

# HAMPTON'S MAGAZINE

(THE NEW BROADWAY)

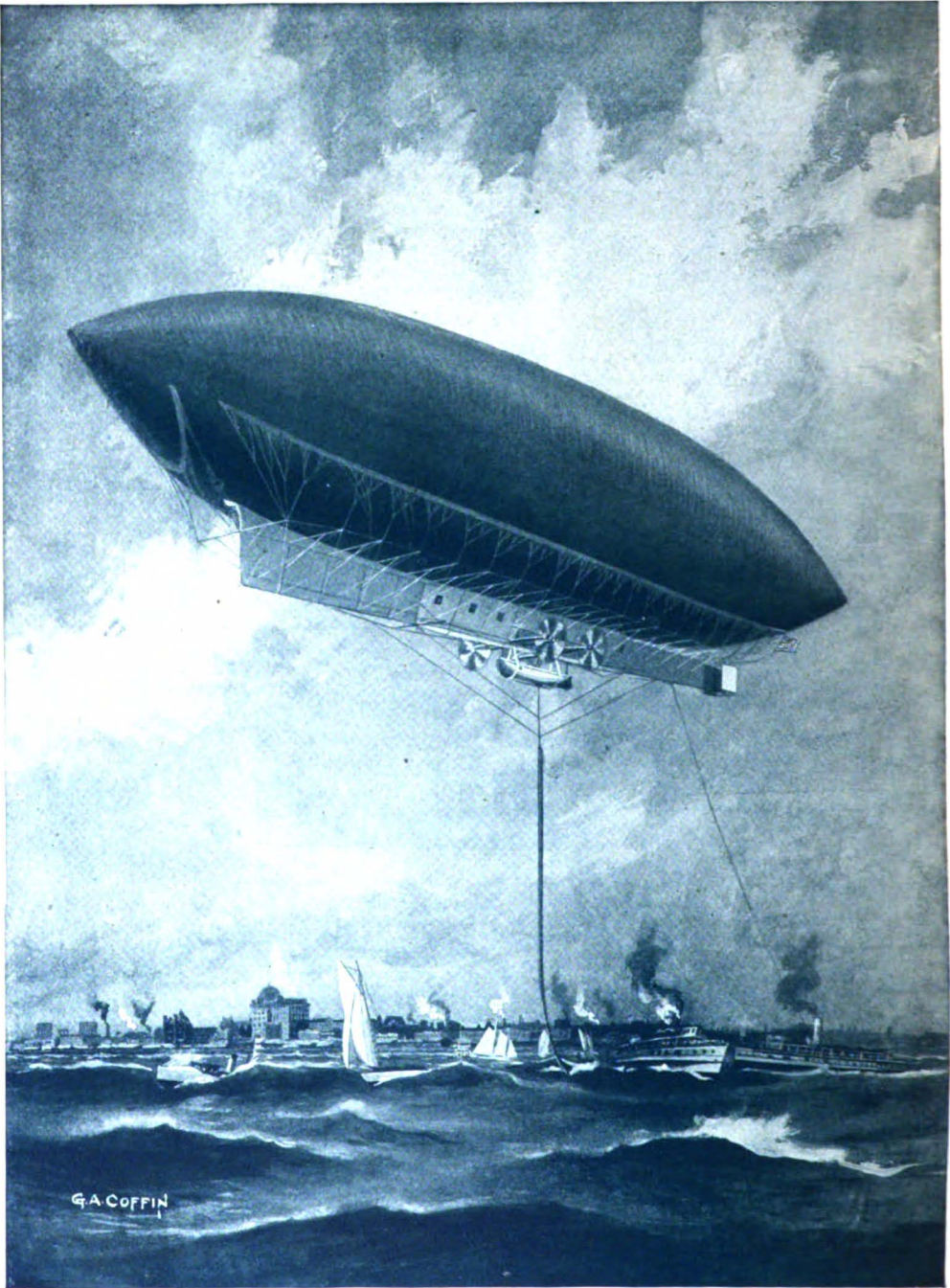
CONTENTS for DECEMBER 1910

FRONTISPIECE—"The America"

