All Tires by Dealers Everywhere*


**American Chain Company, Incorporated**

BRIDGEPORT, CONNECTICUT

IN CANADA: DOMINION CHAIN COMPANY, LIMITED, NIAGARA FALLS, ONTARIO


# The Motorists' Cash Register

## *Watch it*

YOU can find on your speedometer - record much more than the day's run.

*You can find the way to a year's economy.*

Are you using your speedometer to tell you whether you are getting full mileage from gasoline and oil?

And do not make the mistake of assuming that your oil consumption is the less important of the two.

Slower oil consumption indicates less oil breakdown under the heat of service.

That means less engine wear.

It is common for motorists to find that a change to the correct grade of Gargoyle Mobiloils lowers oil consumption a full 50%.

This lowered oil consumption has a direct bearing, too, on gasoline consumption. For it comes partly from a more thorough piston-ring seal. The result is less waste of gasoline down past the piston rings.

With a change to the correct grade of Gargoyle Mobiloils the gasoline saving often amounts to as high as 20%.

We recommend that you use your speedometer now to check your gasoline and oil results—first with your present oil, then with the grade of Gargoyle Mobiloils specified for your car in the Chart shown in part on this page.

Write for 56-page booklet containing complete discussion of your lubrication problems, list of troubles with remedies and complete Charts of Recommendations for Automobiles, Motorcycles, Tractors and Motor-boat Engines.

GARGOYLE

# Mobiloils

*A grade for each type of motor*

The four grades of Gargoyle Mobiloils for gasoline engine lubrication, purified to remove free carbon, are:

**Gargoyle Mobiloil "A"**
**Gargoyle Mobiloil "B"**
**Gargoyle Mobiloil "E"**
**Gargoyle Mobiloil "Arctic"**

***Electric Vehicles*** — For motor bearings and enclosed chains use Gargoyle Mobiloil "A" the year 'round. For open chains and differential use Gargoyle Mobiloil "C," the year 'round.

***Exception***—*For winter lubrication* of pleasure cars use Gargoyle Mobiloil "Arctic" for worm drive and Gargoyle Mobiloil "A" for bevel gear drive.

In buying Gargoyle Mobiloils from your dealer, it is safest to purchase in original packages. Look for the red Gargoyle on the container. If your dealer has not the grade specified for your car, he can easily secure it for you.

## VACUUM OIL COMPANY
Rochester, N. Y., U. S. A.

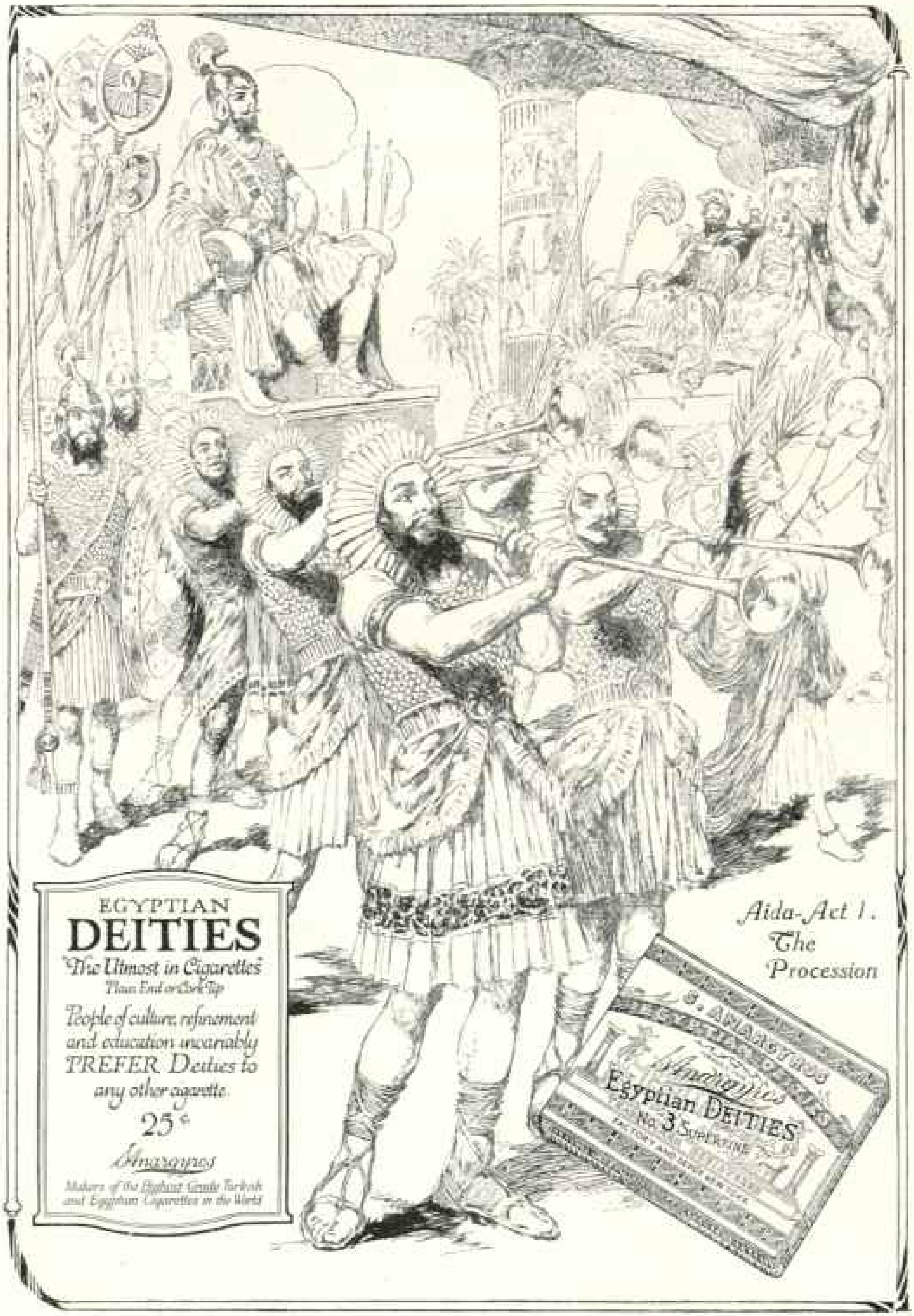
**Specialists in the manufacture of high-grade lubricants for every class of machinery. Obtainable everywhere in the world.**

***Domestic Branches:*** Detroit, Boston, New York, Kansas City, Kan., Chicago, Philadelphia, Indianapolis, Minneapolis, Pittsburgh, Des Moines

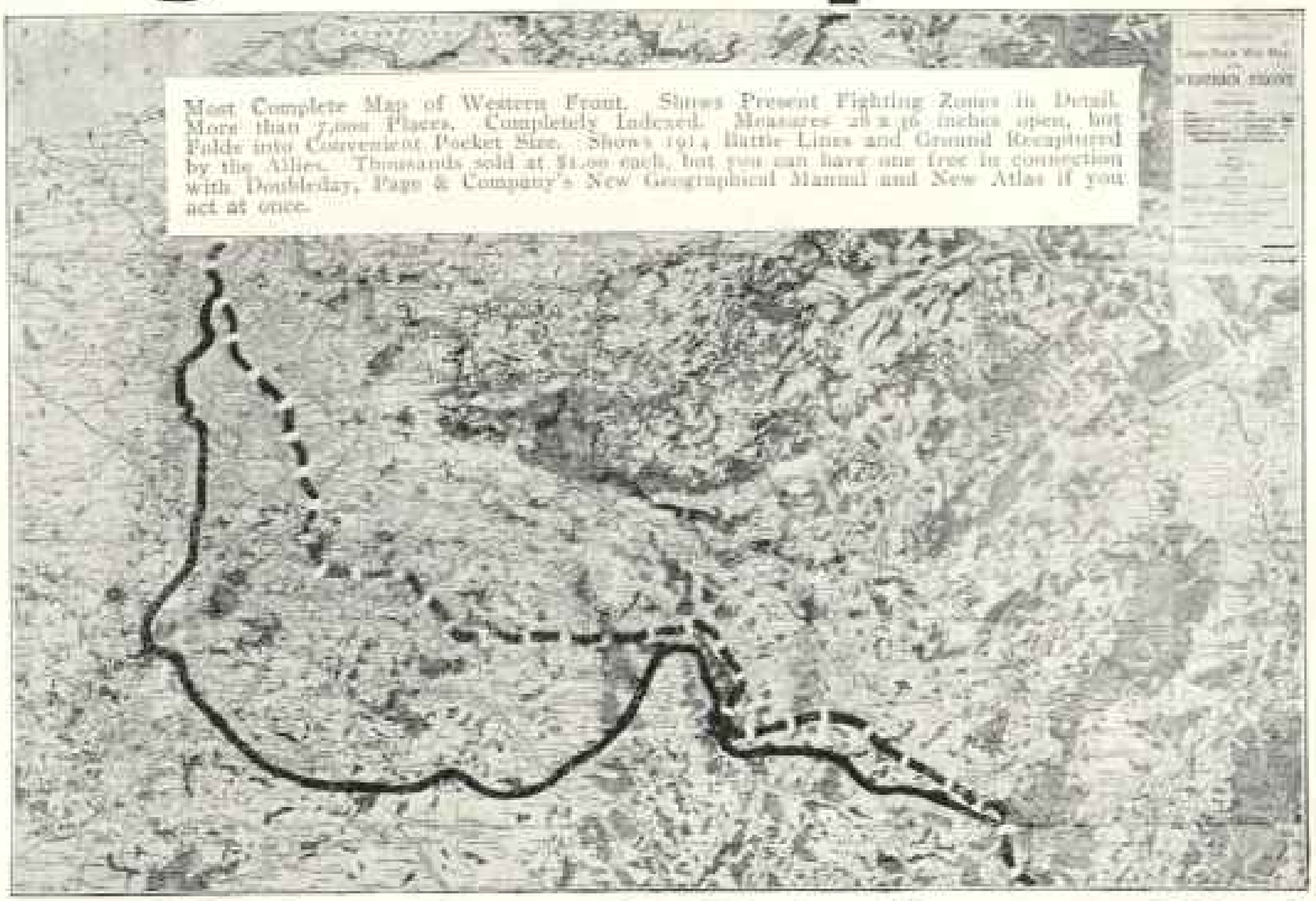
## Correct Automobile Lubrication

***Explanation:*** In the Chart below, the letter opposite the car indicates the grade of Gargoyle Mobiloils that should be used. For example, "A" means Gargoyle Mobiloil "A", "Arc" means Gargoyle Mobiloil "Arctic," etc. The recommendations cover all models of both pleasure and commercial vehicles unless otherwise noted.

This Chart is compiled by the Vacuum Oil Co.'s Board of Engineers and represents our professional advice on Correct Automobile Lubrication.


EGYPTIAN
DEITIES
"The Utmost in Cigarettes"
Plain End or Cork Tip
People of culture, refinement and education uncannily PREFER Deities to any other cigarette.
25¢
Anonymous
Makers of the Highest Grade Turkish and Egyptian Cigarettes in the World
Aida-Act 1.
The
Procession
Egyptian DEITIES
No 3

# Big War Map Free!




# Doubleday, Page & Co.'s Geographical Manual and New Atlas

In order to follow the battle lines intelligently it is necessary to have a complete set of world maps. Nothing is so discouraging as to read of towns we know nothing about—whose position in relation to other towns or the battles being fought we have no idea of. In every home there should be a map of every nation at war if we are to understand exactly what our gains mean and when peace may reasonably be expected. The world's history is told by maps. The world's progress is told by maps. You must have maps to visualize the dream of the Kaiser, the object of the Allies, the progress of the Great War.

To meet the present demand for a complete set of world maps, Doubleday, Page & Co. are now offering a new War Atlas containing 240 pages of maps—*political, economic, geographic, racial, physical, historical,* and showing the *vegetation, population,* and *language.* This remarkable Atlas measures 10 x 13½ inches. To those who purchase the Atlas now a complete set of After-the-War Maps will also be sent without charge.

As an inducement for prompt action, we will send free the new map of the Western Front pictured above. In addition to 7,000 towns, cities, and hamlets, this map gives all woods, fortresses, fortified towns, naval arsenals, forts, redoubts, batteries, air-craft depots, wireless stations, and railways.

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While the first edition lasts, you may secure the NEW Doubleday-Page War Atlas at the amazingly low price and on free examination. Send no money now. Merely mail the coupon, and the Atlas, together with the large Map of the Western Front and Index of 7000 places, will be sent prepaid. Then, after examining them, decide whether you can afford not to have them in your home. Send the coupon or write a letter now and see if this Atlas isn't exactly what you NEED. Address

**DOUBLEDAY, PAGE & CO.**
**Dept. 261**
**Garden City, L. I., N. Y.**


Doubleday, Page & Co.
Dept. 261
Garden City, L. I., N. Y.

Send me, all charges prepaid, Doubleday, Page & Company's NEW ATLAS, measuring 10 x 13½ inches, bound in fine silk cloth, stamped in gold. If it is satisfactory I will remit $1 within 10 days, at your expense. Otherwise, I will send you 50 cents at once and $1.00 a month for 3 months. (If you prefer you may send $3.50 with this coupon.) It is understood that I am to receive the large folder map of the Western Front at once and a complete set of After-the-War Maps free if I decide to keep the Atlas after examination.

Name _____

Address _____

The rich blue leather binding ... [illegible] ... if sent prepaid at $3.50.

# Make Dust A Stranger in Your Home

Without a Bissell you pay three times over in back-breaking labor for the clean, tidy home of which you are so proud.

This is an unwarrantable waste of your strength and energy easily avoidable by the use of a

## BISSELL'S

**Vacuum Sweeper** and **Carpet Sweeper**

The two make a work-saving combination by which you can make dust almost a stranger in your home, in the easiest and quickest possible manner.

There is a distinct field of usage in every home for both a Bissell's Vacuum Sweeper and Bissell's Carpet Sweeper.

Bissell's "Cyco" Ball-Bearing Carpet Sweepers are $3.25 to $6.25; Vacuum Sweepers, $6.00 to $12.50—depending on style and locality. At dealers' everywhere.

Booklet on request.

**Bissell Carpet Sweeper Co.**

Oldest and Largest Sweeper Makers

**Grand Rapids, Mich.**

Made in Canada too.

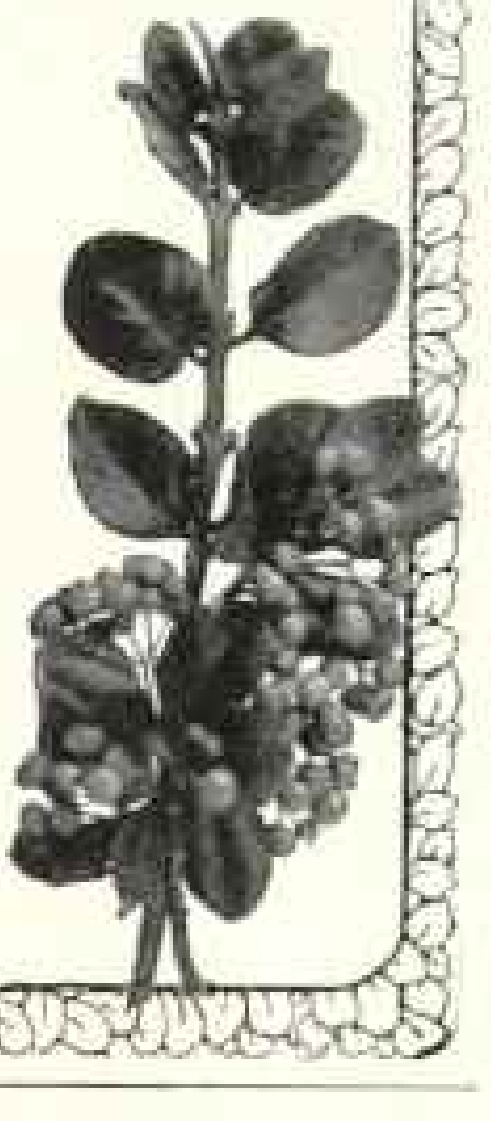
**Bissell Carpet Sweeper**


# Beautiful 365 days in the Year—

## *Evergreen Bittersweet*

With gorgeous red berries against foliage that is green all year round, this vine beautifies the home with a thick shade in the summer, and with glowing fruit and bright leaves when other vines are bare.

Evergreen Bittersweet (*Euonymus Vegetus*) climbs to a noble height in the severest climates, where English ivy can be used only as a ground cover. Two year old vines fruit freely. Planted in rows and sheared, it makes an incomparable evergreen hedge, solid and erect.



*Strong Pot Plants, 50c each; $5 per doz. $35 per 100.*

Write now for latest catalog of

**Hardy Plants, Trees Shrubs, Etc.**

It contains a great variety of the most dependable and popular favorites in hardy plants, Roses, Peonies, Delphiniums, Evergreens, Rhododendrons. Also seeds of superlative quality. Write today.

**Elliott Nursery Co.**
335 FOURTH AVENUE
PITTSBURGH, PA.

# "DO YOUR BIT" By Planting a Garden

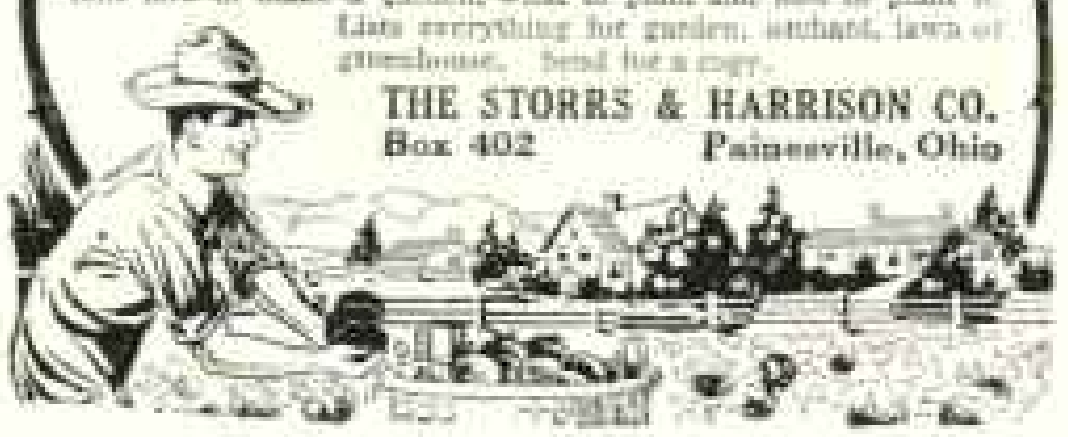
This must be another big garden year. You must help feed millions of people. If you have only a few feet of ground, plant it to vegetables and fruits.

## Storrs & Harrison

**Seed and Plant Annual**

tells how to make a garden, what to plant and how to plant it. Lists everything for garden, orchard, lawn or greenhouse. Send for a copy.

**THE STORRS & HARRISON CO.**
**Box 402** **Painesville, Ohio**



# Lantern Slides from Photographs in National Geographic Magazine

So many requests are being constantly received regarding lantern slides from the copyright photographs in the Geographic that arrangements have been completed to supply them to members of the Society. Slides are not kept in stock, each order being made up as received, and will be delivered within two weeks after receipt of order, unless otherwise advised.

The copyright notice must appear on each slide. The purchase of lantern slides does not carry with it the authority to publish the pictures and they cannot be used for advertising purposes.

Slides cannot be sent upon approval and a remittance must accompany each order. The slides will be carefully packed and sent by express collect. Prices in the United States (standard size), black and white, 75 cents each; colored, $1.50. Address,

DEPT. L,
NATIONAL GEOGRAPHIC MAGAZINE
WASHINGTON, D. C

# DODGE BROTHERS

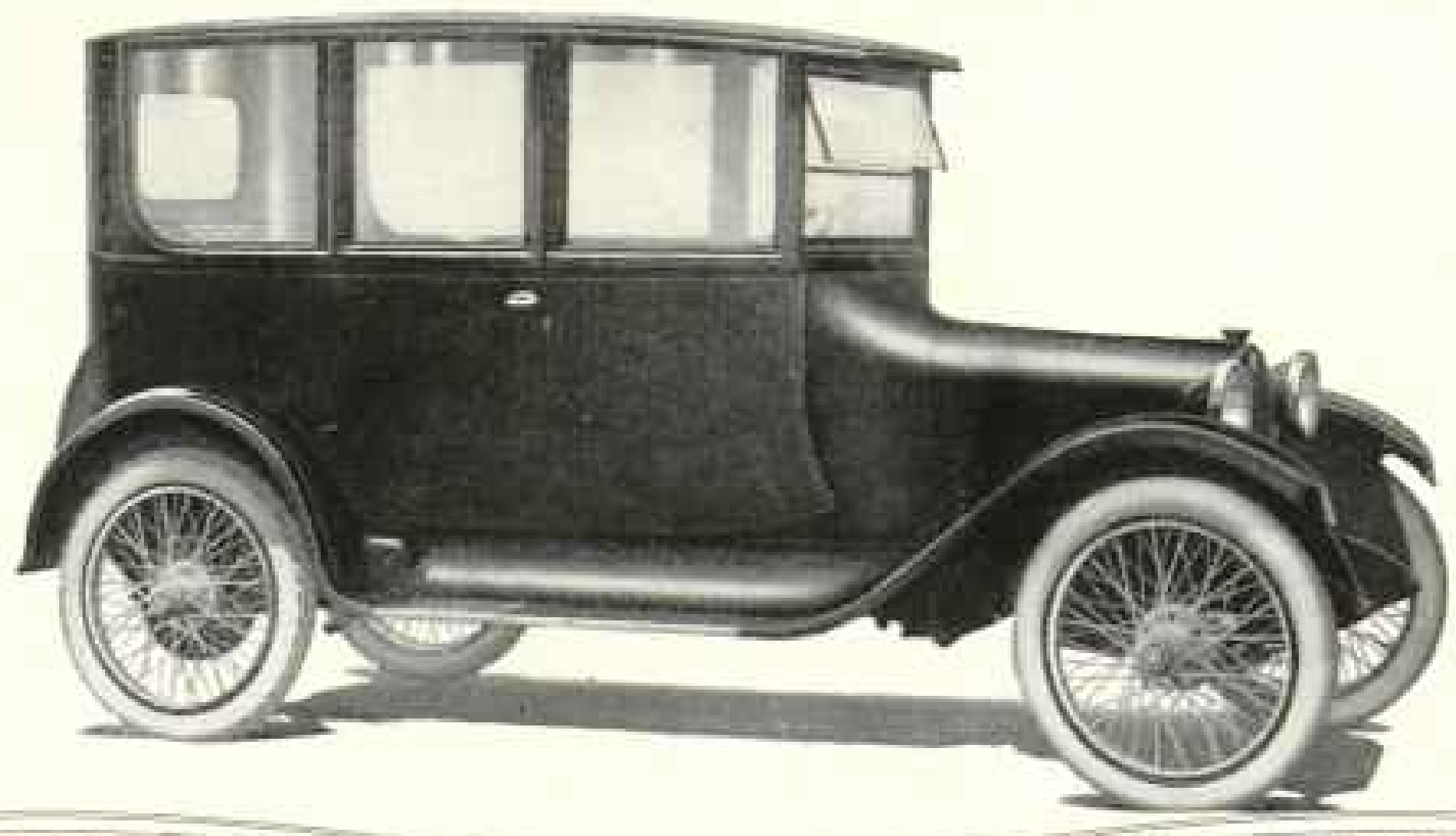
## CLOSED CAR

The convertible sedan adjusts itself to all seasons and all weathers and to every purpose of the entire household—business or social

The gasoline consumption is unusually low
The tire mileage is unusually high

Sedan or Coupe, $1350. In Canada, $1965
Winter Touring Car or Roadster, $1050. In Canada, $1525
Touring Car, Roadster, or Commercial Car, $885. In Canada, $1290
All Prices f. o. b. Detroit

**DODGE BROTHERS, DETROIT**



73d ANNUAL REPORT

# NEW YORK LIFE

## INSURANCE COMPANY

346 and 348 BROADWAY - - NEW YORK CITY

(Organized under the laws of the State of New York)

TO THE POLICY-HOLDERS AND THE PUBLIC:

| | | |
|---|---|---|
| **Admitted Assets, Dec. 31, 1917** | | **$934,929,381.52** |
| These assets are the property of over 1,000,000 people with their dependents (in accordance with their contractual rights). The Company is purely mutual; it has no capital stock. | | |
| **Legal Liabilities** | | $760,742,335.52 |
| Reserved for dividends payable in 1918 | $26,561,063.64 | |
| Reserved for dividends on deferred dividend policies maturing subsequent to 1918 | 107,041,778.00 | |
| Reserved for Contingencies | 40,584,204.36 | $174,187,046.00 |
| **Total** | | **$934,929,381.52** |

**For the year 1917 the Company's mortality rate was the lowest in its history**

Average earning power of total Ledger Assets—

December 31, 1917, 4.59%.
December 31, 1916, 4.54%.

| | |
|---|---|
| New paid business for the year | $316,000,000 |
| Outstanding insurance, end of 1917 | $2,673,000,000 |
| Paid policy-holders during year | $87,000,000 |

*The annual dividend rate of 1917 will be maintained in 1918*

Liberty Loan Bonds owned Dec. 31, 1917 ..... $12,075,000

## SUPPORT THE GOVERNMENT

**We urge all policy-holders to buy War Savings and Thrift Stamps.**

**We have directed all Agents to take no application for insurance from a soldier or sailor unless the applicant already has the limit with the Government.**

## BACK UP THE GOVERNMENT

A detailed statement will be sent to any person asking for it.

January 14, 1918. DARWIN P. KINGSLEY, *President.*

# Bonds Protected By Taxes

offer a degree of safety which is enjoyed by no other class of securities. Municipal Bonds are protected by the taxes of the communities issuing them.

*In saving, make certain your funds are safe.*

Municipal Bonds are free from the Federal Income Tax.

**Our list includes attractive issues yielding from 4½% to 6%.**

Before investing funds, read our booklet, "Bonds as Safe as our Cities."

*Sent free on request for Booklet "N-1"*

**William R. Compton Co.**

MUNICIPAL BONDS

*"Over a Quarter Century in This Business"*

NEW YORK
14 Wall Street

ST. LOUIS
408 Olive Street

CHICAGO
105 So. La Salle St.

CINCINNATI
305 Union Trust Bldg.

PITTSBURGH: 721 Farmers Bank Building

# INVESTMENTS
## of Attractive Yield

Attractive yield and sound character are combined in the offerings in our February list of investments.

Securities suitable for all classes of investors are included.

Send for AN-66

# The National City Company

**National City Bank Building**
**New York**

*Bonds  Short Term Notes  Acceptances*

ESTABLISHED 1865

# Timely, Well-Secured Investments Netting 6%, 6½%, and 7%.

Your present funds can be judiciously and profitably placed in high-grade investments, fully described in our new January booklet.

The range and character of offerings are unusually varied. All issues are secured by properties of first importance to our national welfare and of sufficient value and earning power to completely safeguard interest and principal.

Included on the list are many investments that ordinarily would bring 5% to 6%, but which now yield 6% to 7%.

Short and long time maturities. Denominations of $100, $500, and $1,000.

*Write for Circular No. 1002 D*

# Peabody, Houghteling & Co.

**(ESTABLISHED 1865)**

**10 South La Salle Street, Chicago**

A 4894

ESTABLISHED 1865

# Steady Demand for First Mortgage 6% Bonds

HERE is a fact of profound significance: In these days of war and of economic change, when the market for investments in general has slackened, the demand for first mortgage 6% serial bonds, safeguarded under the *Straus Plan*, has been steadily maintained.

YOU should post yourself on the merits of these sound 6% bonds, and learn the definite reasons for their widespread popularity. A letter or a post card will bring you full information. Write today for

Circular No. A-808

# S.W. STRAUS & CO.

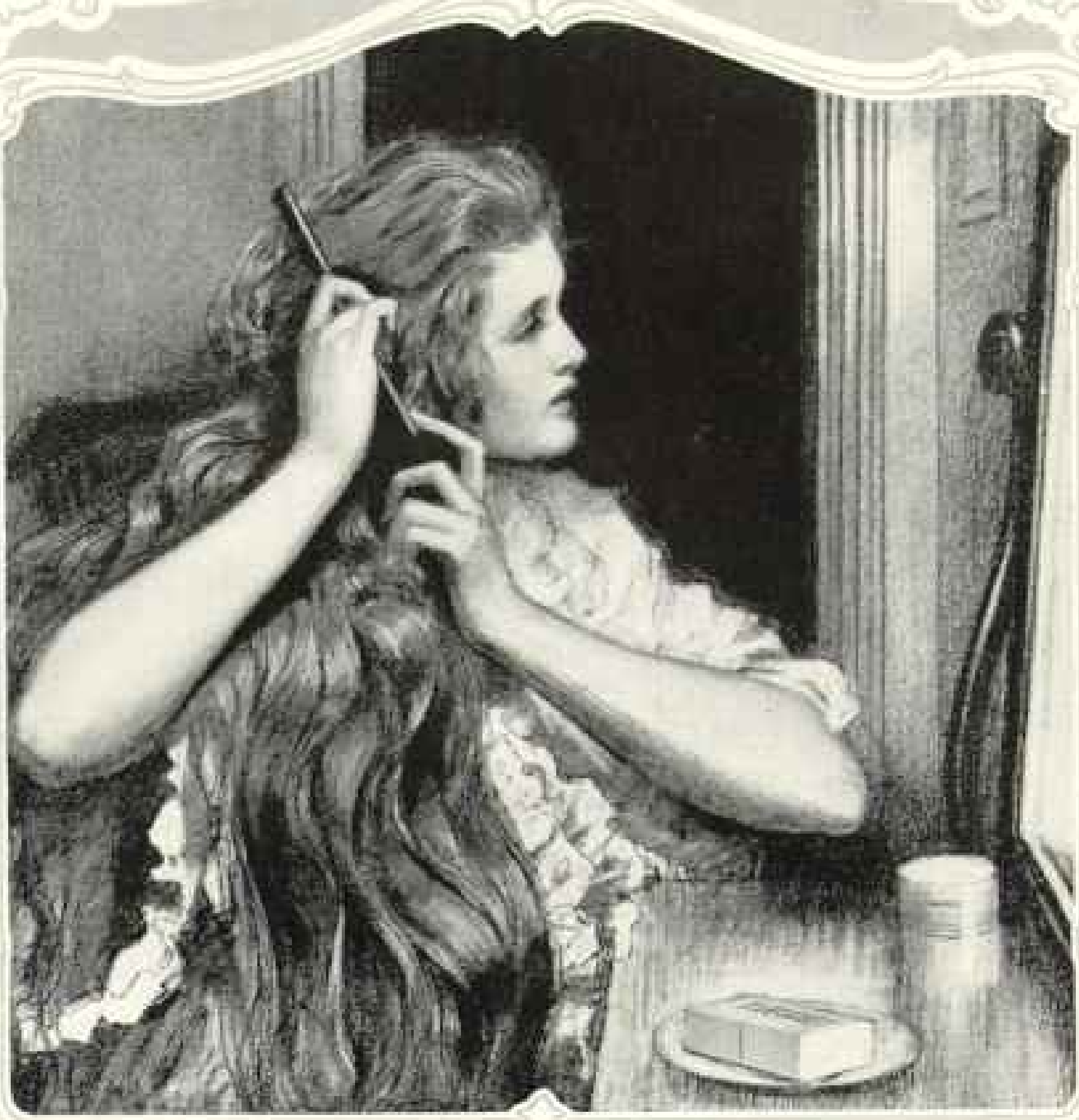
Established 1882  Incorporated

NEW YORK
150 Broadway

CHICAGO
Straus Building

Detroit  Minneapolis  San Francisco
Philadelphia  Kansas City  Dayton

36 years without loss to any investor





THE most beautiful hair is only softer, silkier and prettier after an Ivory shampoo, and it feels as good as it looks. Ivory makes the copious, bubbling, lasting kind of lather that can be rubbed into hair and scalp thoroughly. Then it rinses easily, leaving the hair clean in the strictest sense. And it is so mild and pure that it does not impair the color or health.

*Ivory Soap Shampoo*

Make a warm suds with Ivory Soap. Saturate hair and scalp. Rub the scalp with Ivory Soap paste (see recipe inside wrapper) and dip the suds over it. Rinse with spray or cup, gradually cooling the water. Dry by rubbing, in the sun if possible, but do not use strong heat.

IVORY SOAP. 

. 99 44/100 % PURE

VOL. XXXIII, No. 1 WASHINGTON JANUARY, 1918

THE NATIONAL GEOGRAPHIC MAGAZINE

# AMERICA'S PART IN THE ALLIES' MASTERY OF THE AIR

By Major Joseph Tulasne

Chief of the French Aviation Mission to America

THE summer of 1917 was marked by very spirited air battles for the supremacy of the air.

During those battles the losses of the Allies were great and those of our enemies still greater.

At the present time we are profiting by the lull which the winter rains have caused in air raids and are organizing large fleets of well-armed and well-equipped planes for the spring 1918.

The aërial program of the Allies is a mighty one; that of the enemies is just as mighty. Every one is convinced today of the importance of the supremacy of the air throughout 1918.

The American people have understood admirably the part which American aviation is to play in this gigantic struggle, and the enthusiasm of the American people and their determination to intervene in order to *blind* the army of the enemy has enabled Congress to pass an aviation bill calling for an appropriation of $640,000,000.

The officers in charge of the organization and development of American aviation and the business men who have spontaneously offered their services and business experience have done a great deal during the last six months. Aviation schools have sprung up all over the country. Several of them are at present working at full speed. Hundreds of pilots, full of dash, are being trained, and they are going about their work with the same zeal which they formerly displayed on the football field at college.

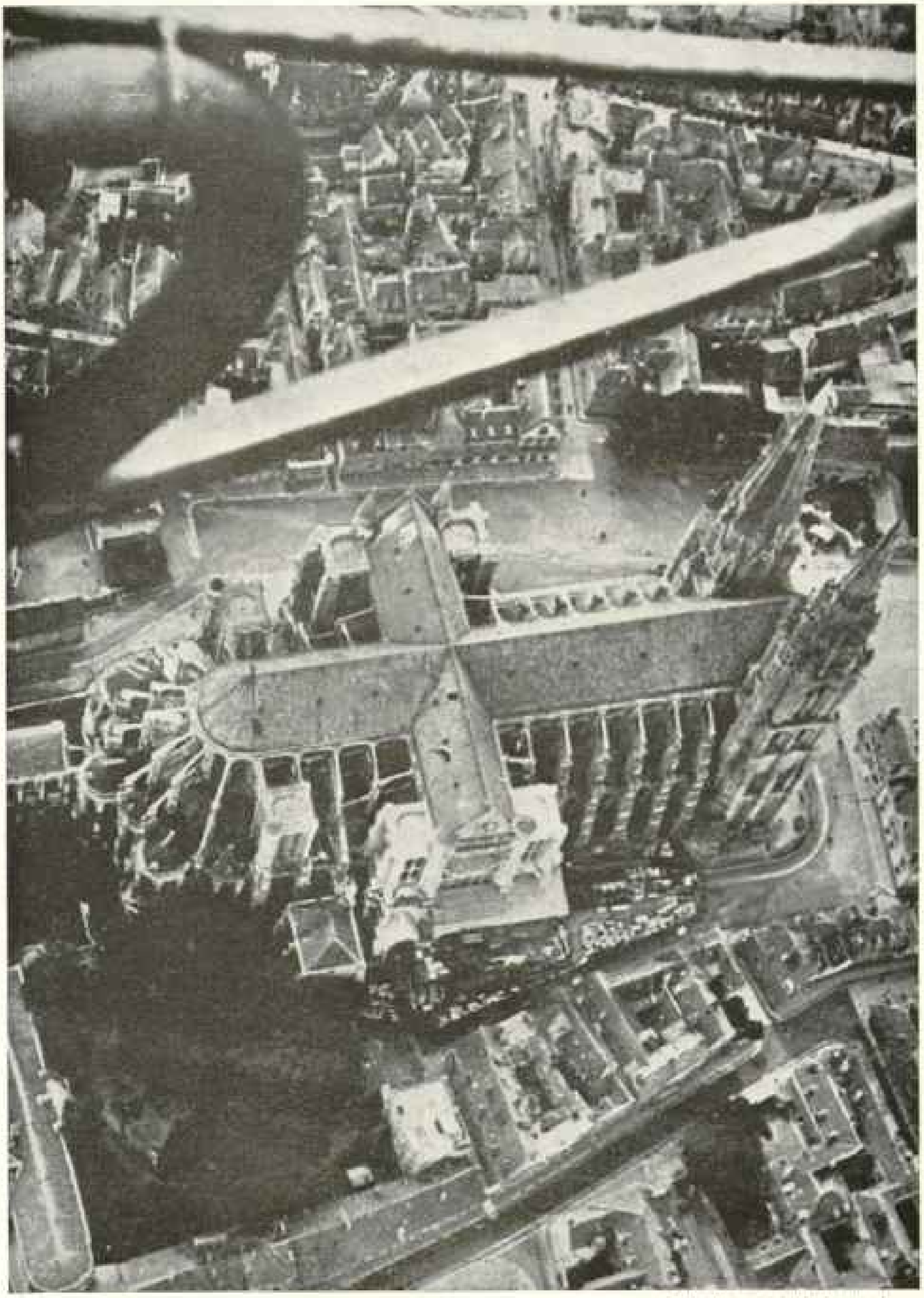
## ARRIVAL OF AMERICA'S AIR FLEET ANXIOUSLY AWAITED

American engineers have designed and constructed a powerful motor, and the workshops for motors and airplanes are fully organized for the task ahead of them; but if these machines are not ready in time, provisions have been made in France and other Allied countries to place the necessary airplanes at the disposal of American aviators, so that they will be able to take part in the air battles in the early spring of this year.

On the whole western front, extending from the North Sea to Switzerland, the arrival of the American air fleet is anxiously awaited. This fleet must consist of a mighty battle squadron and a mighty bombing squadron as well.

*The battle fleet* is the decisive element in securing and maintaining supremacy in the air. But the Allies must also have a large number of pursuit squadrons, efficiently armed and piloted by daring aviators.

The American fleet of battle planes will enable the Allies to secure the indisputable mastery of the air.



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AN AIRMAN'S VIEW OF THE FAMOUS "CROSS OF CHARTRES" CATHEDRAL

A unique picture of one of the most treasured ecclesiastical structures in France. Across the upper half of the photograph may be seen a part of the framework of the airplane from which the picture was made. Situated 50 miles southwest of Paris, this magnificent Gothic pile has not felt the ravaging hand of the Hun.

It it necessary that this air fleet should come at the earliest date possible to take its place in the struggle. *The supremacy of the air for 1918 will be decided during the first months of the spring.* At that stage of the war it will be absolutely necessary that the Allies rule the air. As was the case in the cavalry battles of the First Empire, the supremacy wrested from the enemy in the first encounters will hold for many months, and subsequent small reinforcements ordered into the struggle will not be able to regain that supremacy. The American air fleet must be at the front early this spring and in great numbers. It will be there if American industry turns out products quickly and on a large scale. Time saved will save human lives. If two squadrons of American battle planes could have been at Dunkirk in September, 1917, the French Aviation Service would not have suffered the irreparable loss of Captain Guynemer.

Since 1915 French aviators have been making bombardment raids. The raid upon Karlsruhe, in 1915, made by 20 bombing planes, thoroughly terrified the Germans. In that attack more than 200 persons were killed or wounded, and for many months this reprisal stopped German bombing of French towns.

### SHATTERING THE ENEMY'S MORALE BY AIR RAIDS

In 1917 bombardment of our defenseless towns by German planes began again. London and Dunkirk have suffered most.

Public opinion in America has been aroused against these bombardments. Reprisal bombardments have been suggested frequently and have been effected. Dresden and Frankfort have been visited by French planes. But the people of America must realize that it is more difficult for the Allies to carry out bombing expeditions than for the enemy. The same distance which will take the German machines over London and Paris will take the Allied machines over Belgian towns or French towns in the invaded territory, still quite far short of important German towns. It is thus clear that the problem of bombardment is a more difficult one for the Allies. And this is one reason why we should go at it with all our might. Only a person who has been in a town bombed by enemy planes, especially at night, can understand how panic-stricken the inhabitants become, and this increases the effect of the material destruction by shattering the morale of the people.

A systematic bombardment of open German cities, carried out relentlessly day and night without interruption, in answer to the bombardments the Germans have been carrying on for the last three years, in violation of all laws of warfare, would seriously affect the morale of the enemy.

The air campaign of 1918 will be decisive. A powerful bombing fleet, no less than a great battle fleet, is essential to success, and both should be ready for action in the spring.

By repeated raiding trips, day and night, this bombing fleet would contribute *immensely toward destroying the morale of the German people* and would hasten the end with an honorable peace.

### HOW TIME CAN BE SAVED

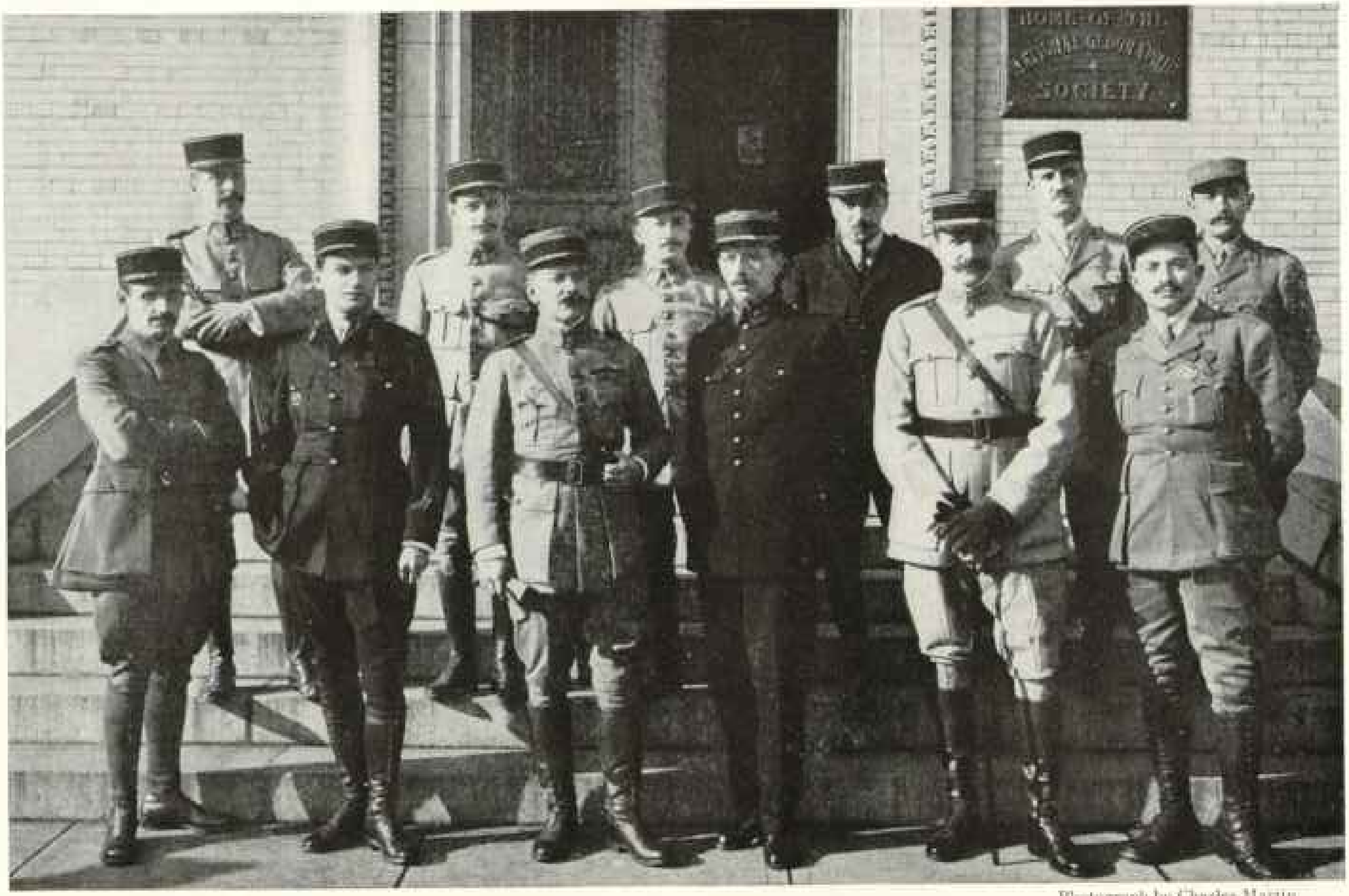
It is, therefore, necessary to put forth every effort to develop and speed up these two forces—a fleet of American battle planes and a fleet of American bombing planes. The thought of getting to France in time must stimulate the industrial population of America in the building of these air fleets, as well as the officers who have the enormous task of organizing this mighty fleet, of training the aviators, and arranging for the supplies.

How is it is possible to save time, and thereby to save human lives? This can be accomplished by spending money and applying to the creation of the American air fleet the wonderful industrial organization of the country, and, finally, by shipping the finished products fearlessly, by facing all risks.

### AMERICAN AIRPLANES IN FRANCE WILL HASTEN END OF WAR

The sooner American planes appear on the French front, the sooner the war will end, the more lives will be spared.

In Europe great numbers of airplanes and engines of the type now used at the front are being built and will be used this spring.




Photograph by Charles Martin

MEMBERS OF THE FRENCH AVIATION MISSION TO AMERICA

Front row, reading from left to right: Lieutenant Espanet, Captain De Berroeta, Major Tulasne (Commandant), Captain Lepere, Captain De Guiche, and Lieutenant Marmier. Second row: Lieutenant Sergent, Lieutenant Lapachet, Lieutenant Vidalie, Lieutenant Tabutean, Lieutenant Guerct.

In America the European types of airplanes and motors will be built, at first, to aid the English and French factories, in order that the Allies may have the largest possible number of battle planes at the earliest possible moment. Then the new airplanes, more powerful and better armed, will be built to be used during the summer of 1918.

The unlimited resources of American industry will make it possible to carry out these two building programs, first, to insure victory in the spring, which will soon be here; and, second, to provide for the future by building machines with the latest improvements.

The Allies are anxiously awaiting the aid of the American air fleet. If this fleet comes in time for the 1918 battle, it will be the deciding factor.

# ACES OF THE AIR

By Captain Jacques De Sieyes

Of the French Aviation Service

AVIATION is a game—an amazing game, a game of adventure, of countless thrills, of soul-stirring excitement, a game in which courage, daring, resource, determination, skill, and intelligence achieve honor in life or, if the fates so decree, glory in death.

To the pleasure of accomplishing one's duty is added that of reaping immortal rewards—perhaps the reputation of a Guynemer, of a Nungesser, of an Heurteaux—men whose names the whole world repeats and acclaims.

The duty is glorious. If an aviator can accomplish his task by sacrificing himself for others, death can be faced with equanimity. And American history is sufficiently rich in glorious examples of sacrifice, of devotion, of abnegation, to prove that the sons of heroes of the past will be just as brave as their forefathers and just as ready to die, if need be, for a worthy cause.

Indeed, Americans have already proved their valor in the Lafayette Escadrille, some of whose members have fallen, but which has continued to increase in numbers until now it is the richest in pilots of any squadron in France. I lived in the Somme with this squadron. One of my friends, Captain Thenault, commanded it.

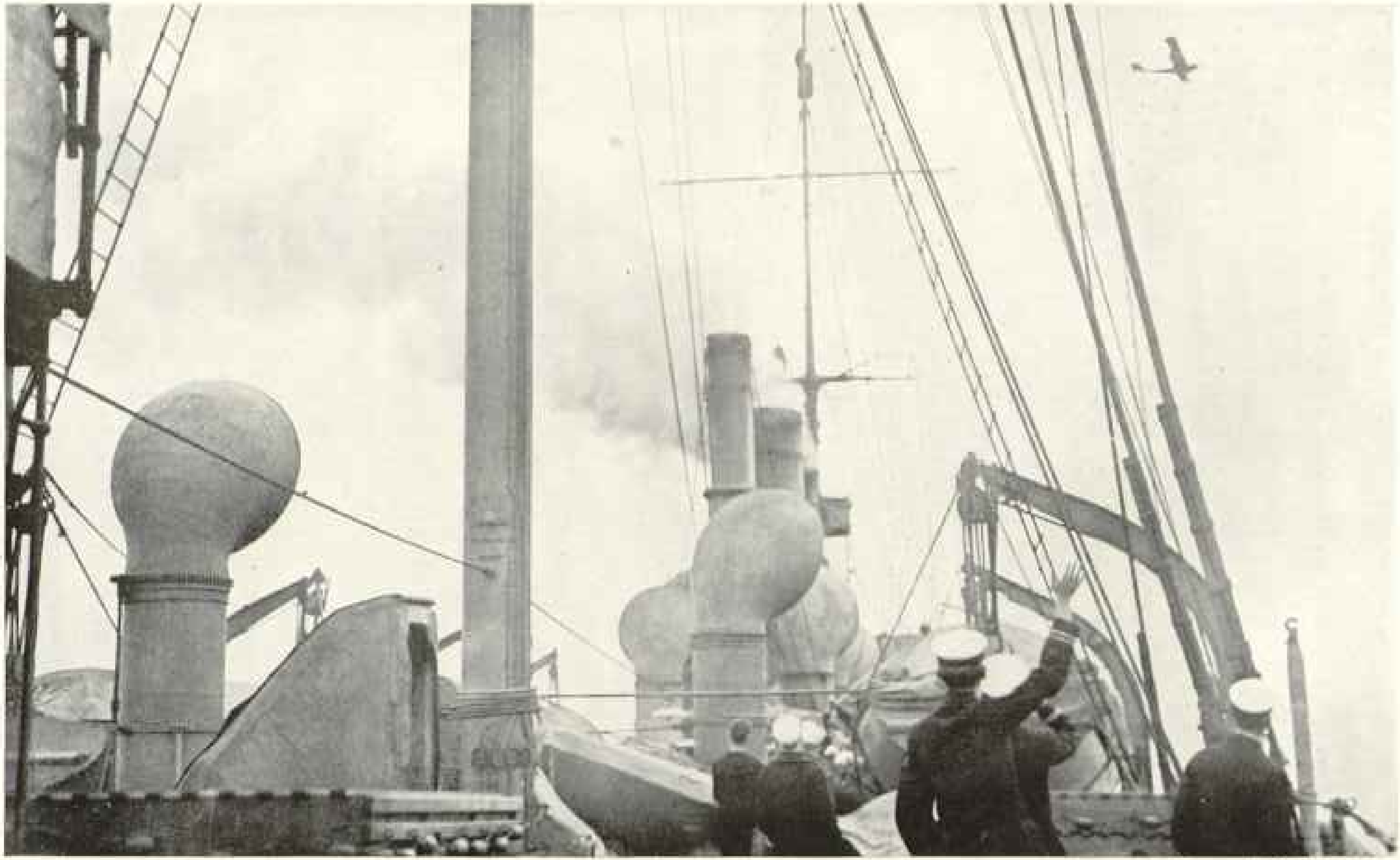
The Lafayette squadron is a squadron of pursuit, equipped with one-seater machines—swift, light, fast climbing, well armed, made to battle against enemy machines, to prevent their entering our lines and attacking our scouting machines while we are at work.

I had the good fortune to be in the aviation service at Verdun and on the Somme in 1916. These two operations, one defensive at first and the other offensive, resulted in the adoption by the aviation service of the organization now employed.

## Living in the Midst of Heroes

I was in the pursuit branch of aviation, living in the midst of heroes who have glorified French flying. I have witnessed in the air acts of legendary courage; have heard on the ground reports of fights that thrilled us with admiration. There was an extraordinary fever among aviators, each one realizing the importance of his rôle and wanting to do more than his duty, and the aviation corps was flying in all weathers—in wind, in storm, in the midst of or below the clouds, at less than 200 meters.

The watch in the sky was never relaxed. From our aviation field, where the group of squadrons of pursuit was stationed, a squadron of 12 machines left every two hours, to replace another on the front. If reinforcements were asked, others left. Lastly, at each attack, the sky was swept by the entire group of nine squadrons, and each day brought new satisfaction. Each day brought also a fresh harvest of heroic actions, bloody



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A UNIT OF THE FRENCH AVIATION SERVICE WELCOMES AN AMERICAN WARSHIP UPON ITS ARRIVAL SOMEWHERE IN FOREIGN WATERS

sacrifices. Each day aviation reaped new honor and new glory.

Once it is the Sergeant de Terline who bravely enters a combat with five enemy airplanes, and bringing down one, puts the rest to flight. He pursues them, is wounded, his machine-gun jammed. In rage, unwilling to let go his prey, he precipitates his more rapid plane into the plane that injured him and drags it in flames with him as he rushes to his death.

Another time it is two of my comrades, pilots who protect me as I take photographs. An enemy machine comes to attack me. Both hear the same voice, the voice of Duty; the two comrades hurl themselves upon the enemy with such force, so straight, that they collide and fall in flames to the ground. The enemy plane, seeing the two dive upon him so fiercely, flees without disturbing me. I cannot recall without the greatest emotion the death of these two friends in saving me.

### DARING ACHIEVEMENTS OF THE ACES OF AVIATION

Then again it is Nungesser, who climbs into his machine at 9 a. m., remains on the lines until 3 p. m., landing twice to take gasoline. In the meantime he has brought down an enemy balloon and two planes, one of which was getting the best of a British plane.

Or again it is Heurteaux who brings down a boche each fine day. I have heard that he was gravely wounded in Flanders a few weeks ago.

Then there are Thaw and Lufberry, the American "Aces," whose courage is a daily topic. And Tarascon, who, in spite of an artificial leg, brings down seven airplanes in three months.

And Captain Erard, an observer, who, in directing the firing of the cannons thus to protect the attacks of our infantry, flies so low above the lines that his plane constantly returns riddled with bullets. He ends finally by being hit, and falls, bloody, but smiling happily at death, in the midst of the infantrymen whom he has led to victory by sparing their lives.

Then there are five pursuit aviators who at each attack fire on the enemy, assembled for the counter-attack, and disperse them with heavy losses.

And Captain de Beauchamp, who bombards Essen at one time, Munich another time, passing from France to Italy. He has since fallen gloriously, a victim of a combat above Verdun.

Then there is Dorme, famous among us for his skill, who plays with German airplanes as with flies. But he loses one day at this dangerous game, and in a struggle with the enemy in superior numbers receives his death blow and falls in the German lines.

### THE GREAT GUYNEMER

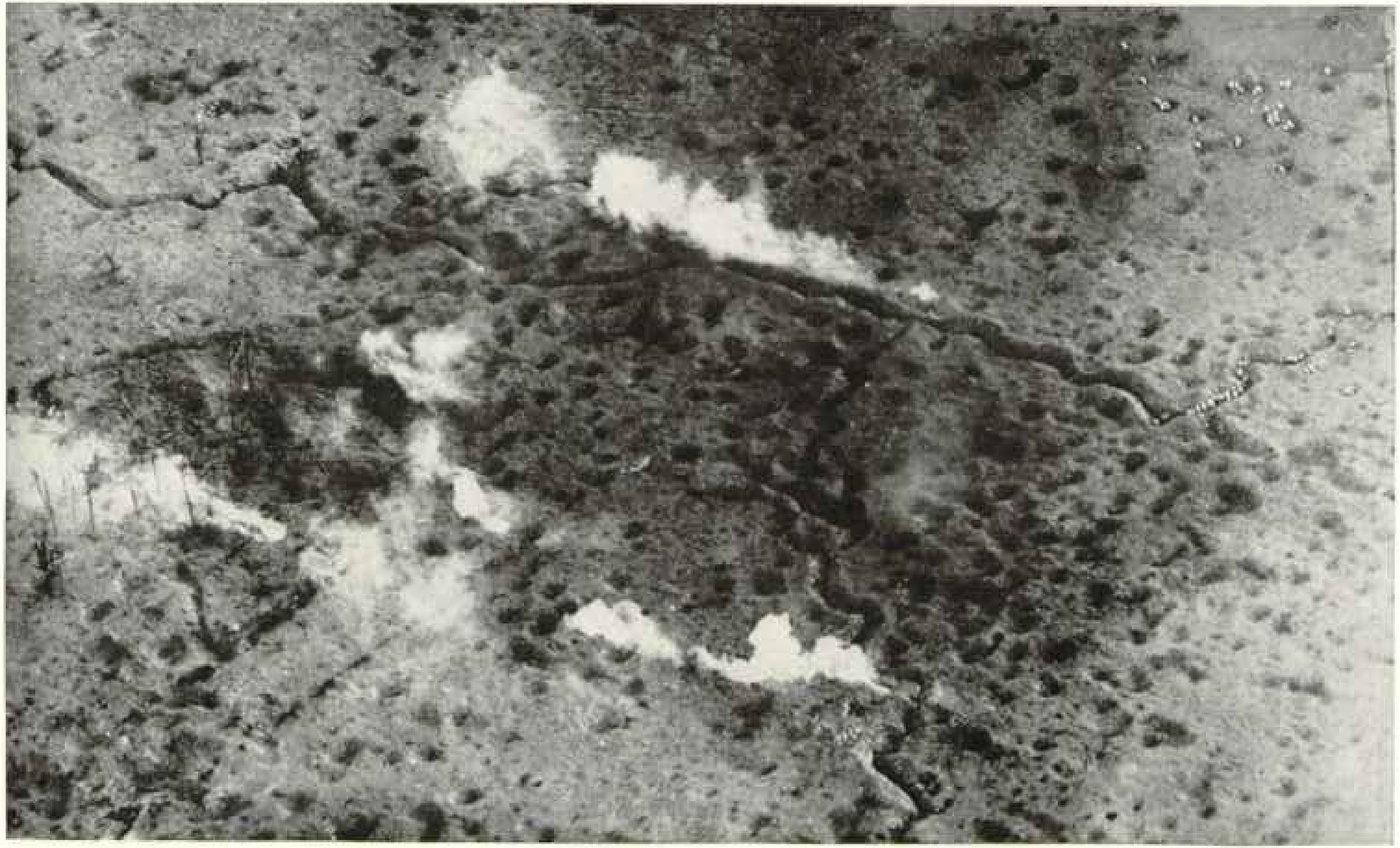
Fallen also is Guynemer, fallen from the sky of glory where he has written his deeds in letters of fire—Guynemer, whose name is on every lip—a pure jewel of valor and sacrifice.

"Fifty-four airplanes, 215 combats, 2 wounds."

That is his last citation before dying. It is quite sufficient to remind you of the whole story of that gallant air champion of liberty.

I have lived near him. I have known his intrepidity, his tenacity, his fascination. Duty of combat was for him a religion. He had an iron will. His presence alone so electrified his comrades that the squadron to which he belonged produced more aces than any other. He was upright as a sword, pure as a diamond, and utterly absorbed in the struggle which he carried on to the detriment of a constitution already frail. This mere child, who was yet more than a man, succeeded in bringing down three enemy airplanes in less than an hour. Chiefs and comrades spoke to him always with respect. He was of a finer essence than ourselves, inspired with a sacred fire which passed our understanding; convinced that he could not always be victorious, having already found himself several times in awkward positions, twice wounded, he kept at it furiously, never refusing combat, rather seeking it. Incapable of retreat, he fought in spite of everything, at any time, with any one, with any number, with 10, with 20, only abandoning the fight when wounded, without ammunition, or without gasoline.

Guynemer fell in the midst of 40 enemy airplanes, of which he had brought down one; one arm was broken, a ball in his



VIEW OF A FRENCH ATTACK FROM AN OBSERVATION AIRPLANE WHOSE RADIOTELEGRAPHY IS DIRECTING THE SUPPORTING ARTILLERY FIRE: ONE OF THE MOST REMARKABLE AËRIAL PHOTOGRAPHS OF THE WAR

In the upper right-hand corner may be seen the French infantrymen taking advantage of the protection offered by shell craters from enemy machine-gun fire. A little below may be seen the attackers in a trench. The white puffs of smoke indicate the activities of the French hand-grenade "trench-cleaners," whose duty it is to bomb the German dugouts after a successful advance. The soldiers belonging to the French infantry attacking corps wear white placards on their backs, so that they may be recognized readily by airmen whose duty it is to keep the artillerists posted so as to have the curtain of fire always a little in advance of their men.

head, and a smile on his lips. No words in any language can convey a just appreciation of his valor or his sacrifice.

In France they have given his mortal remains the place reserved for the great men whose names are the honor of our country—the Pantheon. At least, there they will rest when we shall have snatched away from the Huns the little churchyard of Poelscapelle, where they were buried respectfully.

But Guynemer is not out of the struggle for us. He is a star in the sky. Many stars will come to aviation, more numerous yet, lured by its gleam. Go over there—you shall see that star, and feel its lure, and desire to fly up to it. There is no child in France who does not lisp Guynemer's name; no boy who does not want to follow where he led; no soldier, no chief, who does not have before his eyes the example of that youth who overtopped them all. The path he traced is straight and true. He followed the way of honor.

### THE AUTHOR'S OWN EXPERIENCE

I am reluctant to write of my own case, but I ask your permission to do so in order to show you what a fascination aviation has for one.

Officer by profession, I was interested in flying before the war, but only a few months before. Not being sufficiently trained when the war broke out, I had to go back to my infantry regiment on the eastern frontier.

On the 22d of September, 1914, both my arms were broken in a combat. As soon as I reached the hospital, I put in a request to enter the air service if possible. My request was refused; there was too great a need for infantry officers. So, when my arms were well again, I returned to my regiment at the front. In January, 1915, my foot was blown off by a shell; they cut off my leg and they cured me. They gave me an articulated leg. Not wanting to be discharged, I again put in a plea to join the aviation service, and after a great many formalities was allowed to become an observer. In a combat at Verdun our machine was riddled with bullets and was obliged to hobble back to our lines. A bullet had carried off two fingers of my right hand.

I joined my squadron again in the Somme after six months of illness in a hospital. I remained there five months, with the good fortune not to be wounded, happy to be able to serve once more. It was not the result of a wound, but of illness and weakness after nine operations in two years, that I was again sent away from the front.

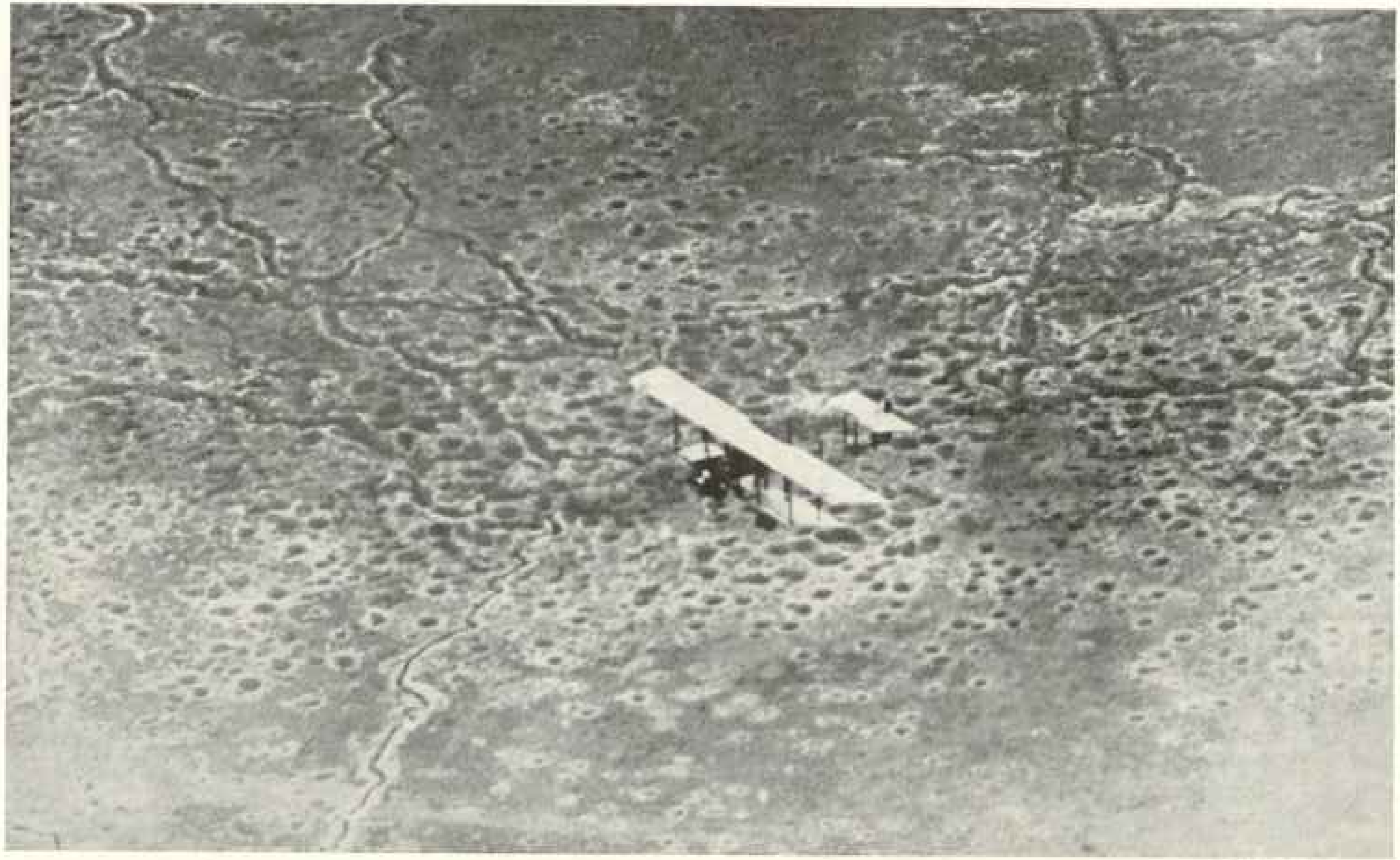
In my assignment to duty in America I would like to think that I have not wasted my time here, and if I have been able to persuade some of my comrades in arms to become aviators my work will not have been in vain.

# FLYING IN FRANCE

By Captain André de Berroeta
Of the French Aviation Service

THE SEVERAL thousand miles which separate the United States from the European battlefields render the conception of a modern battle very difficult for an American.

Moreover, such a rapid transformation in the instruments of war and in the methods of employing the different branches of the army has marked the period during which military operations have been maintained that even one who has witnessed the obstinate struggle throughout these three years has difficulty in following all the details of its mechanical evolution. The transformation has taken place more particularly on the French front, where the operations have reached an intensity unsurpassed elsewhere. The Marne, Verdun, the Somme, the Aisne have been so many



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FRENCH AIRPLANE WITH OBSERVERS FLYING OVER A NETWORK OF TRENCHES: PHOTOGRAPH TAKEN FROM A HIGHER AIRPLANE

Photograph-reading has become one of the highly specialized military professions of this war. The experienced observer, not the observer in the airplane, but the man who takes the camera products of the airman's flight and deciphers the changes in the enemy's trenches since the photograph made yesterday or last week, is invaluable at headquarters. To him a shadow may mean the installation of a new battery, a scarcely observable hair-like line the erection of formidable new barbed wire entanglements.

Photograph by International Film Service.

AT THE THROTTLE ON BOARD A FRENCH AIR CRUISER: BELOW IS A DESTROYER UNDER WAY

Airships are more useful for sea-patrol work than they are over land, as the Germans have discovered to their cost. Near the coast they guard channels or detect mines and act in concert with warships against enemy U-boats. French dirigibles are fitted with at least two motors, strong and light, which give them great speed and their petrol supply insures them an extensive range of action.

diabolical furnaces in which were forged new implements of war and the powerful modern armaments.

The preparation, conduct, and results of an offensive military operation today bear but a faint resemblance to those of a battle at the opening of hostilities.

The extraordinarily effective application of aircraft to the uses of war has greatly accelerated this radical transformation. Today aviation reigns supreme over the field of battle, controlling the faintest pulsations of the great volcano.

The object of the present discussion is to trace the various phases of its evolution and, although it would be particularly bold to prophesy in the matter of military operations, to suggest the decisive influence for victory that the entrance of the American squadrons on the French front may have.

There are, at the present time, three branches of aviation which differ in the duties performed, in the machines used, and in the armament provided.

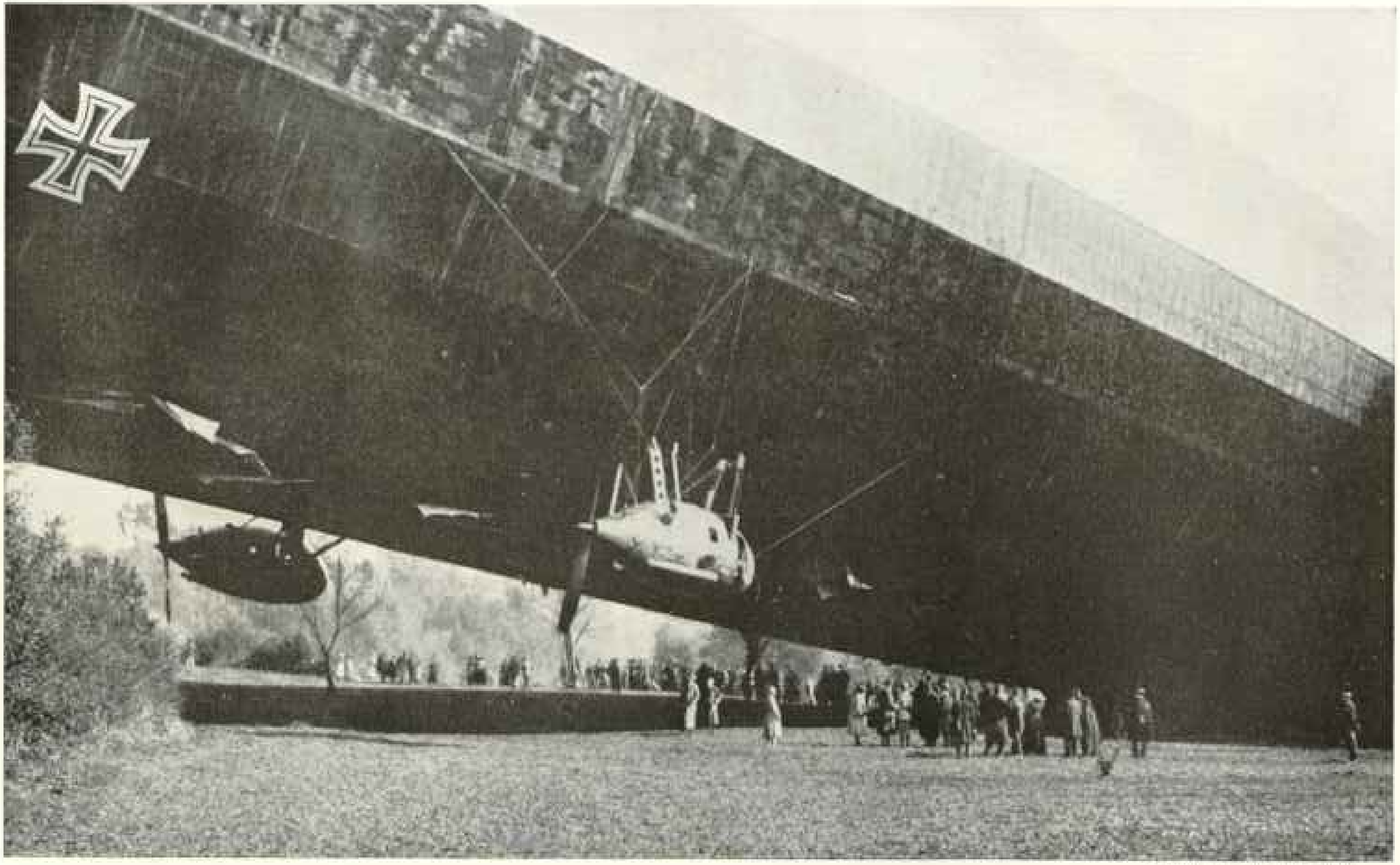
These are:

1. The Divisional or Reconnaissance Aviation, a valuable ally of the staff it serves, of the batteries whose firing it directs, of the infantry it assists in leading during the battle.

2. The Aviation of Combat, younger sister of the first and the most faithful ally she has for her protection from the aggressions of hostile airplanes. "Attack the boche, down him, or compel him to flee," is its clearly offensive motto.

3. The Aviation of Bombardment, hitherto chiefly employed in reprisals for the aërial raids of the enemy, but now called to a much greater and perhaps a decisive rôle.

Although essentially distinct, these three branches of aviation can only be effec-



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A GIANT VANDAL OF THE SKY WHOSE WINGS HAVE BEEN CLIPPED BY FRENCH AVIATORS

This mammoth Zeppelin, more than 472 feet long, was returning from its maiden voyage over London, where it had been murdering women and children. It was attacked by French airmen and brought to earth near Bourbonne les Bains. The two motors, with their propellers, suspended at the right and left of the body or hull of the airship, resemble nothing so much as two great ocarinas.

tively employed by the constant coördination of their efforts.

Let us consider the conditions and influences attending their birth and development and the rôles they are to play in the battles of tomorrow, in which your sons and brothers are to participate.

When the war was declared the chief strength of the French and German armies lay in the masses of their infantry, in the power of their artillery, and in the skill of their cavalry. However, it seemed the part of wisdom to put the few hundred airplanes we possessed at the service of the fighting forces, in order to facilitate the success of their undertakings. The offensive strength of both the French and German squadrons was very small in comparison with the millions of combatants ready to clash with each other, supported by the fire of several thousand cannon.

But these airplanes possessed the power of exploring the field of battle to an extent far beyond that of the cavalry, for which this delicate and dangerous duty had hitherto been reserved. To them, accordingly, from the beginning of the war, was intrusted the observation of the movements of the hostile armies.

During the whole period, termed the "War of Movement," that is to say, until the battle of the Marne, the French commanders were kept promptly informed of the movements of the German forces, thanks to the daring reconnaissances of our pilots, who, accompanied by staff officers, made flights far within the lines of the enemy and at a low altitude, in the rear of the hostile forces. The Aviation of Reconnaissance was thus created during the first days of hostilities.

### AIR SERVICE DEVELOPMENT

The number of aircraft in use was so small that a hostile airplane was rarely encountered in the course of these reconnoitering expeditions. If adversaries did chance to meet, all the pilots could do was to shake their fists at each other or discharge their revolvers without the slightest chance of hitting. It was, however, from these gestures that aërial combat took its birth, the history of which will remain as one of the most brilliant epics of the present war.

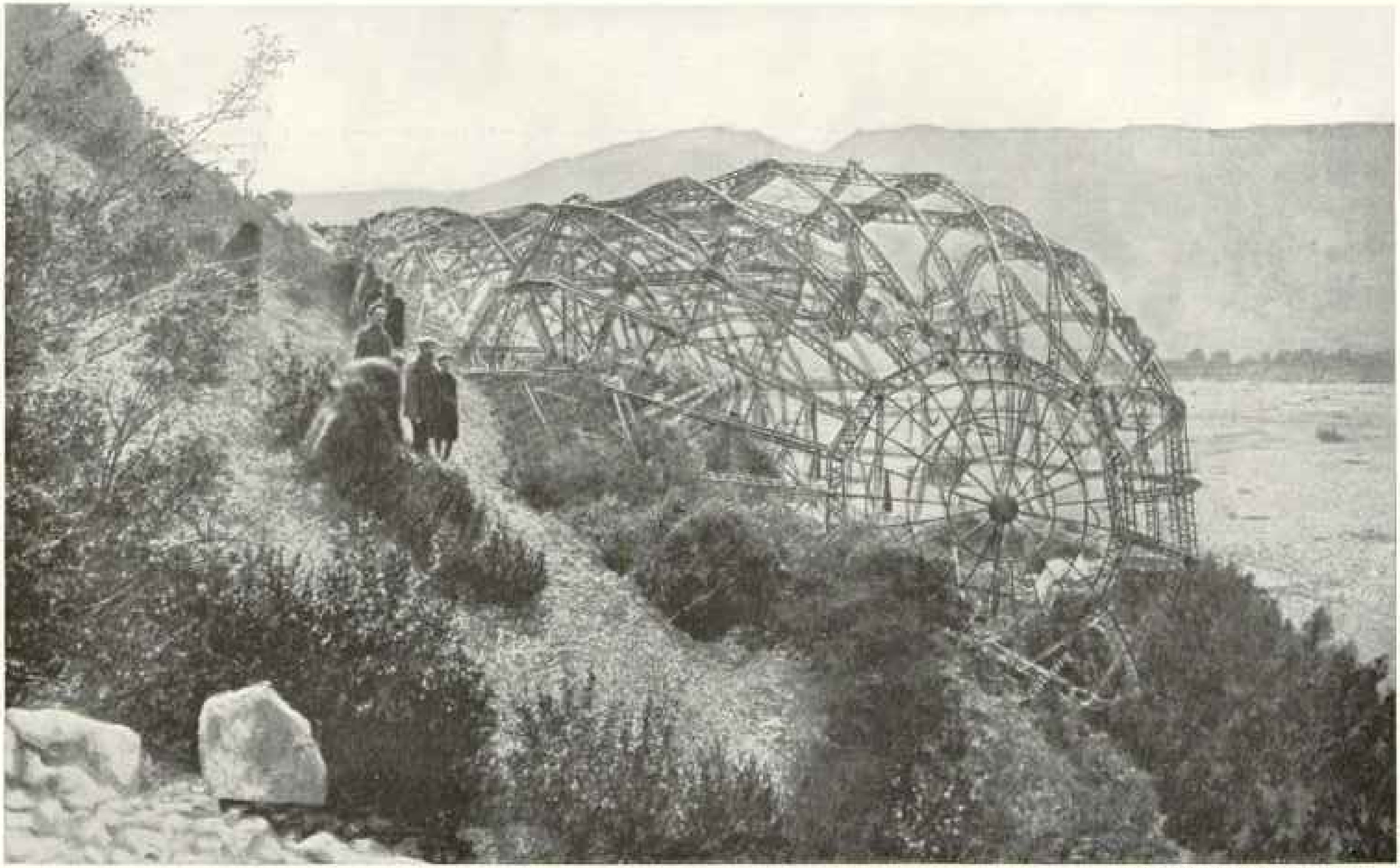
Taking advantage of their excursions within the lines of the enemy, the pilots carried with them a few artillery projectiles which they dropped on hostile assemblages, camps, or columns. Such was the beginning of aërial bombardment, which, at that epoch, was left to the initiative of each pilot. The bombs were thrown without aiming, over the edge of the cockpit, and it was counted a lucky shot when the projectile hit the intended target. Moreover, the airplanes of this period were not capable of carrying heavy loads; so that the pilots, as a rule, had to be satisfied with small steel arrows, which they dropped upon the enemy wherever they found them assembled in large groups.

This is, in brief, the history of aviation. It is evident that the general law governing the development of all technic must apply to the development of aviation, and that the aviators must specialize as observers, as fighters, and as bomb-droppers. If this organization had been effected in time of peace, it would doubtless on the outbreak of war have been immediately introduced at the front in all its forms; but, as I have told you, it is the experience of war that has made aviation what it is today, and only on the field of battle that it has been possible to develop the organization of military aëronautics.

There was no time to lose in France, nor in Germany. Before all else the aviation of reconnaissance was organized. The Marne had exhausted the contending armies. The ammunition had been recklessly expended during this decisive battle, which saved the world from the German yoke. Each army clung to its positions, while strengthening them with works of fortification.

Trenches, dugouts, block-houses, and barbed-wire entanglements—everything that pertained to stationary warfare made its appearance, transforming the field of battle in a few weeks into an immense work yard, where every one disappeared behind natural defenses or improvised earthworks. Several million men buried themselves like moles.

The artillery, profiting by this respite, was able to find positions concealed from the view of hostile observers. Soon the



Photograph by Paul Thompson

THE TWISTED, TANGLED REMAINS OF THE L-45 A FEW MOMENTS AFTER IT WAS FORCED TO DESCEND AT MISON, IN SOUTHERN FRANCE

This Zeppelin was destroyed by one of its own navigators after it had been brought to the ground. The 17 members of the crew were made prisoners, but not before incendiary bullets from a German revolver had accomplished the work of demolition.

field of battle gave to every one the terrible sensation of being spied upon by an adversary who inflicted blows from an invisible source.

### ARTILLERISTS APPEALED TO AVIATORS

Artillery ammunition being particularly scarce, it was important to fire only on reliable information and at objectives known to be actually occupied by the enemy. Under these conditions the artillery quite naturally appealed to the aviators, who, on account of the immobility of the armies, were now less absorbed in distant reconnoitering expeditions.

Our brave pilots, who during the beginning of hostilities had been carrying the staff officers, now placed themselves at the disposal of the artillery officers, who set out to discover the hostile objectives by watching the regions of battery emplacements. The observation officer recorded on his map the position of the batteries that had been surprised in action during the course of his flight. The landing was made on some field in the immediate vicinity of the French batteries, which, being informed in regard to the position of the enemy, opened fire in most cases according to the map—that is to say, without observation of the hits.

But it would have resulted in a far greater efficiency had the aviator, after discovering the objective, remained in the air to observe the firing and report to the battery the errors of its shots. This is the problem of adjusting battery fire by aërial observation (spotting), to the solution of which the artillery officers and aviators are assiduously devoting themselves.

One of the first methods had for its basis the dropping of signal lights. Then the aviator made use of certain evolutions of his machine, indulging in performances almost acrobatic to announce the results of the shots. This crude method was soon supplemented by the use of radiotelegraphy. France enjoys the distinction of having been the first to make use of radiotelegraphy on its airplanes.

The enthusiasm evoked by the success of these first spottings was only surpassed by the chagrin of our enemies, who were subjected to an accurate and murderous fire from our batteries, while an airplane with the tricolored cockade was performing graceful evolutions over their heads. It is only fair to add that within two months after our first trials the Germans had furnished their airplanes with radio apparatus, so that we were able to verify, at our own expense, the advantages of this new method of directing artillery fire.

But for every new weapon there is a corresponding defense, and for protection against the incursions of hostile airplanes they are attacked by airplanes armed with machine-guns, are fired upon from the ground with special guns, and certain curious stratagems are employed which may be briefly described.

### FAKE BATTERIES TO DECEIVE SCOUT PLANES

For the purpose of deceiving scout planes in quest of targets, false battery emplacements have been prepared and provided with wooden guns. Seen from above 4,500 feet, their appearance is the same as that of the real batteries of which they are a faithful copy. To complete the illusion, as soon as a hostile plane passes through the lines, the real batteries stop firing, while the false ones are illuminated by suitable artificial flashes, giving the appearance of a battery in action. This deception is often very difficult to detect. Both French and German gunners have often fired at wooden batteries, while an airplane perseveringly spotted the firing.

These false batteries and the artificial activity given them in the eyes of the aviators could deceive only for a time, because the aviators were not satisfied with simply observing them, but took photographs of the field and were thus enabled to study in detail, far from the excitement of the front lines, the changes which the defensive works of the enemy underwent from week to week.

By a careful study of these pictures they learned to interpret them and thus gave birth to a new branch of military art, that of the interpretation of aërial photographs. Without entering into the details of this fruitful and fascinating study, you can readily understand that by means of lenses with a sufficiently long focus an accurate image of the field can be obtained, and that certain indications on the photographs distinguish the real batteries from the fictitious.

Moreover, the comparison of successive photographs of a given region permits the detection, with practical certainty, of the intentions of the enemy. If he is about to attack, the photographs reveal the bringing up of new pieces of artillery, of ammunition, and even of troops, whose movements widen the trails; they show the creation of new roads, the building of field hospitals, and the enlarging of railway stations near the attacking front.

If, on the contrary, the enemy is about to withdraw, the photographs show the new fortified positions he expects to hold at the time of his retreat and the destruction of railroads and highways, which are the prelude of a retirement. It has truly been said that each adversary inscribes upon the field his plan of operations. It is therefore to the reading of this inscription, as one of their permanent and fundamental tasks, that the scout aviators are called.

In a word, the scout aviators who are at the height of their efficiency never fail to snatch from the enemy the secret of his operations. They no longer permit surprise attacks, which are the most to be feared of all the hazards of war.

Furthermore, they are not limited to the execution of this difficult program. Not content with unveiling the plans of the enemy by the thoroughness of their investigations, and with assisting the artillery in adjusting the firing on the trenches, fortifications, and batteries of the enemy, they render their most effective service during the progress of the attack itself, which they direct and control while allowing it a logical development.

## THE FORMIDABLE TASK OF THE SCOUT PLANES

I shall try to give you a very brief glimpse of the formidable task performed by the scout planes during the preparatory phase of a battle and during the critical phase of the battle itself. The time has passed when one could make an improvised attack upon the enemy, relying simply upon superior numbers and the morale of the attacking troops to gain the victory.

To search out, in all their details, the defensive works of the enemy (barbed-wire entanglements, trenches, block-houses), the position of all his batteries; to locate the trails, railways, munition and supply depots, and headquarters of the commanders; such is the work to be performed by the scout planes before every offensive operation.

To direct the firing of all the artillery, whose task is to destroy the barbed-wire entanglements and the trenches; to bombard the batteries and destroy the larger part of them, to set on fire the munition depots within its range, to prevent or render perilous any passing along the roads and railways, to delay traffic in the supporting railway stations, to control the destruction of objectives and the efficacy of long-range firing; such are the principal tasks of the scout planes during the preparatory period of an attack.

Moreover, they assume the enormous responsibility of the faithful execution of this program, which is carried out entirely through the intermediation of their eyes.

## VITAL REPORTS OF BATTLE'S PROGRESS SENT BY RADIO

Finally, on the day of attack, it is they who, flying at a low altitude over the assaulting waves of the infantry, signal its progress to the superior command; it is they who discover the active batteries and reduce them to silence by causing them to come under destructive fire; it is they who cause the dispersion of wagon trains and troop columns venturing along the roads and trains near the battlefield; it is they who watch for the possible launching of a counter-attack, always to be feared, and which they must announce at the right moment to the infantry and to the commander in charge.

Thanks to the promptness of their reports, sent by radio, the commander is enabled to make his authority felt during the progress of the operation. When, in the midst of the hazards of battle, the energies of the combatants become scattered, causing confusion and disorder, the scout planes, by the accuracy of their reports, permit the harmonizing and coördinating of effort necessary to the final victory.

To describe the airplanes used in scouting, the details of their armament and the devices with which they are equipped,

© International Film Service

FUR-MUFFLERED AND GLOVED, A FRENCH AËRONAUT PREPARED FOR A LONG STAY IN THE AIR TO OBSERVE THE ENEMY'S OPERATIONS

This photograph was made from a new type of observation balloon which carries two baskets. The second basket, accommodating the photographer, hangs very near the one shown in the picture.


Photograph from French Aviation Mission

THE FRENCH VILLAGE OF VARENNES FROM A HEIGHT OF 7,800 FEET

The airplane from which this beautiful bird's-eye photograph was made was flying above the clouds, which veil a portion of the town, only a few miles from Verdun. The observer's record (at the top of the picture) shows that it was made at 10:45 on the morning of May 24, 1917, at an elevation of 2,400 meters.

would carry me beyond the limits of my space. Evidently it is the observer who must have charge of the mission of reconnaissance, of photography, of artillery adjustment, or of infantry communications; but he is greatly assisted by the pilot, whose skill and decision contribute in no small measure to the successful accomplishment of the aërial task.

This, then, is a brief sketch of the immense task of the scout aviators. You can understand why both France and Germany first organized this class, so indispensable for conducting land operations, offensive as well as defensive.

Do not think that the task of the second kind of aviation, *that of combat*, is any less important or any easier. I said that the aviation of combat was the younger sister of reconnaissance aviation and her faithful ally. This is true, for she was born after the latter had attained considerable importance, and grew up at her side, her principal mission being the protection of her elder sister from the attacks of the enemy.

### THE TACTICS OF FIGHTING PLANES

I will explain in a few words the methods of the pursuit or fighting planes and the special duties which the aviators of the pursuit squadrons have to perform. To understand the tactics of our machines you must be acquainted with the methods of the enemy—that is, with the formation adopted by the Germans for the execution of their work.

In normal times the German planes are disposed in three stories, the most elevated being also the farthest from the front.

1. The spotting and infantry planes, at a height of about 3,500 feet and at least half a mile from the front. These are protected by:

2. A defense (barrage) of two-seaters, at a height of about 9,000 feet and from two to three miles within their lines.

3. Lastly by the "Aces," who, utilizing the best single-seat and a few two-seat planes, hold themselves at a height of about 12,000 feet, between three and four miles back of their lines.

In periods of crisis, when an attack is believed imminent, or when photographs are to be taken within our lines, the Germans launch large groups of machines over the affected points. In particular, reconnaissance missions are executed at heights of 13,500 to 15,500 feet.

To this rigid and defensive arrangement we oppose a war of *movement* by the employment of *offensive cruisers*, terraced like the enemy's machines, which it is their duty to attack.

Our fighting machines are at present swift single-seaters, flying from 125 to 140 miles per hour, each armed with one or two machine-guns, rigidly fastened to the airplane and capable of shooting only in the direction of the axis of the machine, not pivoted like the guns on war vessels.

The pilot must therefore fly straight at the enemy in order to be able to fire at him. He must be skillful in aiming and steering at the same time, so that at the moment for firing the hostile plane will be in the sighting line of his machine-gun. I leave you to imagine the skill required to attain this result, when one attacks an enemy flying at an average velocity of 125 miles per hour, with his own machine going at an equal or greater speed.

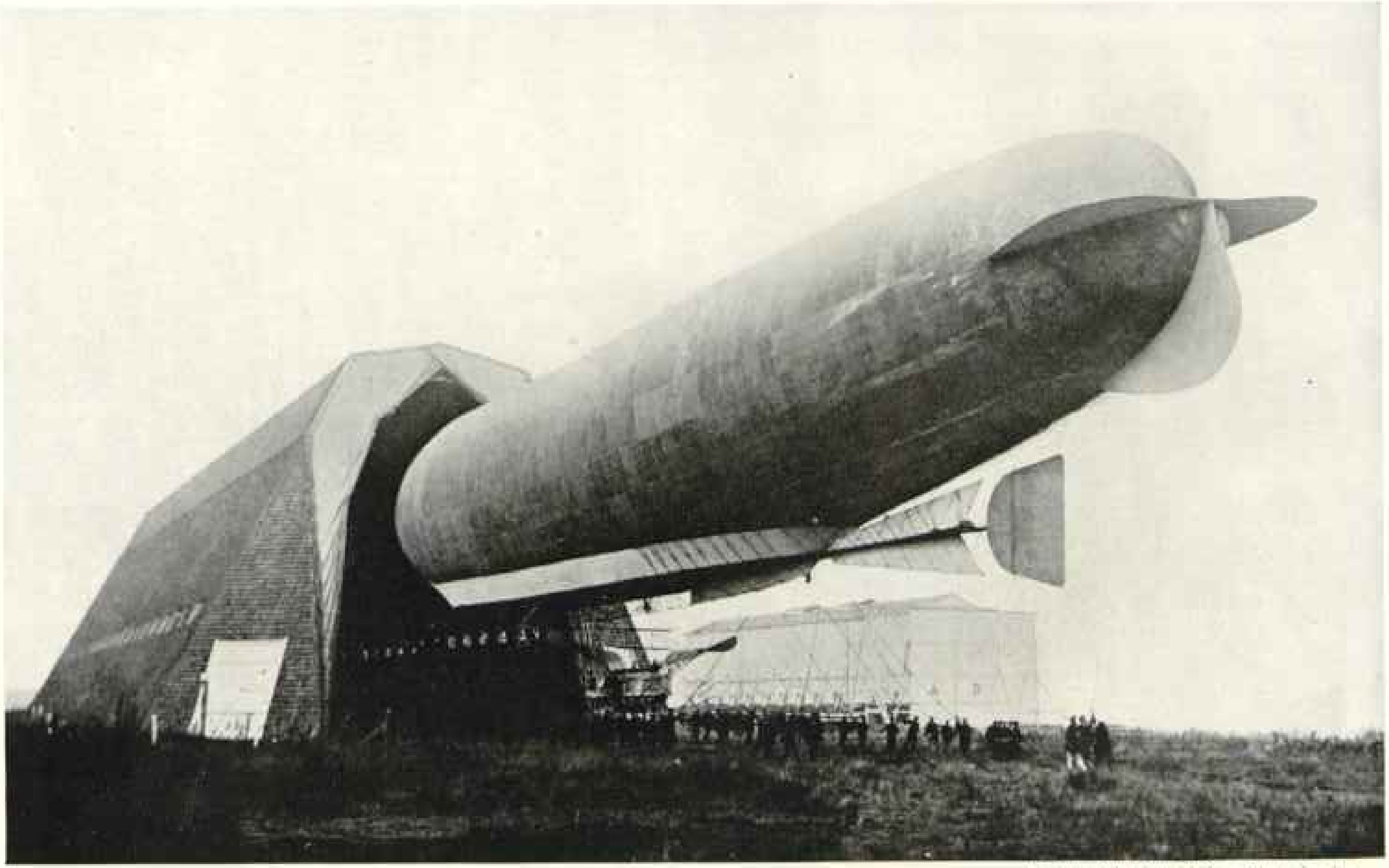
### THE VARIOUS MODES OF ATTACK

The following are the principal cases of attack for fighting planes:

1. *The attack by an isolated single-seater on a single-seater, likewise isolated.*—This is the easiest case. Above all, the effect of surprise is sought, either by taking advantage of fog, or by getting between the sun and the adversary, or getting vertically over him, where he cannot see you. Having made a successful approach, you must get into a good firing position—a short distance below and behind your adversary, while avoiding the wind from his propeller.

To accomplish this, each pilot uses his individual methods, which vary in each particular case. One of the common maneuvers consists in diving from a sufficient distance to about 300 feet behind the adversary, dropping about 60 feet lower and coming into position for firing by an upward dash.

If the enemy has suspected nothing, it is "assassination."



Photograph by Central News Photo Service

A FRENCH DIRIGIBLE ENTERING ITS HANGAR

Except in rare instances, and then only in reprisal for German attacks upon unfortified cities like London, the French and British have not indulged in airship raids upon enemy population centers behind the battle line. But when they have launched their bombs, as at Dusseldorf, the damage inflicted has been enormous.

If he has seen you, he either flees or accepts combat.

If he flees, fire after him.

If he accepts battle, each adversary maneuvers to keep the upper position in the air in order to be able to drop suddenly behind and below the other. It is a question of skill and quickness of eye. After a few passes, one of the two gets the upper hand. When the boche feels himself beaten, he usually tries to escape by diving. If he dives in a straight line, keep firing at him, as at a target. If he zigzags, you must keep close behind him, tacking every time he does. His only salvation then lies in the tail-spin or in turning over on the wing.

Often the single-seaters prefer to operate in pairs. In this case they either both attack at the same time, in order to divide the attention of the German; or one attacks above, while the other guards the rear of the attacking machine.

2. *Attack on a two-seater by a single-seater.* To effect a surprise is always a first consideration. The importance of the attacking position is greatly increased by the presence, on the hostile plane, of a machine-gun operated by the observer and often covering a large field. Before all, one must never get into the three-quarters position—rear, below, nor especially above—for he would certainly receive some bullets.

*The best position is either in front and a little below*, or *under the tail*. If he is coming from three-quarters front, on the same level, he opens fire at about ninety feet, and if the boche veers to give the field to his observer, he takes advantage of this move to get under his tail.

3. *Attack on a hostile group by a single-seater.*—The object of the first maneuver is to isolate one of the airplanes, so as to attack it separately. He drops into the midst of the group while keeping a little above and firing at all his adversaries, so as to force them to maneuver. It is seldom that one of the enemy, in his excitement, does not detach himself by turning to the right, while the others turn to the left. It is upon the former that our fighter precipitates himself.

4. *Battle of a group of single-seaters against a hostile group.*—The group, consisting of four or five machines, holds itself at a high altitude. The V formation of flying is adopted. The leader flies at the point of the V, the others being terraced behind him. The planes leave about 450 feet between them, in terraces, the leader being the lowest.

The Germans fly likewise in V formation or single file, in steps; but, with them, the last plane is the lowest, the leader being the highest.

This results in the following form of attack. The French leader announces that he is about to attack, by balancing twice, and dives at the last German plane, which is the lowest. The other boches make a half-turn and fall upon him. The remaining Frenchmen then attack them, with all the trumps in their own hands, the one uppermost in the air having the initial advantage.

### DESTROYING GERMAN KITE BALLOONS

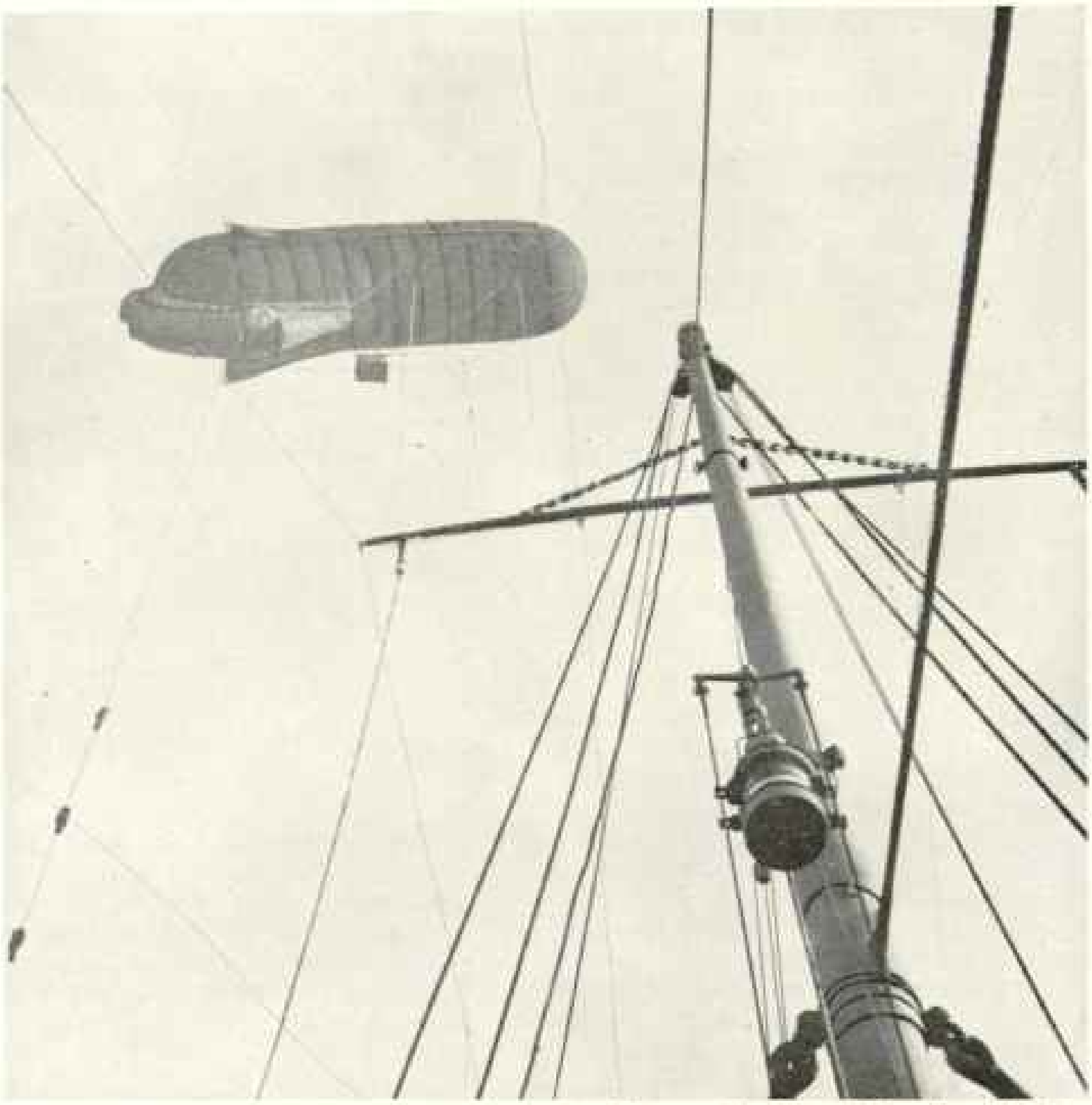
The other possible missions of the fighting squadrons include:

*The destruction of the drachens* (kite balloons), which completes the fight against hostile aircraft for the purpose of blinding the enemy. This mission, indispensable in the course of an important operation, is executed at the request of the commander interested.

The method usually employed is the following: An airplane is designated for each drachen. It is protected by a second airplane, on account of the single-seater defending the balloon. Then our airplane dives in such a way as to make the last 900 feet at an angle of 45 degrees. It approaches the drachen facing the wind, so that the latter will present its maximum of surface, while protecting him from the machine-gun in the basket. At a distance of 300 feet he fires a volley of incendiary bullets. This mode of attack is often successful. If not, the Germans pull the balloon to the ground. In either case the object is attained.

To blind the adversary by destroying his aircraft is the fundamental result sought by the fighting group; but it can also assist in the battle by getting information and by attacking the ground forces.

Having very swift machines at their disposal and being able to open the way



Photograph from Pictorial Press, French Official

LOOKING UP ALONG A SHIP'S MAST AT A CAPTIVE OBSERVATION BALLOON POSTED AS A LOOKOUT FOR ENEMY UNDERSEA BOATS

by main force, the fighting aviators are required to execute *long-range reconnaissances.* But it is especially during their cruises within the hostile lines that the single-seater pilots gather useful information concerning the activities of the enemy in the air and on the ground. By making general the use of automatic photograph cameras, a rich harvest of valuable information will be assured.

### HOW TROOPS CAN BE ATTACKED BY AIRPLANES

The attacking of ground forces is a matter of individual prowess rather than a productive operation. Troops can only be attacked in the open field and from a low altitude with machine-guns, bombs, and darts.