Drawing by G. A. Coffin

DÜSSELDORF . . . . .	Frederick C. Howe . . . . .	697
<i>Illustrations from Photographs</i>		
TO A PESSIMIST (Verse) . . . . .	Alfred Noyes . . . . .	709
TSHUSHIMA STRAITS (A Story) . . . . .	James B. Connolly . . . . .	710
<i>Illustrations by Henry J. Peck</i>		
IN THE ORCHARD (Verse) . . . . .	Richard Le Gallienne . . . . .	720
THE HONEST FARMER . . . . .	Eugene Wood . . . . .	721
<i>Illustrations by Herace Taylor</i>		
A THOUSAND MILES BY AIRSHIP OVER THE ATLANTIC . . . . .	Walter Wellman . . . . .	733
<i>Illustrations by G. A. Coffin and L. A. Shafer and from Photographs</i>		
JOHN JONES COMES TO LIFE (A Story) . . . . .	Harris Merton Lyon . . . . .	748
<i>Illustrations by H. S. Potter</i>		
THE SURRENDER OF NEW ENGLAND . . . . .	Charles Edward Russell . . . . .	759
<i>Portraits by S. G. Cahan</i>		
THE HYBRID HYBERBOREAN ANT . . . . .	Roy L. McCardell . . . . .	771
<i>Illustrations by Albert Levering</i>		
THE CHILDREN'S PLAGUE . . . . .	Jacelyn Manning, M.D. . . . .	780
<i>Illustration from Photograph</i>		
THE GODDESS OF HIS FAITH (A Story) . . . . .	Frederick Palmer . . . . .	788
<i>Illustrations by Robert Edwards</i>		
ANOTHER CHANCE FOR THE BAD BOY . . . . .	Rheta Childe Donr . . . . .	797
<i>Illustrations from Photographs</i>		
AN INTERNATIONAL MATCH (A Story) . . . . .	Herbert D. Ward . . . . .	809
<i>Illustrations by P. J. Monahan</i>		
THE MAKING OF A CHAMPION (A Story) . . . . .	Gene MacLean . . . . .	817
<i>Illustrations by Clarence Rowe</i>		
PLAYS AND PLAYERS . . . . .	. . . . .	822
<i>Illustrations from Photographs</i>		
PERSONALITIES . . . . .	. . . . .	831
<i>Portraits from Photographs</i>		
EDITORIALS . . . . .	. . . . .	839
CURRENT COMMENT . . . . .	. . . . .	843

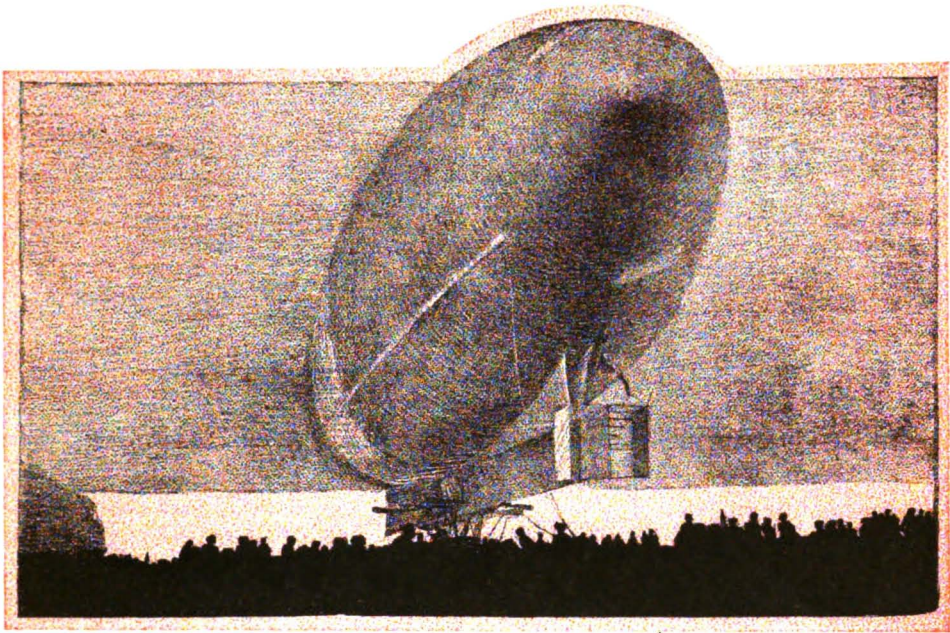
☞ Yearly Subscription, \$1.50 in advance. One Dollar extra for Foreign Postage. ☞ Issued monthly by Broadway Magazine, Incorporated. Benj. B. Hampton, President; Jesse D. Hampton, Vice-President; Albert J. Gubney, Treasurer; Caleb L. Litchfield, Secretary. Address all communications to Hampton's Magazine, 60 West Thirty-fifth Street, New York. Copyright, 1910, by Benj. B. Hampton. All rights reserved. Entered at Stationers' Hall, London, England. Entered at the New York Post Office as Second-Class Mail Matter. Entered as Second-Class Mail Matter at the Post-Office Department, Canada. ☞ The Editors are not responsible for loss or injury to manuscripts, drawings and photographs while in their possession or in transit. Authors should retain copies of manuscripts submitted.