Such, then, are the conditions for the employment of the fighting squadrons.

It remains for me to tell you of *aërial bombardment,* which is, perhaps, destined to be one of the most effective forms of aviation when organized on a large enough scale.

But before all, let us consider what should be bombarded. You well know the revolting conduct of our adversaries, who, in spite of all laws of civilized warfare, initiated the practice of bombarding open cities, hoping by repeated murders

Photograph by International Film Service

A MECHANIC REPAIRING ONE MOTOR WHILE THE FRENCH AIRSHIP PROCEEDS UNDER THE POWER OF ITS TWIN MOTOR ON THE OPPOSITE SIDE

Note the slight blur in the photograph at the end of the shaft at the left, indicating that the propeller blade is revolving rapidly

of helpless children, women, and old men to cause panic among the civilian population of France and England.

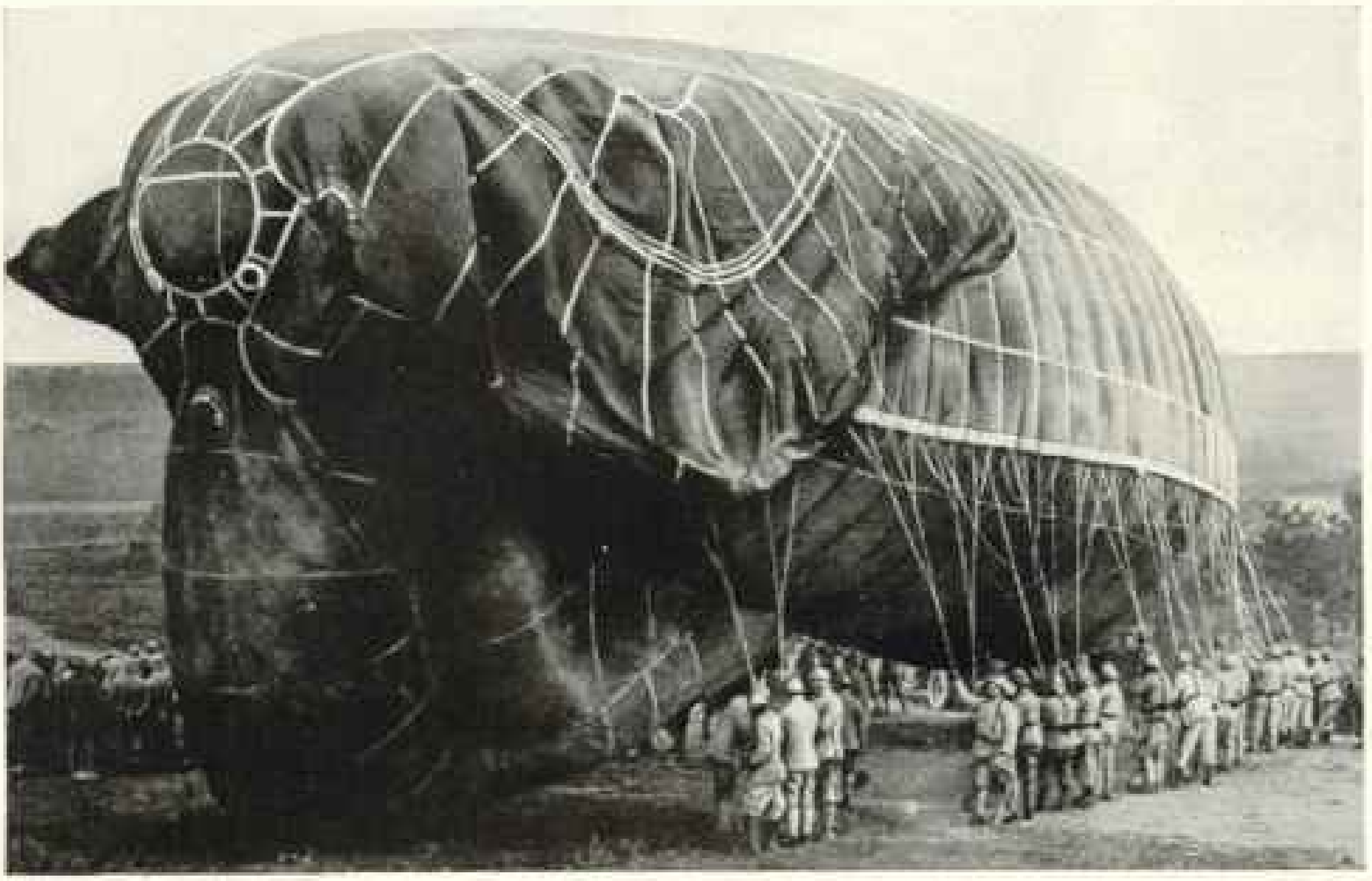
From the purely military point of view, these bombardments are of no value, so long as they attack only non-combatants and do not injure in any way the fighting forces of the enemy. On the day of a decisive battle, of what use is it to have mutilated the civilian population of the enemy, which takes no effective part in the fighting?

It follows, therefore, that this practice should be absolutely forbidden in war. Furthermore, let it be said that France and England have made raids on open cities only in reprisal for German raids on their cities. Among the most famous of these reprisal raids is that on Karlsruhe, in June, 1915—a great success, but with the loss of two airplanes. Then again on the same city in August, 1916, when considerable destruction was caused and the moral effects were far-reaching. This expedition caused the boches to reflect and held them in restraint for fear of further reprisals.

But, I repeat, we have not made a general practice of these raids, first, because they have no definite military object, and also because it is more difficult for us to reach the German cities than it is for them to fly over the French and English cities. In fact, the Germans set out from French provinces or from the borders of Belgium, which they have invaded. The distance traversed by their machines when they go to London, for example, would only carry a French or English machine over Belgium or our invaded provinces of Alsace and Lorraine.

In other words, the German cities are much farther from our lines than the French and English cities are from the enemy lines, since we have to cross Belgium or our invaded provinces before reaching the heart of Germany.

But, apart from these expeditions, are there not purely military objectives that



© Paul Thompson

FRENCH OBSERVATION BALLOON, OR "ELEPHANT"

powerfully equipped bombarding planes can reach and destroy?

### ATTACKING THE ENEMY'S MOST VULNERABLE POSITION

It is the problem of the employment of bombarding or bomb-dropping planes, in cooperation with the other branches of the army, that we are about to consider.

In general, it may be assumed that all objectives on the battlefield which are beyond the range of the guns may be effectively bombarded by airplanes, provided these objectives are large enough to be easily hit. It must be remembered that bomb-dropping by airplanes, although well conducted with the most accurate devices for sighting and launching, never attains the precision of artillery fire. It would therefore be useless to attempt the destruction of small objectives.

Without undertaking the description of the battlefield itself, with its first and second line trenches continually exposed to the fire of the enemy, I wish to mention the principal organizations, which are located immediately back of this fighting zone of about eight miles. In this region of comparative safety the troops are assembled for an attack.

There one finds the army supply stations, artillery depots, ammunition depots; also the airplane landing fields, with their hangars, their machines, their rolling stock. Lastly, it is in this region that the soldiers are located to rest after their sojourn in the trenches, and where they can profit by the relative quiet to obtain the necessary relaxation for their nerves after the rude shocks of battle.

This zone is reached only by an occasional very rare shot from special long-range guns, which are not often used on account of the great expense and the great difficulty and long delays involved in moving and mounting them on new foundations. It follows, therefore, that the rear of the battlefield is *densely occupied*, very *vulnerable*, and *practically unmolested*.

These are the three essential conditions for the profitable employment of bomb-dropping airplanes, and these are the real military reasons why our fighting squadrons have expended their energies in operations over the rear lines of the enemy rather than in distant raids of doubtful military value. In regard to this question of the choice of objectives, I think you will agree with me that the excitement caused by the long-distance raids hardly compensates for the slight gain.

A FRENCH "SAUSAGE" BALLOON READY FOR AN OBSERVATION ASCENT

The tumor-like protuberance at the lower end of the gas bag acts as a stabilizer. The end under the bag is open, and through this simple mechanism the balloon is kept pointed into the wind.

However exciting it may be to *read* of such exhibitions of prowess, far from the fray, it must not be forgotten that it is only by striking the enemy in a vital part that any important weakening of his power can be effected.

Moreover, the ravages resulting from repeated bombardments of the rear lines are considerable, both from the material and moral points of view. A single lucky shot can blow up an ammunition depot containing tens of thousands of shells and effectively weaken the offensive power of the artillery.

### SHATTERING THE ENEMY'S MORALE

A bomb falling into the midst of an encampment of troops at rest throws confusion among the men whose nerves, shattered by the shocks of battle, are commencing to recuperate. I leave you to judge of what value are troops who, harassed by the enemy even in their rest camps, are obliged to return to the front without having been able to get their needed rest.

From this point of view the damage done the enemy by bombarding his aviation fields may likewise be very great. The machines of several air squadrons are often assembled on one field, offering a very vulnerable target to the shots of the enemy.

During the battles of Verdun, the Somme, and the Aisne our bomb-dropping squadrons were daily employed, in conjunction with the other branches, in preparing for the success of our offensives by harassing the vulnerable parts of the enemy's rear lines. Several ammunition depots were destroyed and the ravages caused in connection with the transportation of troops, notably at the railway station of St. Quentin, will be famous in the annals of the war.

A choice must be made between the two methods. The French and English have developed the bombardment of purely military objectives, while our enemies have devoted their energies to dropping bombs on cities.

It goes without saying, that every ef-

A FRENCH GAS ATTACK BEING LAUNCHED AGAINST THE GERMANS FROM A POSITION MIDWAY BETWEEN THE FIRST AND SECOND LINE TRENCHES: PHOTOGRAPHED FROM A SCOUT AIRPLANE

fort is made to carry the maximum load of bombs. But it is evident that this is possible only at the expense of the speed of the airplane and especially of the quantity of gasoline and oil it can carry, thereby limiting its radius of action.

Accordingly, two very different types of machines have been invented—one very swift, able to fly at a speed of over 110 miles per hour, but carrying only 700 pounds of bombs (Breguet type); the other very slow, since it can make only 80 miles an hour, but able to carry 4,400 pounds of projectiles (Caproni type).

The first type is used day and night on the French and English fronts, where the enemy has his most powerful planes.

### AIRPLANES WHICH ARE USED AT NIGHT ONLY

The airplanes of the second type, because of their low speed, can only be used over the front lines by night. They would be brought down, without fail, should they venture within the enemy lines by day, where they would only be the playthings of the swift hostile battle planes.

In regard to what may be expected from the entrance into line of American air squadrons, this spring, it may be said that although the Allies have always held the aërial superiority over their enemies, at the cost of very heavy sacrifices, the advantage in our favor has never been great enough for us to risk a decisive battle, that would forever give us the absolute mastery of the air. Whole squadrons have been beaten down, but the destruction of the enemy's air fleet has not yet been accomplished, owing to the lack of sufficiently powerful means.

This is not, however, an impossible conception, and in the future, when America's air forces arrive to reinforce those of her allies, it is possible that the annihilation of the enemy's fleet may be undertaken, after several days of sustained battle at the outset.

In case our forces prove the stronger, the enemy will have no other alternative, to prevent the loss of his air squadrons, than to refuse battle by not flying; but when our bombing squadrons intervene with an effect so deadly as to compel his fighting planes to give battle, he will then bring on the struggle in which the German air fleet must succumb.

I do not pretend to foretell the future. I can simply tell you this. The decisive air battle has not yet been fought, although gigantic land battles have taken place. America will, I hope, have the honor of fighting this battle at the side of her allies, and it is probable that the road to victory will then be opened by way of the air.

# TALES OF THE BRITISH AIR SERVICE

## By Major William A. Bishop, V. C., D. S. O., M. C.

*Major Bishop, the premier ace of Great Britain's Royal Flying Corps, is the only living person who has won the three distinctions of the Victoria Cross, the Distinguished Service Order (twice bestowed), and the Military Cross. Although only 23 years of age at the present time, he had been a member of the Canadian military establishment for three years prior to the outbreak of the world war, and became an aviator shortly after reaching France with the first expeditionary forces from the Dominion. During the past three years he has brought down 47 German machines in 110 air battles. Captain Albert Ball, several of whose exploits Major Bishop describes in the accompanying article, was only 19 years of age when killed, yet he long held the record among British aviators, the official count of machines destroyed by him being 43. At the time of Captain Ball's death Major Bishop had destroyed 15 planes. The latter rapidly took a commanding position in the records and a few months ago surpassed the count of his compatriot who had fallen. Major Bishop now not only outranks in air achievements every other member of the Royal Flying Corps, but has held the record for all the Allied armies since the death of Captain Guynemer, of the French Aviation Service.*

SOME of the exploits of the late Captain Ball, V. C., were most exciting. He was especially noted for getting himself into the tightest corners and then, in an instant, turning defeat into victory and coming out of the fight victorious.

Upon one occasion in the early part of his career as a fighter he had gone some twenty miles across the enemy lines, vainly looking for some one to fight with. Finally he saw two enemy machines flying together. Without hesitation he flew straight at these two and engaged them in a fight which lasted over ten minutes, at the end of which time he found that he had run out of ammunition. The two enemy machines had also had enough of it by now and seized their first opportunity to escape, diving down to the ground. ground.

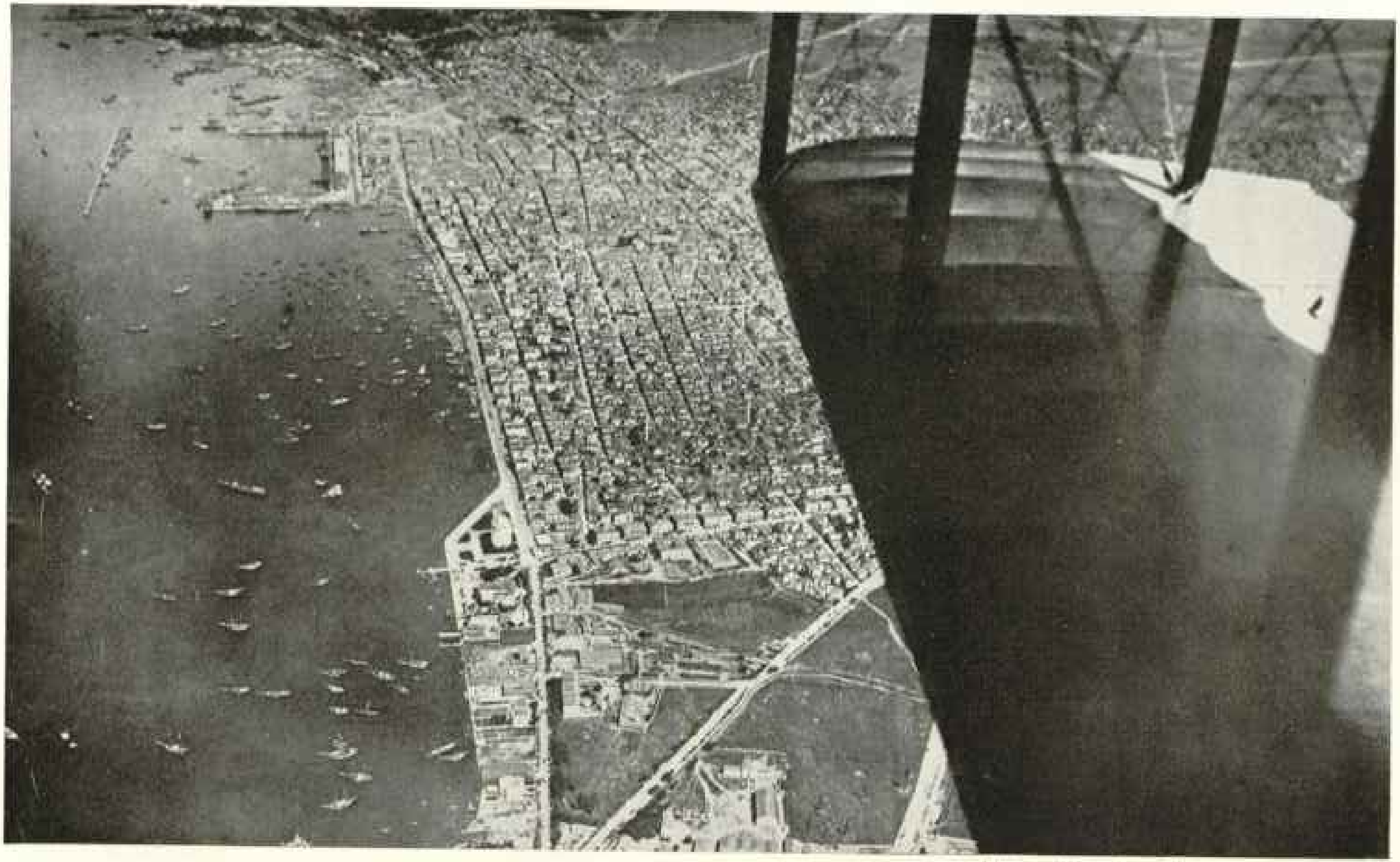
Ball was much disgusted at this and emptied six rounds from his revolver at the two diving machines. He then seized a piece of paper and a pencil which he had with him and wrote out a challenge for the same two machines to meet him at the same spot the next day.

At the appointed time Ball turned up on the spot and a few minutes later the same two enemy machines approached him from the east. He flew toward them to engage in a fight, but at that moment three more of the enemy came down from the sky and attacked him. It was a carefully laid trap and he had fallen into it without even suspecting that there was one.

The three enemy machines that had attacked him from behind were of the latest fighting type and were all flown by expert men.

At every turn Ball, who was underneath and was thus at a slight disadvantage, found himself outmaneuvered. Turn and twist as he would, he always found one of the enemy on top of him and another just ready to catch him if he turned the other way. Several times bullets passed within inches of him. Finally, deciding to escape, he realized that he must do something extraordinary; so he dived toward the ground and, picking out a large field, glided into it and landed.

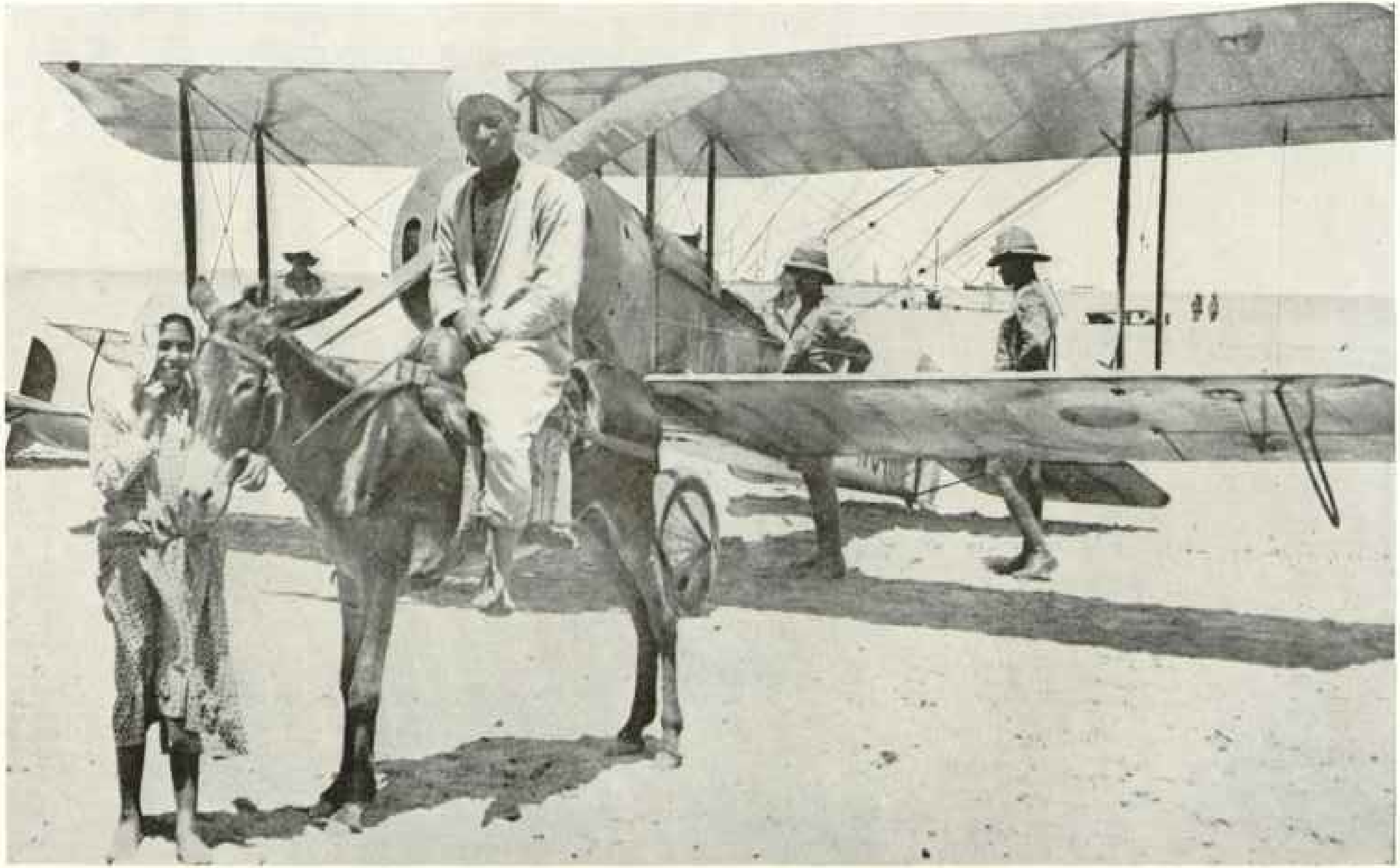
The three enemy machines at once suspected that he had been shot and forced to land, and they all glided down and landed, either in the same field with him or the adjoining one. Then, jumping out of their machines, they ran over to Captain Ball. However, Ball, who had carefully foreseen exactly what would happen, had kept his engine running slowly while he was on the ground, and the moment he



Photograph from Press Illustrating Service, Inc.

BIRD'S-EYE VIEW OF SALONIKI FROM AN AËROPLANE

Perhaps no other city in the world is so "fed up" on airplanes as Saloniki, the Allies' base in the Balkans. The enemy fliers usually make their reconnaissance about the noon hour, flying from behind their lines a hundred miles distant. The Teutons endeavor to learn of important contemplated moves on the part of the Allies by keeping tab on the arrival of any considerable number of ships in the Saloniki harbor.





METHODS OF TRANSPORTATION, ANCIENT AND MODERN: EAST AND WEST MEET

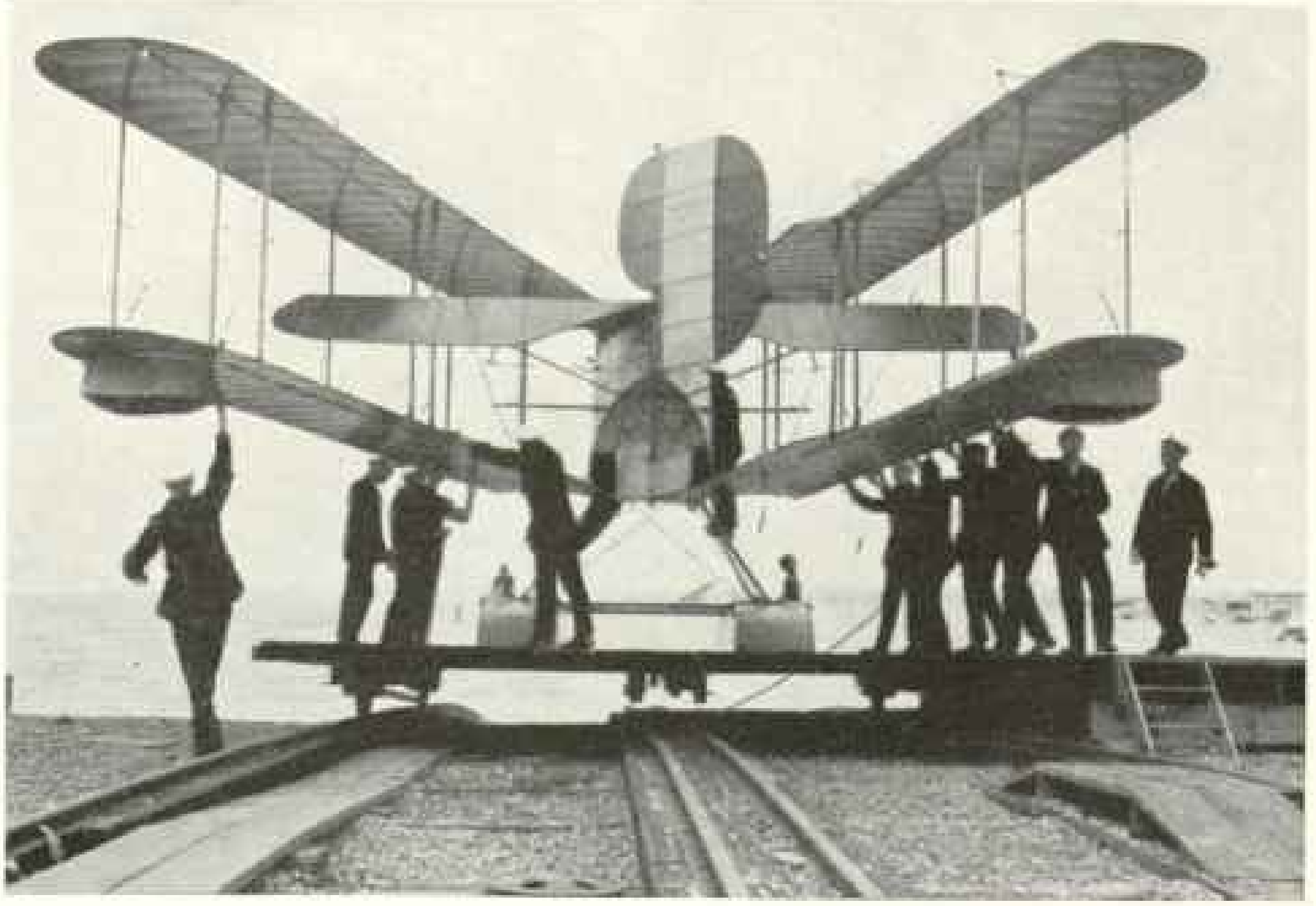
The Royal Flying Corps of Great Britain played an important rôle in the recent conquest of the Holy Land from the Turks. Neither the humble mount nor its Arab rider seems excited over the descent of the winged creature which is helping to restore civilization in the birthplace of Christianity.

© Underwood & Underwood

NO BOMBS WERE DROPPED BY THIS AIRMAN IN HIS FLIGHT OVER THE HOLY CITY OF JERUASLEM WHILE IT WAS STILL IN THE HANDS OF THE TURKS, FOR HIS MACHINE BORE THE EMBLEM OF GREAT BRITAIN AND OF CIVILIZATION

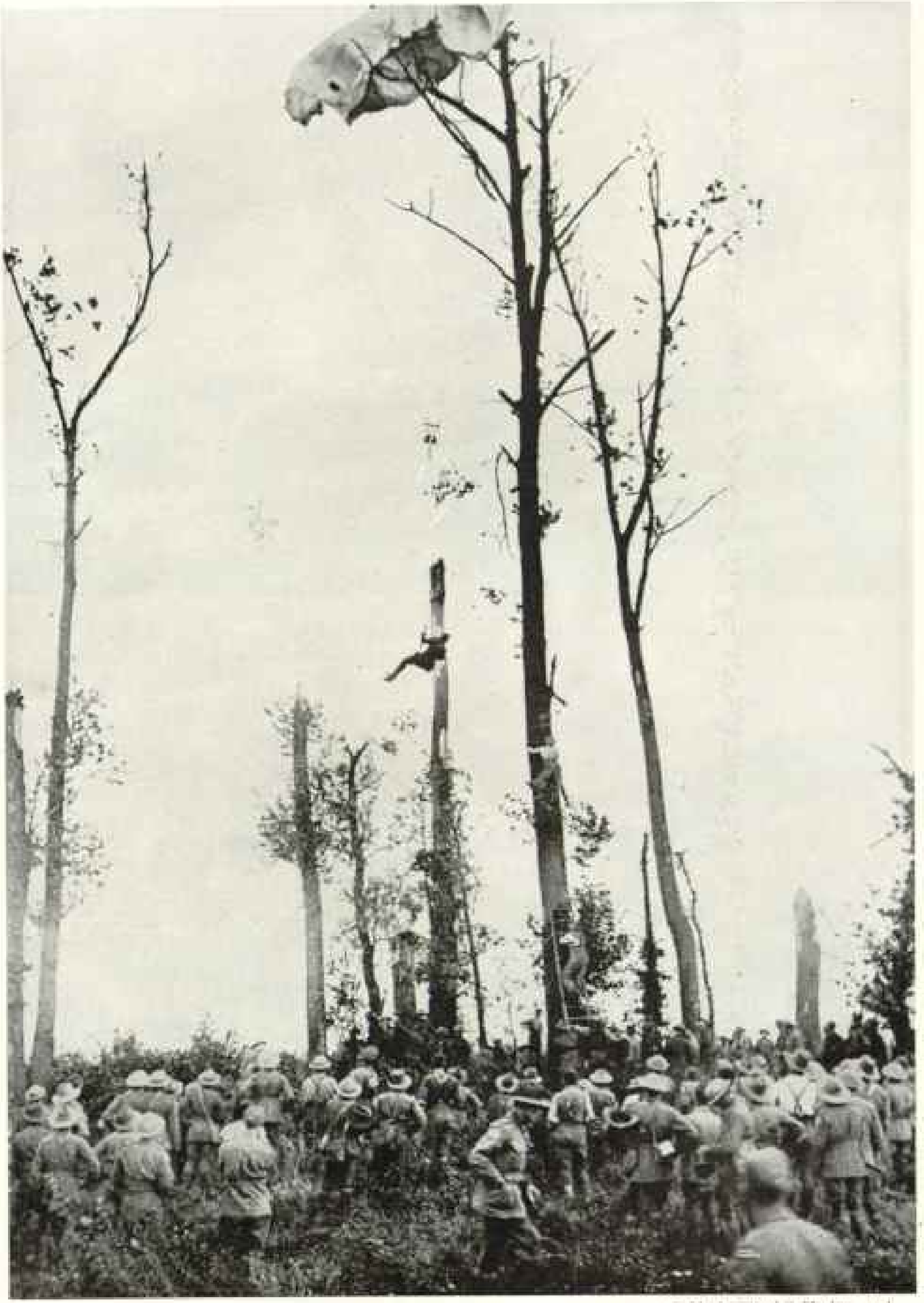
In the foreground is seen one of the holy pools, while the conspicuous structure in the middle background is the Dome of the Rock, a mosque erected over the rock upon which once stood the altar of burnt offering. According to Arab tradition, the Holy Rock covers the abyss in which the waters of the Flood are heard roaring, and it was here that Abraham was on the point of slaying Isaac for a burnt offering.

CAMEL MACHINES IN FLIGHT OVER A BRITISH AËRODROME



AN AIRPLANE WITH FOLDING WINGS, USED IN THE BRITISH ROYAL NAVAL AIR SERVICE

The possibility of landing on the deck of a warship after a flight in air was first demonstrated by the late Eugene Ely on the United States cruiser *Pennsylvania*, off the coast of California. He alighted on a platform on that vessel without mishap to himself or his machine.



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THE PARACHUTE IS THE BALLOONIST'S LIFE-BOAT

This British observer, his balloon destroyed during the battle of Menin Road, in Flanders, descended into a treetop. While his comrades were climbing to his aid the observer succeeded in swinging on one of the ropes of his parachute to a near-by truncated tree, from which he slid to safety.

saw the others come out of their machines he tore off again and flew away from them.

By the time the first of the Huns had been able to get off the ground, Ball was over half a mile away and had made good his escape. The risk he took in landing this way was very great, as his engine might have stopped when he landed, in which case there would have been no way of starting it again and escaping.

On another occasion, about six months later, he had an experience just as thrilling as the one above. He had chased an enemy machine for ten miles behind its lines and, on turning to come home, found himself cut off by several groups of the enemy. Picking out a group just in front of him, and the smallest group which was trying to cut him off, he decided to fly straight at the machines and through them. There were four in the party, and as he flew toward them they all opened fire at him, while he did the same at them.

The leader of the enemy patrol did not like it, however, and swerved to one side, just as Ball was hoping he would. Two of his followers did the same thing, perhaps in the hope that they would be able to catch Ball from the flank; but it was all according to Ball's plan and he carried on straight at the last man, whom he hoped would also turn.

Photograph by Charles Martin

MAJOR WILLIAM A. BISHOP ON A VISIT TO WASHINGTON

While in the National Capital, a few days before his return to the front, Great Britain's greatest airman called at the headquarters of the National Geographic Society to give the accompanying account of several of the exploits of his fellow aviator, the late Captain Albert Ball, V. C. During his stay in this country Major Bishop has rendered valuable assistance to American officers charged with the development of our great air fleet.

At a speed of 250 miles* an hour they approached, both firing two machine-guns at each other. It looked as if they were going to go into each other. Both men seemed determined that they would not swerve the slightest. Ball told me later

* They were each moving at 125 miles per hour.

Photograph by Central News Photo Service

BRITISH AIRMAN GIVING A "PASS-WORD" SHOT TO HIS OWN MEN BELOW

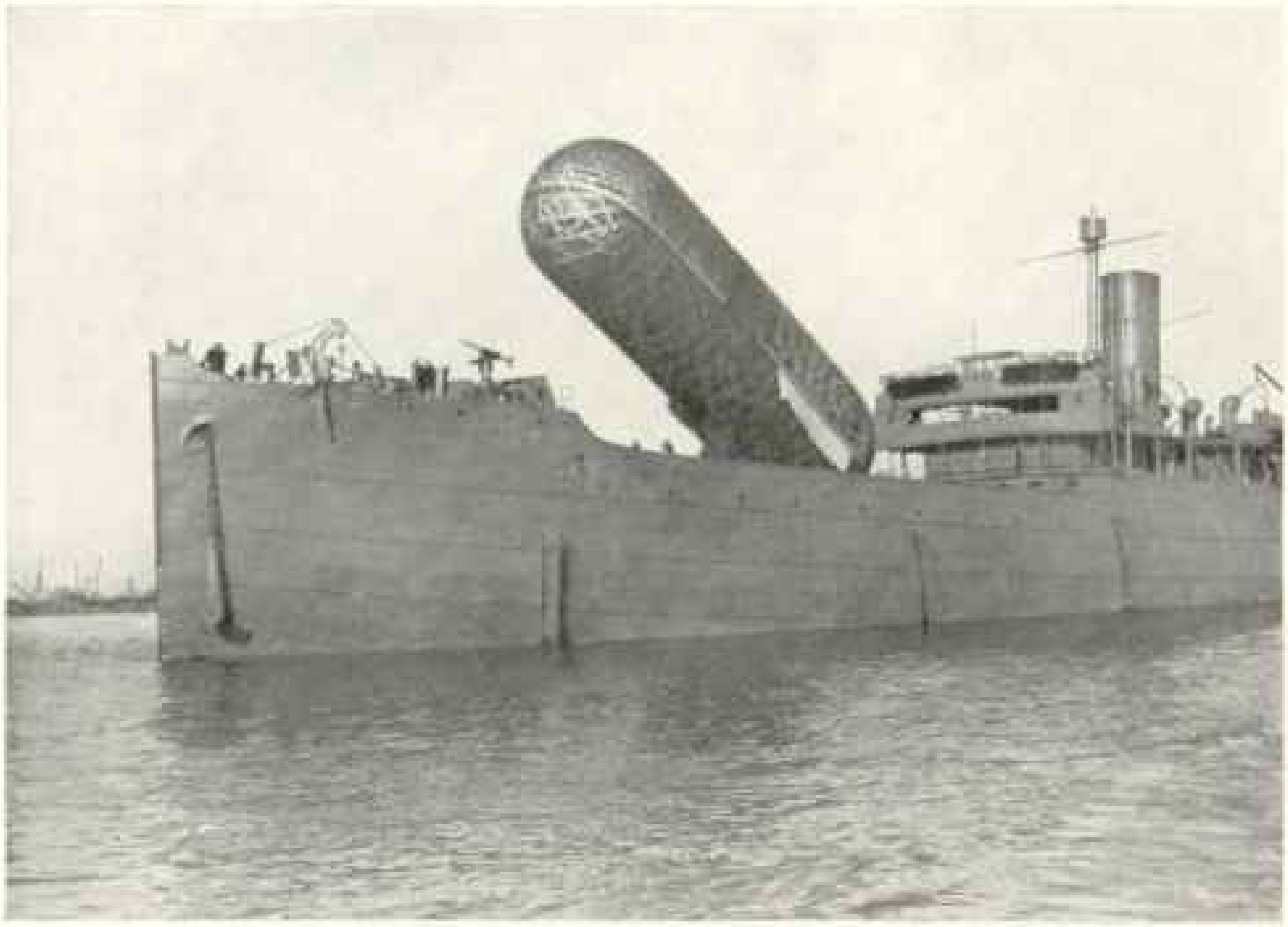
It not infrequently happens that anti-aircraft gunners mistake one of their own fliers for an enemy. In such cases the aviator fires a smoke signal from this type of revolver to identify himself as a friend. Today the signal may be two puffs of white smoke; tomorrow it may be three. It is the "pass-signal" of the skies.

that he was quite sure in his own mind that the man intended ramming him and thus causing death to them both.

Many bullets struck Ball's machine, one hitting an oil pipe, allowing the oil to leak and splash over him. His face was covered with it and some of it got in his eyes and he could hardly see. He closed his eyes and flew straight, firing as he went, expecting every second to hear the awful crash when they would strike. The other man, however, when only about twenty yards away, suddenly dived down and went straight to earth, where Ball saw him crash into the ground.

Upon looking back upon the encounter Ball came to the conclusion that he must have killed his adversary with an early shot and the way in which the German fell back in his seat must have just held the machine in a level position for the length of time while he came on straight at him. Ball thought the man's fingers must have remained on the triggers of his guns.

Ball managed to escape the remainder



H. M. S. "CANNING" AND ITS KITE BALLOON

The captive balloon is the all-seeing eye of a warship. It not only gives warning of approaching enemy fleets, but it readily detects the lurking submarine. It also directs the fire of long-range guns.

of the crowd, but a little later he had a most terrifying experience. While crossing the lines he had to pass over a very intense battle raging on the ground. Shells were dropping everywhere and he knew that in flying over this ground he was passing through air which was literally full of shells in their flight.

Suddenly, with an awful sound, a shell struck his machine about two feet behind where he sat, passing clean through the body of the machine without exploding. The unfortunate part of it was that in passing through the machine it practically severed all his control wires, which meant that all the mechanism which directed the machine—except a few strands of the cable—had been destroyed.

His machine immediately went into a spinning nose dive and fell, out of control. Simply by means of the most delicate handling and great skill he managed, when only 2,000 feet from the ground, to regain control of his machine and headed it in the direction of home. Any ordinary pilot would have been content to come down and land in the first field; but not so Ball. His aërodrome was still twenty miles away; yet he flew this damaged machine all the way to it and landed there without further damage.

His flight home must have been a terrible experience, as the shell in passing through his machine had strained it and damaged it tremendously, and at any moment the whole machine might have collapsed and fallen in pieces; yet Ball, with his customary coolness and courage, brought it back home to his aërodrome and landed. Twenty minutes later he was in another machine and on his way to the lines to look for another fight.

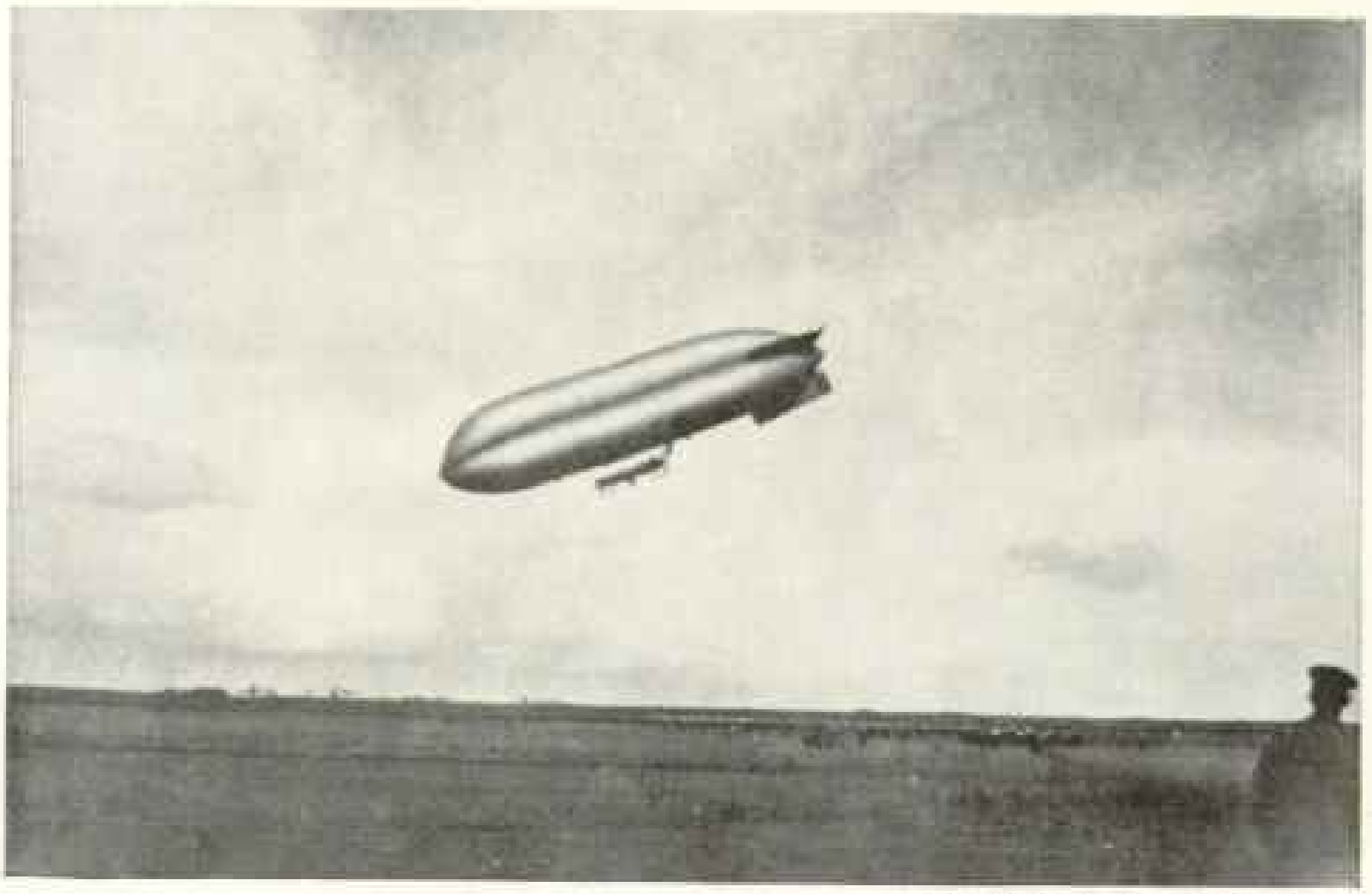

Photograph by Paul Thompson

A MAMMOTH BRITISH HANDLEY-PAGE BOMBING MACHINE SHOWN IN COMPARISON WITH ONE OF THE SMALL 125-MILES-AN-HOUR FRENCH WARPLANES

The large machine is the type of plane which recently electrified the world with its 2,000-mile flight from London to Constantinople by way of Paris, Lyons, Marseilles, Spezia, Pisa, Rome, Otranto, and Saloniki. On the last lap of the journey it carried a cargo of 16 bombs, many of which eventually found their targets—the cruiser *Goeben* and several other warships anchored in the harbor of the Turkish capital. On returning to its base at Saloniki, after a round-trip night flight of 640 miles in seven hours, the plane was found to have been punctured by 26 bullets.

A QUINTET OF BRITISH AIRSHIPS SETTING FORTH ON PATROL DUTY

This striking view of an English sky fleet was made from a sixth dirigible. Note the typical English landscape with numerous hedges and rows of trees dividing the fields into odd-shaped polygons.



Photograph from Geoffrey Butler

ONE OF THE BRITISH COASTAL AIRSHIPS LANDING IN A GALE

# ITALY'S EAGLES OF COMBAT AND DEFENSE

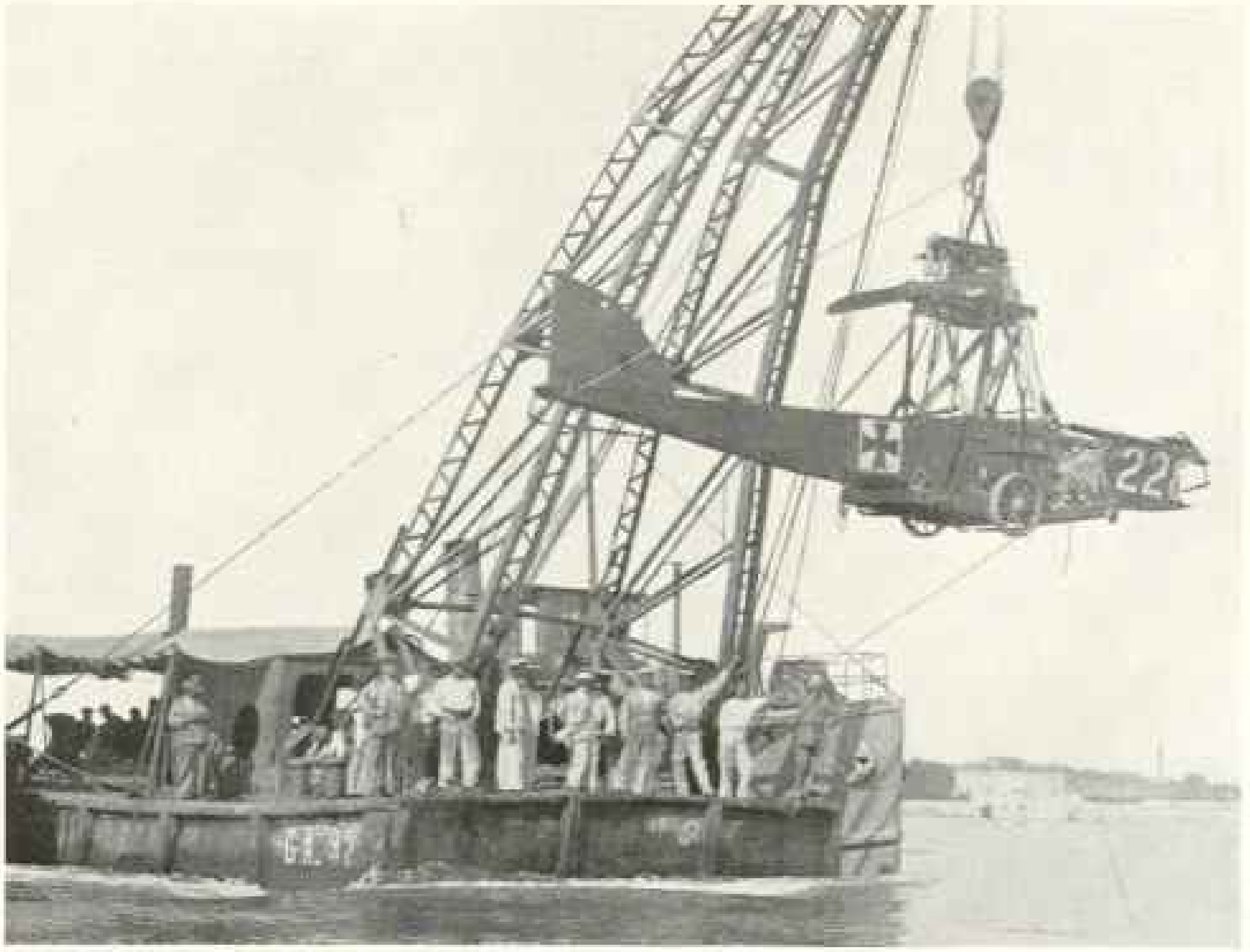
## Heroic Achievements of Aviators Above the Adriatic, the Apennines, and the Alps

By Kindness of General P. Tozzi, Chief of the Italian Military Mission

IN THE supreme struggle of civilization the employment of twentieth century warfare's most important weapon, the airplane, has entailed tremendous sacrifice and called forth inspiring deeds of heroism on the part of Italy's airmen.

None of the other Allied nations has faced such a variety of difficulties in the terrain over which its flyers have had to operate incessantly since the peninsula kingdom declared war on Austria in May, 1915. For two years the battle line ran tortuously among the perpetual snows of the Alps, and high above the mountain peaks Italy's aviators performed with stoic fortitude their patrol of the skies, ever watchful of the enemy's planes and keenly alert in scouting for information to aid their own advancing Alpine troops.

While one branch of the Italian aviation service has been employed as auxiliary to the land forces, an even more numerous force had to be organized at the beginning of the war to protect Venice and many other beautiful and historic



A SALVAGE CREW HOISTING AN ENEMY AIRPLANE WHICH BECAME A SUBMARINE AFTER AN ENCOUNTER WITH A VICTORIOUS ITALIAN AIRMAN

Photograph by International Film Service

SENTINEL OF THE SKY

High up in the snow-covered Alps circling above the rocky Dente del Pasubio, the lone Italian airplane is a veritable sky sentinel. In this picture the Italian machine is chasing an Austrian Albatross which attempted a raid on the Italian position on the mountain top.

cities of the Venetian plains from the ruthless bombing raids of enemy airplanes. Fleets of seaplanes were also required to patrol the long Adriatic seaboard of the peninsula to give warning of the approach of raiding Austrian warships, while a constant lookout maintained for enemy submarines was no small part of the duties performed by the Italian air forces.

With mention of her defensive and scouting air service, developed in the face of a foe already thoroughly equipped in this branch of warfare, the story of Italy's air achievements only begins. Tremendously effective has been the destructive work which this nation's aviators, piloting huge Caproni cars, have wrought on Austrian naval and military bases—Pola, Fiume, Trieste, and Cattaro.

### TWO EXAMPLES OF ITALY'S AIR ACHIEVEMENTS

Two concrete examples of Italian exploits in the air are typical of countless deeds involving exceptional skill, undaunted perseverance in overcoming enormous difficulties, and magnificent daring in the face of death and disaster.

A short time ago two squadrons of Caproni bombing machines, rising at four-minute intervals between units, flew from a base aviation camp, located somewhere in the Venetian plain, to another camp in the vicinity of Milan. This was the first lap of a history-making expedition through the air. The start for the second lap, from Milan to Rome, was made at 8 o'clock the following morning.

Rising from a sunny field in Lombardy, the machines had proceeded only a few miles in their southward flight toward the Apennines when they were enveloped in dense banks of fog and masses of cloud. But on they flew, the pilots guided only by their compasses and barographs.

Over Piacenza they soared, but that city was hidden from the air voyagers by impenetrable mists. Now, according to their calculations, they were approaching the foothills of the Apennines. They began to mount higher and higher, until their barographs registered an elevation of nearly two miles—a height sufficient to enable them to negotiate the rift in the peaks known as Cisa Pass. The calculations were accurate; had they been even slightly in error, the great machines, their pilots sightless amid the clouds, would have shattered their wings against the rocks, like migrating birds dashing themselves to death against the walls of lighthouses in their night flights to southern climes.

### CAUGHT IN DANGEROUS CROSS-CURRENTS

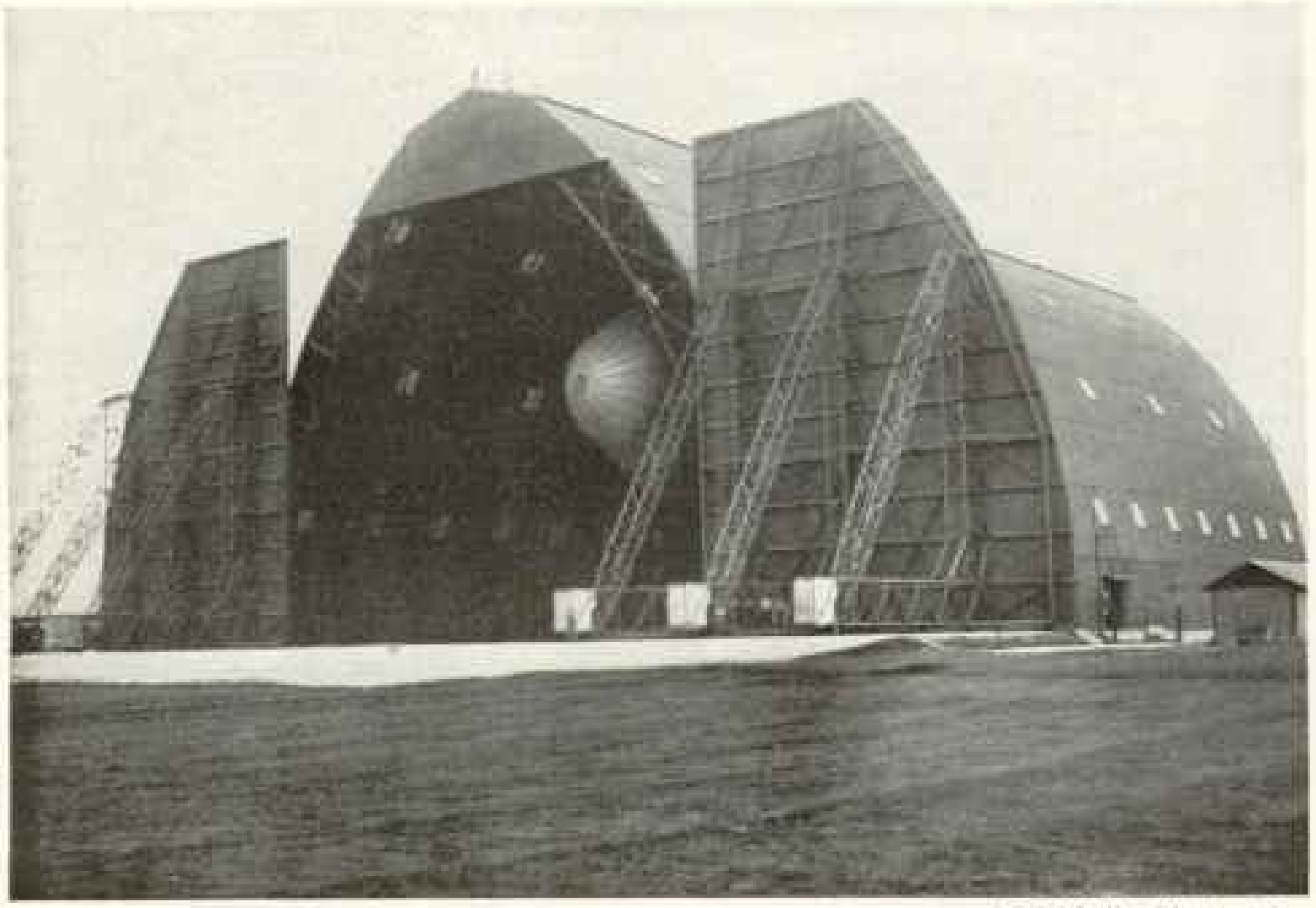
Once over the great range of mountains known as the backbone of Italy, the pilots dropped to within a few thousand feet above the land, between the cities of Spezia and Massa, on the shores of the Ligurian Sea.

Scarcely had the air fleet emerged from the clouds, however, than they were caught in the dangerous cross-currents lying between the mountains and the sea. The machines rolled and pitched like cockleshells in a choppy sea. Safety had to be sought in smoother air strata, and the groups of airplanes were forced to break up into units in their search for less turbulent currents.

A whimsical fate directed one of the pilots over Viareggio, his home town, and as the whir of his propellers was heard in the distance the people gathered at their doors to watch the birdman soar by. Passing within a hundred yards of his own house, the pilot waved his hand to the aged couple standing on the steps gazing with eager eyes at the giant aircraft but ignorant of the fact that it was their own son in the seat of honor.

Past Pisa and Leghorn and over the Lake of Bracciano the squadrons flew, and shortly before noon, after a great spiral evolution over the Eternal City, they descended in the rain on the field of the great aviation camp which lies almost in the shadow of the Seven Hills. The trip from Milan, through fog and over mountain, had been accomplished in less than four hours. The second lap in the journey had been completed without accident.

At ten the next morning the two squadrons once more spread their wings, heading this time toward the southeast, their



Official Italian Photograph

THE DOORS OF AN ITALIAN AIRSHIP STABLE ARE STRONGLY BUILT, IF NOT ALWAYS LOCKED

Danger lies not in the theft of the machine, but in the irreparable damage which would result if a gale should blow the doors in upon the dirigible, rip the gas bag, and derange the delicate mechanism.

objective being the Adriatic seaport of Brindisi, famous in ages past as the port of debarkation for many historic expeditions against the enemies of Rome.

It was a five-hour journey, performed according to schedule in spite of the fact that at one time the airmen were forced to mount several miles in order to rise above a thunderstorm. Thus ended the third lap.

### THE FLIGHT ACROSS THE ADRIATIC

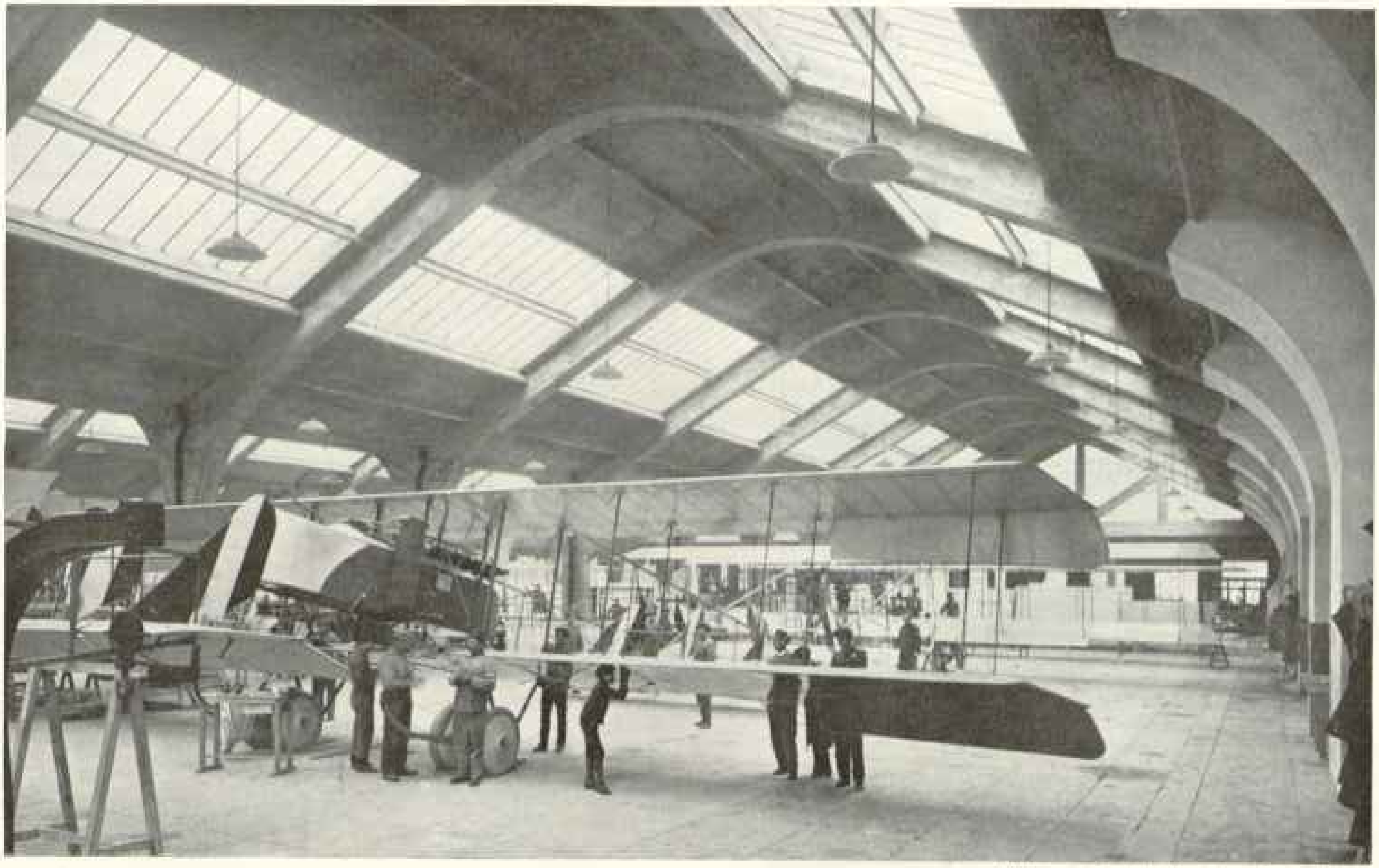
The fourth and final stage of this momentous expedition was begun after darkness had closed in upon the Adriatic. Reserve tanks of gasoline had been attached to the machines, assuring fuel for a six-hour continuous flight at top speed, for these were not hydro-airplanes, and a sudden descent into the sea would have meant the loss of planes, pilots, bombers, and observers.

As the great night-birds set out over the sea, steering in a northeasterly direction, a dim glimmer of lights flashed from the waters like the fitful glow of fireflies. These were the Italian torpedo-boats marking the way for the airmen.

After a flight of more than 150 miles across the Adriatic the dim shoreline of Montenegro was vaguely discerned through the mist. A half hour longer and the squadron veered to the north, over the Lake of Scutari.

Soon the darkly wooded mass of Monte Loveen (the Black Mountain, from which the Kingdom of Montenegro takes its name) loomed like a vast shadow upon the horizon. Passing to the east of this peak, the Capronis soared over Cettinje, where Austrian lights twinkled in what was once the palace of King Peter. No bombs were dropped here, for all were needed to wreak destruction upon Cattaro, which the raiders were now rapidly approaching.

Suddenly the searchlights of the Austrian ships in the basin of Cattaro harbor began to cut the skies; the whir of the Italian planes had been heard. Almost simultaneously with the realization that danger was at hand, the Austrians began



Photograph from Capt. Lamberto Vannutelli

A MAMMOTH GLASS, STEEL, AND CONCRETE HANGAR OF THE POMILIO FACTORY FOR A GROUP OF POWERFUL ITALIAN RECONNAISSANCE MACHINES

These planes, regardless of the wind, rain, and snow, continuously fly over the enemy's lines, taking photographs of the Austrian trenches and positions, and, by means of wireless apparatus, notifying the Italian artillerists of the location of enemy batteries

Official Italian Photograph

A GROUP OF ITALIAN HYDRO-AIRPLANES ABOUT TO START ON A MISSION

Photograph from Capt. Lamberto Vannutelli

SQUADRONS OF ITALIAN AIRPLANES READY TO MOUNT ABOVE THE ALPS

Few fighting airmen have encountered so many difficulties and with such signal success as have the Italians. They have had an extended sea-coast to defend against a near-by enemy; they have had a vast sea area to patrol in search of submarines, and they have been forced to carry on their above-land operations among the snowy heights of the Alps and the Apennines.

Official Italian Photograph

THE BLACK CROSS OF DEFEAT

An Austrian airplane brought down on the Italian front

to feel the deadly blows from above. Fires in arsenals, shipyards, and warehouses began to flare in the wake of low-flying machines, and the noise of the anti-aircraft guns was mingled indistinguishably with the detonation of exploding bombs.

Releasing their remaining explosives upon the island of San Marco, the two squadrons, unscathed by the shots from the fort batteries, successfully eluded the Austrian airplanes and made the return flight without loss or further incident, having performed one of the most extraordinary feats of the war. Cattaro was supposed to be Austria's most inaccessible naval base.

While not so noteworthy in the character of its military mission, even more thrilling was the bombing raid carried out by a squadron of twelve Caproni's from a base near Pordenone, the objective being a strong Austrian railway center and supply depot 100 miles distant.

The bombing machines were under the direction of Squadron Commander Barbieri, mounted in an airplane piloted by Captains Salomone and Baila.

Scarcely had the fleet taken the air when a dense fog was encountered. In it several of the units became separated from the main group, and among these was the machine of the commander. When the enemy lines were reached Colonel Barbieri was cut off from his companions, and the Austrian pursuit planes singled out the commander for destruction.

A terrible battle ensued, the Barbieri airplane being attacked on all sides by the Austrian combat planes. The Italian pilots jockeyed for position with daring evolutions, while their machine-gun spurted a constant stream of bullets. Finally, Colonel Barbieri, who was working the forward aircraft gun, was struck in the forehead and lay lifeless on his weapon.

But the struggle continued, for Captain Baila, who had left Captain Salomone to steer the airplane, worked the rear machine-gun without a moment's pause. Soon he also was hit and fell dead in his seat. Still Salomone would not surrender. Seated between his dead companions, tense over his controls, he

Photograph by Edwin Levick

THE GREAT CAPRONI BIPLANE FLYING NEAR THE WOOLWORTH TOWER, THE TALLEST BUILDING IN THE NEW WORLD, ON SECOND LIBERTY LOAN DAY

This gigantic plane sailed from Newport News to New York with ten passengers. With its Italian pilot, it also flew from Newport News to the National Capital and return, following the course of the Potomac. Although a ten-passenger aircar, this machine is only the "little brother" of the Caproni triplane, which has a carrying capacity of 25 passengers.

continued to defy the enemy. A bullet struck him in the head; he was blinded by his own blood.

The Austrian planes were now certain of their prey. Perceiving the two dead passengers in the car, they made signs to the pilot to surrender. But Salomone's will was firm—the Italian machine must not fall into enemy hands! With unparalleled fortitude he maneuvered incessantly and, although seriously wounded, succeeded in escaping from his assailants. He brought back to the Italian camp his machine with the bodies of his fallen comrades.

In addition to the marvelous work done by the Italian bombing machines is to be recorded the admirable daily work of the reconnaissance Italian machines, which, regardless of the rain, wind, and snow, continuously fly over the enemy's lines, taking photographs of the Austrian trenches and positions, and by means of the wireless apparatus notifying the Italian artillery of the location of the enemy's batteries. And when, on dark nights or

in the early dawn, the Austrian and German planes come to bombard our open cities and barbarously to destroy the art treasures of Venice, of Padua, and of Verona, then it is that our courageous combat pilots mount at once to the sky and, with firm hand and stout heart, meet and bring down the invaders—as, for instance, Major Baracca, who brought down 30 of the enemy's machines, and Colonel Piccio, who brought down 20.

The achievements of Italian aviation during the last three years have not been confined to the theater of war. Its pilots recently have established new world records for non-stop flights, for speed and altitude. The plaudits of the Allied nations recently sounded for an Italian aviator, Captain Laureati, who piloted a Sia plane from Turin over the Alps, across France and the English Channel to London, a distance of 700 miles, without alighting; but this distance record was almost immediately eclipsed by the same pilot, with another non-stop flight of 1,004 miles, from Turin to Naples and return. Another Italian aviator, Lieutenant Guidi, established the record for highest flyer of the world when he took his machine to a height of 26,400 feet, five miles above the earth and more than two miles above the summit of Mont Blanc, the loftiest mountain of Europe.

Sergeant Stoppani, piloting a one-seater fighting airplane, type "Savoia-Verduzio," on the 28th of September, 1917, left Turin at 2.45 p. m., crossed the Apennines to the sea, and, following the shore line, arrived in Rome at 5.35 p. m., covering a distance of 390 miles in two hours and fifty minutes and at an average speed of 138 miles an hour.

These achievements are indicative of the place Italy is expected to take in the development of aviation when the world is once more at peace and men's minds may turn with confidence to the productive pursuits of transportation and international commerce.

# THE ITALIAN RACE

WHILE most of America's airmen will probably see service above the battle-line which extends from the North Sea across Belgium and France, they will not be forgetful of the superhuman skill, daring, and self-sacrifice of their allies beyond the Alps, the intrepid Italians, whose country produces no coal, no steel, and food insufficient for her needs, yet has managed for nearly three years to maintain her armies against the ceaseless hammering of Austrian and German guns.

Italy, the mother of civilization, of art, and of science, and the cradle of intellectual liberty, began fighting the invaders from the North a thousand years before the discovery of America. She has given to the world Marcus Aurelius and Dante, Columbus and John Cabot, Leonardo da Vinci and Galileo, and in more recent days Volta, Galvani, Garibaldi, Verdi, and Marconi.

Just as the New World was given to civilization by her two great navigators, Columbus and Cabot, so the infinite realms of space were revealed to man through the gift of the telescope from Galileo, that monumental genius who also helped to perfect the compound microscope which has made modern medicine and modern chemistry possible. Likewise it is Marconi's gift of wireless telegraphy which makes the observation airplane a truly potent factor in battle.

One of the marvels of human history is this extraordinary Italian race, that for 2,000 years has blessed the world with one succession of geniuses—musicians, authors, creators of inspiration and advancement—from which all other peoples have benefited.

THE EDITOR.

# BUILDING AMERICA'S AIR ARMY

By Lieut. Col. Hiram Bingham, Signal Corps, U. S. A.

Chief of the Air Personnel Division in the Office of the Chief Signal Officer of the Army

AFTER a trip halfway around the world, there arrived recently in a Southern port of the United States a large steamer loaded with castor-oil beans. During its voyage many thousands of acres of ground were being made ready to receive the cargo the moment it was discharged, and factories even now are being prepared to turn the forthcoming crop into lubricants.

Here is a little side glimpse into the new industrial problems created in the manufacture of America's wings. America, though in a sense the home of lubricating oils because of her enormous factory system, had not in her whole long list one which could stand up under the power of the Liberty Motor. All of them scotched and burned in this new-found strength.

The lubricant from the castor-oil bean, however, proved a single exception. Unfortunately the growing of these beans had been discontinued, owing to the influx of cheaper beans from India. The importation of these had been stopped recently by an embargo put into effect by the British Government. The only solution to the problem was to reëstablish the castor-oil bean-raising industry in America. By a special arrangement with Great Britain a cargo of beans held at Bombay was released and rushed to this

LIGHTNESS WITH STRENGTH

If 60 people can sit on the *unsupported* end of one pair of wings of an airplane, as shown here, we need have no fear that these wings will "crumple up" in the air

© Underwood & Underwood

WOMEN AT WORK ON THE WINGS OF VICTORY

The planes of a flying machine are covered with a special quality of Irish linen, which is stitched tightly over the framework by women seated on opposite sides of the plane and using three-inch needles. The British Government has promised that linen in sufficient quantities will be supplied to the United States as rapidly as needed to complete our airplane-building program (see page 55).

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AT A PUNCHING MACHINE IN AN AIRPLANE PARTS FACTORY

The world is no longer a stage with the men and women merely players, but a vast machine shop where each must do his or her bit—in this instance punching, and punching with care, the fittings for a flying machine.

country. Meanwhile, necessary preparations were made for planting the crop and extracting the oil when the harvest shall have been gathered.

This has been done, as so many other new, unexpected, and surprising things have had to be done, in building up America's Air Army. If ever there has been a succession of unforeseeable needs, of baffling problems, and of almost heroic methods to hew through to results *in time*, it has been in the effort to establish upon almost no foundations whatever one of the most intricate, and I am not sure it is not the most intricate, industry in the world. I only wish it were possible to thrill others with a little of the romance of this new industry which has so thrilled us here in Washington during the past six months of effort.

Many people think an airplane is a simple thing to build—a pair of wings attached to some sort of body, with an engine in between and a propeller in front. A few rough cuttings, it is pictured, a little nailing up, and the machine is ready. This is not at all surprising, for even many manufacturers themselves are ignorant of the fine workmanship and materials which must go into an airplane.

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GIRLS MAKING AIRPLANE TURNBUCKLES

Every job in the manufacture of a flying machine is a responsible job, for, like the famous One Hoss Shay, every part must bear its burden of terrific strain as long as any other part.

Colonel Deeds has in his office a letter from a manufacturer who gave two dredges, among other things, as equipment on hand which might work in somehow in airplane work.

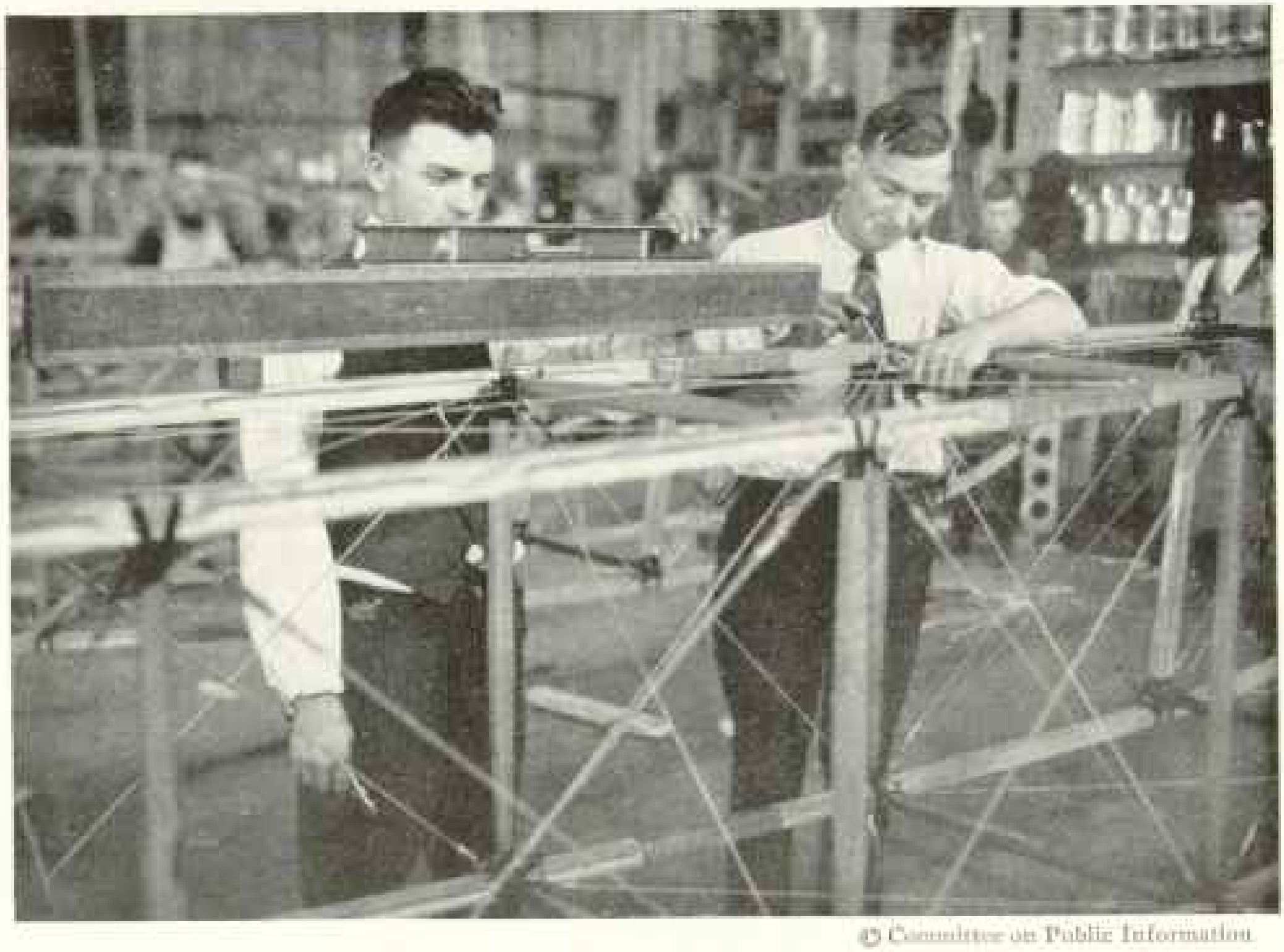
Let me try to depict by a rough picture a plane in the making. Suppose, for instance, you were set to driving 4,326 nails and 3,377 screws. Undoubtedly that would be quite a task—a total of 7,703 separate operations. Well, when you had reached the 5,000 mark you could truthfully be told that you had done less than two-thirds of the work of this sort required for a single airplane. (These figures are for a training plane; for a French battle-plane 23,000 screws are said to be needed.) Somehow a plane looks so simple and floats so gracefully through the air that we lose all thought of the skill that goes into its making.

### ONE OF AMERICA'S AIR TRIUMPHS

Just recently we have received some figures of the material which is required for one of the simpler training planes. For instance, 921 steel stampings must be cut out, 708 forgings cast, and 276 turn-buckles, all for a single machine.

Think, then, of the hundreds of thousands of such pieces needed for the thousands of planes in the American program and of how utterly hopeless the situation would be if those parts were not standardized, turned out by machinery in tens of thousands, and usable in scores of different factories on any kind of plane. The reduction of aircraft manufacture to the simplest, standardized, quantity production basis has been one of America's great triumphs in the air and an achievement which very soon will be making itself felt.

But metal must be used in an airplane as little as possible. It is altogether too heavy, especially when a few extra pounds make all the margin in speed between victory and defeat. An engine of 300 horsepower is in itself enormously heavy to rise into the air; so that the rest



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TRUING THE AIRPLANE, ONE OF THE VITAL INITIAL STEPS IN THE CONSTRUCTION OF AMERICA'S SKY FLEET

A manufacturer who wanted to build flying machines for the government, but whose bid was rejected because his plant was inadequate, was very wroth and declared scornfully that he could whittle an airplane out of a tree in a few weeks' time, at a cost of a few hundred dollars. The illustration shows one of the necessary operations which the whittler would have overlooked—the establishment of an exact level for the key part of the fuselage, or body. The man to the left is watching the bubble in the spirit-level, while the other mechanic is adjusting the supports to the required tautness.

of the machine must attain the very acme of lightness.

That very lightness, however, entails enormous strength and perfect adjustment. Think of the strain which is exerted on every wire and nut, every inch of linen, and every bit of wood as this 300-horsepower mechanism rushes through the air at 150 miles an hour. Cyclones often do not go as fast, and we can easily picture what happens to a strongly built house when the air strikes it at that speed.

### TREMENDOUS PRESSURES MUST BE WITHSTOOD

But if the strain is great simply because of high speed, what must it be when a plane suddenly careens downward, taking a tremendous pressure off one part and hurling it upon another. It is that kind of sharp, sudden, unevenly distributed shock which allows the slightest tap of a knife to crack an egg or the explosion of a depth bomb to crush in the unprepared side of a submarine. Obviously a plane must be built so skillfully and of such perfect material as to withstand not only the pressure of its cyclone speed, but also the added shocks of its sudden evolutions.

The one material which gives this double characteristic of strength with lightness is spruce; not the ordinary spruce, but a super-selected spruce from the giant trees of the Pacific coast. Few would believe that this would present much of a problem with America's vast resources; but when one considers that only a small fraction of the very best spruce is usable at all, and that the war has vastly increased the demand for that,

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AMERICA'S WOMEN ARE ENLISTED IN THE AIR SERVICE OF THEIR COUNTRY

Not only in munitions factories does the skilled workwoman find her opportunity for war service. Filing fittings for the wing spars of airplanes is this girl's task.

the difficulty will begin to appear. Let me explain this in detail.

The ideal trees for airplane spruce are the fine old patriarchs, scarce enough at best, which have a girth of about 14 feet and run up 160 feet without a branch. Now when this splendid wood is cut 52 per cent is thrown out at once—the part in the heart where the grain is too circular and the part at the circumference where the grain is too coarse. Another 10 per cent is culled out for various reasons and another 7½ per cent lost in kiln shrinkage. This leaves us less than one-third of our original wood for further selection.

Of this third, however, only a small proportion is fit for the more delicate work. Less than 1 per cent of it has the necessary length and strength for ailerons; 2.3 per cent is fit for the wing beams; 4.6 per cent for the long struts, and the same for the landing gear. The balance can only be used for ribs and the smaller fittings.

### STRAINING AMERICA'S LUMBER RESOURCES

These figures show why America's vast lumber resources are being strained to the limit to build our air fleet. They explain also why it has been necessary for

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WINGS FOR THE AMERICAN BIRDMAN

Upon the flawless strength of its parts may depend in some critical moment a precious piece of information or the life of one of America's "Aces"

the United States to take over the whole spruce output as agent for the combined Allied program and eliminate the ruinous competition which had prevailed between the English, French, and Italian governments.

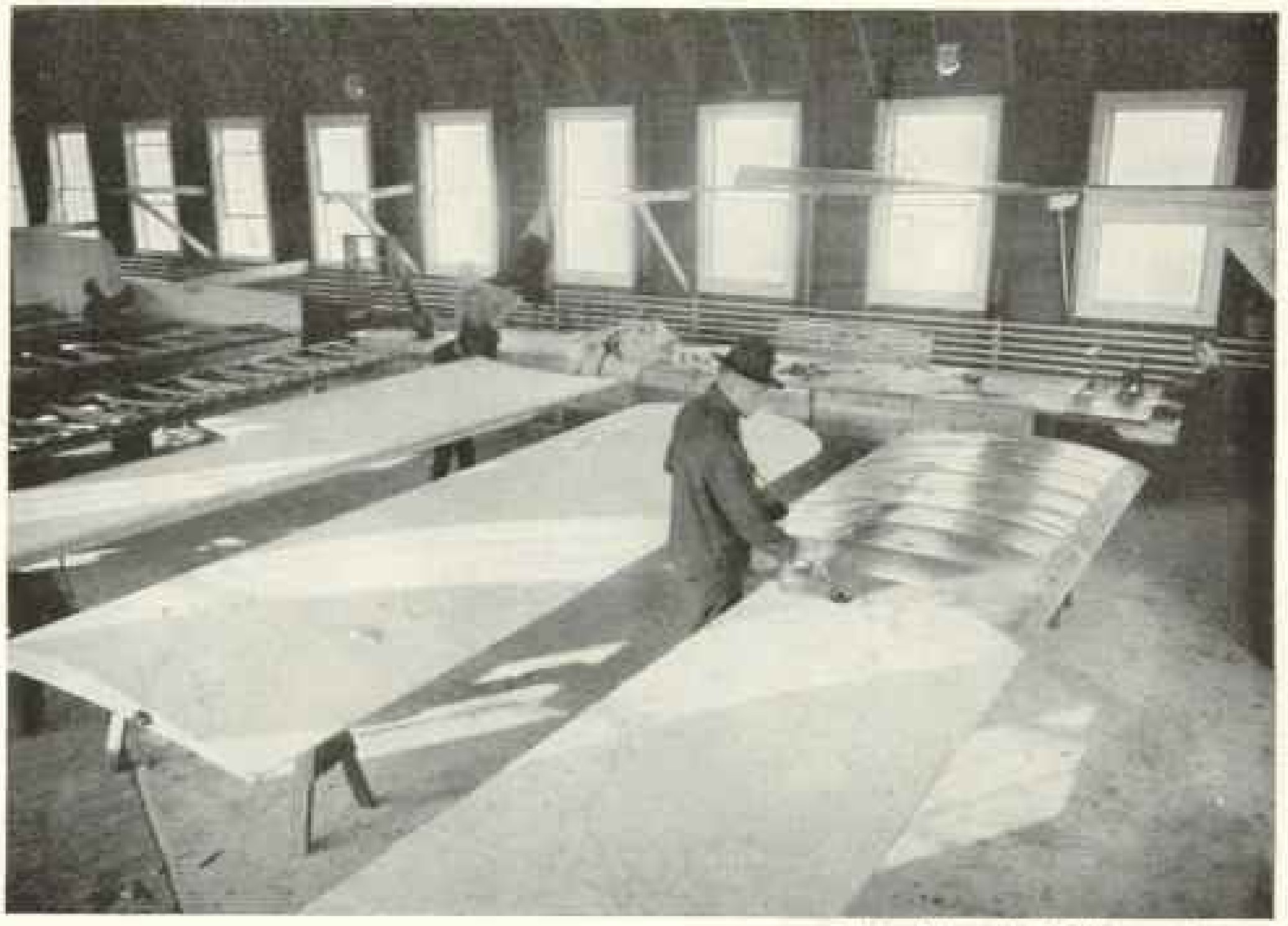
Despite every effort, however, the supply was still inadequate. There was neither the labor nor the mills to get out the necessary cut. Consequently Uncle Sam has had to go into the forests himself to supplement the present private resources. Lumber squadrons of several thousand men are being recruited to get out the trees, and additional mills are being set up to saw the overflow which the present mills cannot handle; for the war will not wait.

But, even with our lumber all milled, the task is but well started, for all the detailed cutting to standardized sizes, the construction into base units, such as wing-spars and ribs, and the assembling into completed sections of a plane still remain. Now that planes must be built by thousands, it is easy to see how vital it is to simplify and standardize each part so as to decrease manual labor as much as possible. It has, indeed, been no light task to harmonize all the conflicting sizes and shapes and bring them down to a few simple forms, especially when types are changing almost daily.

FOLLOWING AN AIRPLANE WING THROUGH ITS MANUFACTURE

Let us follow an airplane wing, for instance, through its various steps in manufacture. It looks simple enough as we see it all finished, with its slightly polished covering and its ultra-simple lines. Little does it show, as the face of a watch fails to show the delicate works within, that its making has necessitated the mobilization of the best workers and the best materials of America.

The lumber, as we have seen, comes to the factory roughly cut along standard lines. Here, however, it must be reinspected and a large proportion thrown out because of sap-pockets or deviations in grain. It must also be further shaped, reinforced in places of stress, hollowed



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"DOPING" THE WINGS OF AIRPLANES

In the parlance of the day, "dope" suggests sluggishness and lowered vitality, but in the manufacture of airplanes it means speed. Dope is a liquid compound with which the linen covering the wings of a flying machine is treated to shrink the fabric and make it taut over the framework, thus reducing its resistance to the air.

out in places of extra weight, and made ready as unit pieces. This is a task for the finest woodworkers or cabinet-makers.

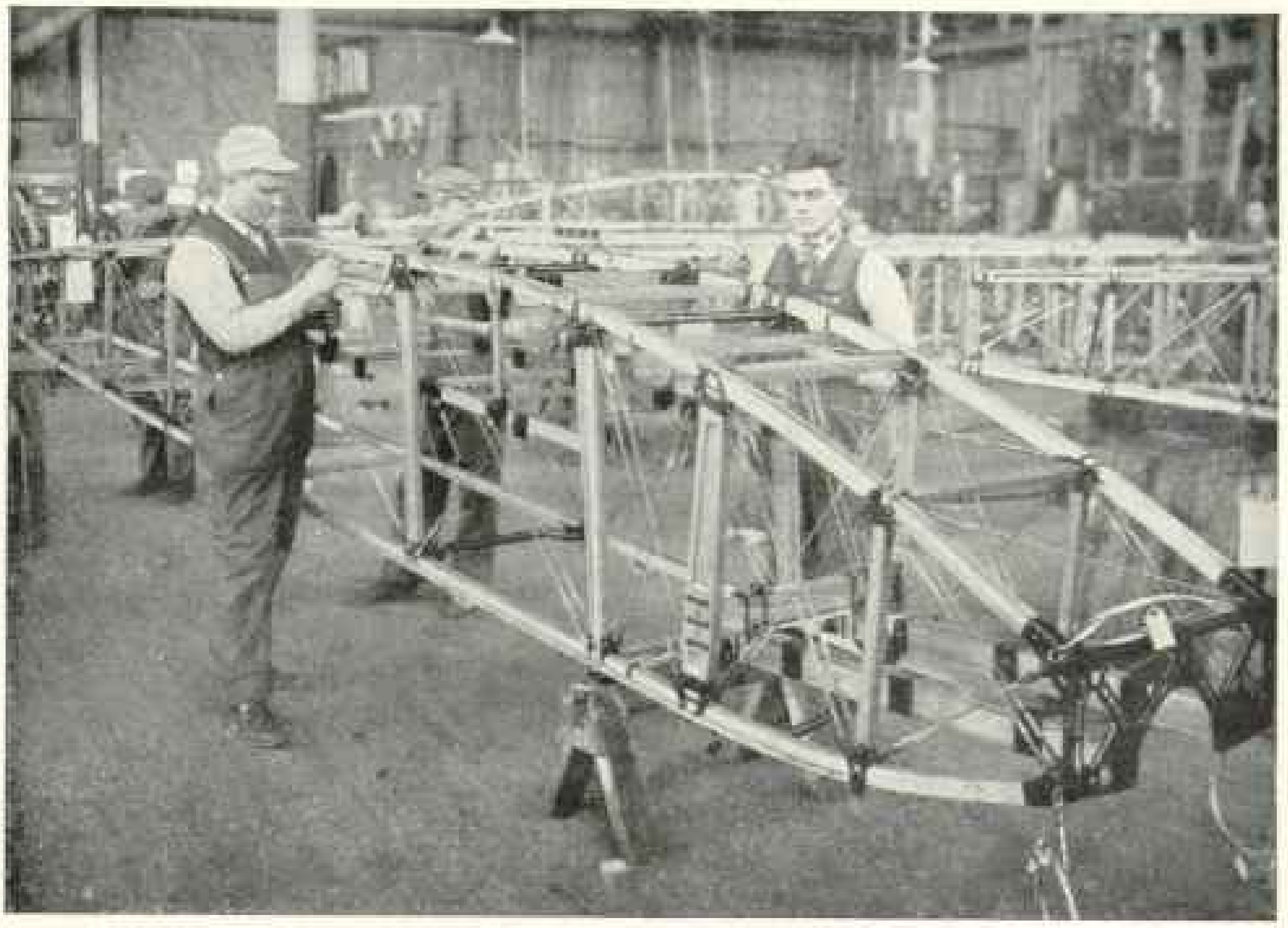
Then comes the laying of the keel, as we may call it, the putting down of the basic wing-spars, simple enough in appearance, but so carefully selected that their final cost is estimated at from $30 to $80 each. Next is the fitting in of the ribs, or cross-pieces, as many as 30 to a wing, and themselves coming to a final cost of about $9 each. Obviously, again, only an expert in woodworking can secure the exact setting required.

When finally all the ribs are firmly joined, the wing remains but a skeleton without the necessary covering to make it solid. Linen is the one perfect material known for this purpose, because it is light, strong, and will not rip, as cotton does, when pierced with bullets. But the supply of linen also ran short under the tremendous war demands, especially with that from Belgium and northern France cut off, and it was only when England mobilized all her strength that the world's best supply center in Ireland was able to rise to the demand. A little idea of how much is needed for the American program alone is found in the fact that each of our thousands of machines requires 201 square yards.

### A MAXIMUM OF STRENGTH AND LIGHTNESS

Once secured, the linen must be cut to size, reinforced in places of stress, and then sewed in back and forth over each rib to make it absolutely tight and able to withstand a 150-mile wind pressure. This work is mostly done by women working in pairs, pushing a long 3-inch needle from one side to the other. No one has ever estimated the number of stitches necessary for a single plane.

When the sewing is completed, our wing is in a semi-finished state. It represents the maximum of strength and lightness which human ingenuity has as



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ARTICULATING THE SKELETON OF AN AIRPLANE'S FUSELAGE, OR BODY

Various parts of the framework of our flying machines and the metal fittings are made in widely separated factories. They are then shipped to assembling factories, where the parts are put together and wired by highly specialized workmen.

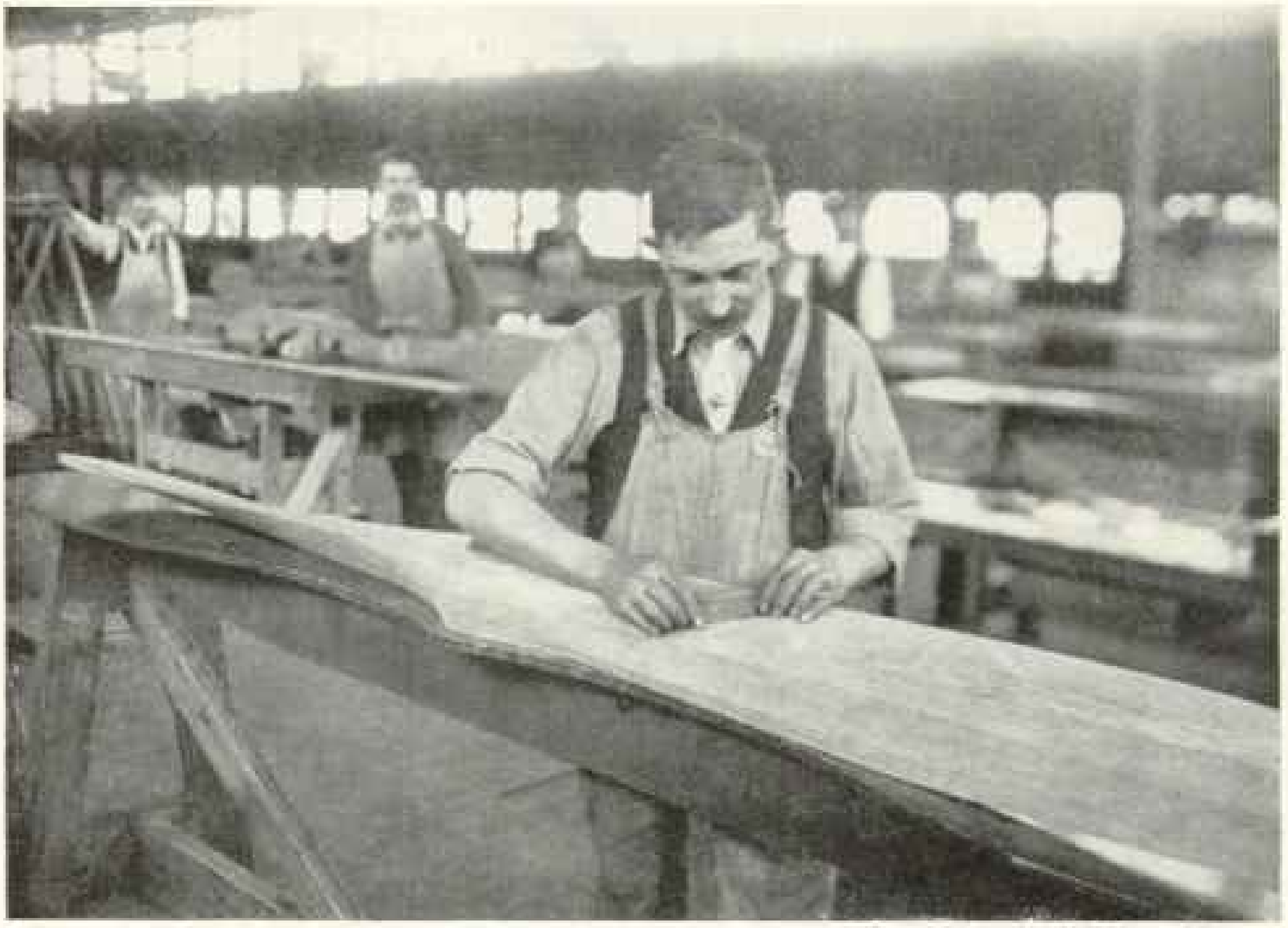
yet developed; but its surface is still rough and not yet drum-tight. To effect this, three coats of "dope" must be applied. This is a cellulose chemical preparation which was produced here only in small quantities before the war and of which 30 gallons are necessary for every plane. It contracts the linen appreciably, making it very taut and slippery, so as to decrease wind resistance. A final application of varnish to make the wing water-tight renders this part of the plane ready to be brought together with the other parts—engine, fuselage, propeller, controls, etc.

And so throughout the whole plane there is not an item which has not been built with infinite care and skill, balanced to the finest mechanical nicety, reduced in weight to the smallest margin of safety, always in the continued struggle to harmonize the antagonistic elements of lightness and strength. When, for instance, we look at the gently sloping curve on the fuselage behind the pilot, we are not apt to realize that some expert engineer has made this in place of a right angle in order to prevent air currents from eddying back and decreasing the speed of the plane several miles an hour.

Every sharp line, every superfluous wire, every unnecessary bit of material, adds to the weight and the wind resistance of the plane and holds up its speed through the air. Hence a continual struggle is ever going on between the experts of each army. With every enemy machine captured betterments are noted which further tax our industrial resources here and call for a higher degree both of skill in labor and of perfection in materials.

### A DAY-AND-NIGHT RACE

I shall not repeat the story of the Liberty Motor, for that is well known; but I do want to place one question: Where has it been possible to secure sets of the accessories needed for every one of our thousands of machines, sets including a



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PUTTING THE FINAL TOUCHES ON AN AIRPLANE PROPELLER

Like the screw of the ocean liner, the air propeller of the flying machine is the primary medium of locomotion. It must be able to withstand a terrific air pressure, estimated at several tons, and must revolve with sufficient rapidity to drive the machine at incredible speeds, up to 150 miles an hour. These propeller blades are not made of single pieces of timber, but of from 10 to 25 pieces of walnut, mahogany, white oak, or cocoa-wood, all carefully laminated. It takes ten weeks to make a propeller, three weeks of that time being required to allow the parts to set after having been glued.

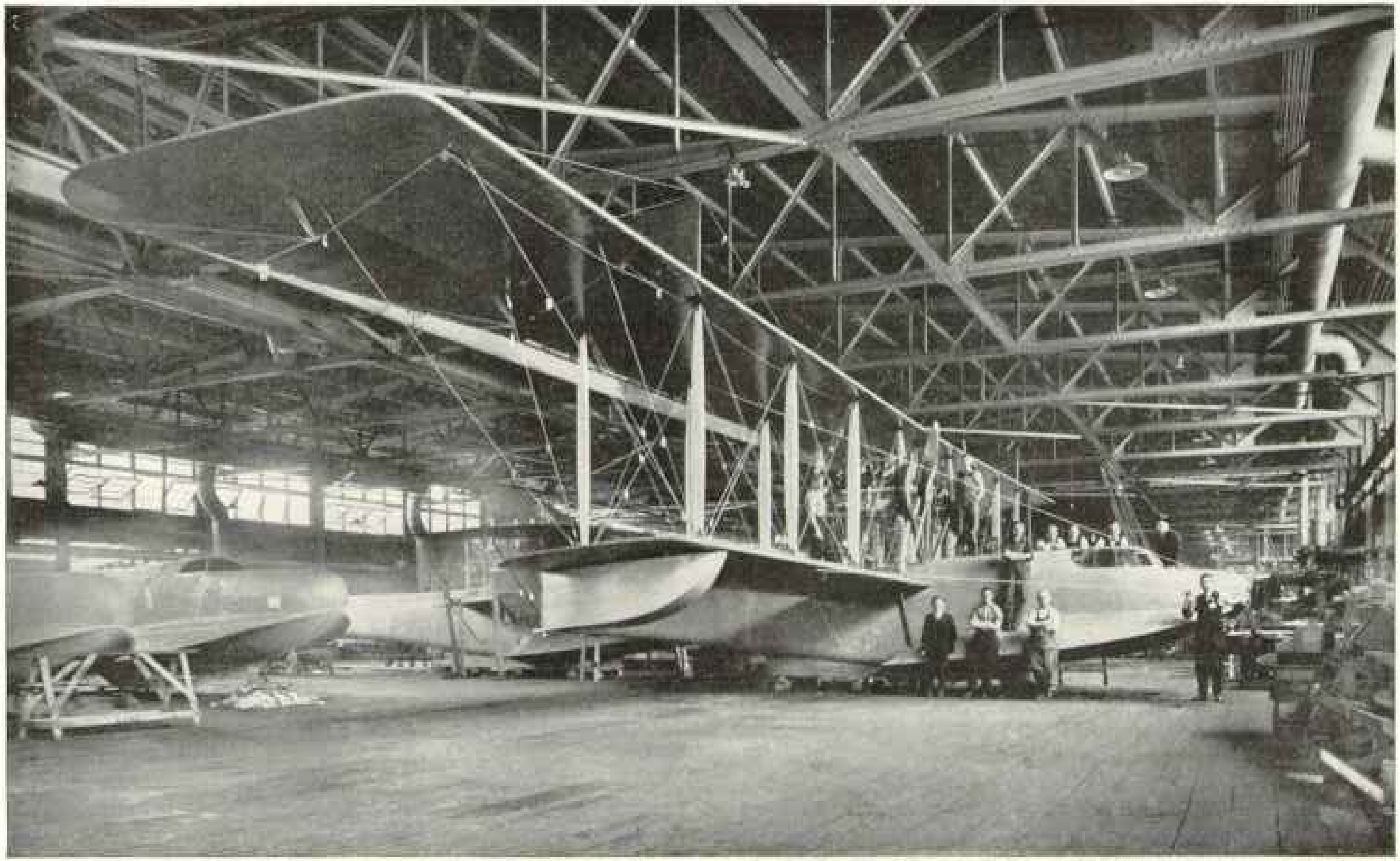
barometer, an air speed indicator, an aërial compass, an inclinometer, an altimeter, etc., the finest kinds of implements, practically non-existent in this country before the war? The mere names of the instruments and the skill which every layman would associate with their manufacture open up what has been another tremendous industrial problem in our Air Service.

Earlier in this article I used the word "intricate" in connection with airplane manufacture. Perhaps the foregoing statements will have demonstrated its correctness; but let me add a few other considerations. This program spells victory or continued deadlock abroad. Its completion means thousands of lives saved. Yet overprecipitateness means defeat and terrible losses. The two must be harmonized—a superhuman speed in building up a series of new industries, together with an absolutely infallible mechanical judgment and skill. Naturally the strain on those responsible is great.

I only wish the country might catch the romance of our new air industry. It is a day-and-night race against time along a course only semi-lighted and full of pitfalls. So far we have been fortunate in that the delays, the mistakes, and the difficulties have been largely offset by the unanimous effort and good-will which have met us on all sides. The race, however, is not yet over and will not be until peace is signed. And until then we need the intelligent interest of the public in the baffling but fascinating work before us.