THE RECORD-BREAKING WELLMAN-VANIMAN AIRSHIP *AMERICA* TRAVELING UNDER ITS OWN POWER: FROM THE LIFE-BOAT BETWEEN THE PROPELLERS HANGS THE EQUILIBRATOR.

—See page 733.





THE AIRSHIP *AMERICA* SAILING FROM ATLANTIC CITY, OCTOBER 15, 1910.

# A Thousand Miles by Airship Over the Atlantic

By Walter Wellman

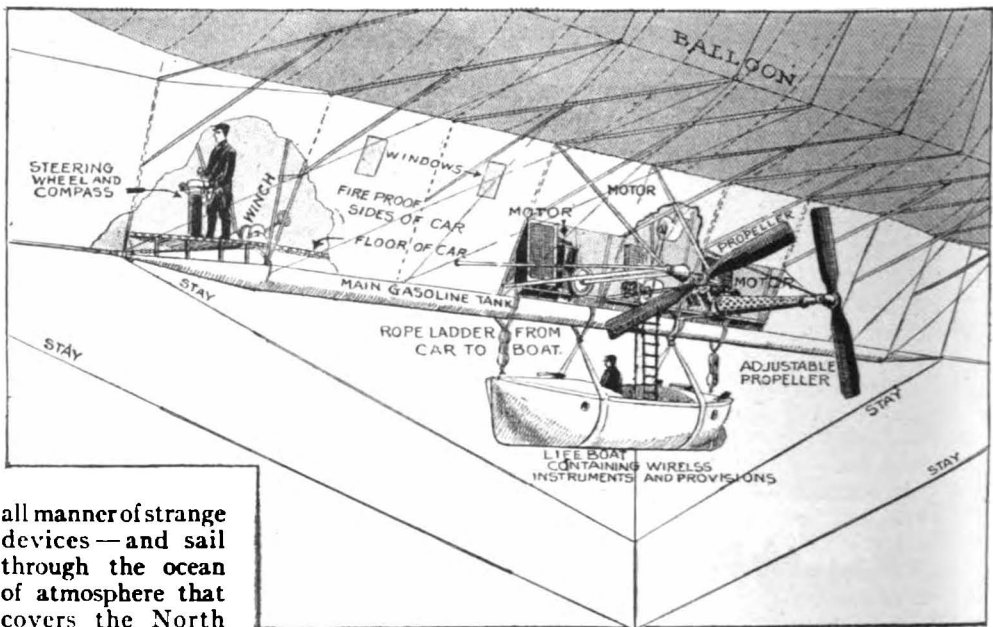
*Of the Airship "America" Expedition*

Illustrations from Photographs: Drawings by  
G. A. Coffin and L. A. Shafer

EDITORIAL NOTE.—The whole world was thrilled recently by the most daring aerial navigation adventure ever known, the Wellman-Vaniman expedition's attempt to cross the Atlantic Ocean, from the United States to Europe, in the airship *America*. It was a bold venture even for this advanced stage in the history of man's conquest of the air. Europe was not reached, but the expedition was enough of a success to turn skeptics to applauders and believers, and to make one of the most ambitious of dreams seem entirely practicable. Important records were broken. The voyage of the *America* was the longest ever made by an airship. She was in the air longer than any other airship ever before had been. This trip was made over the ocean, not over land, as had been the other great airship trips. For the first time wireless telegraphic communication was utilized by an airship at sea to communicate with the land and with steamships upon the ocean. The complete story of this thrilling adventure has been written by Walter Wellman exclusively for HAMPTON'S.

IT is the dawn of the fifteenth of October at Atlantic City. The morning is thick and heavy with fog. There is no wind. Crowds of people are assembling at the great balloon house which stands at the edge of the ocean. They have come to see

us set out upon one of the most difficult and dangerous voyages men have ever undertaken. In a few moments six of us are to take our places in a great ship of the air—a huge combination of chemistry, mechanics, fuel, force, engines, instruments,



all manner of strange devices—and sail through the ocean of atmosphere that covers the North Atlantic, with the hope of reaching Europe before we again alight.