## THE EVEN GREATER PROBLEMS OF PERSONNEL

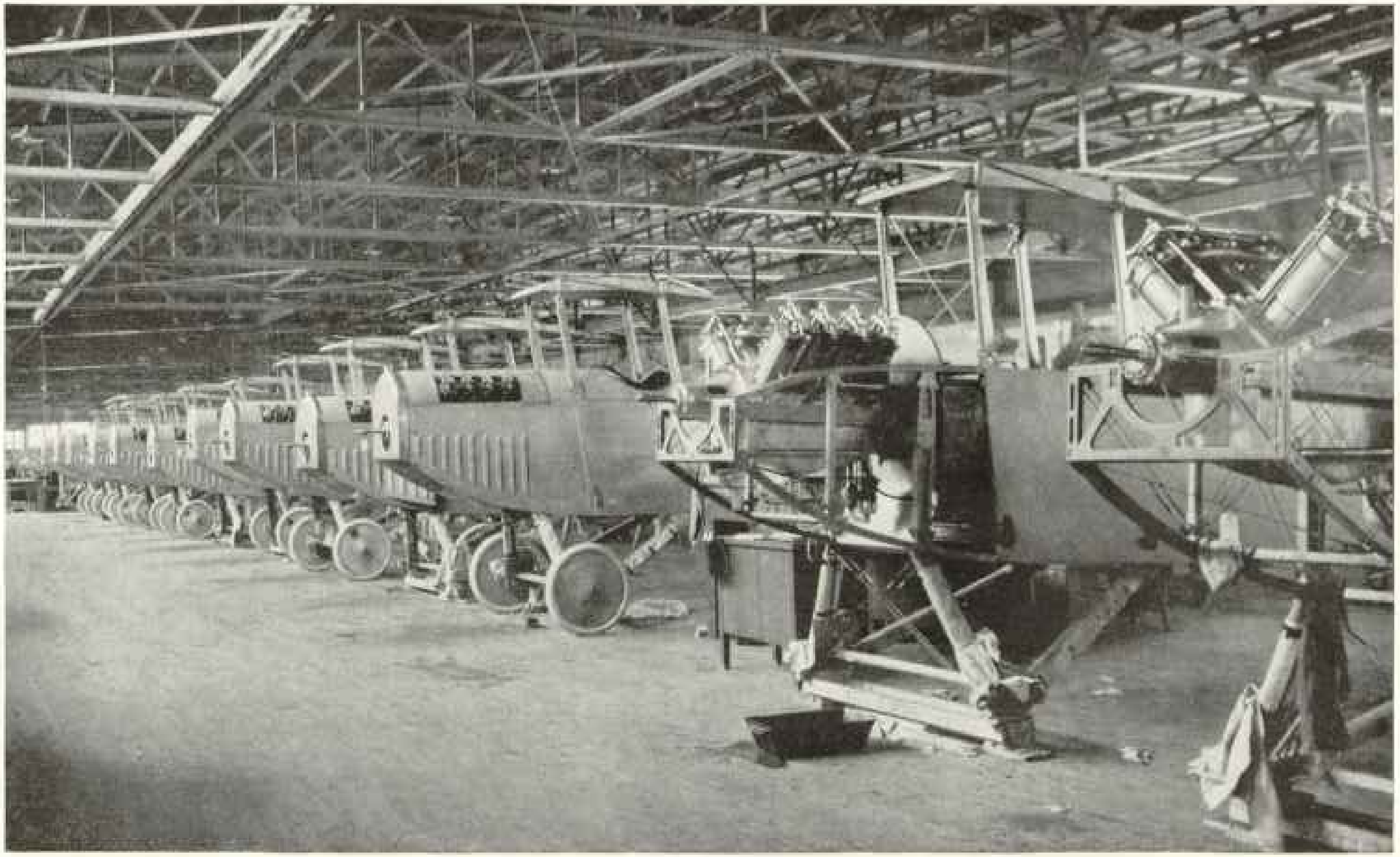
If the problem of providing machines and equipment for a great Air Army is one to tax the industrial and natural re-



Photograph by Central News Photo Service

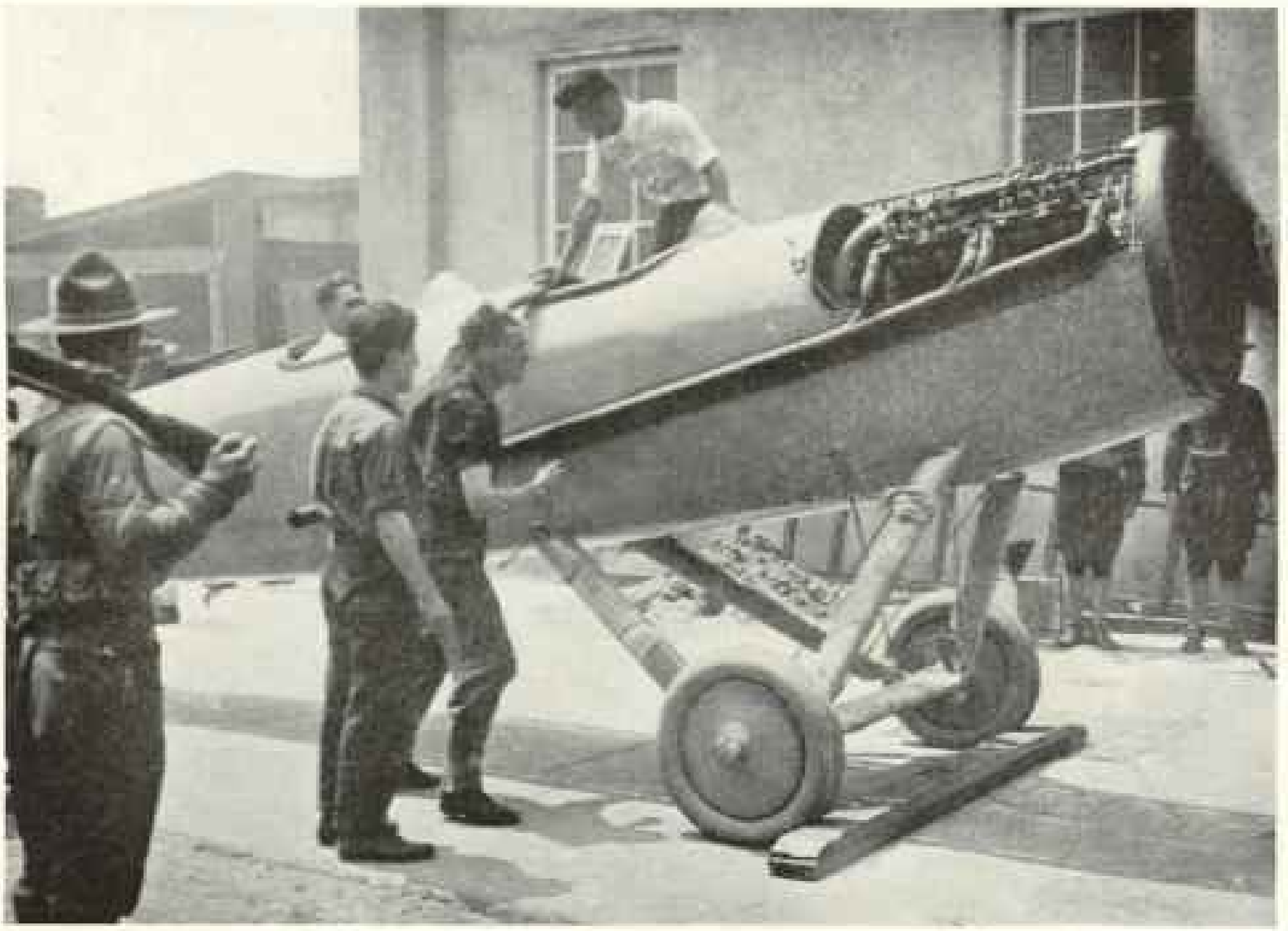
BUILDING A GIANT HYDRO-AIRPLANE FOR AN AMERICAN PILOT

An aviator may sleep in a dugout, a tent, or under the open sky, but his plane requires a large, substantially built structure. Immense hangars of sheet metal, concrete, and steel are to be found in rapidly multiplying numbers throughout America. In France and Italy they are even more numerous.



A DOZEN FLEDGLINGS OF WAR ALMOST READY TO TRY THEIR WINGS

Various parts of the Liberty Motor are being manufactured in scores of factories throughout the United States, but the construction of the planes themselves is a highly specialized industrial science, requiring not only skilled workmanship, but the most watchful supervision, for a weak joint in the framework may mean death to the aviator.



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AN AIRPLANE IN THE CATERPILLAR STAGE OF ITS EVOLUTION

Before it receives its wings, the flying machine's motor mechanism is thoroughly tested. All the big plants where these craft are being made are under the protection of our soldiers, one of whom is to be seen on guard in the foreground of this picture.

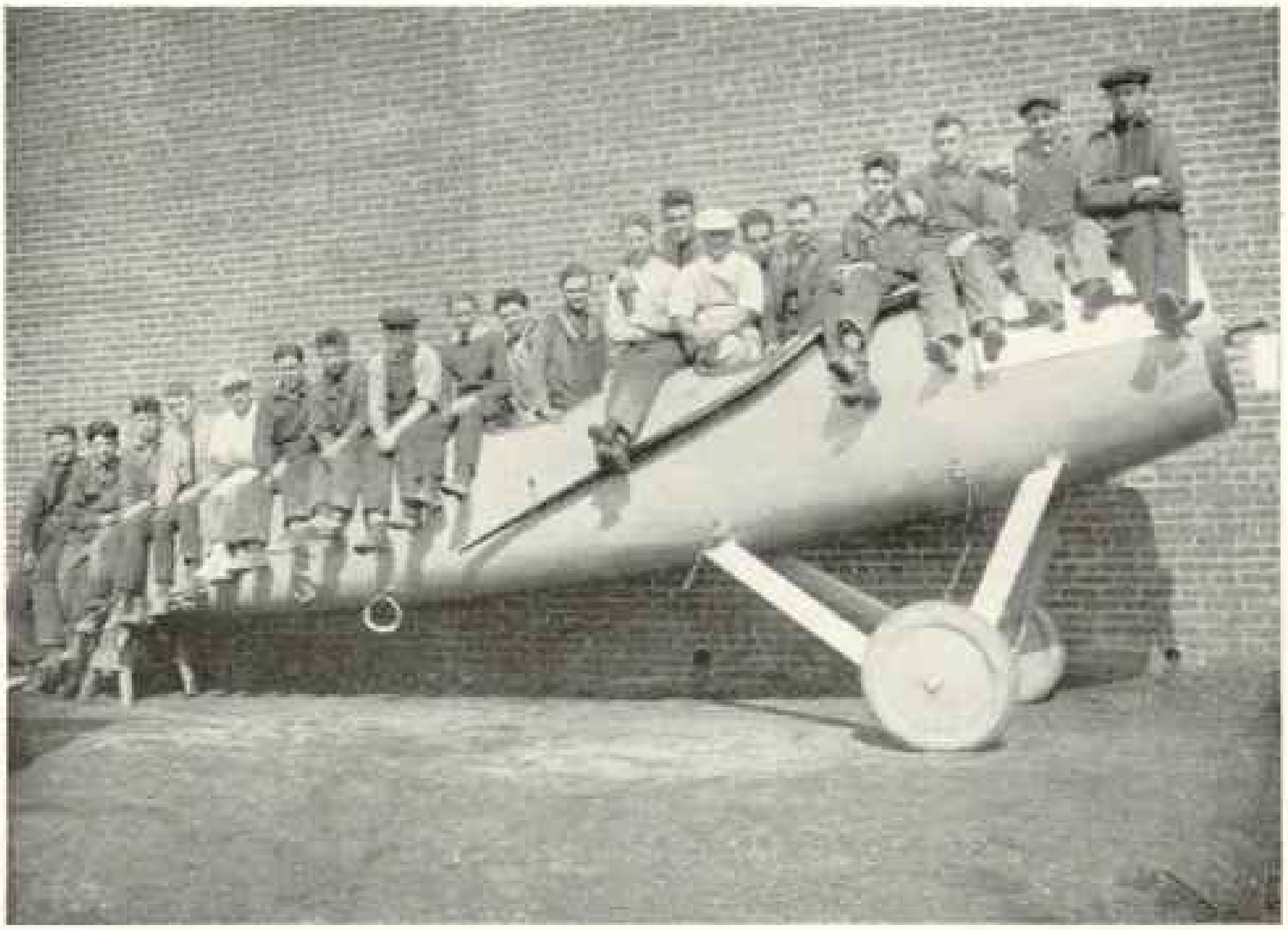
sources of the nation, and the ingenuity and enterprise of our people, the selection and training of a matchlessly skilled and intrepid personnel to man our sky fleets when they are completed present problems of perhaps even greater intricacy. The task of providing men has required not so much a broadcast recruiting as a careful, intensive selection among various isolated classes of specialists and the upbuilding of nearly a dozen courses of training as widely different as black is from white.

We are apt to think of the air service only in the terms of aviators, little realizing that for every aviator there must be nearly a score of other men—psychologists, factory inspectors, photophysicists, welders, expert enginemen—and so on down through a long list. All such men are truly specialists; they are scattered very thinly through society, but must be sought with the utmost care and given a specialized course of training to adapt their present skill to the intricacies of aircraft work.

NEEDS DIFFICULT TO FORESEE

Needs for such men are most difficult to foresee at a glance; in fact, they are apt to become suddenly evident as the situation unfolds. One day, for instance, the Equipment Division will complete its analysis of requirements and put in a request for several thousand trained factory inspectors, vitally necessary to approve the material purchases of about $350,000,000 entrusted to this division. Obviously, this is difficult, painstaking work, requiring the selection of men of experience from a field not very large.

Photophysicists may be the next necessity—fast news photographers trained in the speed of journalism and able to convert a plate from an airplane into a print ready for the General Staff within ten minutes' time. They must be almost hand-picked from the newspaper offices of the country, creating indeed a void here, but at the same time becoming the only authorized photographers of all Uncle Sam's military operations, both for



LIGHT AND TRIM, BUT TOUGH AS STEEL

The strain of twenty men seated on this eggshell of an airplane body is not nearly so great as the tremendous tension caused by a many-horse-powered motor driving the machine through the air at twice or three times the speed of an express train.

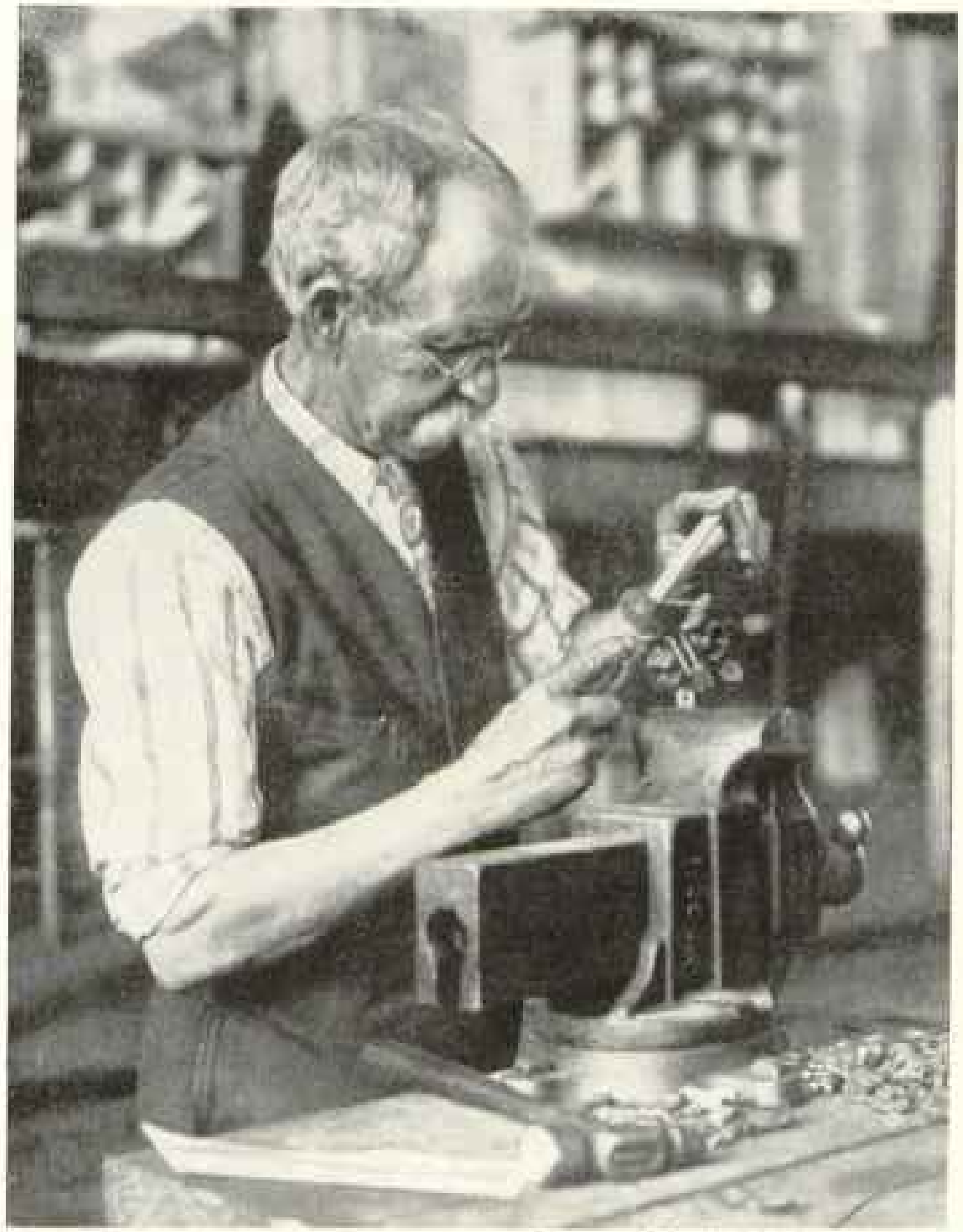
immediate public distribution and for "The Official Pictorial History of the War."

Then comes the need for psychologists, doctors, dentists, and pharmacists. Few people realize that the air service must have its own medical staff, first, because our new flying fields are in themselves large communities subject to the ordinary sicknesses, and, second, because a most careful check must be kept by a skilled physician against the nervous wear and tear of the service. Some aviators who might slowly burn themselves out by too steady concentration are saved by watchful attention to the first signs of weakness.

### LIFE OF AN AIRPLANE ENGINE ONLY 100 HOURS

Very possibly the Squadrons Sections will suddenly state a need for several hundred mechanical engineers to carry through all the intricate oversight of planes in the field. We little realize that the life of an airplane engine, for instance, is hardly over a hundred hours, and that the continual substitution of new parts, a few at a time, often entirely remakes it. Indeed, for every plane and engine which we ship to Europe we must ship approximately 70 per cent of spare parts for repairs. The judgment as to when new parts shall be put in is the answer to the life of the plane and must be entrusted only to expert engineers.

Even more difficult, on account of the very much larger number involved, has been the supplying of skilled mechanics—men who can take an engine or a plane apart and put it together again; men skilled in such work as engine-fitting, welding, propeller-making, magnetos, wing construction, lithography, vulcanizing, and the like. It has been necessary to seek them out oftentimes in the byways of industry, in small boat companies, for instance, where are found men ideal for woodworking, or in garages throughout the country, where are found



Photograph by Kadel & Herbert

EACH SCREW MUST BE TRUE, EVERY BOLT MUST BE STRONG, IF AMERICA'S ARMADA OF THE AIR IS TO ACHIEVE VICTORY AND PEACE

One of the most delicate operations in the manufacture of airplanes is the making of metal fittings for the fuselage (the body of the car).

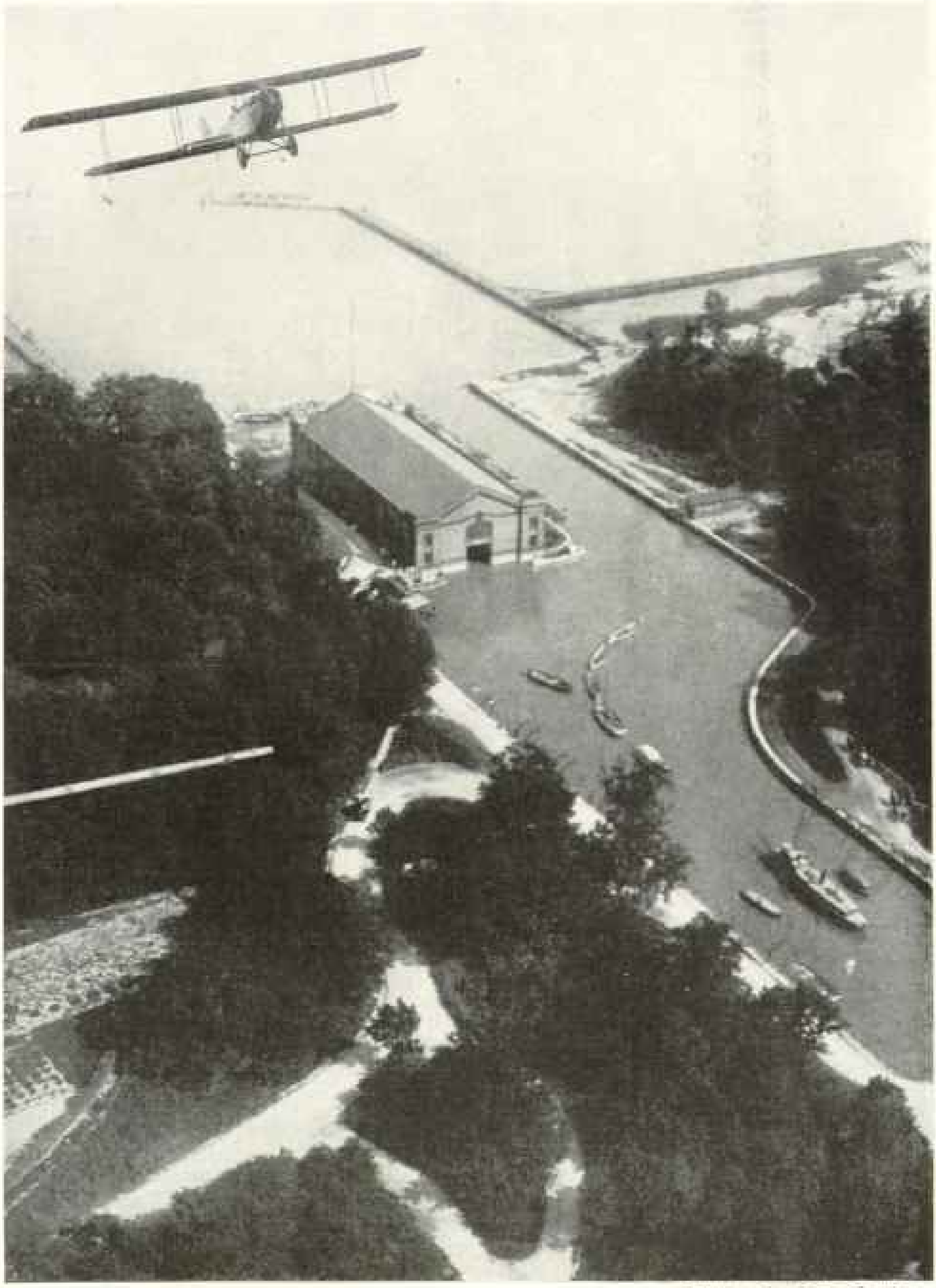
Photograph by Western Newspaper Union

PAINTING THE DISTINGUISHING STAR ON THE WINGS OF AN AMERICAN AIRPLANE

In order to be readily discernible at high altitudes, the emblems on the wings of the fighting planes of each nation must be as large as possible. The American star, in this instance taller than the man who is painting it, is white on a blue field. The center is red. For the aircraft emblems of other countries see NATIONAL GEOGRAPHIC MAGAZINE, Flag Number (October, 1917), page 319.

AN AVIATION SCHOOL MACHINE FLYING OVER BISCAYNE BAY, FLORIDA

Speed, handiness, and great climbing ability are three essential qualities in a warplane. A machine admirably constructed for fighting at low altitudes but ineffective at an elevation of two and a half miles would be worthless, for in modern air battles it frequently happens that the scene of conflict is four miles above the trenches. The quality which a fighter most values in his machine is "handiness," of which speed is one of the chief factors.



© International Film Service

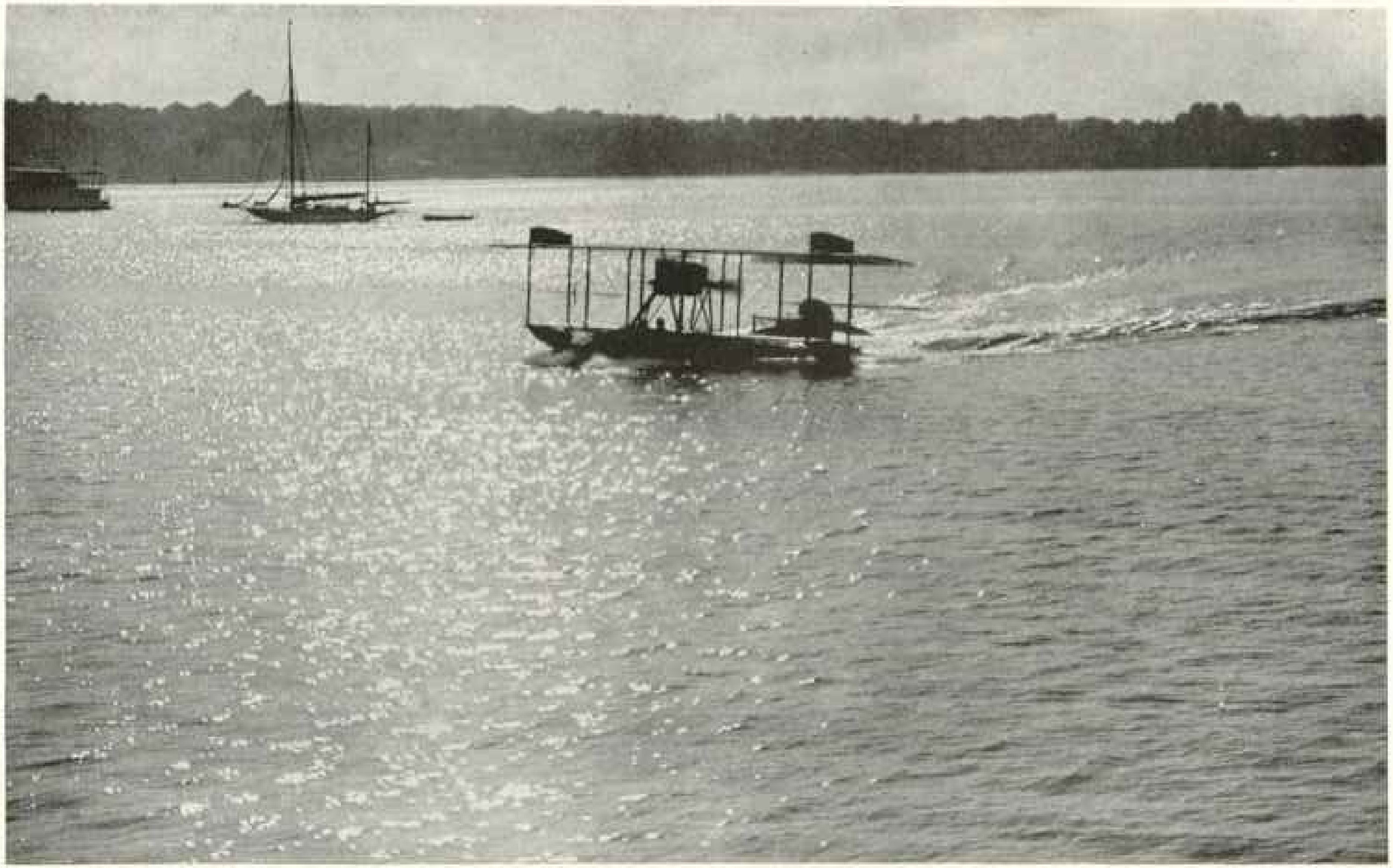
BOAT-HOUSE AND LAGOON AT THE GREAT LAKES TRAINING STATION

In training aviators for the war necessities of the hour America is also providing for the days of peace, when the airplane will play an important rôle in national and international commerce. Many questions remain to be solved—rules of the air, as compared with rules of the road and of the sea; the right of landing; the mapping of air currents; the collection of customs on airplane freight which may be deposited in any part of the country after a flight over international boundaries.

Photograph by Edwin Levick.

MINEOLA CAMP MILITARY AVIATION SCHOOL.

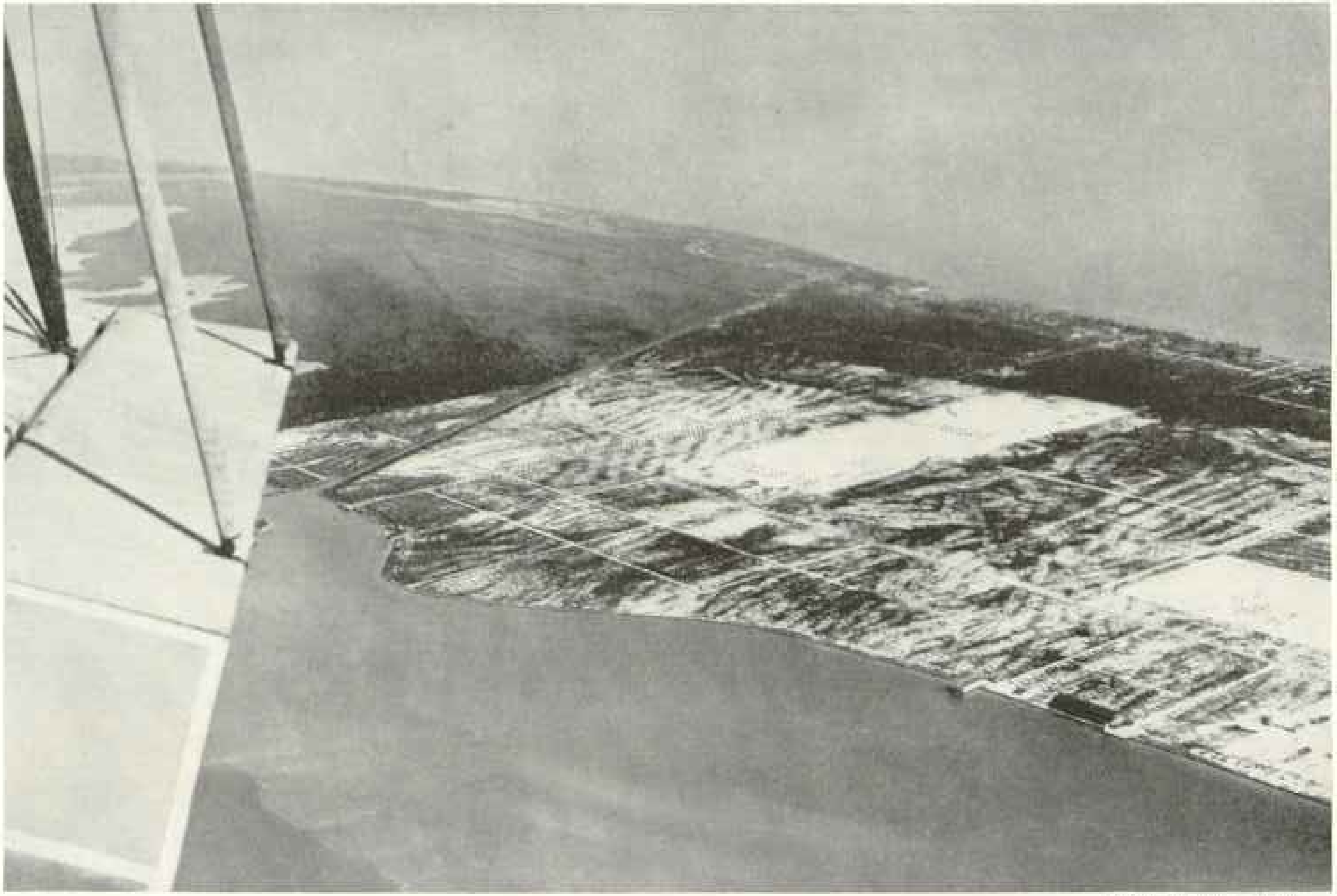
American fliers are in training not only in this country, but also in Southern France, and in a short time the red-white-and-blue star, distinguishing symbol of the United States military airplane, will be "clipping the corners of the pyramids," as our student airmen have been invited to use Great Britain's splendid flying school in Egypt, where the weather conditions are ideal from December to December.



Photograph by Edwin Levick

A HYDRO-AIRPLANE RETURNING TO ITS HANGAR: PORT WASHINGTON, LONG ISLAND

The amphibious machine is a comparatively recent development of man's newest weapon of war. It will be one of our most important instruments of national defense in the years to come, however, if the proposed program of aerial coast patrol is developed.



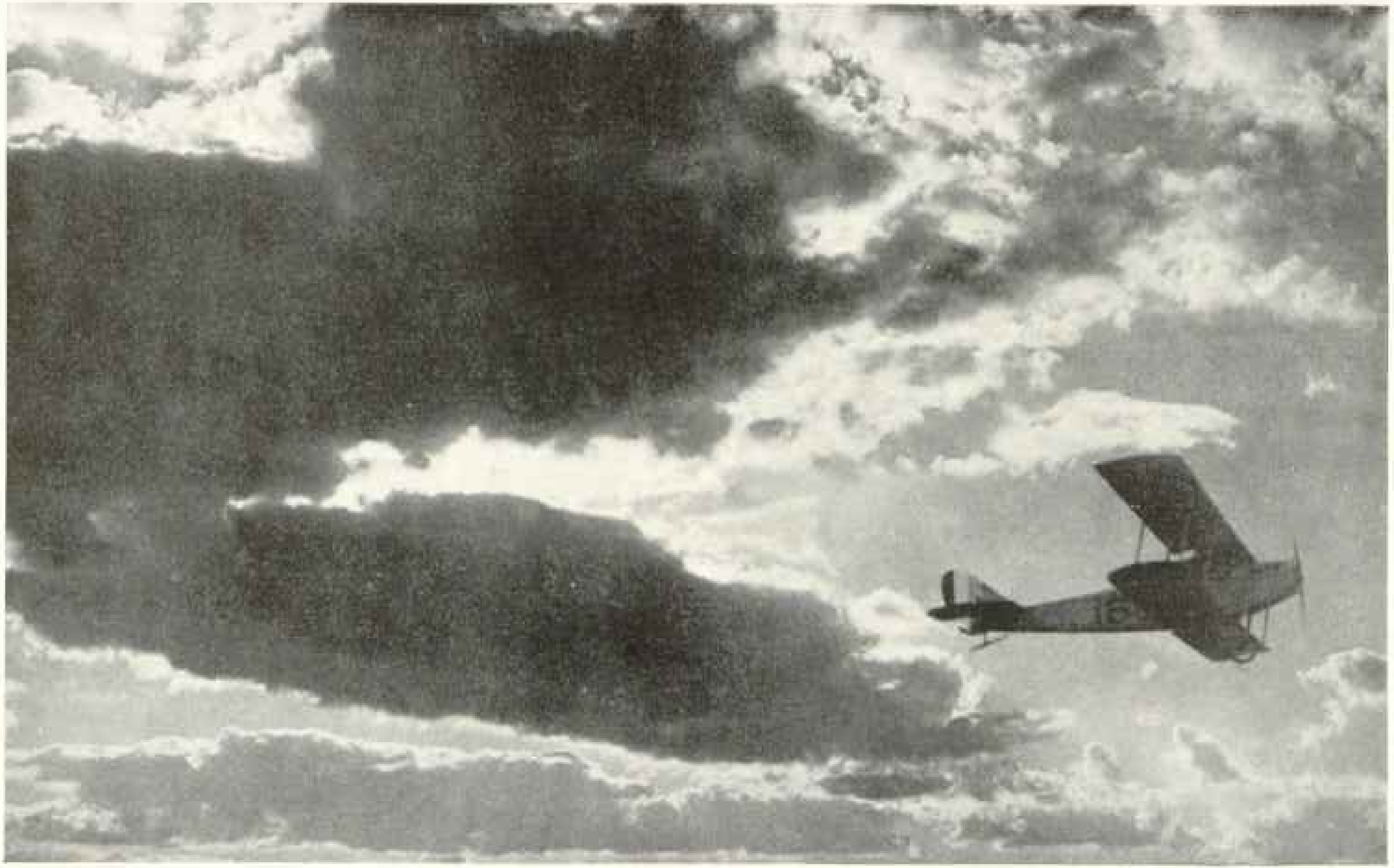
Photograph by R. B. Holt

AN AËROGRAPH OF ALTON BEACH, FLORIDA, LOOKING TOWARD THE ATLANTIC: PICTURE MADE FROM AN AIRPLANE SOARING OVER BISCAYNE BAY

© Underwood & Underwood

NOT A NOSE DIVE, BUT A LOOP-THE-LOOP OVER NEWPORT NEWS, VIRGINIA

The biplane is being operated by an instructor of U. S. Army fliers. This remarkable photograph was made from an airplane soaring hundreds of feet above the black flier in the foreground.



Photograph by Edwin Levick

OUT OF THE STORM

The most dreaded Nemesis of the cadet aviator is a "dead hole" in the air—an area of extreme low pressure caused by ascending and descending currents. When a plane reaches one of these spots it drops like a plummet. Dead holes abound in summer-time up to a height of 1,000 feet, and on extremely hot afternoons they have been encountered at elevations of a mile. They are much less numerous on winter days, and are practically non-existent at night; so that night flying is safest, so far as "holes" are concerned.

© Paul Thompson

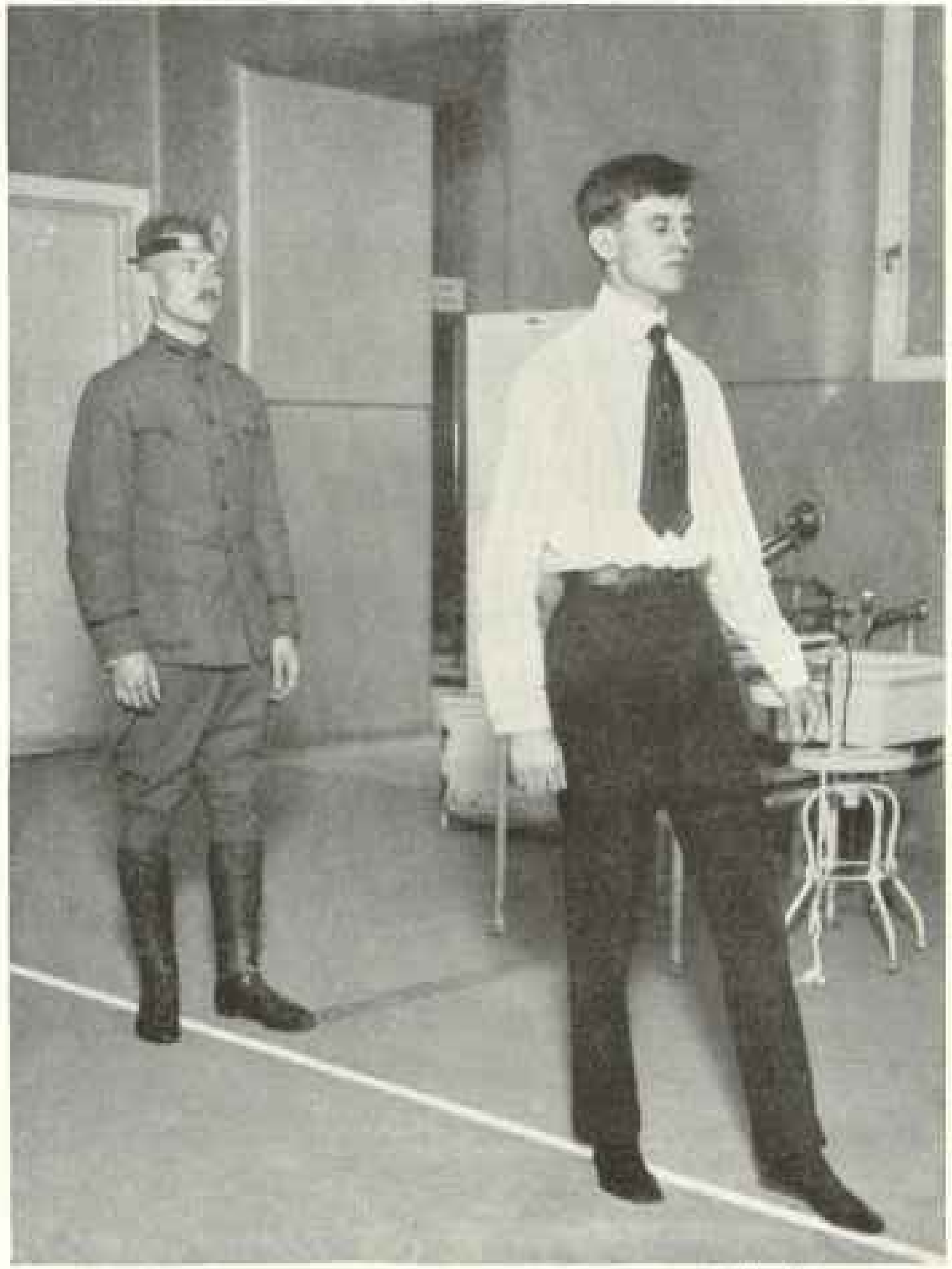
AN AIRPLANE OBSERVER WHO COULD NOT PASS THE STEREOSCOPIC VISION TEST WOULD BE A LIABILITY

It is essential for the airman to be able to judge correctly whether one object is nearer than another; whether one machine is higher than another; whether one battery is further advanced than another. Otherwise he could not direct artillery fire accurately, nor could he protect himself against the attack of enemy aviators.

© Paul Thompson

THE MAN WHO SEES DOUBLE IS NOT DESTINED TO BECOME AN AIR PILOT

In the muscle balance test the candidate watches a candle flame through a peculiar contrivance. The examiner gradually adjusts the apparatus, causing the flame to appear double, one above the other. A spirit-level indicates the point at which the flame should appear duplicated. This is one of the most important tests.



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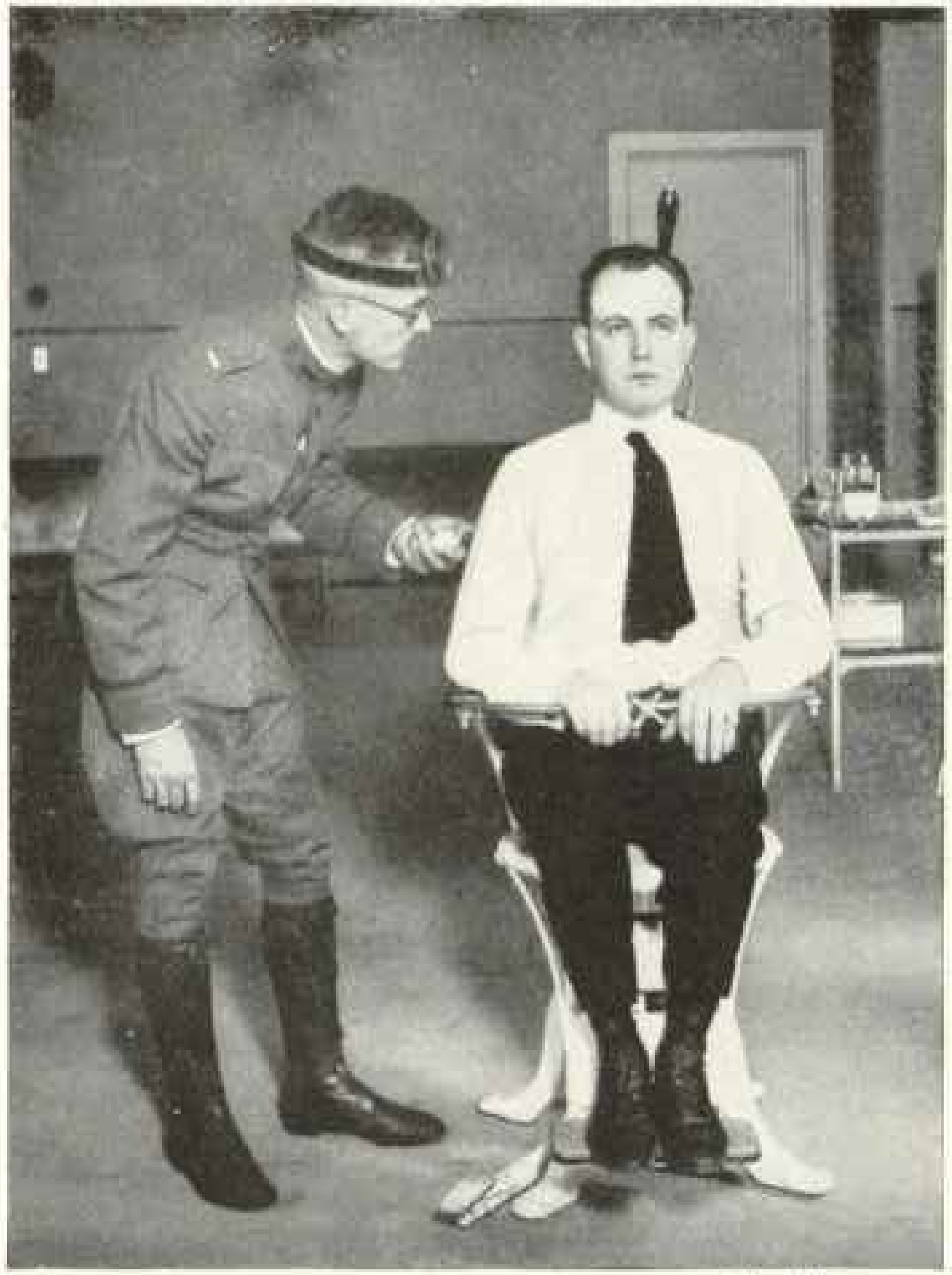
MAKING THE AVIATION CANDIDATE WALK A LITERAL CHALK-LINE

With eyes closed, the applicant walks forward and backward. His deviation from the straight and narrow way is one of the determining factors in his acceptance or rejection for service as a pilot of America's great air fleet.

© Paul Thompson

PUTTING THE AIR PILOT CANDIDATE THROUGH THE "NYSTAGMUS TEST"

With eyes closed, the applicant, seated in a revolving chair, is whirled around ten times in twenty seconds. The chair is then stopped and the applicant is told to focus his eyes on a distant object. The visual disturbance which results from the whirl is known as the "nystagmus."



© Paul Thompson

WHERE THE MEDICAL EXAMINER USES A STOP-WATCH INSTEAD OF A STETHOSCOPE

After a whirl in a revolving chair, each candidate for America's flying service is tested to see how quickly he recovers his equilibrium. The eyes are the index to man's balancing apparatus.

© Paul Thompson

SUBJECTING THE PROSPECTIVE AMERICAN AIRMAN TO THE FALLING TEST

The sixth sense—that of equilibrium—is a function of the labyrinth of the internal ear. One part of the labyrinth consists of three semi-circular canals, set in different planes. Through these flows the endolymph, a fluid which acts like a spirit-level.

© Paul Thompson

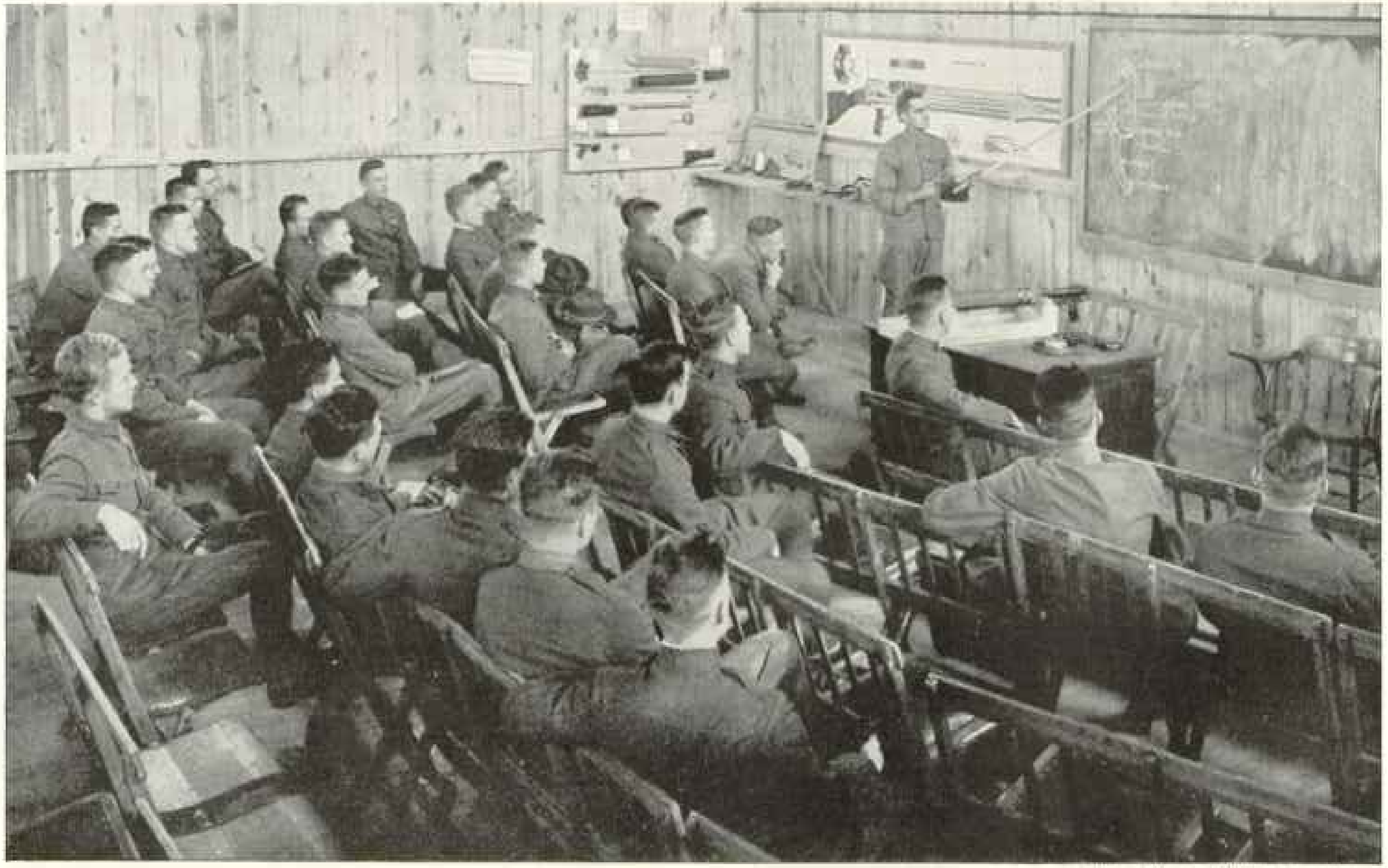
A CANDIDATE WHO IS RESPONDING NORMALLY TO THE FALLING TEST

With his head forward and eyes closed, the candidate is placed in a spinning chair, which is revolved five times to the left in ten seconds. When the chair stops the candidate is told to raise his head and open his eyes. If he is normal his head will drop to the left, showing that the canals of the inner ear function properly.

© Paul Thomson

THE "PAST POINTING" TEST TO DETERMINE ONE'S SENSE OF BALANCE AND DIRECTION

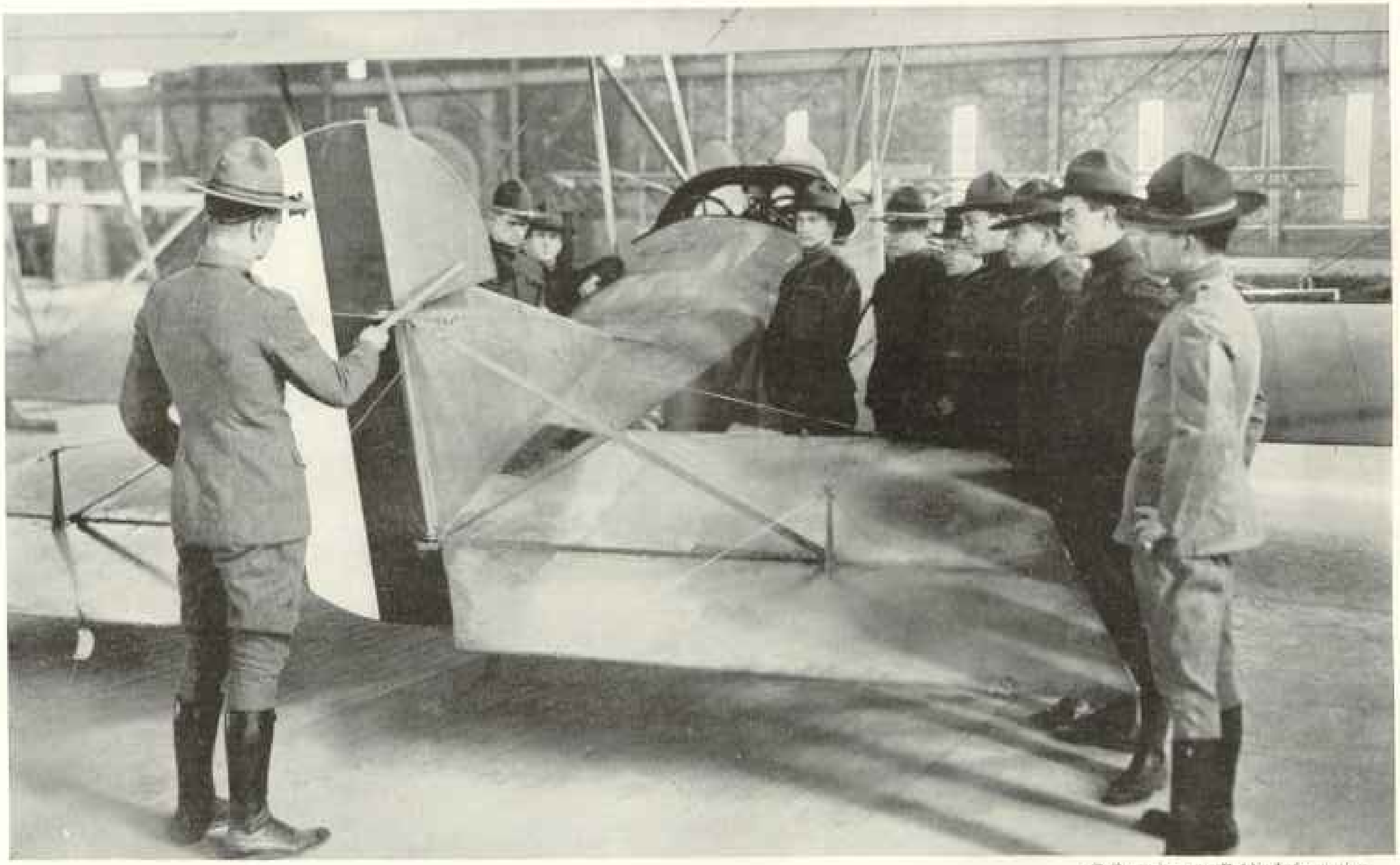
The candidate, eyes closed, is trying to touch the examiner's hand with his left forefinger after being whirled ten times in ten seconds. When the chair stopped, the candidate raised his left arm and with eyes tightly closed dropped his arm and "past pointed" to the right, away from the examiner's hand in a sweeping arc.





STUDYING THE ANATOMY OF A MACHINE-GUN

These husky lads are preparing for the day when they will become America's golden eagles of the air. From their vantage point in the air they will watch every movement of the enemy. The far-flung battle line will stretch beneath them, with men appearing as ants, serried rows of trenches as mud-cracks on the face of the ground, and the dazzling flashes of big guns but as the feeble coruscations of a firefly on a distant hill. The earth will appear to them as but a map in slight relief, the green betokening the grass field, the yellow the ripening grain, the dark patches the woods, the mirror-like gleam a river or a lake, and the white ribbons the macadam road. And the two streaks of thin brightness are the traffic-polished surfaces of the rails of a railway to the front, stretching across the picture as though ruled by some mighty pen.



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STUDYING THE MYSTERIES OF FLYING

It is impossible to tell how much the armies at the front owe to their aviators. In days past it was the cavalryman, wounded and galloping across the country, mayhap with a thousand foes at his heels. Today there comes flying across the heavens a resolute young hero on the wings of a modern Pegasus, defying shot and shell alike, and enabling his commander to see what Wellington always wanted to see—"what was on the other side of the hill." With an adequate air service for army and navy and the enemy must play his war game with his cards on the table. He has no chance whatever under these conditions to make capital of the element of surprise.

© Committee on Public Information

AVIATION STUDENTS GETTING ACQUAINTED WITH THEIR AIRPLANE ENGINES

It has been said that a first-class mechanic is worth more to a training school than a first-class pilot, and it has been found that they are harder to recruit; yet every pilot must know his engine. He must know by its rhythm when it is running properly; he must have keenness of ear for any unusual sound, for such sounds are danger signals, which, observed in time, may save a machine and its precious freight. Hence, at the training schools every pilot is given the most thorough training in the care of his engine.

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STUDENT AVIATORS MASTERING THE INTRICACIES OF THE AIRPLANE MOTOR

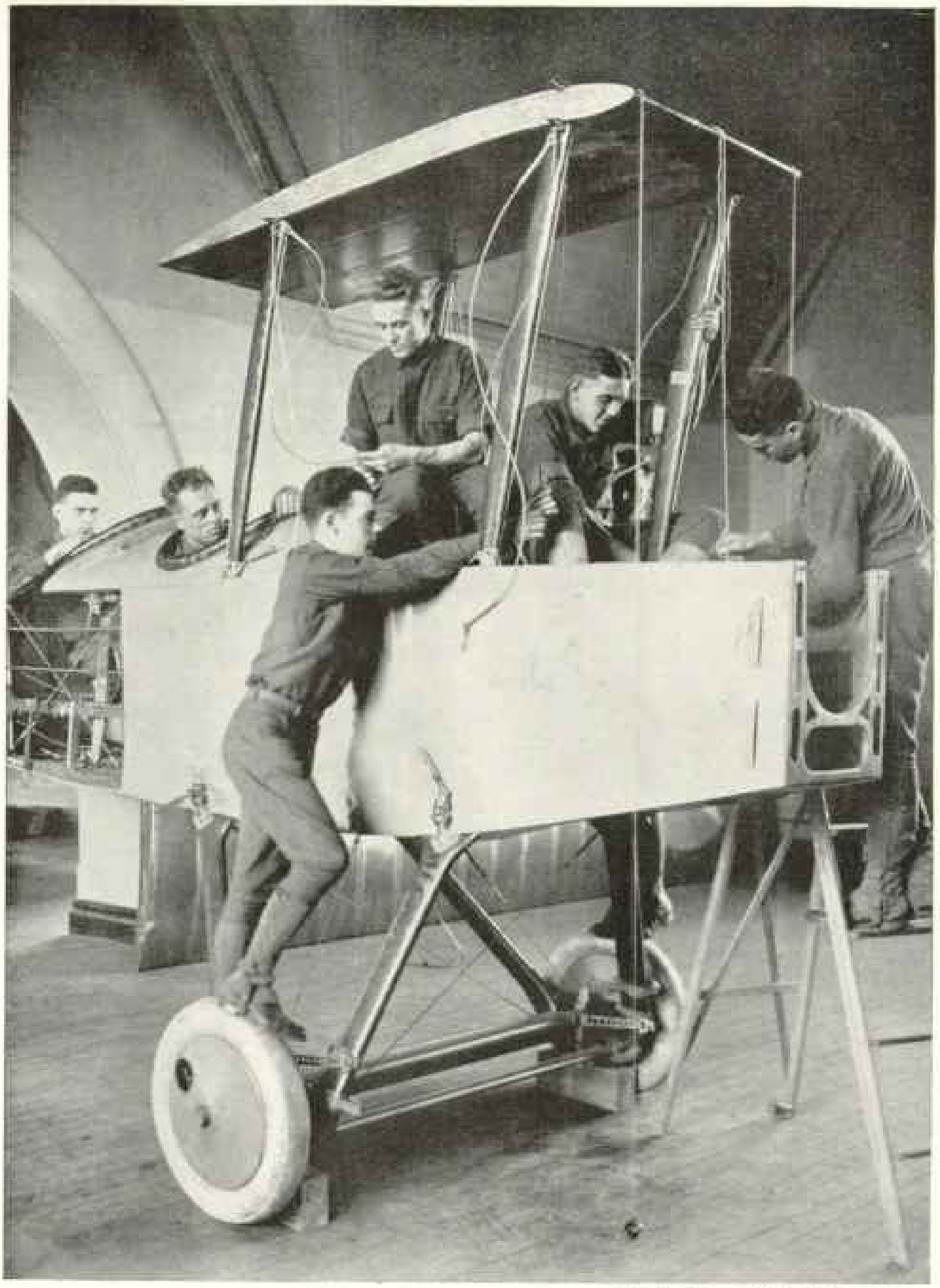
Upon his knowledge of his machine and his ability to make a hasty temporary repair under fire may depend the life of the airman and the information which he has gathered for his commander. It behooves him, therefore, to be a master mechanic as well as a daring fighter.

practical enginemen. The need for this sort of men has not now been filled and very likely will not be as long as the war lasts.

The troubles do not end with their enlistment, however, for all of them must be given a special training to adapt their skill to the peculiar problems of airplanes. Here the government has had splendid cooperation from private plants, which have admitted many such men for a short period of practical instruction.

AN ADMINISTRATIVE PERSONNEL MUST BE TRAINED

All this force when organized into squadrons will require a considerable administrative personnel which we are little inclined to have in mind in thinking of the air service. Adjutants, supply officers, and disbursing officers must be secured from among men of executive ability and trained to the peculiar problems of military procedure, purchasing, hygiene, law, and the like, in order that



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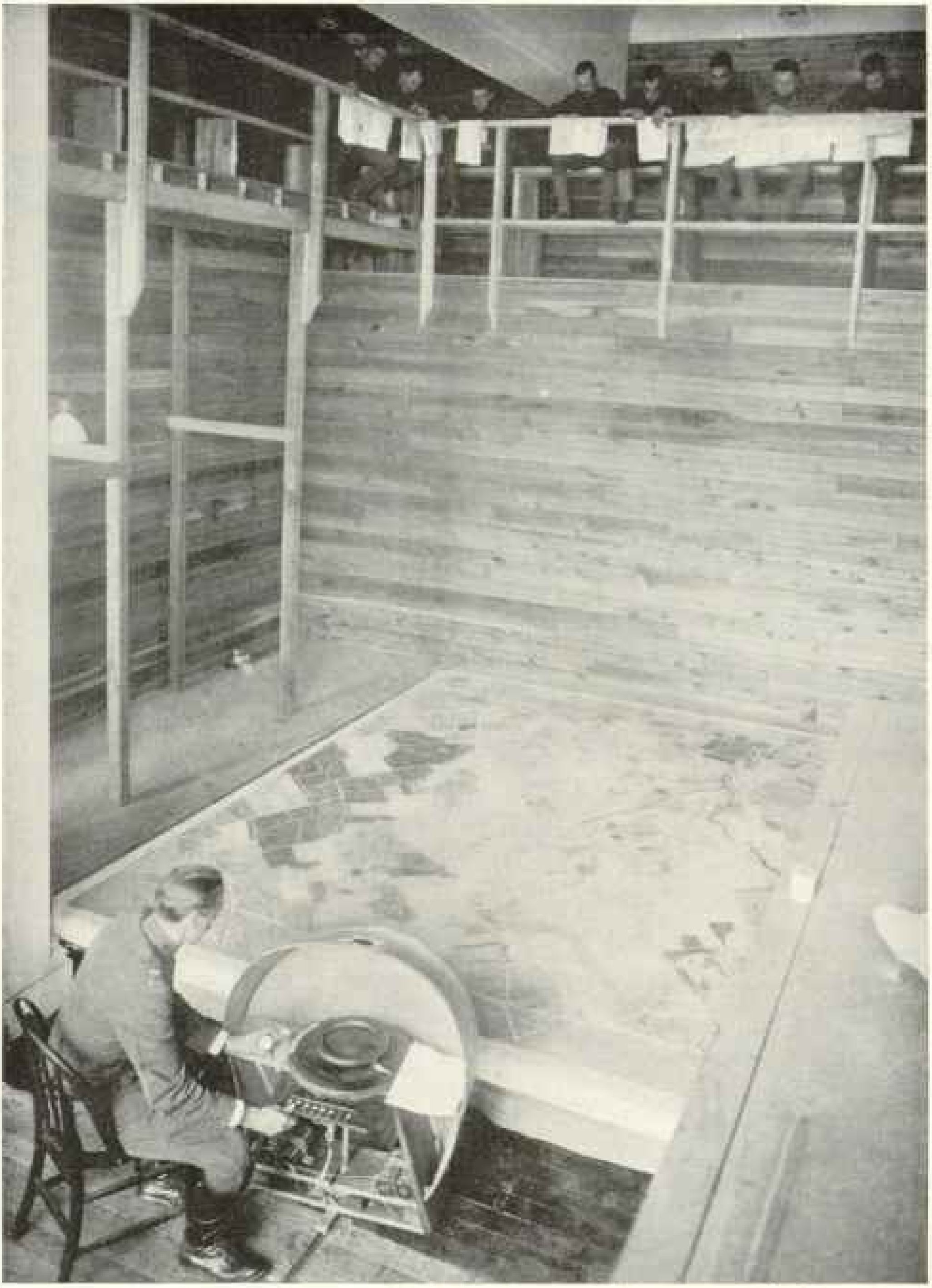
WORK AT A "GROUND SCHOOL."

A knowledge of flying, such as the Western Front requires, is not to be gained merely by flight. Cadets at a "ground school" are shown here assembling the parts of an airplane, one means of acquiring a familiarity which will make the operation of it intuitive.



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TRAINING FOR OBSERVATION WORK AT THE FRONT

The aviation students, seated above the platform with their maps in hand, are being drilled in the art of reporting artillery fire at the front. Below is a landscape drawn to scale, and appearing exactly from their perches as if they were in an actual airplane 6,000 feet above the ground the landscape represents; and while they look down on the stretch of territory thus represented the instructor below makes various-colored lights, representing various kinds of artillery fire, according to a schedule as to order and speed. The students make full note on their own maps before them of the location of the shots and prepare the radio messages they would send were they at the front. These are checked up and the poor observers are weeded out, so that only the best men continue on to the front.

Photograph from Collegiate Ballooning School

ADJUSTING THE VALVE OF AN OBSERVATION BALLOON BEFORE ITS INFLATION WITH HYDROGEN GAS

the squadron as a whole may become a smoothly running unit of the larger service.

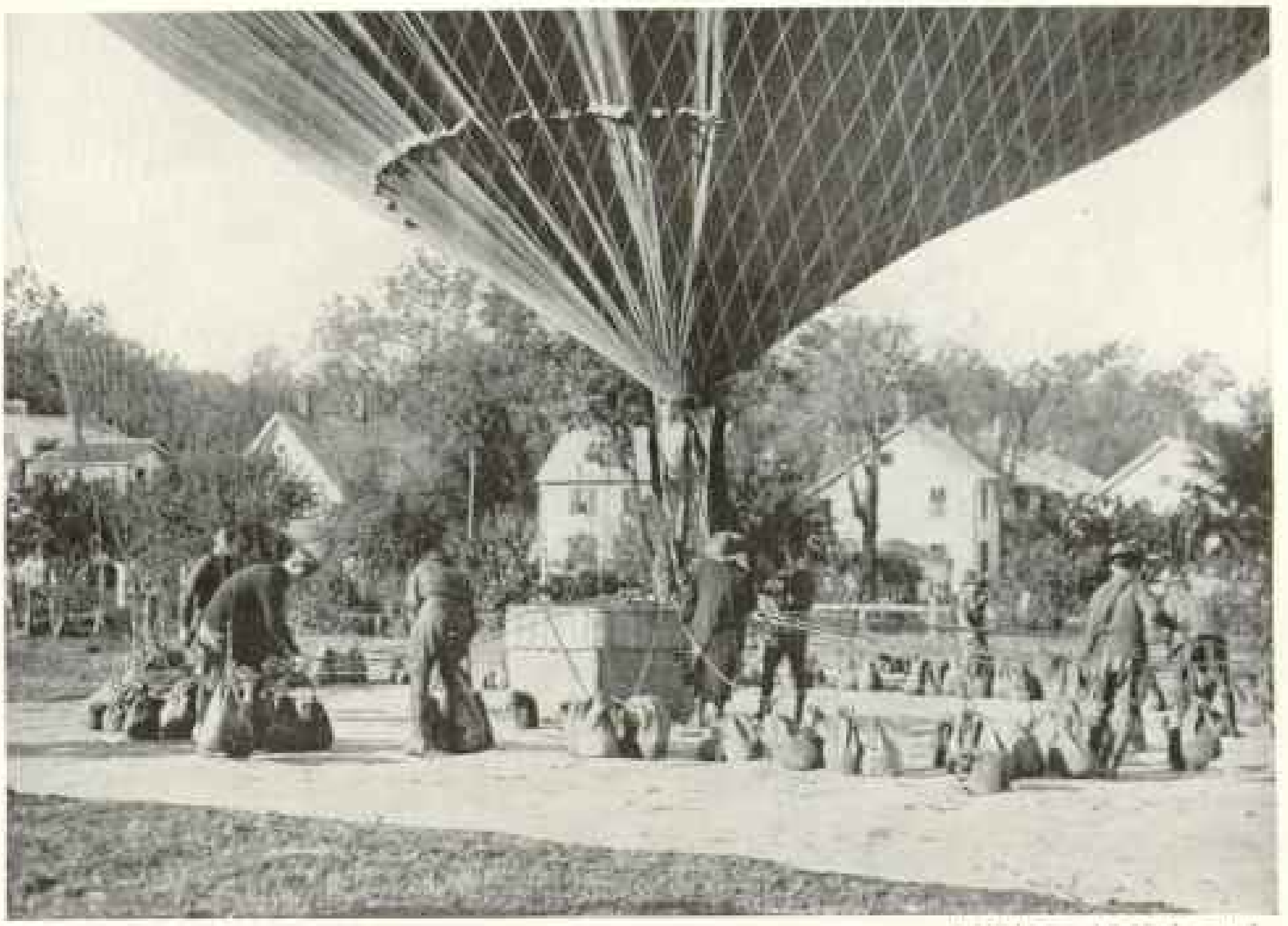
So, too, men for work as observers and bombers to accompany all aviators except the individual fighters have had to be most painstakingly selected from men possessing the two-sided physical and mental requirements necessary and in a proportion of three to every five aviators. The best ages have been found to be from 25 to 35; but as the reports of these men will dictate the movements of whole army corps, it has been necessary to put them through a special eight-weeks' course of instruction to test and develop their keenness of vision, power of deduction, and ability in machine-gunnery, map-reading, and aërial reconnaissance.

Last, before coming to the aviators themselves, is the twin service of the balloonists. This question has presented peculiar problems and has made necessary a two-months' course of training in meteorology, gases, observation, instruction, and flying. The balloonist, while not so spectacular as the aviator, is only less important, for with his range of vision of eight miles and his constant telephonic communication with the ground, he is able to keep a most accurate time schedule of every enemy movement and a detailed record of all gun-fire. For hours at a time he rides calmly and patiently, a mile in the air, noting details which the longer-winged, but more cursory, aviator may overlook.

### MANY SPECIAL COURSES OF INSTRUCTION

All these demands for all these different kinds of men have put Uncle Sam into the business of instruction in a way that we little imagine. Special courses have had to be built up, in addition to those of the flying fields, for observers, for bombers, for balloonists, for radio experts, for photographers, for administrative officers, and for enlisted men, each solving entirely new difficulties raised by the new sciences in aviation and the adaptation of old sciences.

So far, then, we have seen the need of an intensive and specialized selection of men for the various collateral work con-



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ADJUSTING SAND-BAG BALLAST PREPARATORY TO THE ASCENT OF A CAPTIVE BALLOON

While not as spectacular as the aviator's work, the aëronaut has an important rôle in the "economy" of war. The information which he is able to obtain from his perch among the clouds often saves the lives of thousands of his fellow-soldiers who otherwise would be sent, unsuspecting, within the range of some battery cleverly concealed from observers stationed on the ground.

nected with flying. Perhaps a truer perspective of the picture could be derived from this angle than from that of the aviator. Nevertheless, so much romance and popular interest attaches to the latter that a brief outline of his career would be valuable.

The difficulty in securing aviators is not in securing enough applicants, but in securing the right kind of applicants. It is too obvious for statement that the man who is to fly several miles above the ground and upon whose reports may depend the fire of half a dozen batteries, the shifting of the steel wall of the barrage, even the success of the whole battle, must have a peculiar combination of both physical and mental attributes.

Some criticism has arisen as to the severity of the tests; but let it ever be remembered that a poor aviator has all the power of harm that a good aviator has of good. Hundreds of applicants obviously unfit have had to be turned away, both for their own good and for the good of the service, but that most emphatically does not mean that a good man is not just as vitally, indeed more vitally, needed than ever.

### A SENSE OF RESPONSIBILITY IS VITAL

The whole emphasis of the service now is to secure men who, besides perfect physique, have a full sense of the responsibility of their work to the men below. An aviator sent to get a photograph, investigate an emplacement, or drop bombs has no other business. He must carry out his orders and, particularly, must avoid jeopardizing himself and his machine unnecessarily. The air service today is an earnest, responsible science, where stunts have their place only as a means to carry out a larger mission and where "dare-devils" and circus performers must give way before the real teamwork of the air.

Certain special physical qualifications

Photograph from Collegiate Balloon School

READY FOR A "SOLO" FLIGHT

This type of observation balloon has one serious disadvantage: when held captive it oscillates in the slightest breeze, making it difficult for the observer in the car or basket to take accurate note of enemy movements and day-to-day changes in fortified positions back of the front-line trenches.

are, of course, fundamental. The prospective aviator is probably not surprised when his chest is tapped by the medical examiner, when he is asked to expand his lungs, and when his arm is bound in a tight rubber band to test his blood pressure. Similarly, the testing of the nose and throat to guard against any obstruction in ventilation which might cause vertigo or nausea may be unexpected, but not startling, to a man who expects to go through the aviator's wide range of temperature and atmospheric pressure. The Jennings self-recording color-sense tester probably appears only a little unusual, for it is realized that perfect vision is essential to observation work from the clouds, and that any defect of vision might prove fatal in a sudden emergency.

The balance test, however, will prove a distinct surprise, for few people realize that the sense of balance is controlled by a fluid which flows back and forth in the labyrinth of the inner ear, just as the fluid in a spirit-level flows back and forth. To set this fluid in motion and see how quickly it reacts, the candidate is seated in a revolving chair which is spun rapidly around. When it is brought to a stop, the candidate is asked to point out certain objects, his visual disturbance is noted, and a pretty good estimate is made as to whether he could bring himself out of a spiral or right his machine after a falling-leaf evolution.

### THE MENTAL EXAMINATION IS NOT FORMIDABLE

Next comes the mental examination, not nearly so formidable as the phrase implies. Its purpose is to find out from the candidate's records, from his history, education, athletic ability, and general presence whether he has the alertness, aggressiveness, accuracy, and sense of responsibility desired. A good aviator should be neither all brains and no physique nor all physique and no brains, but

© International Film Service

FOUR "SAUSAGE BALLOONS" AND A DIRIGIBLE FLYING OVER AN AMERICAN AERONAUTICAL TRAINING STATION

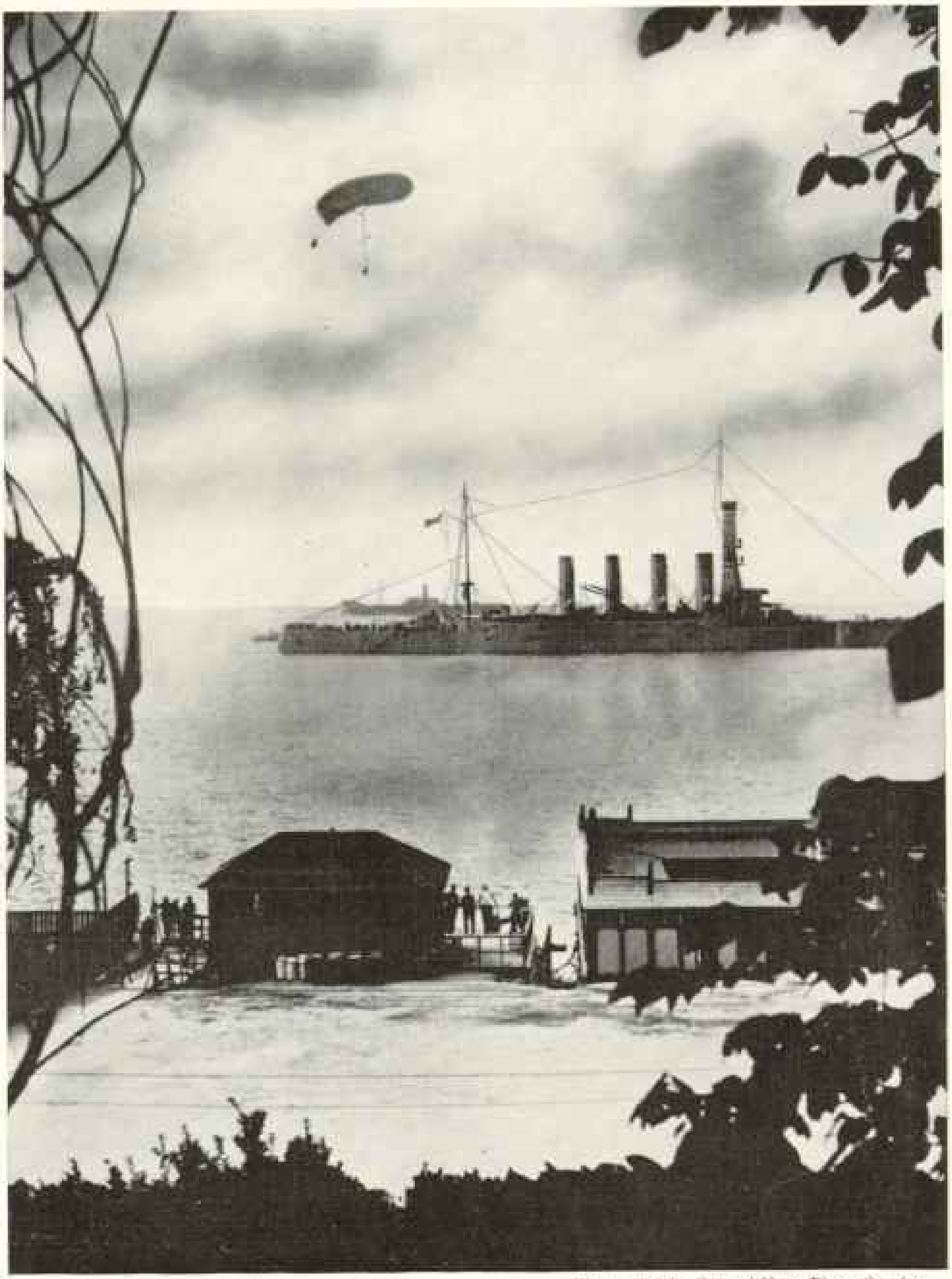
Airships and balloons are known in the slang of the fighting front as "gas-bags." In the British service they are frequently called "S. S.'s"—Submarine Seekers.

should combine the two in an all-round ability.

If accepted, the candidate becomes a "flying cadet." That status he holds throughout his course of training until he passes his reserve military aviator test and receives his officer's commission. Technically he is enlisted in the Signal Enlisted Reserve Corps at a salary of $30 a month, with quarters, uniform, and food allowance of 60 cents daily provided by the government. At any time, of course, he is subject to discharge if it is obvious that he is mentally or morally unqualified to become an aviator.

His first assignment is to a "ground" school at one of the eight large engineering universities working in cooperation with the government. Here there is action and interest at once. In company with several score other physically fit and eager men, in an atmosphere of earnest work, the principles of the sciences he intends to master are unfolded.

During these crowded eight weeks he secures a basic instruction in the principles and theory of flying, radio work, codes and photography, the operation and care of airplane engines, planes, and machine-guns, and the theories of cooperation between the air service, the infantry, and the artillery. He is also given pri-



Photograph by Central News Photo Service

ON GUARD ABOVE A BATTLESHIP AT ANCHOR IN HOME WATERS

An important advantage which the airplane or captive balloon enjoys in the rôle of a lookout is the fact that an observer high above the sea can easily detect the shadowy presence of a submarine beneath the waves, whereas the sinister craft may be entirely invisible to one on the deck of a threatened warship.

mary instruction in meteorology and astronomy and devotes considerable time to military drill and calisthenics. From reveille, at 5.30 a. m., to tattoo, at 9.30, there is serious and interesting work.

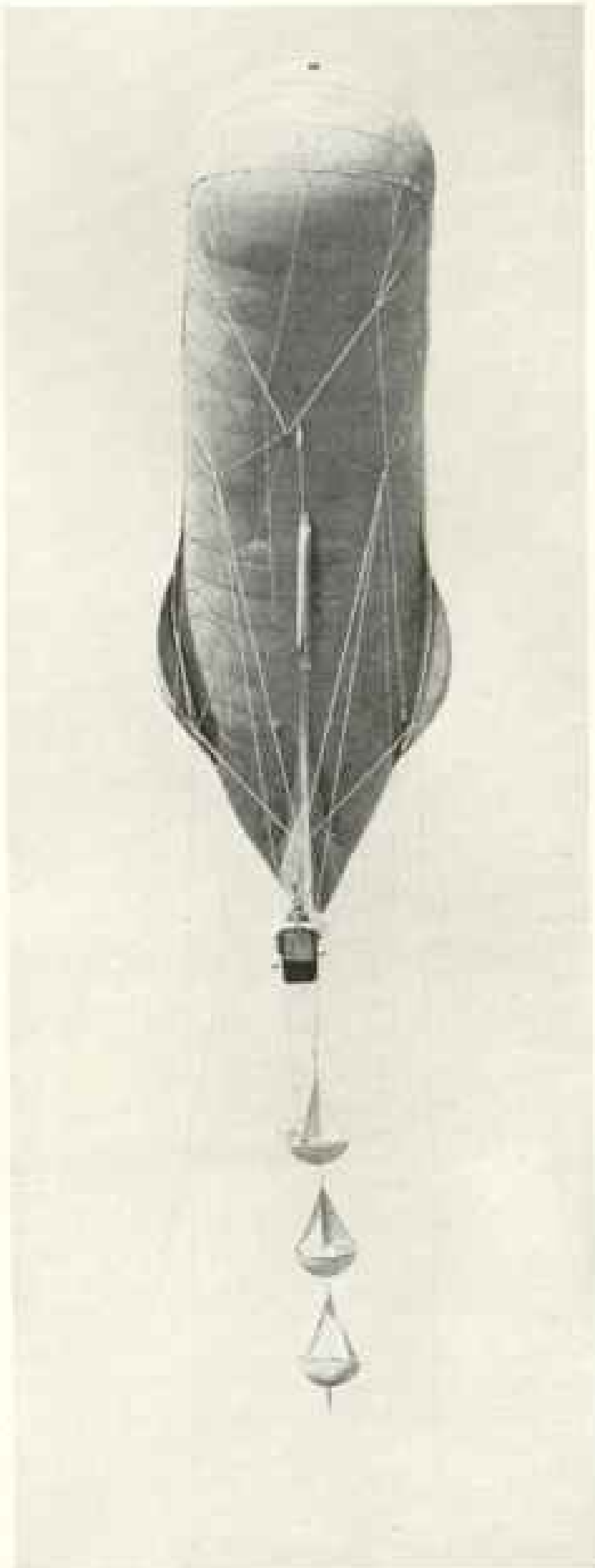
The next step is to one of the great new flying schools, where instruction in actual flying is given. First comes the dual work with the instructor, beginning with long "hops" into the air and down again, to accustom the pupil to the various controls, such as the rudder, elevator, throttle and switch, and to the general "feel" of an airplane. Baffling enough at first, mastery of this work affords an instinctive control of the machine, so that whatever happens later he will not lose his head and make the wrong move.

### WHEN THE CADET FIRST FLIES ALONE

Gradually, as the cadet's skill and confidence increase, he is given increasing responsibility for the machine, though the instructor remains with him to save him from a slip. When at last he has demonstrated absolute control of himself and his plane, he is ready for the third stage, the proud moment when he leaves the ground alone. He is held back, however, rather than hurried forward into this, on the theory that it is far better to spend a few extra days in intensive instruction than it is to lose either a cadet or a plane, both of which are now part of America's air capital. The infrequency of fatal accidents in America's great training program has more than justified this caution.

The next stage is known as solo work, or flying alone. Backed by the fundamental training of the ground school and the dual instruction, the cadet is fully qualified to take the air by himself. His every move is noted and suggestions for improvement given on his return to earth. Gradually, he is allowed to lengthen out the distance and the height of his flights, until he is easily executing 30-mile cross-country trips and the simpler evolutions at an altitude around 10,000 feet.

By now he has completed the requirements for his designation as a "reserve military aviator," which automatically carries with it his first commission, that of a second lieutenant, with a salary of $1,700 a year. How long it has taken



Photograph by Central News Photo Service

A KITE BALLOON ON OBSERVATION DUTY OVER AN AMERICAN WARSHIP TO WHICH IT IS ATTACHED

The three round-bottom cones are air anchors, which serve to keep the basket of the observer stable and facilitate his careful watch for submarines. These canvas stabilizers constitute the tail of the kite balloon.

depends on his skill, his adaptability, and his attention to discipline.

THE POST-GRADUATE COURSE IN FRANCE

The finishing touches of the training still remain, however. These are given in advance schools in France, and comprise the more complex evolutions in the air and tactical movements by wings and squadrons. By the end of this course he is complete master of the air, is able to spiral, side-slip, execute the falling-leaf, and handle radio, photography, or machine-gun, a fully trained member of Uncle Sam's new army, entirely at home in this new element.

Thus is the great personnel of America's air service mainly built up; so is the appeal of the Allies being answered, to furnish them with an unequaled force of men; for if there was one thing that was hoped for when the United States entered the war, it was that we should make from our rich resources of fearless, adventurous, and quick-thinking young manhood a trained air personnel to fill the places of that corresponding class of men among the Allies, many of whom had been ruthlessly killed off in the trenches before the true place of aviation was realized.

# THE LIFE STORY OF AN AMERICAN AIRMAN IN FRANCE

## Extracts from the Letters of Stuart Walcott, Who, Between July and December, 1917, Learned to Fly in French Schools of Aviation, Won Fame at the Front, and Fell Near Saint Souplet

STUART WALCOTT was a senior at Princeton University in the winter of 1916-17. In view of his approaching graduation in the spring, his father wrote to him that he had best begin to think about what he was to do after graduation, in order that he might get on an independent basis as soon as practicable.

In response, under date of January 7, he wrote:

"You spoke of my being independent after I graduated in the spring. If I go to Europe, as I want to, to drive an ambulance or in the air service, I will be doing a man's work and shall be doing enough to support myself. If the work is unpaid, it is merely because it is charitable work and as such is given freely.

"If you want to pay my way, I will consider it not as dependence on you, father, but as a partnership that may help the Allies and their cause. I will furnish my services and you the funds to make my services available. If not, I will be willing to invest the small amount of capital which has accumulated in my name.

"I have been thinking of this work in Europe for over a year now and am still very strong for it. I don't know what the effect will be on myself, but if it will be of service to others, I think that it is something I ought to do."

Being assured that the expenses would be provided for, he then began an investigation as to the best method of procedure to obtain training as an aviator.

BELIEVED THE AVIATOR OF GREAT SERVICE TO HUMANITY

In a letter dated January 26 he said:

"Many, many thanks for sending me the book on the French Flying Corps, by

Winslow. I read half of it the night that it came and stayed up late last night to finish it. He gives a very straight, interesting, and apparently not exaggerated account of the work over there, which has made somewhat clearer to me just what it is that I want to get into. Now I am even more anxious than I was before to join the service over there.

"The more that I think about it and the more that I hear of it, the more desirous I am of getting into the Flying Corps. If a man like Winslow, with a wife and daughter dependent on him, is willing to take the risk involved, I see no reason why I should not.

"You mention the Ambulance Service in your last note. I have thought of that quite a little and would definitely prefer the aviation. The ambulance is worth while, I think, in that it gives one an opportunity to be of great service to humanity, but not so much so as the other. There will be a number of my classmates who will enlist in the American Ambulance Service this spring, but the air service appeals to me."

He then made arrangements with the American representatives of the Lafayette Escadrille to go to France on the completion of his college year.

January 29 he wrote:

"I will get a physical examination in a few days. In regard to getting the training over here first, I do not think that it would be worth while. The instruction over there would be first hand, tried, for a definite purpose, and on the whole superior to what I could get here. I could also be picking up the language and the hang of the country at the same time."

On February 24 he received word that his papers, presented with his application for admittance to the Franco-American Flying Corps, assured him on their face of a welcome when he presented himself in Paris. He was informed that if he utilized his spare time in availing himself of any and every opportunity to familiarize himself with flying, it would shorten his stay in the Student Aviators School in France.

On March 26:

"I haven't been able to find out anything definite about the school at Mineola. As yet, no change has been announced, to my knowledge, in reference to hastening up the course in event of the coming of war. Over a hundred men have left college (Princeton) already to start training for the Mosquito Fleet and the rest of them are drilling every afternoon.

"What do you think of the advisability of stopping college and going to some aviation school? Considering that it takes several months to become at all useful as an aviator and that war is practically inevitable now, I think it would be wise to get started right away."

### ANXIOUS TO LEARN FRENCH METHODS OF FLYING

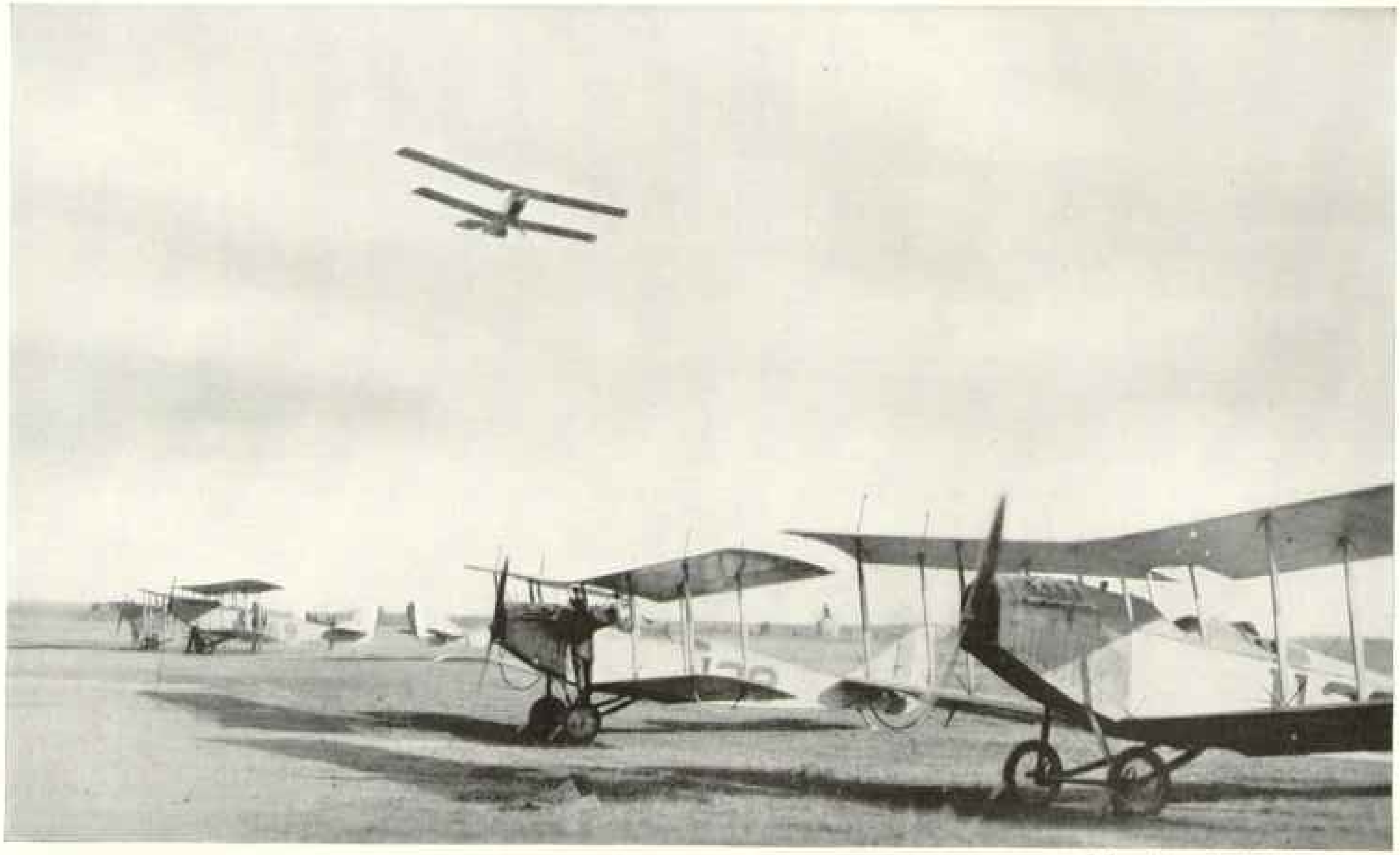
In a letter of April 3:

"I saw in the morning paper that the American flyers in France would be transferred to American registry immediately after the declaration of war. When you next see General Squier, I wish that you would sound him on the probability of a force being sent to France to learn to fly according to French methods. That is the one thing above all others that I want to get into. If there is any chance of that I do not want to get involved in anything else. . . .

"It is quite certain that seniors who leave college now, to go into military work, will receive their degrees. I would not object to losing the work, as it is not my present intention to keep on with theoretical chemistry, and that is what I am devoting my time to this spring. From the standpoint of education alone, I think that my time could be more profitably spent in the study of aviation."

Leave was granted by the university, and on April 6 E. Stuart Walcott was appointed a special assistant to Mr. Sidney D. Waldon, inspector of airplanes and airplane motors, Signal Service at Large. He immediately reported to Mr. Waldon and worked with him through April. May 1 he went to Newport News, Virginia. May 2 he reported:

"My first trip up was this afternoon with Victor Carlstrom. We were out 16 minutes and climbed 3,500 feet. It was all very simple, getting up there—a little wind and noise and some bumps and pockets in the air—a glorious view of the harbor.





TWO-SEATER AIRPLANES READY TO ASCEND AT ONE OF THE NEW AMERICAN FLYING SCHOOLS

One method of training the student aviator is by means of the dual control machine. The student takes his place as pilot, while the instructor sits behind him. As long as the student is operating the mechanism correctly he is master of the plane, but the moment he makes a false move the instructor, with duplicate control levers, rights the machine and prevents a spill.

"Then we started to come down. First I saw the earth directly below through the planes on the left. Then the horizon made a sudden wild lurch and Newport News appeared directly below on my right. This continued for a little while and then we started down at an angle of about 30 degrees to the perpendicular, turning as we went. I later learned that Carlstrom had executed a few steep banks, or sharp turns, and then spiraled down. It ended with a very pretty landing, following with a series of banks to check speed.

"Flying, from my first impression, is a very fascinating game and the one I want to stay with for a while. I have signed up for 100 minutes in the air. While this 100 minutes will not make me a flier by any means, I think it is well worth the while, in that it gives me a little element of certainty in going abroad. I will know, if all goes well, that I am not unable to fly."

The next day he wrote:

"Two flights this morning; 25 minutes *in toto*. The greatest sport I ever had. Wonderful work. I did most of the work after we got up a safe distance."

Having obtained a certificate of 100 minutes' flight and passed the necessary physical examination, he left for France, arriving at Bordeaux May 31, and soon reported at Avord for training.

### WALCOTT'S LETTERS HOME

*Escole d'Aviation Militaire,*
*Avord, Cher, France,*
*Friday, July 13, 1917.*

You see, it's Friday, the thirteenth, my lucky day, and I'm happy because the work is going well. First, I'll tell you about a smash I had a week or so ago.

The roller, or *rouleur*, class which I smashed in has the same machine as those that fly with a 45 P motor. Only it is throttled down, and we are supposed to keep it on the ground—just about ready to fly, but not quite getting up—a speed of about 30 m. p. h.

When there is the slightest wind we cannot roll, because the wind turns the tail around and swings the machine in a circle—a wooden horse—*cheval de bois*. I rode about the end of the list Saturday, and the wind had come up as the day got on. Work stops at 8.30 a. m. always, because there's too much wind.

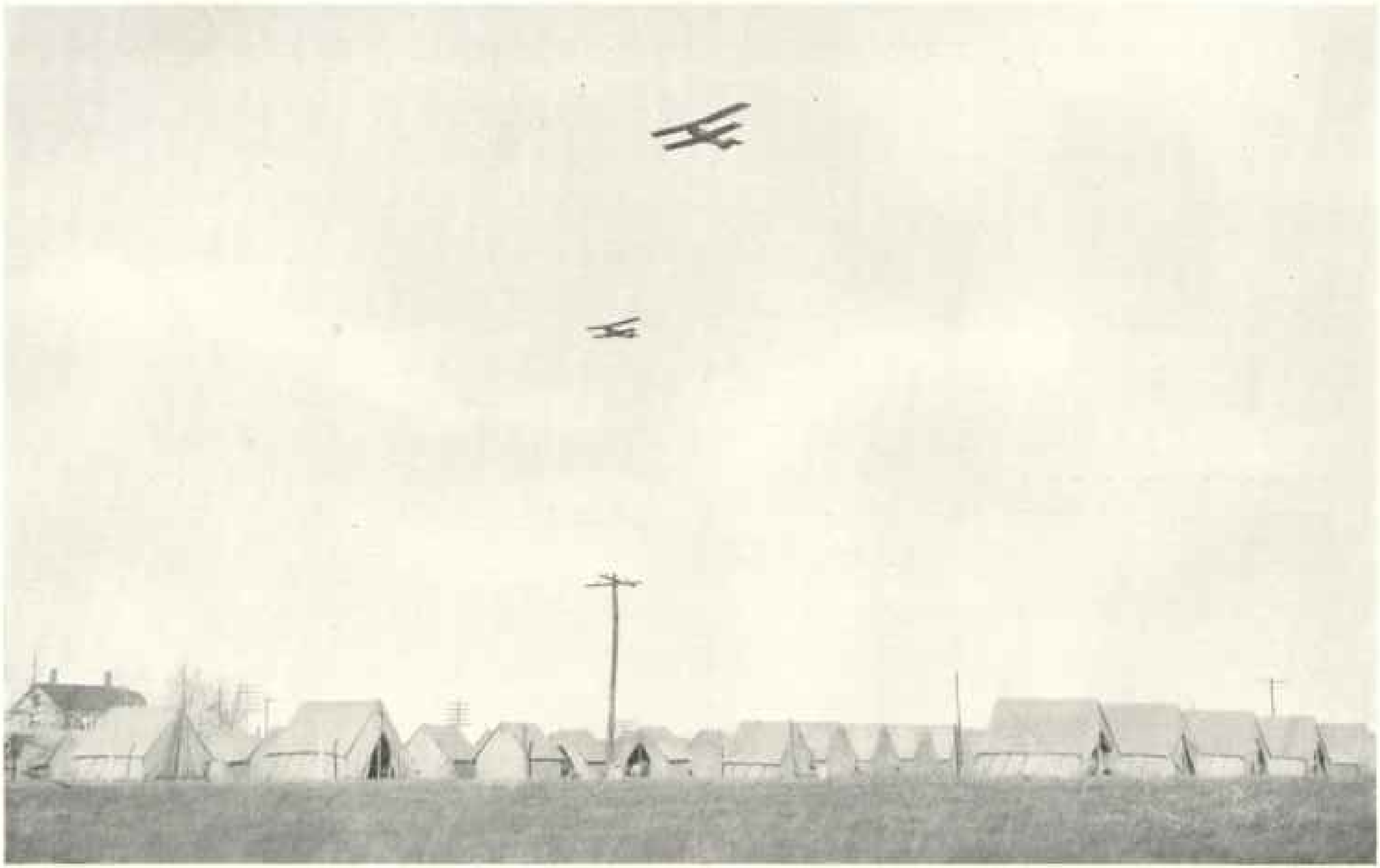
My first sortie, or trip, went O K, with a considerable breeze on the tail, but on the second there was too much wind, and after I got going pretty fast, around she went. The wind caught under the inside wing and up it went. Smash went the outside wheel and a crackle of bursting wood. All the front framework of wood that holds the motor was smashed—a pretty bad break. The monitor was a bit mad and talked to me a bit in French.

The next morning I was called in to see the chief of the Bleriot School, St. de Chavannes, a very nice officer. He told me that my monitor was not satisfied with me; that he had told me to do something (cut the motor when the machine started to turn) three separate times, and that each time I had intentionally disobeyed; that if anything like that happened again I would be "radiated" (discharged from the school).

That was quite the first I had ever heard of it, and I was so mad at the monitor that I could have kicked him in the head. I tried to explain to the lieutenant, but he never heard a word; so I just gurgled with wrath and didn't do anything. But yesterday we got another monitor, who is a different sort.

The class after *rouleur* is *decollét;* it is the same machine, but one gets off the ground about a meter or two, then slacks up on the motor and settles to the earth. It is strictly forbidden to *decollét* in the *rouleur* class. This morning I had a sortie in the *rouleur*, and all of a sudden noticed that I was in the air a bit; managed to keep it straight and get out of the air without smashing. The monitor said nothing, so I *decollèed* on all the sorties.