All the world was kind enough to watch that voyage with keen interest and warm sympathy. All the world knows now its outcome. I shall ask the reader to accompany my comrades and myself on that memorable voyage, that strange journeying for three days and nights through the air over the stormy sea, a voyage which had the grim specter ever hovering near, which broke all airship records for time and distance, and which in the end was brought to a fortunate conclusion by one of those combinations of chance so rare and strange as to seem almost miraculous.

Before taking the reader with me upon this remarkable adventure, I want him—and doubtless he wants for himself—to know more of what has gone before; what the enterprise really is; why it was called into being; how the idea had its genesis; what the plan, what the difficulties in its way, and how we had contrived and striven to overcome them. The story of the voyage itself will be rapid, vivid, full of action, life, human interest, peril, adventure. But a great part of that story will be only half clear, will lose much of its true value and significance, if the reader has not become familiar beforehand not only with the soul and heart, but with the lungs, the muscles, the sinews of the project.

As we stole forth through the fog that morning of the fifteenth of October and set our prow to the eastward over the waters of the broad Atlantic, we were a half dozen human pigmies astride a great machine weighing a total of about 26,000 pounds—thirteen tons of steel, silk, rubber, gasoline, en-

gines, provisions, hydrogen, a thousand things welded together in a modern lighter-than-air aerial craft.

Whether this frail combination of art, artifice, and science was to prove a true and serviceable ship of the air, or a grim Frankenstein, we did not know. That is precisely what we were trying to find out. We were trying to achieve with steel, power, engineering and man's mechanical cunning such mastery of space and distance through an aerial ocean never yet traversed as would constitute the realization of a splendid dream.

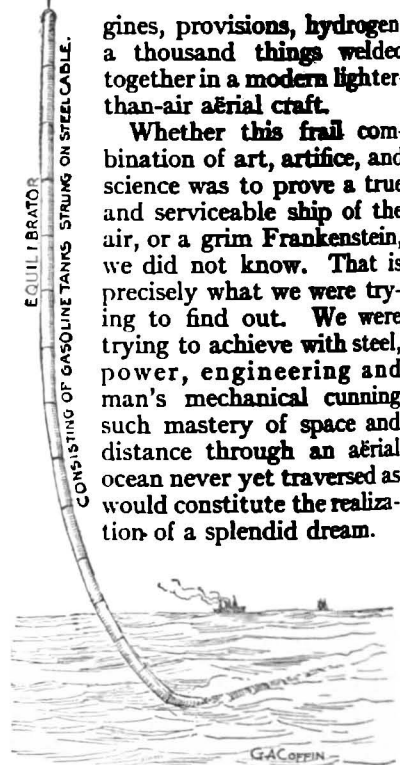
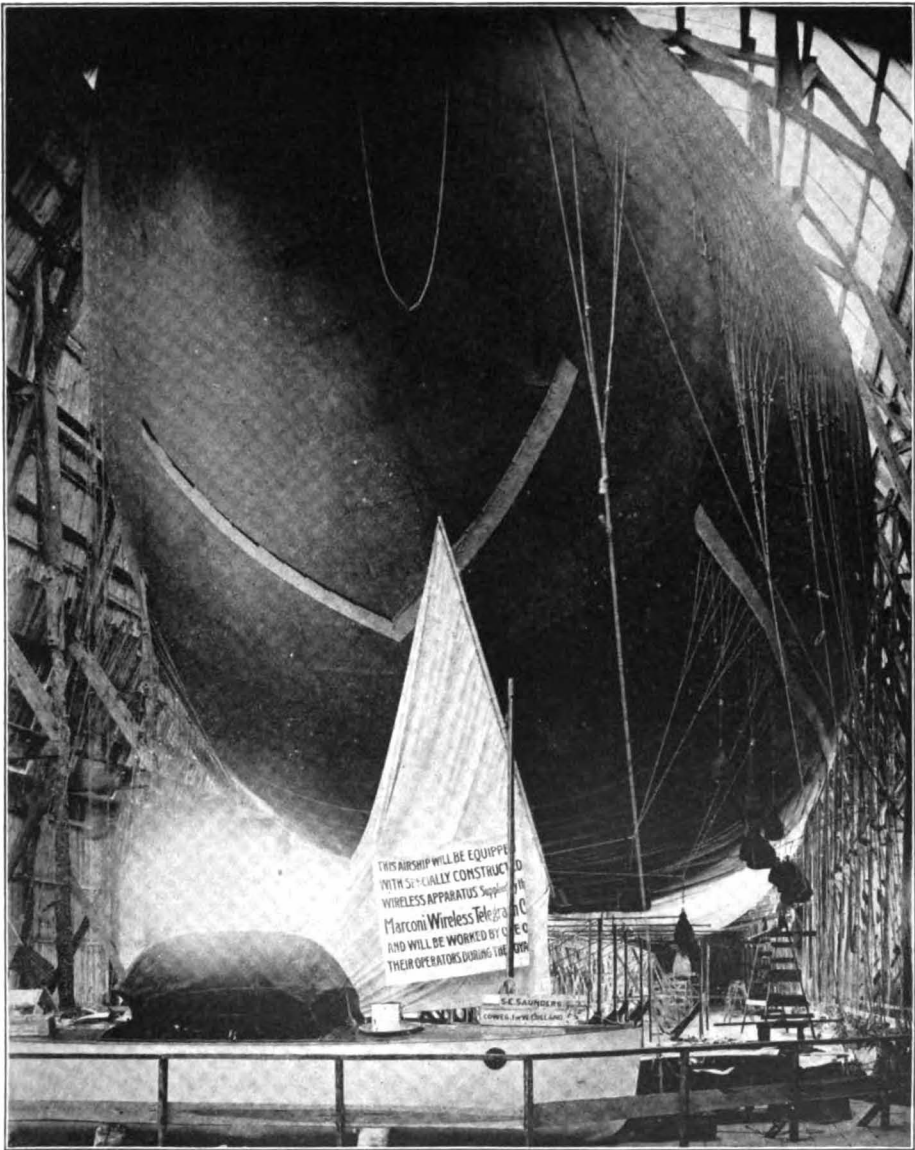


Diagram showing construction of ship, equilibrator, etc. The equilibrator was designed to keep the "America" at a comparatively uniform height, thus automatically counteracting changes in buoyancy due to atmospheric pressure.



Copyright, 1910, by The Geo. A. McKrague Co., Atlantic City.