When I got out the monitor explained that it was strictly forbidden to go off the ground in the *rouleur* class; that I shouldn't have done it, and then asked me if I would like to go up to the other class. Whereupon, consenting, I am now in the *decollét* class, leaving 16 rather peeved Americans who arrived in the *rouleur* the same time I did, who can perform in the *rouleur* quite as well as I





AIRPLANES HOVERING OVER THE TENTS OF TROOPS STATIONED AS A GUARD AT AN AMERICAN AVIATION SCHOOL CAMP

The flying machines and other equipment of our future airmen must be watched day and night to protect them from the tamperings of Teuton spies and sympathizers

can, and who will remain in the *rouleur* for some time yet. They've no grudge against me, however, as it was only a streak of luck on my part.

Later in the morning I had some sorties in the *decolleur* and got up 2 or 3 meters. The wind was too strong, so my trips were a bit rough, but nothing was damaged; so hurrah for Friday, the thirteenth.

RAPID ADVANCEMENT AT THE FRENCH SCHOOL

*July 17, 1917.*

The work has been going very well since last I wrote you, which was only two or three days ago. I told you about at last leaving the blessed *rouleur;* I never was so relieved in my life.

The first evening in the *decollét* class I was requisitioned to turn tails, and the morning after there was too much wind to work. The *decollét* is the one where you go up 2 or 3 meters and settle down by cutting speed. The first time I had three sorties in the wind, bounced around a lot, but did no damage.

The next time was first thing in the morning. Two meters up on the first—four or five on the fifth—strictly against orders. I even had to *piqué*—point the machine toward the ground—a little, which is not at all *comme il faut* in the *decollét*. If I had smashed while doing more than I was told to, there would have been a lot of trouble; as it was, no objection, and the monitor personally conducted me to the *piqué* class with a very nice recommendation.

Now there are two *piqué* classes: one with a *pisté*, about one-fourth of a mile long, in which one is supposed to do little more than *decollét*, get up about 5 meters and *piqué* a *tout petit peu*—hardly at all. After comes the advanced *piqué*, with a much longer *pisté*, on which one can get up 100 meters (300 feet).

On my first sortie in the *piqué*, I was told to roll on the ground all the way; so, continuing my policy, did a low *decollét*. Next I was supposed to do a 2-meter *decollét*, so went up ten and *piquéd*. Had ten sorties in that class one morning, getting as high as I could—about 20 meters—and went to the advanced *piqué* that night—last night. Four sorties there last night with a machine with a poor motor, so didn't get up over 100 feet.

And this morning I did my first real aviating. There was a bit of a wind blowing, so the monitor, Mr. Moses, only let a lieutenant and me go up, as we had gone better than the others last night. First it was a bit rainy and always bumpy as the deuce—air puffs and pockets which require the entire corrective force of the wing warp and rudder to overcome.

My last sortie was decidedly active. The wind had developed into a bit of a breeze, which is to a Bleriot like a rough sea to a rowboat. Two or three times I got a puff that tipped the machine way over—put the controls over as far as I could and waited. It seemed a minute before she straightened. The trouble was that the machine was climbing and therefore not going very fast. If I had *piquéd*, it would have corrected quicker.

ADVANTAGES OF THE BLERIOT TRAINING

I had no trouble at all in making the landing. Hopping out of the machine, I saw the head monitor rushing over to Mr. Moses on the double, shouting volubly in French and berating him severely. I gathered that he had been watching my maneuvers, expecting something to fall every instant, and that he strenuously objected to Moses' letting me go up. Work stopped there for the morning, and it was very fully explained to me what the trouble was. If I have some sorties there tonight, I go to *tour du piste* (flying field) in the morning. I may be on Nieuport in two weeks.

I am now beginning to see the advantages of the Bleriot training. There is a great deal of preliminary work on or near the ground. In all other aviation training, such as at Newport News, 90 per cent of the work is in making landings—in piquéing down, redressing at the proper moment and making gradual connections with the earth.

I haven't made a really bad landing yet, and the reason is that I have been in a machine so much on and near the ground that I have sort of developed a sense or feel of it, and almost automatically redress correctly and settle easily; also I

can tell pretty closely what is flying speed because of the work on the rollers. It's the same way with all the other students, only I know it now from my own experience.

And this morning I began to realize that my 100 minutes at Newport News was invaluable. I not only found out some of the tricks of a master hand (Carlstrom), but also developed a bit of confidence in the air, and air sense, without which I could have gotten into trouble this morning.

My bumpy ride this morning is absolutely invaluable. I'll probably never have so much trouble in the air again, because a fast machine, or even a Bleriot with a good motor, would hardly have noticed those puffs. It was a bit risky, I guess, or the head monitor would not have been worried; but now that it's over I know a lot more.

### A FLYER IN A BEAN PATCH

*August 25, 1917.*

I started for my altitude test three days ago. The requirement is one hour above 2,000 meters. I got to 1,950 meters and one cylinder refused to fire, so I was forced to come down.

The next morning I tried again; got to 900 meters and the magneto ceased to function, thereby stopping all progress. I glided towards home, but didn't have quite the height to make the *piste*, so had to land in a near-by field, just dodging a potato patch. A flock of curious sheep came around and carefully examined the machine, getting mixed up in the wires of the open tail construction and leaving considerable wool thereon.

When the mechanics eventually got the motor going, I started off; didn't get quite in the air before the motor went bad, and then I ran into a bean patch, gathering about a bushel of beans with the same tail wires. Yesterday morning I tried again; climbed to 2,000 in 14 minutes and to 3,500 meters (11,500 feet) in 40 minutes.

I went up through some light clouds, and when I got to 3,500, the top of my recording barograph, more clouds had formed and I was practically shut off from the earth, nothing but a sea of clouds below me—a very beautiful sight. One other machine was in sight, far below me, but on top of the clouds.

Not wanting to get lost, I came down through the clouds and stayed out my hour, just above 2,000 and below the clouds, where the air was very much churned up, keeping me very busy. Just as soon as the time was up I came down, with a pair of chilled feet, making the 2,000 meters in five minutes to the ground. No work since then on account of bad weather.

This morning I attended my first Catholic funeral, that of the commandant of the school, who was the victim of a mid-air collision, a very unusual accident. The other machine got down safely, though badly smashed. Everybody in camp attended the funeral in the chapel of the artillery camp next door. I understood none of the service, but the music by a tenor and a 'cello was excellent. While the cortege was going down the hill to the cemetery, a Nieuport circled overhead very low for half an hour or more and dropped a wreath. It was a very impressive ceremony.

I expect to start on *triangles* and *petits voyages* in a few days. When they are done, I will be a breveted flyer in the French army. Then comes *perfectionne* work and acrobacy; so it will be quite a while yet for me.

### THE WILD MAN IN THE NIEUPORT

*September 1, 1917.*

The wild man in the Nieuport was out again this morning giving some one a joy ride. There is a long straight stretch of road in front of our *piste* and he came down that several times, a nasty, puffy wind blowing which bothered him not at all, flying only two or three feet off the ground.

In front of the *piste* is a telephone wire crossing the road. He came along the road 100 miles an hour until almost on top of the wire, and jumped up just in time to clear it by a few feet—really beautiful work. He goes all over the surrounding country flying low, hopping over trees and houses—sometimes turning up sideways to slip between two trees a bit too close together to fly through—

sometimes dragging a wing through the space between a couple of hangars or doing vertical virages just in front of them.

It doesn't seem possible that any man can be so much a part of his machine, can be so consistently accurate that he never misses. For this chap, Lumière, has never had a smash. . . .

A chap named Loughran started off on one of his brevet voyages a few days before I got ready for brevet. He got quite a ways along, ran into a storm, went above it, got caught in a cloud, kept on for quite a long way, being drifted by a strong wind, then came down through the clouds and found that they were only 400 feet above the ground.

After a while he found a place to land and came down safely. He went to a farmhouse, got his machine guarded and tied down. In the meantime, word had spread over the countryside that an aviator had come down there and the entire population came out to look him over.

A grand equipage drove up with a Count who lived in a near-by château. He insisted that Eddie come to the château and accept their hospitality. There the fortunate Ed stayed five days—the Countess talked English, and also some house-guests. He hadn't brought a trunk, so borrowed razor, etc., from the Count—went down to see the machine every day in the baronial barouche.

Photograph by Western Newspaper Union

SUIT IN USE BY THE UNITED STATES ARMY AVIATORS

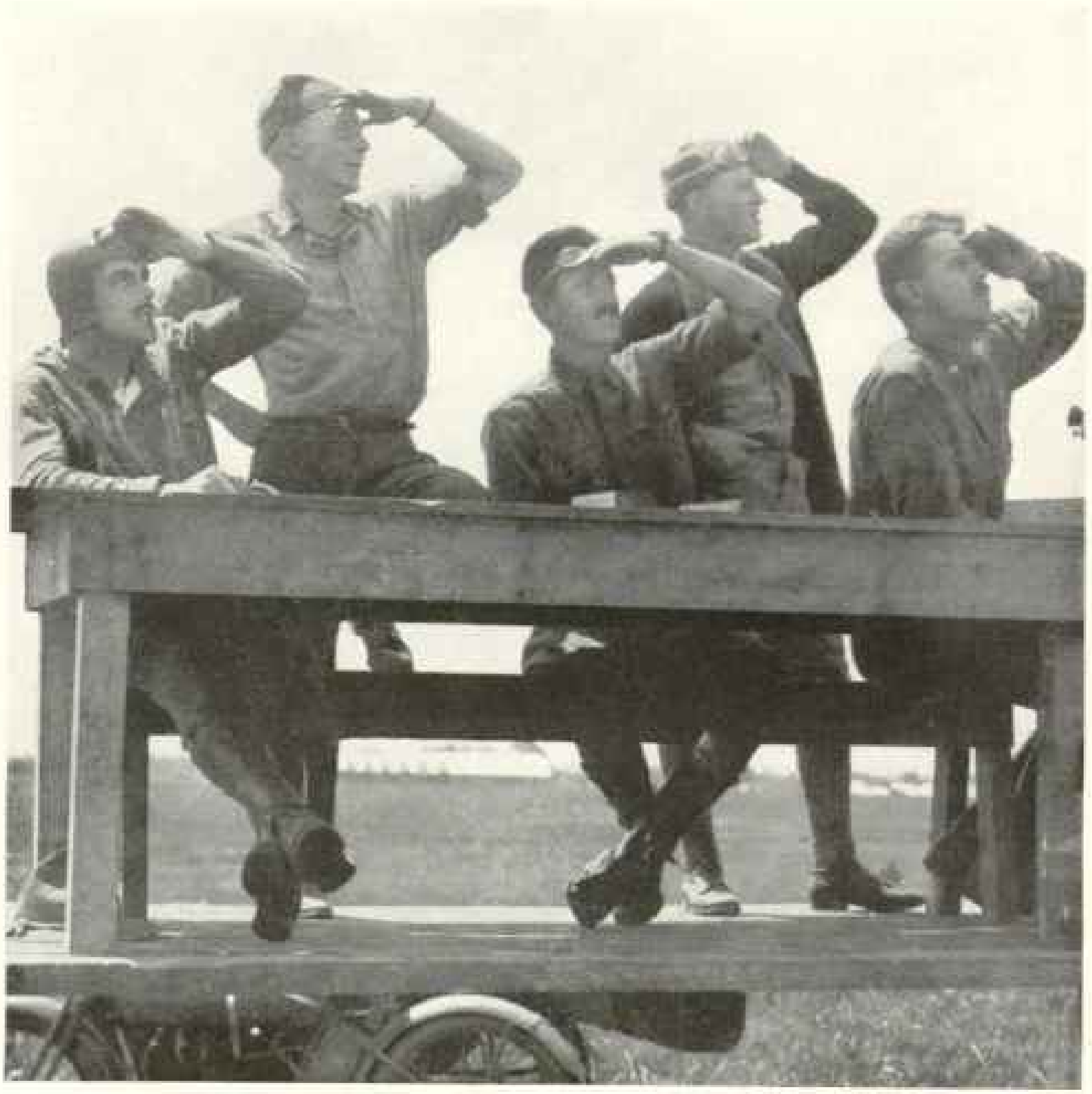
The airman cannot be clad too warmly. Recently in an altitude flight an Italian aviator, Lieutenant Guido Guidi, encountered a temperature of 89 degrees below zero at a height of 19,750 feet, but he continued to mount another mile.

Whenever he went to the little town in the vicinity, all the kids followed him around the streets; and when at last he left he was presented with a multitude of bouquets and had to kiss each and every donor. He brought back pictures of the château—a delightful-looking old place—and numerous addresses.

THE FIRST CROSS-COUNTRY FLIGHT

*September 4, 1917.*

At last the two weeks of wind and



Photograph by Edwin Levick

STUDENT AND INSTRUCTING AVIATORS MAKING NOTES OF FEATS OF MEN IN THE AIR

The amount of actual flying time allotted to a student aviator at a training school is comparatively brief. A major portion of his instruction is derived from watching the mistakes of others and in being told how to remedy his own defects, carefully noted by experts while he is "up."

rain has ceased and now it is perfect weather—a bit of a breeze and lots of sun for the last two days. Yesterday morning there weren't enough machines to go around, so I did not work, making the eighth consecutive day I hadn't stepped in a machine.

Last evening I, at last and with much rejoicing, started out on my "maiden voyage" to another school about 60 kilometers away (37.5 miles). It was delightfully easy—nothing to do but climb 2 or 3 thousand feet and just sit there and watch the country unfold, comparing the map-like surface of the earth spread out below with the map in the machine. In good weather it is very easy to follow, spot roads, towns, woods, rivers, and bridges. Railroad tracks get lost at high altitudes and are harder to find anyway.

One has to keep an eye open for a place to land within gliding distance in case of a *panne* always; but the country is so flat and so much cultivated around here that it is absurdly simple. I endeavored always to keep some pleasant-looking house or château in range in case of trouble, for the French are proverb-

ially hospitable to aviators *en panne* (lying to, descending).

Coming back yesterday evening, the sun was pretty low and the air absolutely calm—nothing but the drone of the motor and the wind; the only movements necessary an occasional slight pressure on the joy-stick to one side or the other to keep the proper direction. I came very nearly going to sleep, it was so peaceful up there; several times closed my eyes and swayed a bit.

As a matter of fact, one is perfectly safe at that altitude—anything over a thousand feet—because the machine, at least this particular type, won't get into any position from which one cannot get it out within 200 meters at most. But nevertheless I haven't tried any impromptu falls as yet.

This morning I repeated the same identical performance, because for some reason we have to do two "petits voyages," and had much the same kind of a time as yesterday. On the way home one cylinder quit its job and threw oil instead, covering me from head to foot and clouding up my goggles so I had to wipe them off about every minute. When I got back the mechanics decided that that motor had died of old age and would have to be repaired, so I am again without a machine.

Have watched a beautiful afternoon pass by from the barracks, when without my luck I'd be working. But with a machine and weather I can be finished tomorrow; two triangles to do, about 200 kilometers (125 miles) each, and I can do one in the morning and the other in the evening and then I'm breveted. Perhaps by day after tomorrow I'll start *perfectionne* on Nieuport. I hope so.

### FLYING IN A NIEUPORT

*September 9, 1917.*

Since my last to father, I have had some very interesting times. First, I finished my brevet with very little excitement, made all my voyages, and only got lost a little bit once. Then I saw two machines on the ground in a field, made a rather dramatic spiral and steeply banked descent midst a crowd of villagers, and got away with it; then found that the machines belonged to two monitors who were bringing them from Paris and had effected a *panne de chateau*.

Being demanded what I was doing, I fortunately found a spark plug on the burn and got that repaired, and "alley oop!" The rest of it was very easy—a bit of flying in the rain which stings the face a bit, but is not bad otherwise.

Since I have been on the Nieuport. There are three sizes of machines on which one is trained, starting with the larger double-command and going to the smallest. At Pau we got another even smaller, about as big as a half a minute. Four times I went out without a ride—bad weather, crowded class, and hurted machines; the same old story.

Then last night I had my first rides with a monitor who is rather oldish, crabbed, and new at his job—a brand-new aviator. As you know, when an airplane takes a turn, it does not remain horizontal, but banks up—*comme ca* (if you can interpret that illustration; it shows signs of remarkable imaginative power). *Alors*, one banks to ——— (trees), takes a turn, and uses the rudder only a very little because the machine turns along when banked. There is a sort of falling-out feeling the first few times, until one becomes a part of the machine.

To get back to the story: This monitor does not like to bank his machine, and sort of sidles round the corners, keeping it quite flat and almost slipping out to the outside of the turn. I have done many fool things in a machine and made many mistakes, but never have I been so scared in anything in my life as when riding with this monitor. A monitor is supposed to let the pupil drive as much as he is able, but this bird never let me make a move, and when we got through told me I was too brutal.

I was never madder in my life and cursed nice American cuss words all the way home. There's a 15-kilo ride in a seatless tractor back to camp to improve a bad humor.

### "THE MADDEST MAN I EVER SAW"

Well, this morning I saw some more rides impending and didn't like it, so

asked the *chef de piste* to put me with another monitor. He had to know why, and I registered my kick, which practically said that the first monitor didn't know his business and couldn't drive; that I was scared to ride with him. The *chef* was a bit sarcastic, and told me to take two rides with another monitor to show how *I* could make a *virage*. I did it the way I've been accustomed to; made a fairly short turn. When we got down, the monitor said, "Eclatante" (Am. "stunning"), or something like that, to the *chef*.

The *chef* had meanwhile communicated my complaint to the first monitor, and he was the maddest man I ever saw. Demanded what *"ce type la,"* indicating me, wanted: said the *virages* I had just made were dangerously banked (the monitor I was with didn't mind, though), and then all three started arguing at once at me and I spelled all the French I knew.

Then, of all things, the lieutenant, without further remarks, said I was to continue with my first monitor. My heart sank into my boots. I had visions of staying in that class without rides, or with only rides and fights, for months. I rode no more this morning, and what was my delight to find this evening that my bewhiskered pal had left on *permission*.

I got another monitor, a fine one, who put his hands on the side of the machine and let me do everything, with a bit of assistance on the landing, which is different from what I've been doing on the Caudron. Seven rides and a finish—the 23-meter tomorrow morning. I wasn't very good, but got by.

*September 14, 1917.*

Things for me are going all right. Have made progress on the Nieuport since last I wrote and will fly alone soon. As regards the U. S. Army, things are at a standstill until I get to Paris, which will be a week or so. I hope to go to the front in a French Escadrille and in an American uniform. Some say it can be done; some that it cannot. It sounds so sensible that I am afraid there must be some regulation against it.

THE TRUCK SALVAGES THE WRECK WHEN A PUPIL "CAPOTES"

*September 27, 1917.*

Since last I wrote a regular letter, considerable has taken place. First, I am now at Pau, having finished up Avord. Have sent post-cards to father right along to keep track of movements. After brevet was over, I did not take the customary permission of 48 hours, but went straight to work on Nieuport D. C. (double command). One cannot learn a great deal riding with an instructor—only about enough to keep from smashing in landing, because one never knows when the instructor is messing with the controls, when it's one's self.

There are five kinds of Nieuports—differing mainly in size, the smaller being faster and more agile in the air, better adapted to eccentric flying. They are 28, 23, 18, 15, 13 (the Baby Nieuport). At Avord I had about a week of D. C. on 28 and 23 (the numbers refer to size of wings), with several days of no work. Then some days on 23 alone, and finally on 18 alone.

The landings are a bit different from those of the machines I had been flying, as they are faster, and the machines are quite nose-heavy. In the air the nose-heavy feature makes them "fly themselves"—that is, according to the speed of the motor the machine will rise and climb or *pique* and descend, with never a touch from the pilot. If the weather is not very bad, the Nieuport will correct itself automatically from all displacements.

But in landing the nose-heavy feature causes a great many *capotages*. If the landing isn't done about right with the tail low, over she goes on her nose or all the way onto her back. It is a very common occurrence and has become almost a joke. When a pupil "capotes," everybody kids him. No one hurries over to see if he is hurt; not at all. He climbs out from under, usually cursing, and in ten minutes the truck is out to salvage the wreck.

It is astounding the way smashes are taken as a matter of course. Yesterday one chap in landing hit another machine,

Photograph by Edwin Levick

A TRIO OF PLANES AT A TRAINING CAMP FOR AVIATORS

In the "air colleges," which the government has established recently, the time between matriculation and graduation is measured in months instead of years, but if the period of education is shorter in these schools than in regular colleges the expense is in inverse ratio. A conservative estimate of the cost of training an aviator is from $10,000 to $20,000. Great tracts of land are required for ground schools; many airplanes must be kept on hand, as the breakage is heavy, and repairs are often tedious; motor trucks and motorcycles are necessary subsidiary equipment.

demolishing both, but not touching either pilots, being worth some $15,000 or $25,000, but no one seemed to worry—it's very much a matter of course. The monitor was a little peeved because he will be short of machines for a few days, but that was all. I've seen as many as ten machines flat on their backs, or with tails high in the air, on one field at the same time.

For myself, I haven't capoted or busted any wood since the Bleriot days, but I'm knocking on the wooden table now. On several occasions it has been only luck that saved me, as I've made many rotten landings.

Well, to get back to the diary. After finishing at Avord, I waited around for two days to get papers fixed up, requested and obtained a *permission*, and

then decided not to use it and left straight for Pau, after fond farewells to the friends I've been with for 3½ months. Looking back, I didn't have such a bad time at Avord after all, though I did get terribly tired of the living conditions.

### DIFFICULTIES OF TRAVELING IN FRANCE IN WAR TIME

My trip to Pau I put down to experience. I discovered one schedule not to travel by in future. Leaving Avord at 2.15, I got to Bourges at 2.45 and found that the train left at 7.29. Fortunately, there was another chap from the school on the train, Arthur Blumenthal, an old Princeton football star, whom I have gotten to know quite well, so we managed to waste the afternoon together; almost made ourselves sick on candy and then ate ourselves stupid at the hotel at dinner time.

At 7.29 I started another half-hour's journey, at the end of which the time-table said that the train for Bordeaux left at 10.30 (this is all p. m.). At this town there were some American engineers, so I embraced the fellow-countrymen in a strange land. Finished up a not very gay evening by attending the movies—a most odd institution. Clouds of tobacco smoke obscured the screen, and most of the action was around the bar at one side of the hall. Nobody was drunk, but nearly every one was drinking and very gay. This was merely Saturday night in a small town of the provinces; not in gay Paree.

At 10.15 I got in a first-class compartment and tried to find a comfortable position in which to sleep. At 2.15 a. m. I had mussed up my clothes considerably, lost my temper and not slept a wink. Then we had to change again. The rest of the morning I sat opposite an American officer, a queer old fogey, and we tried to kid each other into thinking we were sleeping, with no success. Arrived at Bordeaux at 7 a. m. and found that the train for Pau left immediately, so I missed out on breakfast, too—oh, it was a hectic trip. My idea of a very unpleasant occupation is that of a traveling salesman in France.

### QUARTERED WITH HEROES OF THE LAFAYETTE ESCADRILLE

*Escadrille Spa-84,*
*Secteur Postal 181,*
*Par A. C. M.—Paris.*
*November 1, 1917.*

Well, I'm here—in sight of the front at last. To date I haven't been out there yet and won't for a few days more, as they take lots of care of new pilots and don't feed them to the Boche right away. Probably day after tomorrow the lieutenant in command will take me out to show me around the lines, and after that I'll take my place in patrols with the others.

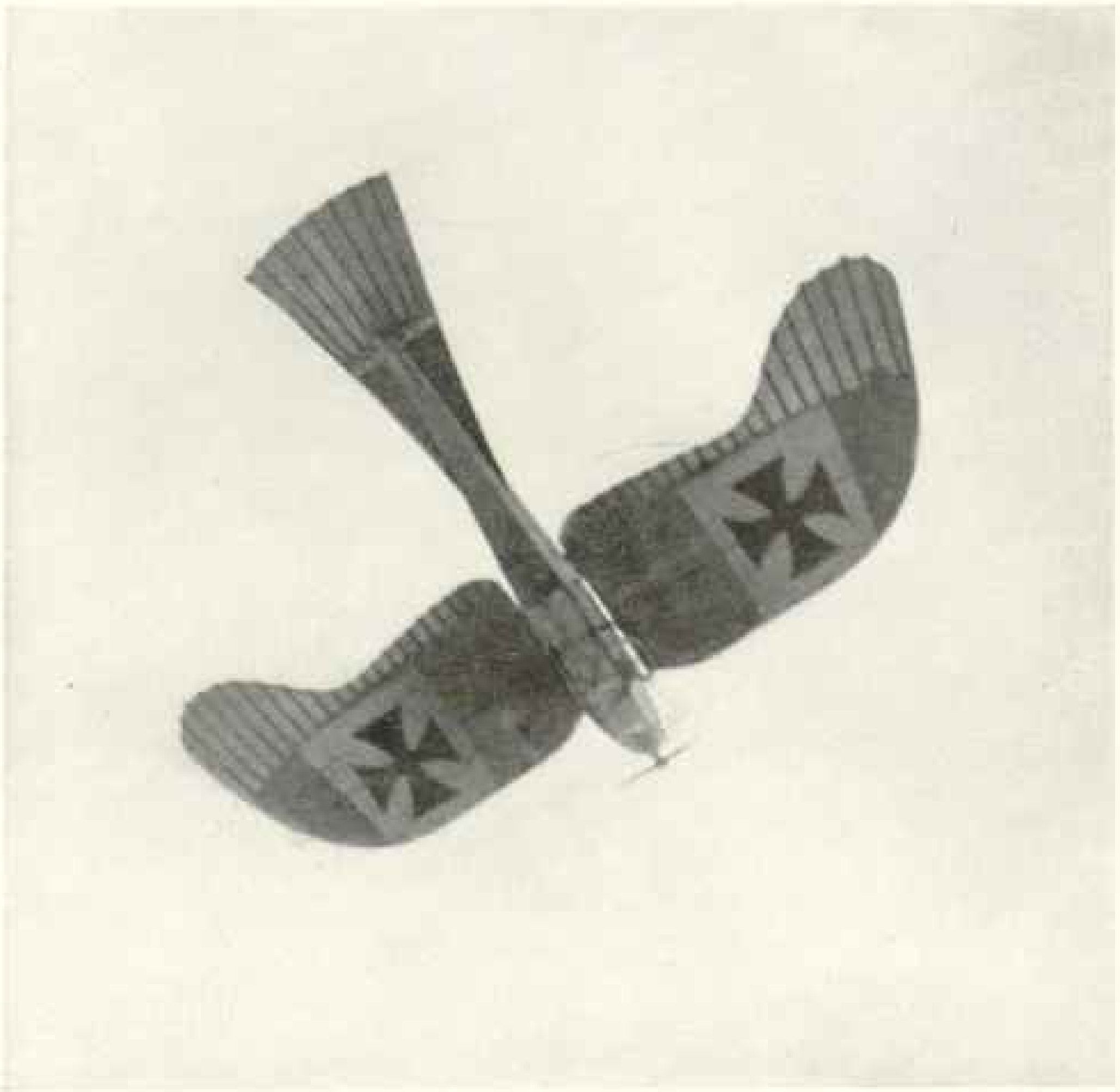
The work is exclusively patrolling, establishing, as it were, a barrage against German machines and preventing as far as possible any incursions of the French lines. As the big attack is over, there is comparatively little activity. Sometimes one goes for a whole patrol without being fired on and without seeing an enemy machine anywhere near the lines.

During the three days I've been here the group has accounted for several Boches without any losses whatever. Young Bridgeman, of the Lafayette Escadrille, had a bullet through his fuselage just in front of his chest, but suffered no damage except from fright.

There are several escadrilles in the group—a *Groupe de Combat* it is called; all have Spads, which makes it very nice. The Lafayette, 124, is of our group and have adjoining barracks, which makes it very nice (I seem to repeat) for us lone Americans in French Escadrille. We drop in there far too often and the first few nights I used the bed of the famous Bill Thaw's room-mate, away on *permission*.

Did I write you that one morning he brought in Whiskey to wake me up, and my eyes no sooner opened than my head was buried under the covers. Whiskey is a pet—a very large lion cub—which has unfortunately outgrown its utility as a pet and was sent yesterday, with its running mate, Soda, to the zoo, at Paris, to be a regular lion.

They are a very odd crowd—the members of the Lafayette Escadrille—a few nice ones and a bunch of rather rough-



© Brown & Dawson

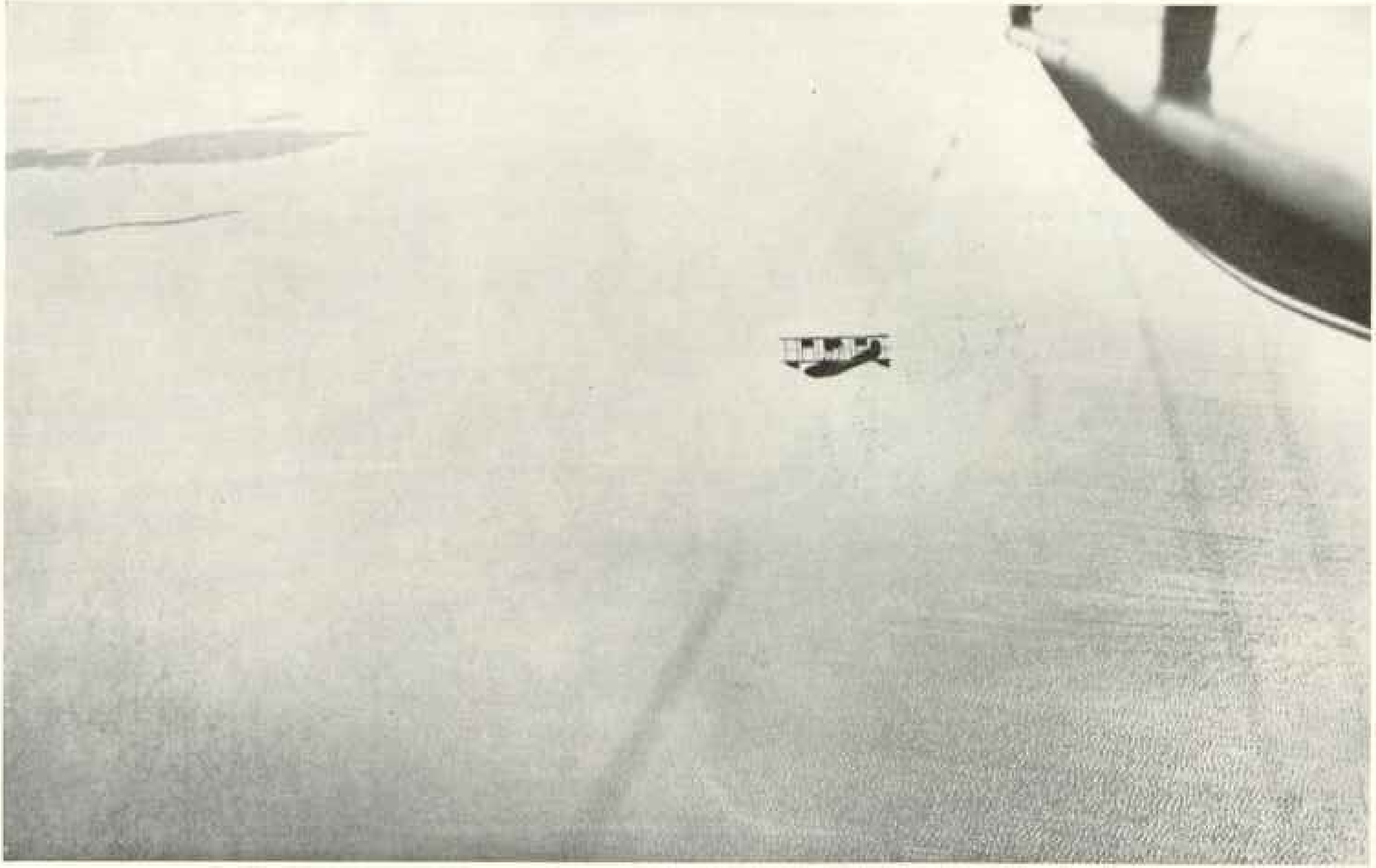
THE TYPE OF TAUBE WHICH MADE THE FIRST AIR RAIDS ON PARIS

This plane, whose outspread tail and rounded wings so closely resemble those of a bird, is too slow to contend with the 1918 type of 125-miles-an-hour machine which is now a commonplace of the Western Front. It is to the latest speedster warplane what the "one-lunger" automobile of fifteen years ago is to the 12-cylinder racer of today. This style airplane still has its uses in the aviation schools, however.

necks. Their conversation is an eye-opener for a new arrival. Mostly about Paris, permissions, and the *rue de Braye*, but occasionally about work and that *is* interesting. Nonchalant doesn't express it. When Bridgy got shot up, as mentioned above, they all kidded the life out of him, and when he got the Croix de Guerre, they had him almost in tears—just because he's the kiddable kind.

But in talking about the work, for instance, Jim Hall: "I piqued on him with full motor and got so darn close to him that when I wanted to open fire I was so scared of running into him that I had to yank out of the way and so never fired a single shot."

Or Lufberry just mentions in passing that he got another Boche this morning, but those —— observer people won't give him credit for it. He has 14 official now and probably twice as many more never allowed him. Some days ago during the attack he had 7 fights in one day, brought down 6 of them and got credit for one; which must be discouraging.



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A SHAM BATTLE IN THE SKY

One of the final tests given a student aviator before he is commissioned as an experienced pilot is a sham battle, in which the newly trained fighting man is given an opportunity to display his ability to outmaneuver his opponent and get in position for the "assassination," as the French say.

SEASICK IN THE AIR

*November 10, 1917.*
*Evening.*

You know November in France. I've been here almost two weeks now and am still à l'entraînment; that is, I haven't started in to do any regular work yet. Only five times have I been able to fly in two weeks. But I've got my own machine and mechanic, everything is in order, and I've been assigned to a patrol the last two mornings when it rained.

Tomorrow again at 8.30 with four others—patrol for one hour and fifty minutes at about 15,000 feet, back and forth over our sector, sometimes over our own lines, sometimes in Bochie. I'm getting very impatient to get started. In what few flights I've had, I've been working on acrobacy a bit and am gradually learning a few simple things; twice I stayed up a little too long and had to lie down a few hours afterward, almost seasick.

I like Spa 84 very much indeed. The Frenchmen there are regular fellahs.

Wertheimer, a sergeant, is a sort of informal and unadmitted chief of the *sous-officiers*. It is he that speaks English and has helped us a lot in getting settled, etc. Very much of a gentleman he is and understands a bit of Anglo-Saxon customs and eccentricities, always gay and an indefatigable worker.

We have all been arranging the one big room of our barracks—dining room, reading-room, and probably eventually American bar. The walls are covered with green cloth, green paper (of two different shades and neither quite the same as the cloth), red cloth (on top as a sort of frieze), and red paper. The ceiling is done in white cloth to keep in heat and lighten the room. A monumental task it has been, especially as materials are hard to get and expensive.

FED AMAZINGLY FOR FOUR FRANCS A DAY

Wertem (as Wertheimer is called) and Deborte have done most of the work. Deborte is also *chef de popote*, which means housekeeper, and a very efficient man. For four francs per day we are fed amazingly well, especially when one realizes that we are near the front in a country which has had three years of war. Deborte hasn't the pleasantest manner in the world at times, but usually is very agreeable, willing to tell me things about flying or the escadrille, always ready to work, and a dependable man in the air.

And Verber, who rooms with Wertem, he speaks a little English; has a great deal of trouble understanding it, but is picking up; wears a monocle all the time, because he's got a bum eye; carries a stick, and has an extremely eccentric appearance, but withal is very agreeable and a very valuable man. He has the habit of taking long trips all alone, far into Germany, just to see what is going on.

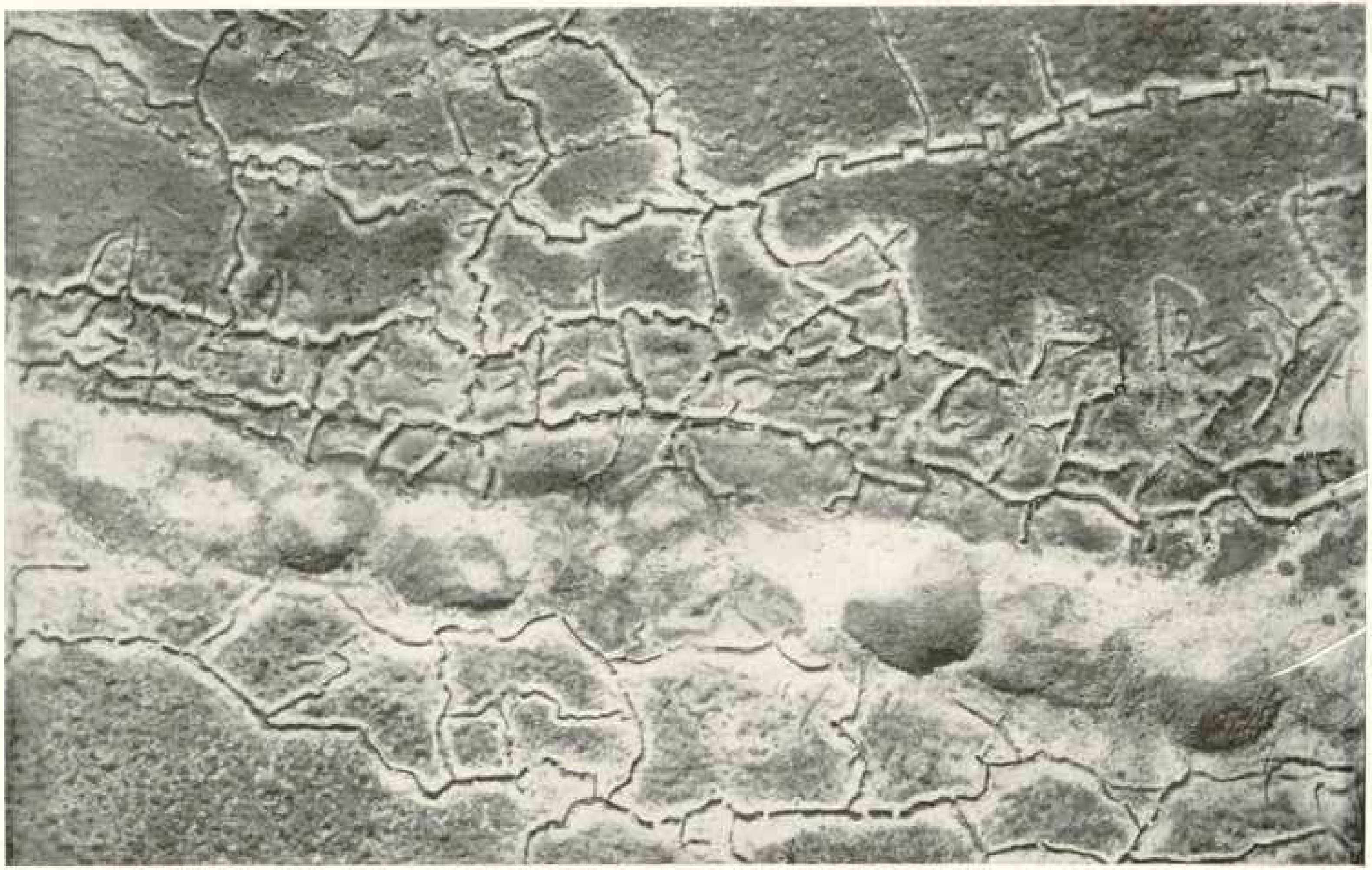
Pinot is the name of the little roly-poly chap everybody calls Bul-Bul, who used to be a mechanic and now is a very good, merry pilot. He has a great penchant towards Pinard, is violently but not at all objectionably non-aristocratic, is forever laughing or kidding some one, walks on his hands to amuse people, and is the delight of all the mecanos.

Demeuldre is a very quiet sort of school-boy type, who has been a pilot of biplanes and reconnaissance machines for a long time. He came to the escadrille recently with a record of two Boches as pilot of a biplane (that is, his machine-gun man did the shooting and they both get credit), and a few days ago brought down a German in flames, his first as *pilot de chasse*. There are two others away on permission, whom I don't know yet.

ESCAPING DESTRUCTION BY A MIRACLE

*Somewhere in France,*
*November 13, 1917.*

DEAR FATHER: Campbell was in the Lafayette Escadrille and they are a member of the same group as Spa 84, so I have asked them about him. He was on a patrol with another chap; they attacked some Boches and when it was over the other chap was alone. Campbell was brought down in German territory and so reported missing. I believe that the chap he was with has seen and talked to Campbell's father or some close relative since.



A VIEW OF THE GERMAN FIRST AND SECOND LINE TRENCHES ON THE WESTERN FRONT: FROM A PHOTOGRAPH TAKEN AT AN ELEVATION OF 3,300 FEET

The most conspicuous features of this warscape—the five deep depressions in the lower half of the photograph—are not shell craters; they are the scars left by the explosion of mines under enemy listening posts which had been dug out into No Man's Land. In studying aërial photographs it is usually easy to distinguish between the German and French lines from the fact that the German system almost invariably consists of two well-defined lines of trenches, while the French have one, a first line with numerous irregular ramifications.

Another chap named Bulkely was brought down in similar circumstances about the first of September. Ten days ago, word was received from the American Embassy that he had communicated with them, a prisoner in Germany. There are many similar cases, where men brought down with crippled machines or wounded, escape destruction by a miracle. The only sure thing is when a machine goes down in flames or is seen to lose a wing or two.

For instance, there are two officers in the group who are in the best of health and daily working. Several months ago they were on patrol together; collided in the air. One cut the tail rigging completely off the other and they separated, one without a tail and the other with various parts of a tail mixed among the cables and struts of one side of his machine. They both landed in France, one on his wheels, followed by a *capotage*, or somersault turnover, the other quite completely upside down. Then a term in the hospital and back they are again.

### THRILLING FEATS OF DARING

Kenneth Marr, an American, had the commands of both his tail controls cut in a combat, the rudder and elevator, leaving him nothing but the aileron—the lateral balance control and the motor. He landed with only a skinned nose for casualties and got a decoration for it.

Another chap in an attack on captive balloons, drachens, dove for something like 10,000 feet *vertically* and with *full motor on*, thereby gaining considerable speed, as you can imagine. He came right on top of the balloon, shot, and to keep from hitting it, yanked as roughly as he could, flattening out his dive in the merest fraction of a second.

Imagine the strain on the machine! When he got home all the wires had several inches sag in them; the metal connections of the cables into the struts and wood of the wings had bit into the wood enough to give the sag.

Machines are built to stand immense pressure on the under side of the wings. In some acrobatic maneuvers I was trying the other day, I made mistakes and caused the machine to stall and then fall in such a way that the full weight was supported by the *upper surface*—by the wires, which in most machines are supposed merely to support the weight of the wings when the machine is on the ground.

Yes, the Spad is a well-built machine—the nearest thing to perfection in point of strength, speed, and climbing power I've seen yet. Of course, it's heavy, and that's why they put 150 to 230 horsepower in them. The other school, that of a light machine with a light motor, depending for its success on lack of weight rather than excess of power, may supplant the heavier machine in time; I can't tell.

### WHEN DECORATIONS ARE BESTOWED

So, as any one who knows has said right along, there is a long way to go in the development of the J. N., or even the little triplane, before American-built planes get to the front. Of the bombing game I don't know anything at all.

Yesterday there was a revue here in honor of Guynemer and decorations for the pilots of the group who had won them. Three Americans received the Croix de Guerre—members of the Lafayette Escadrille. Lufbery, the American ace, carried the American flag presented to the escadrille by Mrs. McAdoo and the employees of the Treasury Department, beside the two aviation emblems of France.

He was called to receive his decoration "for having in the course of one day held seven combats; descended one German plane in flames and forced five others to land behind their lines" (which means that he is officially credited with one, his thirteenth, and that the other five, though probably brought down, do not count for him because there were not the necessary witnesses required by the French regulation)

Being the bearer of the flag, he was a very worried man to know what to do with the flag when he should go up to get his medal, till one of the fellows in 124 (the Lafayette) came to his rescue. For a military revue it was decidedly unmsing. Aviators are not very military.

The chief of one of the escadrille was

commissioned to command the mechanics who are plain soldiers, with rifles and steel helmets for the occasion. He is a bit of a clown and amused the entire gathering, kidding with the officers. The pilots of each of the five escadrilles were in more or less formation; most of them with hands in their pockets, for it was chilly, and presenting a mixture of uniforms unparalleled in its heterogeneity; every branch of the service represented and endless personal ideas in dress.

Because of the occasion, *repos* has been granted to the entire group for the afternoon, another group taking over our patrols; so that after the revue every one had the afternoon to waste—a sunny day, which is quite unusual this month. Within a half hour every machine that was in working order was in the air, forming into groups and then off for the lines, just looking for trouble—voluntary patrol they call it—which opened my eyes a bit to the spirit in the French aviation service after three years of war.

Word from Paris that those Americans in the French service who have demanded their release to join the U. S. A. have obtained that release, which probably means that all we wait for now . . . on the commissions.

This afternoon I took another trip with one of the old pilots to look over the sector. We stayed over France and didn't get into trouble, although there were lots of Boches around. Hope to get really started soon.

An amusing one this morning: Two pilots from the group were on patrol and attacked a single German about two kilometers behind the German lines. They completely outmaneuvered him; he got cold feet and started for the French lines, giving himself up. The funniest part about it is that the machine gun of one of the attackers was jammed and he couldn't possibly have hurt the Boche—just had the nerve to stay and throw a bluff.

They came back to camp just before dark this evening, one of them flying the German machine and the other guarding him in a Spad. The machine is an Albatross monoplane (biplane), finished in silver, with big black crosses on the wings and tail—a really beautiful thing. It flew around camp for several minutes before landing. It is the second machine that has been scared down since I've been out here.

### A MIMIC COMBAT IN THE AIR

*At the Front,*
*Somewhere in France,*
*November 17, 1917.*

At present things are hopelessly slow on account of bad weather, so I have a good deal of time to write and naught to write of. I still am waiting for my baptism of active service, which is assigned for each day and held up on account of fog, low clouds, or rain. In the afternoon it usually lifts a little, not enough to fly over the lines, but sufficient to permit a little *tol d'entraînment*—a practice flight around the field. I've been taking every chance to learn to fly—practicing reversements, vertically banked turns, 90-degree nose dives, etc.

Two days ago we had a very interesting mimic combat in the air. The Boche machine, which has been captured, and a Spad, both driven by very clever pilots, maneuvered for position during 15 or 20 minutes at 1,000 feet or less, back and forth over the field, doing almost every possible thing in the air—changing direction with incredible rapidity, diving, climbing, wing-slipping, upside-down dives—everything under the sun.

Two of them were at it again today in two Spads—just maneuvering. What a lot there is to learn! When I got through acrobacy at Pau, I had the impression that that kind of stuff was relatively easy; now I know different. For the present I'm working on the system of try one thing at a time; get that fairly well and then commence another. And small doses—10 or 15 minutes for an acrobatic flight; not more—because one can easily get dangerously sick in a very short time. Not that there is any particular peril in getting ill in the air; only it's beastly uncomfortable.

### RATHER GET A BOCHE THAN A COMMISSION

*At the Front,*
*Somewhere in France,*
*November 30, 1917.*

The rumor at the Lafayette Escadrille

B. STUART WALCOTT, THE AMERICAN AVIATOR

this evening is that they have been at last transferred. Of course, they had similar rumors many times before. For myself I am becoming rather indifferent; very well satisfied here, except for weather, and getting what I came over here for.

Father mentioned something about a monitor's job (after I had had experience at the front). My present inclination is decidedly against the idea. There is no job in the world I like less to think of, and there are plenty of people who want to get comfortably settled in the rear; so let them, say I, and may they enjoy it. It is not a very pleasant job.

As a retirement after a period of service at the front, it is another matter. Of all people I can think of I have the smallest right to an *ambussé* job at present; so here I hope to stay. Whether I fly with an American or French uniform, I don't care very much at the present moment. I had rather get a Boche than any commission in the army; but one cannot always tell about the future; perhaps after a few good scares I'll be ready to jump at a monitor's job.

THE STRENGTH OF A SPAD

*At the Front,*
*December 1, 1917.*

I tried to give you all some idea of the strength of a Spad in a letter a while ago. At home people speak of a factor of safety, meaning the number of times

stronger the machine is than is necessary for plain flying. The Spad is made so that a man can't burst it, no matter what he does in the air—dive as far and as fast as he can and stop as brutally as he can, it stands the racket. Of course, motors do stop, and if it happens over a mountain range—well, that's just hard luck.

Have had a few patrols since last I wrote; one at a big height, 4,000 to 4,500 meters, considerably above the clouds, which almost shut out the ground below, a wonderfully beautiful sight, but beastly cold, and a couple when the clouds were low and solid. The patrol stays at just the height of the clouds, hiding in them and slipping out again to look around.

If it stays below, the enemy anti-aircraft guns pepper it, whenever near the lines and at a low altitude, that is rather awkward; so the patrol shows itself as little as possible.

It's lots of sport to try to keep with the patrol; be behind the chief of patrol, see him disappear and then bump into a fog bank, a low-hanging cloud, and not see a darn thing; then dive down out of the cloud, wondering whether the other guy is right underneath or not; shoot out of the cloud and see him, maybe 500 yards away, going at right angles; then bank up and turn around fast and give her the gear full speed to catch up, and so on; see a Boche regulating artillery fire, start to maneuver into range, and zip! he's out of sight in the clouds, and the next you see he is beating it far back of his lines. Not very dangerous this weather, but lots of fun.

*Châlons sur Marne,*
*December 8, 1917.*

Yesterday we were awakened at 6 and told that we were going to move out, bag and baggage, at 2. So, as new barracks were not ready, we came down here last night and have been seeing the sights of the town since. It is full of Americans, ambulances, doctors, Y. M. C. A. workers, everything but fighting men, which I trust we'll see before long.

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### THE LAST FLIGHT

On December 12, while on patrol, R. Stuart Walcott met a German biplane carrying two men. Three cable reports agree that he shot down and destroyed this machine about two and a half miles within the German lines. He then started back for the French lines and was overtaken by three Albatross German planes. He was overcome and his machine went down in a nose dive within the German lines, it being assumed that either he was shot or his machine disabled.

There was still a hope that he might have escaped death. Inquiries were at once instituted through the American Red Cross and the International Red Cross, with the result that on January 7 a cable came from the International Red Cross stating that it was reported in Germany that S. Walcott was brought down during the afternoon of December 12 near Saint Souplet, and that he was killed by the fall.

On January 11 the French Government awarded the Croix de Guerre to the fallen flyer, with the accompanying citation:

"Corporal Walcott, an American, who volunteered for the duration of the war, and a young pilot of admirable spirit and courage, on December 12, 1917, attacked an enemy airplane. He pursued it four kilometers behind the German lines, where he brought it down. He was in turn attacked by three other monoplanes and was driven down."

The medal was received on his behalf by members of his squadron and has been forwarded to his father, Dr. Charles D. Walcott, Secretary of the Smithsonian Institution, Washington.

# THE FUTURE OF THE AIRPLANE

By Rear Admiral Robert E. Peary, U. S. Navy

UTILIZATION of the atmosphere for commerce and transportation presents possibilities far beyond anything that we can now imagine.

Sea power—military and commercial—has been for centuries an absolute essential to every great nation, insuring its continued existence and opportunities for legitimate growth and expansion.

We are now entering upon an era of air power—a stupendous era—which in the near future will be as far superior to the greatest sea power of the present as the unlimited ocean of atmosphere now sweeping unbroken around the globe is greater than the land-bordered Atlantic or Pacific.

The beginning of this era, the opening up of a mighty and entirely new world for exploitation, presents to the United States, with its unique geographical position, its boundless resources, mechanical and inventive ability, and its splendid reservoir of ideal American manhood, the opportunity to be the *first air power in the world*. This should be the second article in our national creed, the first article in that creed being the Monroe Doctrine.

In the midst of our great plans for carrying the war home to Germany through the air we must not forget to protect our own valuable and vulnerable coasts and coastwise shipping with airplanes.

The eagle is our national emblem. Give us 10,000 fighting sea-eagles—far-seeing, swift-flying, steel-taloned—to render our coasts immune from the bloody "killers" of the sea.

Give us thousands of swift sea-going hydro-airplanes, with capacity for carrying powerful guns and bombs; perfect a device—bomb, torpedo, or gun—that will enable a plane three times out of five to destroy a submarine on or just below the surface; then drill, and *drill*, and DRILL with this device until our airmen have the deadly precision of the dead shot with his gun, the whaleman with his harpoon, and the cowboy with his lasso or revolver.

Any one who has seen a fish-hawk or a sea-eagle sweep over the surface of the waves, then pause, hover for a moment, dive like an arrow, and proceed with a fish in its claws will understand the statement that when we have ten powerfully armed airplanes to assign to every lurking, murderous submarine, the finish of the undersea craft will be as inevitable as that of the fish.

This method of defense can be made so effective by American skill and energy as to constitute a complete protection for our coasts, leaving our swift battle cruisers and destroyers free for a far-flung offensive in any one of the seven seas.

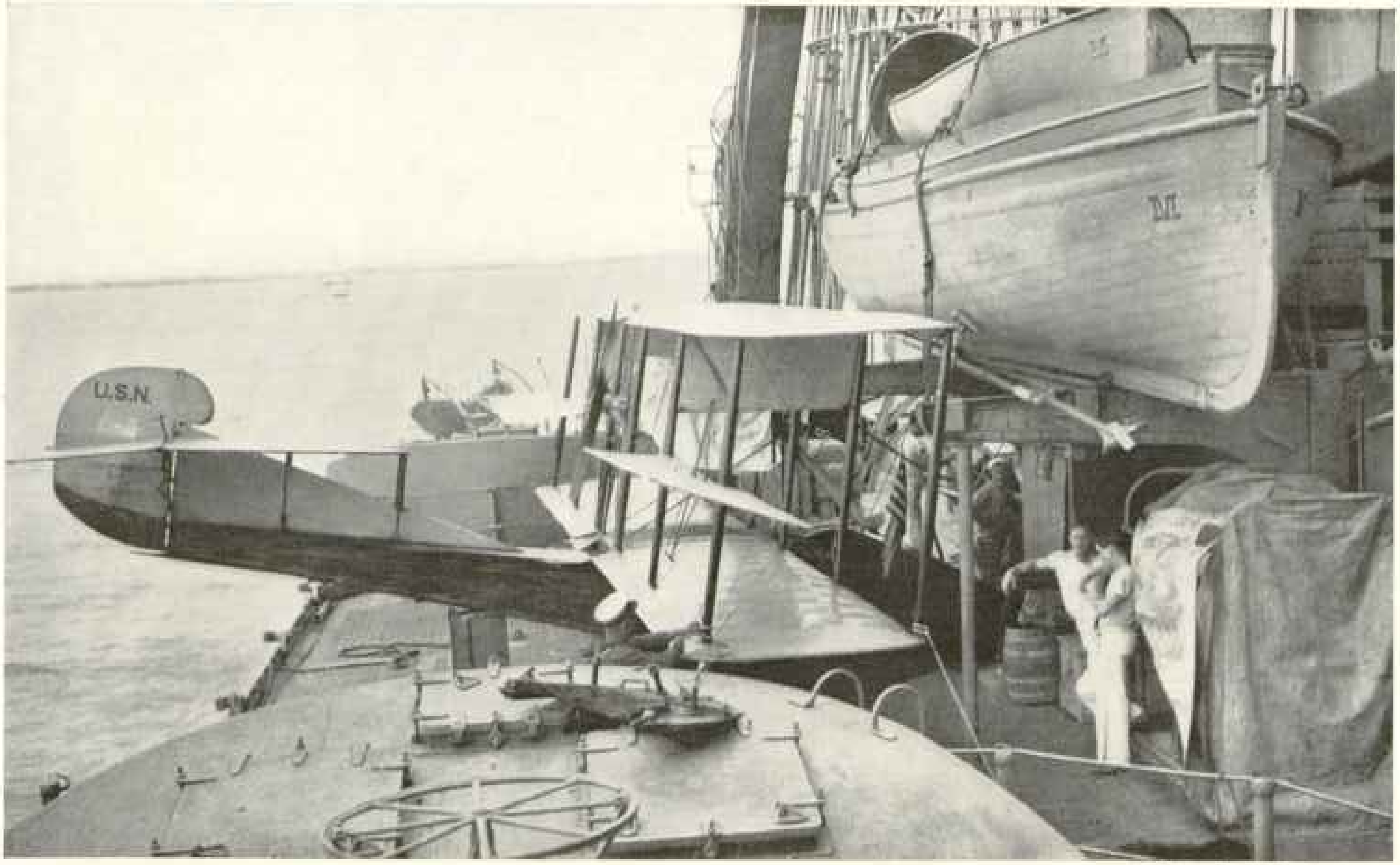
Not only must America depend upon her air fleets to protect her from the attack of hostile sea fleets, but from air raids upon her cities, for the rapid advancement in the science of aviation makes it only a question of time before we shall be vulnerable to attack from above, even though the enemy be separated from us by thousands of miles of ocean.

## AIR ADMIRALS OF THE FUTURE

The military evolution of the airplane has advanced from the single machines, scouting and fighting hand to hand, to the squadron of twelve planes; then to bombing companies of thirty to forty machines; then to the formation, as in the battle of Messines Ridge, last June, where three strata of Allied aircraft were engaged—the fighters in the upper, the observers and bombers in the middle, and the machine-gun planes in the lower, close to the ground. This work of the air service really won the battle.

We are now very near the stage that I ventured to suggest two years ago, in which the aërial unit will be 500 to 1,000 machines, and we shall have air divisions made up of brigades, each composed of several such units.

The air admiral of the near future will need to know more than the possibilities of an aëro squadron. He must know from long practice, drills, evolutions, and




© International Film Service

A NAVAL HYDRO-AIRPLANE LASHED TO THE DECKS OF A BATTLESHIP FOR TRANSPORTATION

"The air has a call of its own that few can resist. It runs through a man's veins like flame and whispers courage and defiance into his ear. It invites his sympathy, love, and esteem. Every known sensation is experienced in flying: joy—the joy of youth astride the dull old world, accomplishing what previous generations dared not attempt; excitement—a feeling that comes from the cool air flying past one's face and whistling by one's ears; also fear, danger, hope, despair, and elation—all these are crowded into one brief hour of life."

experience the possibilities and the methods of handling an aëro division made up of brigades of aëro squadrons.

### SUBMARINE SECONDARY TO AIRPLANE

The submarine, an American invention perfected abroad, ranks at present with the airplane as a revolutionary device, but in my opinion it will soon take second place.

The fundamental limitations of the airplane are less than those of the submarine. It possesses potentialities of offensive in the air, on the sea surface, and under the sea. In other words, airplanes can attack other planes or dirigibles, they can attack ships, and they can attack submarines.

The possibilities of the submarine can and probably soon will be confined to under-surface offensive. The range of the airplane is much greater than that of the submarine. To the flying machine sea or land is all the same. It can go wherever there is air. In the case of nearly all European nations, except Great Britain, the land phase of flying will probably be the most important. With us the reverse is the case and our geographical position and thousands of miles of coasts make the marine phase most important to us.

It must be fully recognized, as a matter of permanent national policy, that the air fleets of the United States must be both numerous and powerful enough to patrol and protect all sea approaches to the entire continent of North America.

### AMERICA RICH IN AVIATOR MAN-AND-WOMAN POWER

As regards aviation personnel, the United States is uniquely favored. In numerical strength we surpass every other nation except Russia and China. The Lafayette Escadrille in France has already given the world a practical illustration of the kind of aviators Americans make.

Along our thousands of miles of coasts there is a quantity and quality of personnel that is among the most valuable assets of this country. It is the personnel composed of the young boatmen, fishermen, sailors, and those who have been brought up beside and earned their living on and by the ocean. They constitute the nucleus of a personnel which is hardy, courageous, enduring; knows the sea and its ways; has the sense of navigation born in it, and above and beyond all has the quality of individual initiative and the power of instant execution developed to the highest degree.

Take the young fellow who, from the age of six or eight, has been handling his own boat, and from the age of 12 or 14 has, singlehanded, driven his fishing boat daily offshore almost out of sight of land, made his day's haul, and has driven his craft back home again in the teeth of all kinds of weather. I know this breed well. I have cruised with them many an hour. I can feel the salt spray of 45 years ago upon my face and in my eyes now. I know their capabilities—rosy-cheeked, clear-eyed, fearless, alert, and quick as a cat.

These youngsters can take their motors apart and put them together again with eyes shut, and they can keep them going under all circumstances, in a way that at times seems almost unbelievable.

They have been forced to this by the supreme incentive of safety for one's own life. When fighting the breaking seas of an easterly gale off the Maine coast, if motor trouble develops the cause of it must be determined at once and the remedy applied instantly. If not, the little boat broaches to, a sea comes roaring aboard, and the life story of that particular youngster comes to a full period.

In considering the air personnel resources of America, the patriotism, intrepidity of spirit, and energy of the young women who are anxious to fly must not be overlooked. That women can become skilful aviatrices has been splendidly demonstrated by the brilliant achievements of Miss Ruth Law and Miss Katherine Stinson.

### WAR'S BIRDMEN TO PLAY USEFUL RÔLE IN PEACE TIMES

That the young men who are training for fliers in war service will have an important and useful rôle to play in the commercial, industrial, and scientific growth of aviation is apparent.

When peace comes thousands of men and thousands of planes will be required for the mail service of the future, for policing the air, for aërial coast patrol,

for aërial map-making by means of aërial photography, for exploration, and for rapid transit of passengers and freight.

An aërial mail service has already been outlined tentatively in Europe by both the Entente Allies and the enemy governments. France and England have had committees at work for nearly 12 months on plans for utilizing their air fleets and air personnel after the war; Bavaria has proposed an aërial traffic service for central Europe, and Prussia is said to be perfecting arrangements for a peace-time Hamburg-to-Constantinople mail and passenger service.

How extensive may prove this after-the-war aviation service may be surmised from the fact that already airplanes have been perfected which are capable of carrying aloft 25 passengers; other machines have developed a speed of 150 miles an hour, while the record non-stop flight to date is 1,004 miles, only 191 miles short of the longest water gap in the America-to-Europe air course, by way of the Azores from Newfoundland. That transatlantic flight is a certainty of the next few months, no reasonable person doubts.

British authorities have expressed the belief that it will soon be possible to go from London to Paris and return in one day, or from London to Bagdad in a day and a half; to New York in two days, and to Ceylon in two and three-quarter days. Air routes to India, with air currents and possible landing stages are even now being mapped.

Every obstacle of nature has been overcome by the airman—deserts, seas, and mountains. The attainment of an altitude of four miles is now almost commonplace, and the Alps have been conquered on numerous occasions.

AIDING THE GOVERNMENT IN TRAINING FLYERS

That America is not waiting supinely for peace to be declared before she makes her preliminary preparations and experiments for the age of the airplane is indicated in the establishment recently of a well-marked air route from Dayton, Ohio, to Rantoul, Ill., as an aid to the training of aviators.

This work has been carried forward under the direction of Carl G. Fisher, of Indianapolis, chairman of the Mapping Committee appointed by the National Advisory Committee on Aëronautics.

The initial program for a marked route consisted of serial numbers painted in large white figures on barn roofs, with an arrow pointing the direction where a clear field of the proper area for safe landing might be found, in the event an emergency landing was necessary.

With the Indianapolis Motor Speedway as a central point, landing field numbers from 1 to 72 were painted on barn roofs between the speedway and Dayton, at an average distance of about two miles apart. From the speedway to Rantoul the field numbers ranged from 1 to 28; size used, 6 to 10 feet long by 24 to 36 inches wide. The distance between the fields on this end of the route averaged about four miles.

This campaign required the services of two men and a specially equipped motor truck and consumed two and one-half months' time. To complete the numbering, 111 gallons of paint and 50 gallons of oil were used.

Following the landing field or daylight route marking scheme, the second phase of the work was to afford assistance in furthering the difficult training in night flying. A patriotic spirit and the desire to assist the government prompted the citizens, town authorities, and civic organizations of the various municipalities selected for signal stations to purchase, erect, and provide for the maintenance of signal lighting equipment at Dayton and Eaton, Ohio, and at Fairfield and Wright flying fields near Dayton; Richmond, Cambridge City, Knightstown, Greenfield, Cumberland, Fort Harrison, Indianapolis, Indianapolis Motor Speedway landing field, Brownsburg, Jamestown, Crawfordsville, Waynetown, Veedersburg, and Covington, Indiana; Danville and Champaign, Illinois, the last-named city being only ten miles south of the government training field at Rantoul, Illinois.

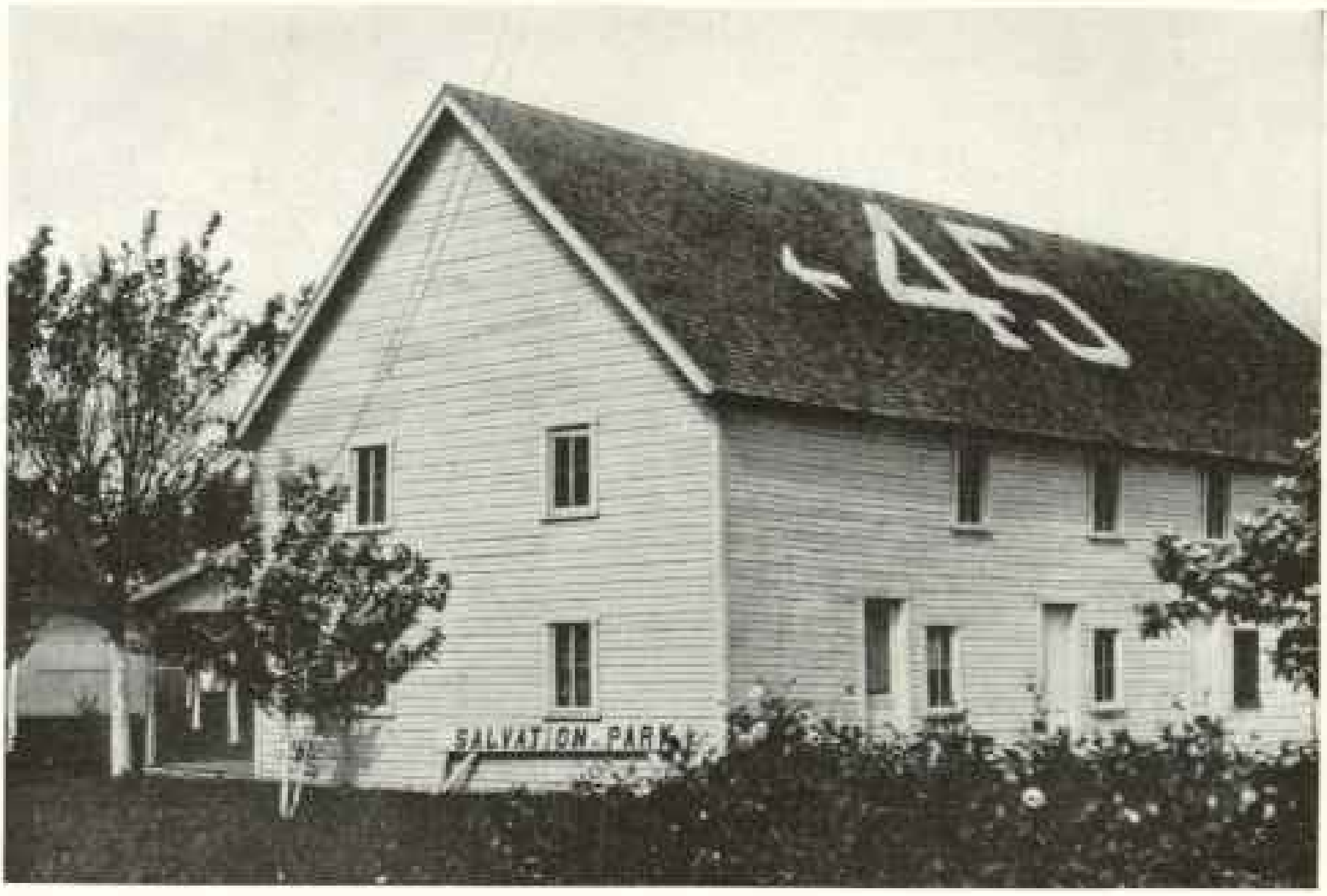
Signal equipment consists of four- or six-light projectors with red or green lenses, equipped with lamps of 200-watt capacity. The projectors are mounted on an angle-iron frame four feet square, standing three feet high. Each unit has an automatic flasher system attached. On the four-light frames the projectors

THE FIRST WOMAN TO FLY FROM CHICAGO TO NEW YORK

Miss Ruth Law established a new American cross-country flight record when she piloted her airplane from Chicago to New York, a distance of 832 miles, her actual flying time being nine hours and one minute. Her longest continuous flight lap on the journey was 590 miles. Miss Law is seen receiving the congratulations of Major General Leonard Wood upon her arrival at Governors Island, New York.

AN AVIATOR'S SIGN-POST FOR NIGHT FLYING

"Signal equipment consists of four- or six-light projectors with red or green lenses. They are mounted on angle-iron frames four feet square, standing three feet high. Each unit has an automatic flasher system attached. For indicating the direct flying route from Dayton to Rantoul, lights flash on and off at about six-second intervals."




AN AVIATOR'S LANDING FIELD INDICATED BY HUGE NUMERALS PAINTED ON THE ROOF OF A BARN

The initial program for a well-marked air route from Dayton, Ohio, to Rantoul, Ill., designed as an aid to the training of aviators, includes the painting of large white figures on barn roofs, with arrows pointing in the direction in which the birdmen can find safe landing places.

are set, two lamps directed east and two west. Six-light signals read two east, two west, one north, and one south. East and west lights are trained ten degrees off the direct course. All projectors on both the four- and six-light units are set twelve degrees above the horizontal.

For indicating the direct flying route from the Dayton flying fields to the Rantoul field, lights flash on and off at about six-second intervals. To assist the pilot to check his location, the station at the end of the first fifty miles west of Dayton flashes green and red alternately. The completion of the second fifty-mile leg is indicated by the rapid flashing signal for the Indianapolis Motor Speedway landing field. Continuing west, the third checking signal consists of six green lights flashing on and off, indicating Crawfordsville, Indiana. Again, at Danville, Illinois, the light flashes red and white at six-second intervals. All other units which indicate to the pilot or his observer that they are following the direct course employ red lights flashing on and off at the regular stated intervals.

Drifting with the air currents and unconsciously leaving the direct flying course will be corrected by a system of side marking lights. At about twenty miles north and south of the air route and located approximately twenty miles east to west, two fixed lights are to be stationed. Those on the south will use red and point directly north, while the lamps north carry green lenses and are directed due south; hence, should the airplane drift from the course, the pilot would be reasonably sure to detect either the stationary red or green lights and correct his direction until the flashing signals telegraph the welcome news, "Straight ahead." Lamps used for side markers are of the same type of projectors and are to be purchased, installed, and maintained by the towns where stationed without cost to the government.

On clear nights the radius of all lights will be from eight to ten miles.

### FOUR TRANSCONTINENTAL AIRWAYS

The details of this Dayton-Rantoul route present in a general way the nature of the task which the aviation sign-post pioneers will undertake in mapping and marking the four transcontinental airways, proposed by the Aëro Club of America and known as the Woodrow Wilson, the Langley, the Wright Brothers, and the Bell & Chanute routes.

The last of these routes, extending from Boston, Mass., to Seattle, Wash., via Albany, Syracuse, Rochester, Erie, Buffalo, Detroit, Grand Rapids, Minneapolis, Bismarck, and Great Falls, will be a richly deserved memorial to Octave Chanute, the pioneer aëronautic engineer, and Alexander Graham Bell, whose name is more frequently associated with other great gifts to humanity, but who in an unspectacular way was a potent factor in advancing man's mastery of the air.

It was the financial support and personal encouragement of the inventor of the telephone which largely enabled Samuel P. Langley to continue his experiments with heavier-than-air machines—experiments which were of inestimable value to Orville and Wilbur Wright, who finally achieved success.

Alexander Graham Bell's support was given at a time when the foremost physicist of Great Britain, Lord Kelvin (Sir William Thompson), the foremost astronomer of America, Simon Newcomb, and the foremost business genius of this age, Andrew Carnegie, scoffed at the possibility of man's flying.

The name of this airway will also be a tribute to Mrs. Bell, whose gift of $50,000 to the Aërial Experimental Association in 1907-1908 made possible the experiments which resulted in Glenn H. Curtiss and J. A. D. McCurdy taking an active part in the development of aëronautics.

The Woodrow Wilson airway will extend in an airline from New York to San Francisco, with Cleveland, Toledo, Chicago, and Cheyenne the principal cities en route.

It is proposed that both the Langley and the Wright Brothers routes shall have Washington as their starting point. The Langley line will end in Los Angeles, passing near Wright field at Dayton and within a few miles of St. Louis. The Wright Brothers airway will pursue a more devious route through Virginia, North and South Carolina, Georgia, Alabama, Mississippi, Louisiana, Texas, New Mexico, and Arizona, and terminates at San Diego.

# GERMANY'S AIR PROGRAM

WHILE America and her Allies have been organizing their wealth, natural resources, and industrial forces to place a fleet of flying machines above the battle lines of Europe this spring, the fact should not be overlooked that Germany and her vassal nations are equally alive to the importance of mastery in the air. Her highly centralized war industries are exerting every effort to match the gigantic program of the Entente Allies.

While no official figures have been allowed to leak from Germany as to just what is being done in preparation for the supreme battle of the sky, the trend of public opinion in the Teuton nations is reflected in such reports as the following news item (translated by a correspondent of London *Flight*) which appeared recently in *Der Motorwagen*, a Berlin journal:

"At a recent meeting of the Deutscher Fliegerbund (German Aërial League) the treasurer, Lieutenant Bothe, of Berlin, gave some interesting details regarding the objects and activities of the League.

"He first gave a very clear and comprehensive survey of the present position of aëronautics in Germany, claiming that the Germans had now really obtained the supremacy of the air on the western front as on other fronts, though he had to acknowledge that at the time of the great Somme offensive the mastery in the air belonged to the British and French.

"This led to a reawakening in German military circles and to a redoubling of their efforts to regain that supremacy, and no stones were left unturned until that object had been successfully attained.

"The Germans had now left their adversaries far behind, both in number and quality of the aircraft being turned out, as the English were learning to their cost.

"Lieutenant Bothe then dealt at some length with the position of military aëronautics after the present war. He foretold that on the cessation of the present hostilities all the nations would at once proceed to build up an impenetrable series of modern defensive works, extending several miles behind their frontiers, and which it would be beyond the power of human beings to break through, except by the aërial arm.

"In future wars it would be necessary to invade the enemy's territories by means of tens of thousands of aëroplanes, which by dropping hundreds of tons of explosives would destroy all industrial works, transport routes, etc., and thus delay the advance of the troops and impede preparations for offense or defense.

"The war would be won within the first few days of the declaration of hostilities by the Power, or Powers, which were thus able to throw in the largest weight of aërial 'frightfulness,' and thereby paralyze the fighting efficiency of their opponents, before even a battle had been fought or a campaign opened.

"Where, it may be asked, are to be found the pilots to man these tens of thousands of aëroplanes? This would be one of the chief duties of the German Aërial League, an institution which was daily growing in importance and influence.

"By suitable courses of training at aërodromes and in the workshops, the youth of the country would be prepared for later service in the Flying Corps.

"The speaker urged every one interested in this subject to give the League all the support possible by joining a local branch and by making its objects more widely known."

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**INDEX FOR JULY-DECEMBER, 1917, VOLUME READY.**

Index for Volume **XXXII**—July-December, 1917—will be mailed to members upon request.

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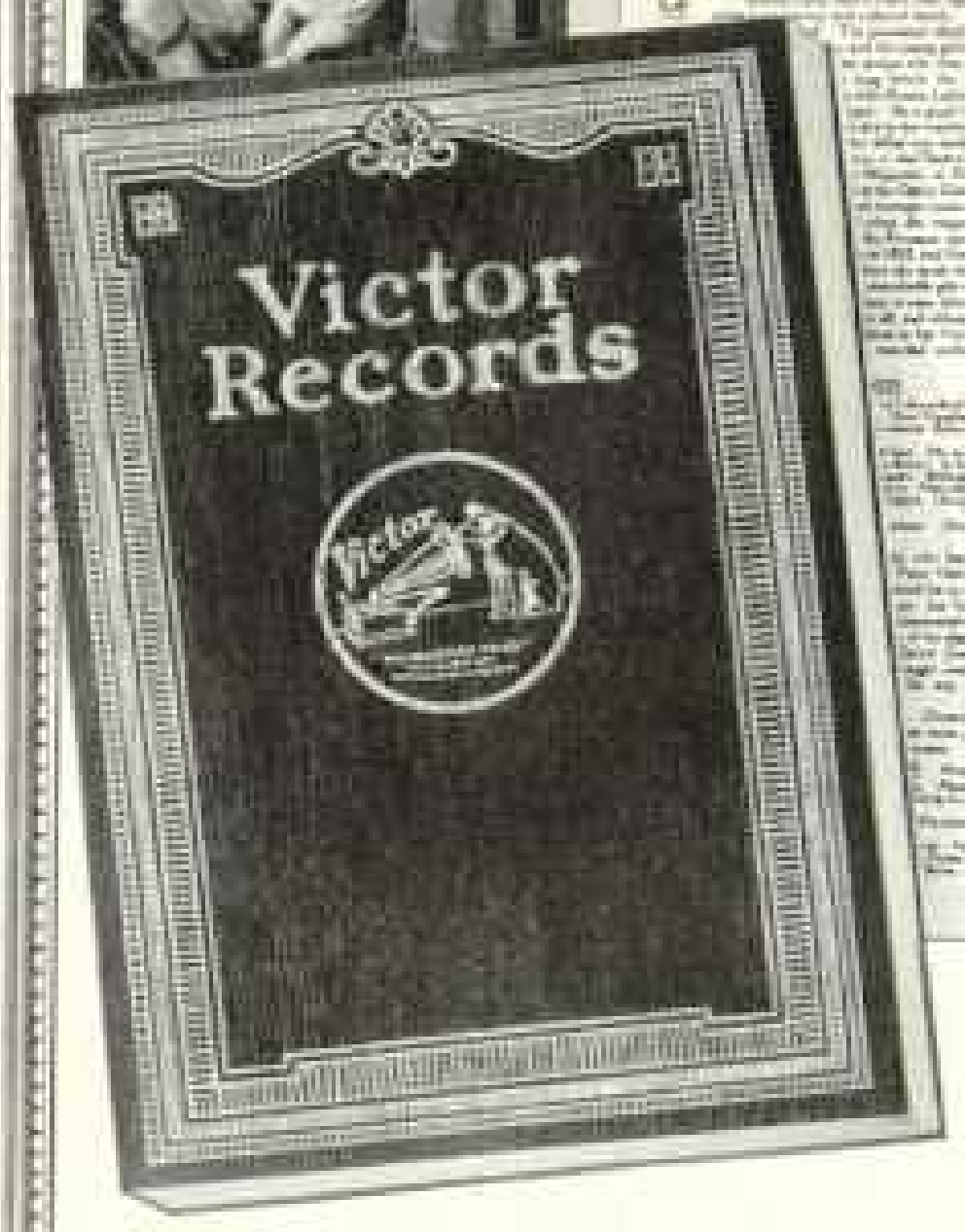


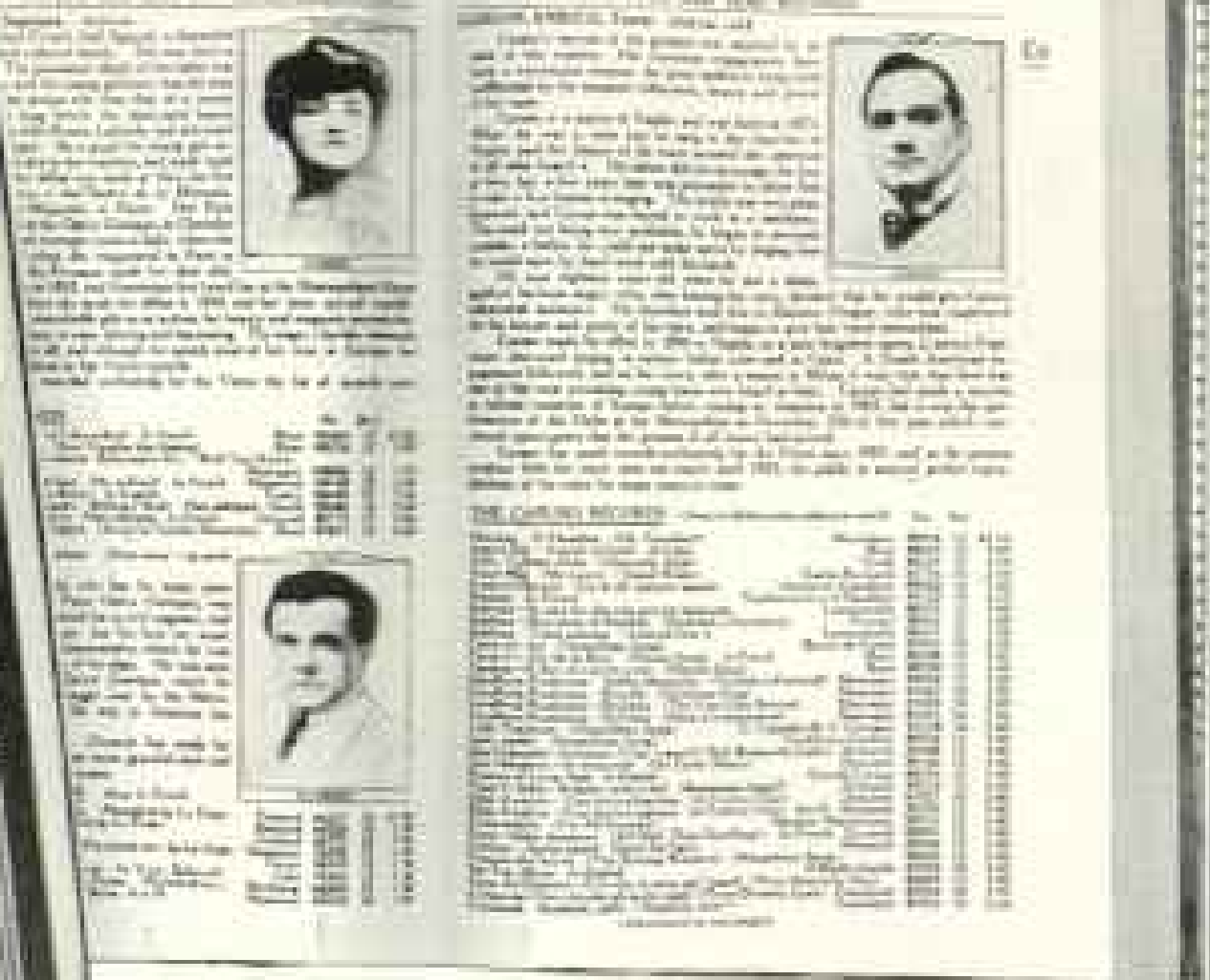

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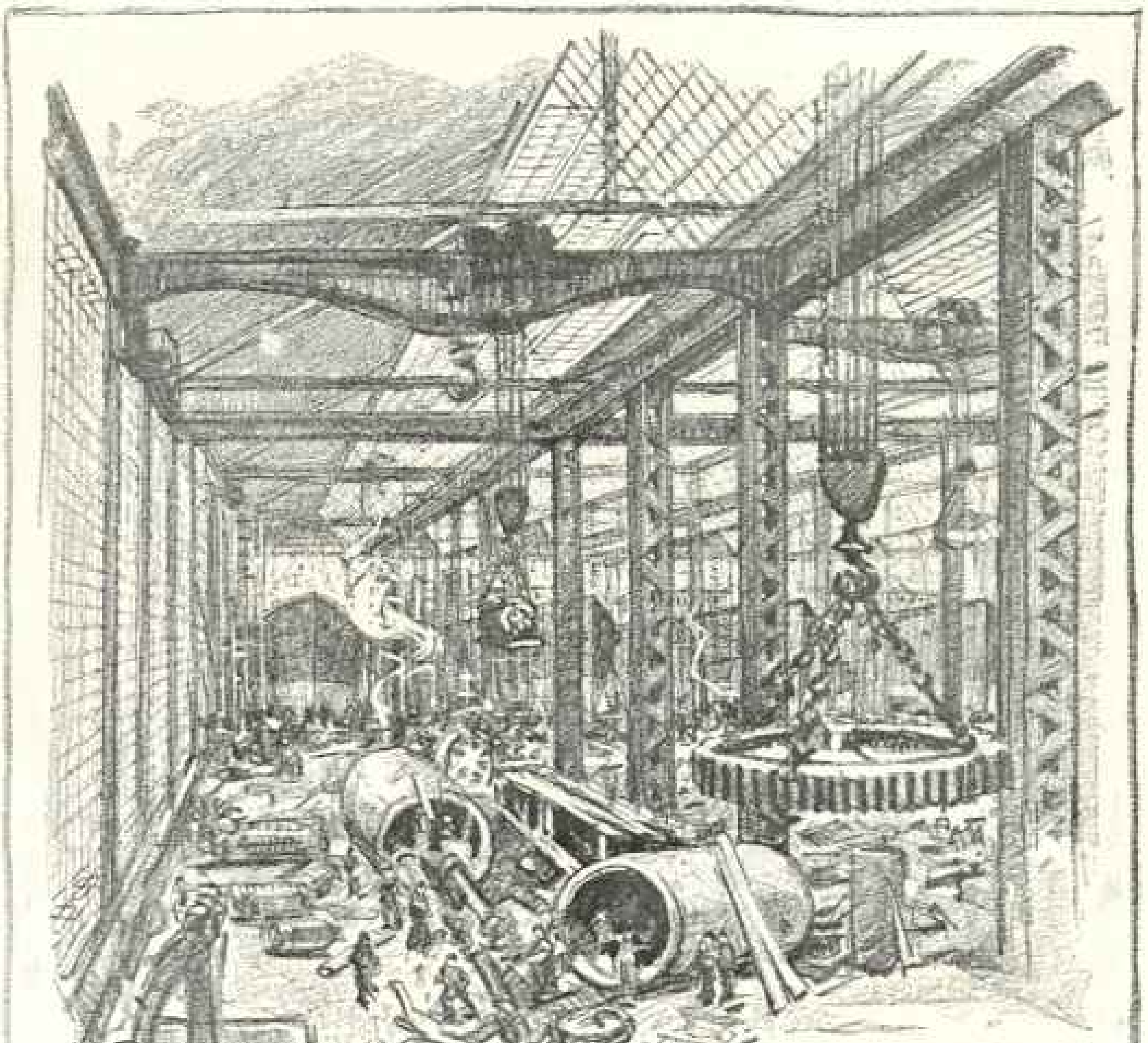

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# *Why Franklin Cars Are Selling And Why They Will Continue To Sell*

YOU hear a great deal of talk about the automobile business.

Just write this down for a fact.:

The service car—the car of practical utility—has nothing to fear from these exacting times. The *nature of demand* has changed, but *demand* goes on.

Buyers want economy.

The car that meets conditions is not suffering for buyers.

The economical utility car will "carry on" as long as the country carries on—men must get about.

Unthinking people, who refer to every passenger automobile as a pleasure car, do not speak of the "pleasure elevator" or the "pleasure trolley."

When the utility car stops, the country will stop. We cannot go back to old methods. Feed is high and there are not enough horses.

### *In Every Thrift and Efficiency Test Held the Franklin Established a Record*

Perhaps because the automobile is a comparatively new invention is the reason why no *universal standard* of mileage for either gasoline or tires has been adopted by all cars; or perhaps it is figured that motorists are not interested in low operating and maintenance costs.

It remains a fact, however, that if all fine cars were as efficient as the Franklin a gallon of gasoline would deliver more than the typical average of six to eleven miles. It would go twenty or *more* miles, as Franklin owners daily make a gallon go.

It is also certain that if all cars were as efficient as the Franklin, a set of tires would do considerably better than 6,000 or 7,000 miles. The national mileage of Franklin owners, over a five-year period and compiled from owners' own reports, shows 10,203 miles to the set.

For every fine motor car to be as efficient as the Franklin, every fine motor car would have to be *scientifically* constructed—a *scientific light-weight* car.

### *Trend Toward Franklin Cars Since Increased Costs of Gasoline and Tires*

To get Franklin efficiency means doing away with the gasoline-consuming Water Cooling System and adopting DIRECT AIR COOLING.

This means the *elimination* of the 177 complicated parts of plumbing that hold water; then, as in the Franklin, there would be nothing to freeze in winter, and in summer there would be nothing to overheat; and the expense that follows these annoyances, of course, would be avoided.

To get Franklin tire mileage and Franklin long life, every fine motor car would have to adopt *Franklin flexible construction*; its light *lasting* weight; its full elliptic springs—the *basic* Franklin principles that *minimize* friction and drag and do away with excessive and unnecessary hammering on the tires.

The used-car problem, too, would be solved. All a motorist has to do to ascertain the relative long life of fine motor cars is to study used-car advertising and the *prices* quoted. It tells the motorist, if he is alert, what to *avoid* when considering the purchase of a *new* car.

### *Construction of Motor Cars Shows Motorists Whether Economy Is Possible*

Whenever a motorist wonders why he is unable to join in the conservation of the nation's gasoline and rubber;

Whenever he feels that his operating and maintenance costs are double that of his friend, the Franklin owner—

He need only to examine the *construction* of his car.

Then know the facts about the Franklin Basic Principles of Scientific Light-Weight Construction.

These principles and the 1,000 pounds difference in weight in favor of the Light-Weight Franklin are very likely to make him a Franklin Owner—immediately.

**FRANKLIN AUTOMOBILE COMPANY, SYRACUSE, N. Y., U. S. A.**

"Mention the Geographic—It identifies you."


# Enlist Your Lens in the Air Service

IF you have a powerful photographic lens, put it to work for our men "over there;" let it disclose from the skies of France hidden machine-gun nests waiting to spread death among advancing American troops; let it save hundreds of American lives from being snuffed out in the trenches by shells from concealed batteries. An official report calls the situation "critical," brooking no delay.

What is especially desired at the present time are lenses of from 7 inches to 24 inches focal length and with speeds of from F 3.5 to F 7.7. Practically all lenses of this type will be purchased as soon as they can be found. The following are some of the foreign makes wanted: Carl Zeiss Tessars, Bausch & Lomb Tessars, Voigtlander Heliar, Euryplan, Cooke, Goerz, Bush, Ross, Ross-Zeiss, Krauss, Krauss-Zeiss, Steinheil-Isostigmar, Rodenstock. In addition, matched pairs of stereoscopic lenses, with speeds of F 4.5, focal lengths of 4½, 5, 5½, 6, 6½, and 7 inches, are needed.

*If you are in doubt as to the value of your lens, ask the nearest photographer.*

Remember that you can probably replace your Anastigmat lenses with others just as serviceable for you but not adaptable for the army. If you have a lens such as your army needs, send at once its description and the price you think fair to

SIGNAL EQUIPMENT No. 33
WASHINGTON, D. C.

# National Geographic Society Ward

IN THE

## American Ambulance Hospital
## Neuilly, Paris, France

EAGER to contribute their share in mitigating the suffering which will be the lot of many of our boys who are now or who soon will be in France fighting the battle of civilization for those who must remain at home, members of the National Geographic Society are subscribing to the fund for the establishment of a

## National Geographic Society Ward

in the American Ambulance Hospital at Neuilly, in the environs of Paris.

A host of members of the National Geographic Society or their sons have themselves enlisted in the armed service of our country, and it is comforting to picture the feeling of gratitude which they will experience if, in the hazard of war, they are brought into a completely equipped Ward of this wonderful American institution which has been doing such noteworthy work for stricken France since the first days of the great struggle.

The American Hospital at Neuilly is housed in a splendid four-story structure built around the sides of a beautiful court. It accommodates daily in the main building and auxiliary hospitals 1,500 patients. The average number of patients in the main institution is 451 a day.

Subscriptions in any amount sent to the National Geographic Society for the Geographic Ward will be wisely expended, without one dollar of overhead expense. Each contributor may feel secure in the knowledge that every penny given will alleviate the suffering, add to the comfort, or assist in the restoration to health of some American soldier who has risked life and limb in the cause of his country.

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16th and M Sts., Washington, D. C.

# We Must "Follow-Up"

The story of the Gallipoli withdrawal is a tale of inadequate support. Like Salamanders clinging to the red-hot bars of a fiery furnace, the boys of Australia and New Zealand clung to the slopes of Anzac. Desperately, heroically they clung. No troops under any circumstances ever displayed greater soldierly qualities or upheld more sacredly the best traditions of England's Army. But they had to withdraw because the "follow-up" was not there.

To some of us it has been given to march with the columns of troops that go to France. And to others it is given to wave Godspeed. But he who marches and he who stays is equally a citizen of the world's mightiest republic and equally responsible for its success in this greatest of undertakings.

Then let us at home turn from our flag waving and consider how necessary we are, how useful we must be. Those who go to fight cannot hope to win by naked bravery and we cannot hope to win unless every individual at home does *all* he can. We must have no Gallipoli.

The Bell System is only one of the myriad great and small industries which are co-operating that nothing be left undone to keep a constant, efficient stream of men, guns, ammunition, food, clothing and comforts flowing to the front.

# "THE EYES OF THE NAVY"

## "S.O.S." Call for Binoculars, Spy-Glasses, and Telescopes

NAVY DEPARTMENT
ASSISTANT SECRETARY'S OFFICE
WASHINGTON

The Navy is still in urgent need of binoculars, spy-glasses, telescopes, chronometers, and sextants. The use of the submarine has so changed naval warfare that more "EYES" are needed on every ship, in order that a constant and efficient lookout may be maintained.

Heretofore the United States has largely relied upon foreign countries for its supply of such articles. These channels of supply are now closed, and it is necessary to appeal to the patriotism of private owners to assist the Navy.

Several weeks ago an appeal was made through the daily press, resulting in the receipt of over 3,000 glasses of various kinds, the great majority of which has proved satisfactory for naval use. *This number, however, is wholly insufficient, and the Navy needs many thousands more.*

All articles donated should be securely tagged, giving the name and address of the donor, and forwarded by mail or express to Franklin D. Roosevelt, Assistant Secretary of the Navy, care of Naval Observatory, Washington, D. C., so that they may be acknowledged by him.

Articles not suitable for naval use will be returned to the sender. Those accepted will be keyed, so that the name and address of the donor will be permanently recorded at the Navy Department, and every effort will be made to return them, with added historic interest, at the termination of the war. It is, of course, impossible to guarantee them against damage or loss.

As the Government cannot, under the law, accept services or material without making some payment therefor, one dollar will be paid for each article accepted, which sum will constitute the rental price, or, in the event of loss, the purchase price of such article.

Very sincerely yours,

FRANKLIN D. ROOSEVELT,
*Assistant Secretary of the Navy.*

The Director,
National Geographic Society,
Washington, D. C.

The National Geographic Society donated this space to the United States Navy in the belief that its members will heartily respond

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## MOTOR TRUCKS

THOUSANDS of owners have chosen the Denby, not on the clarion call of publicity, but on its performance record in their own lines of work.

**Denby Motor Truck Company**

**Detroit, Michigan**

*The "D-D"*
# KHAKI WATCH
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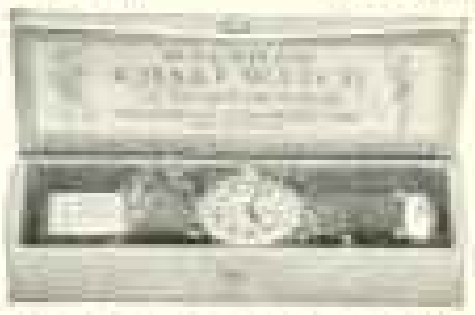
**Prestige** **WALTHAM MOVEMENT** **Accuracy**



*Always wind on this line. Instant upon hearing the Watch on the "Khaki" Bar.*

**Radium Dial—"No Fuss" Strap**

*"Commando" Buckle*

**Olive Drab Webbing**


*Drink Alcohol! It Can't Crack!*

*Do not buy any military watch till you have read this short history of*

**"THE WATCH IN THE TRENCHES"**

*It will be sent on request*

All features of the "Khaki" Watch combine to make the strongest and most reliable watch possible. It is equipped with Waltham Movement, known the world over, and it is the easiest and safest watch to adjust to the wrist, because of the patented one-piece clasp.

Avoid imitations. Unbreakable Glass used on some military watches, material and is inflammable and dangerous. The "Khaki" Glass is non-explosive and unbreakable and is held tightly by Double-Cliuch Bezel, patented September 11, 1917.

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**Resistal Goggles Are Safe Because They Are Non-Shatterable**

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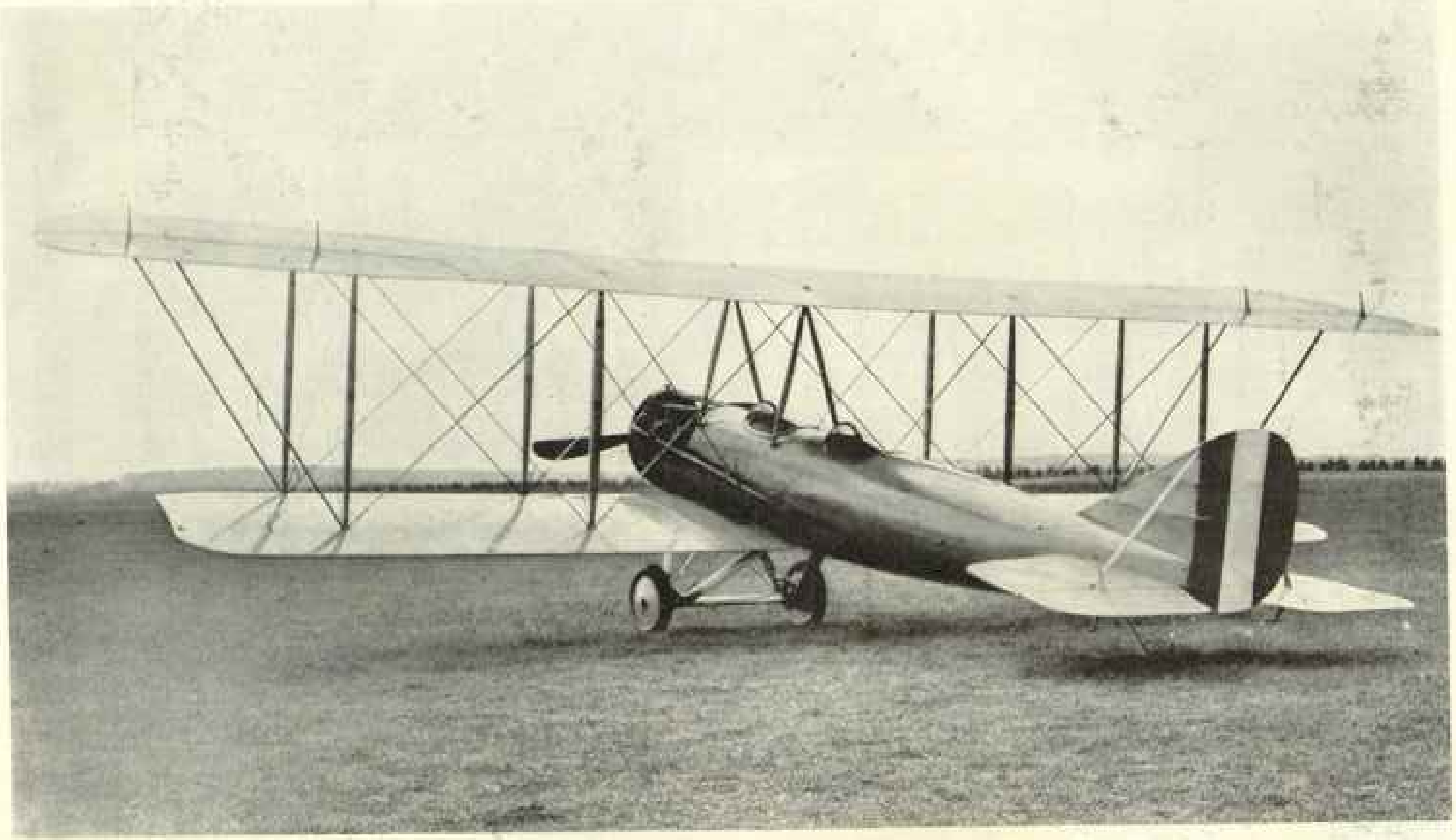
**Master Printers**

420-422 Eleventh Street — Washington, D. C.



THIS L.W.F. AIRPLANE flew from Rantoul, Illinois, to San Antonio, Texas, a distance of 1,357 miles, in 9 hours and 48 minutes actual flying time, at an average speed of 138.4 miles per hour. This flight breaks all records for speed and distance.

L.W.F. ENGINEERING COMPANY, INC.

COLLEGE POINT, N. Y.


"OPENING THE CASE."

*Painted by Edward V. Brewer for Cream of Wheat Co.* *Copyright 1918 by Cream of Wheat Co.*

JUDD & DETWEILER, INC.
WASHINGTON, D. C.

*Four forms of*
**Williams'**
Shaving Soaps


Williams'

PATENTED
# Holder Top Shaving Stick

WILLIAMS' Shaving Soap is no slacker. In camp and "over there" as well as at home it is doing its bit toward lending aid and comfort and economy to the shave.

Its rich, soothing, lasting lather is always on tap for the boys at the front, getting into action at the touch of the brush and making the shaving rule the easiest one to obey.

If you are going into service take Williams' Shaving Soap along. If you have a soldier at the front, send him Williams'.

Send 2lc. in stamps for trial sizes of the four forms shown here. Or send 4c. in stamps for any one.

The J. B. WILLIAMS COMPANY
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After the shave you will enjoy the comforting touch of Williams' Talc. Send 4c. for a trial size of the Violet, Carnation, English Lilac or Rose.