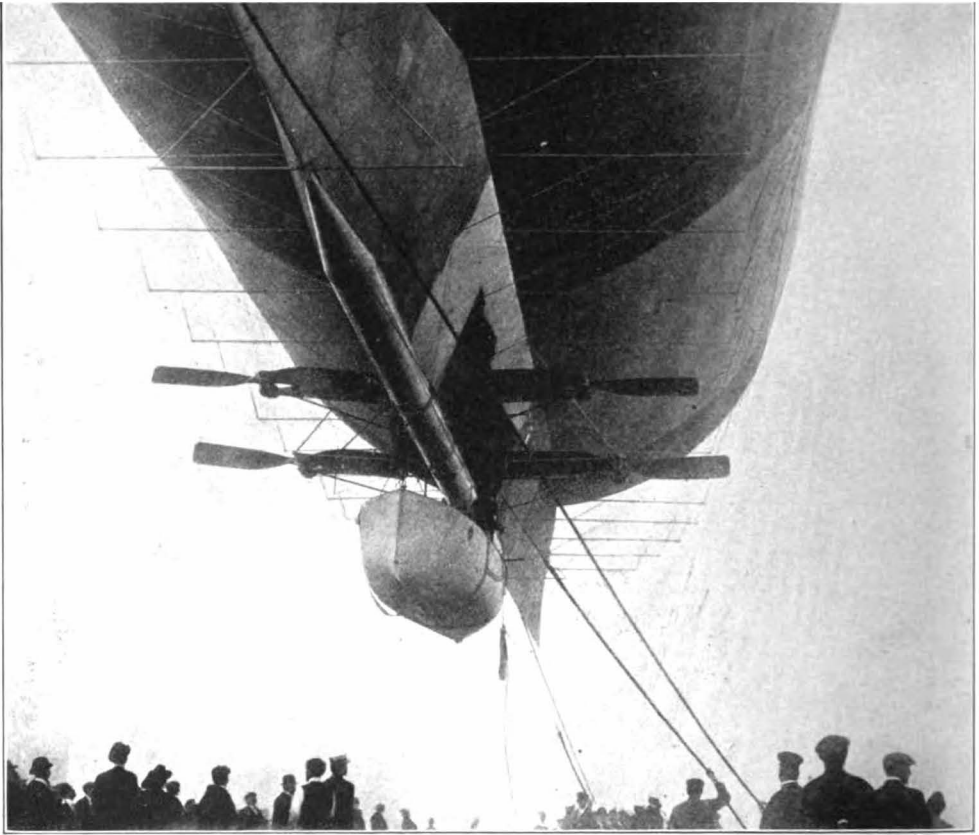
THE WELLMAN-VANIMAN AIRSHIP *AMERICA* DURING THE PROCESS OF CONSTRUCTION IN THE HANGAR IN ATLANTIC CITY, NEW JERSEY. THE BALLOON FULLY INFLATED WITH 345,000 CUBIC FEET OF HYDROGEN; THE LIFEBOAT IN THE FOREGROUND.

That was what made it worth while. It is always worth while to strive, to venture, to work, to dare—and leave the rest to the gods—in an effort to realize man's dreams of conquest of the elements; to do something—be it much or little—for progress, to widen the frontiers of knowledge and achievement.

It is even worth while to try and fail, because failure often teaches as much as

success. Of course it is far better to try and win. But the men who do try in any of these fields of endeavor, be they fit for their work, have a way of looking all the possibilities squarely in the eye.

Our effort to cross the ocean by airship we had always regarded as a great scientific experiment whose outcome, like that of all experiments, must be in doubt. Everyone can see the dramatic aspect of sailing forth



Copyright, 1910, by Edwin Lesick.

BOTTOM VIEW OF THE *AMERICA* JUST BEFORE CASTING OFF ON HER TRIP FROM ATLANTIC CITY.

upon a voyage three thousand five hundred miles through the air over a stormy sea, despite the fact that the longest airship voyage thitherto made was only about nine hundred miles, and that over land.

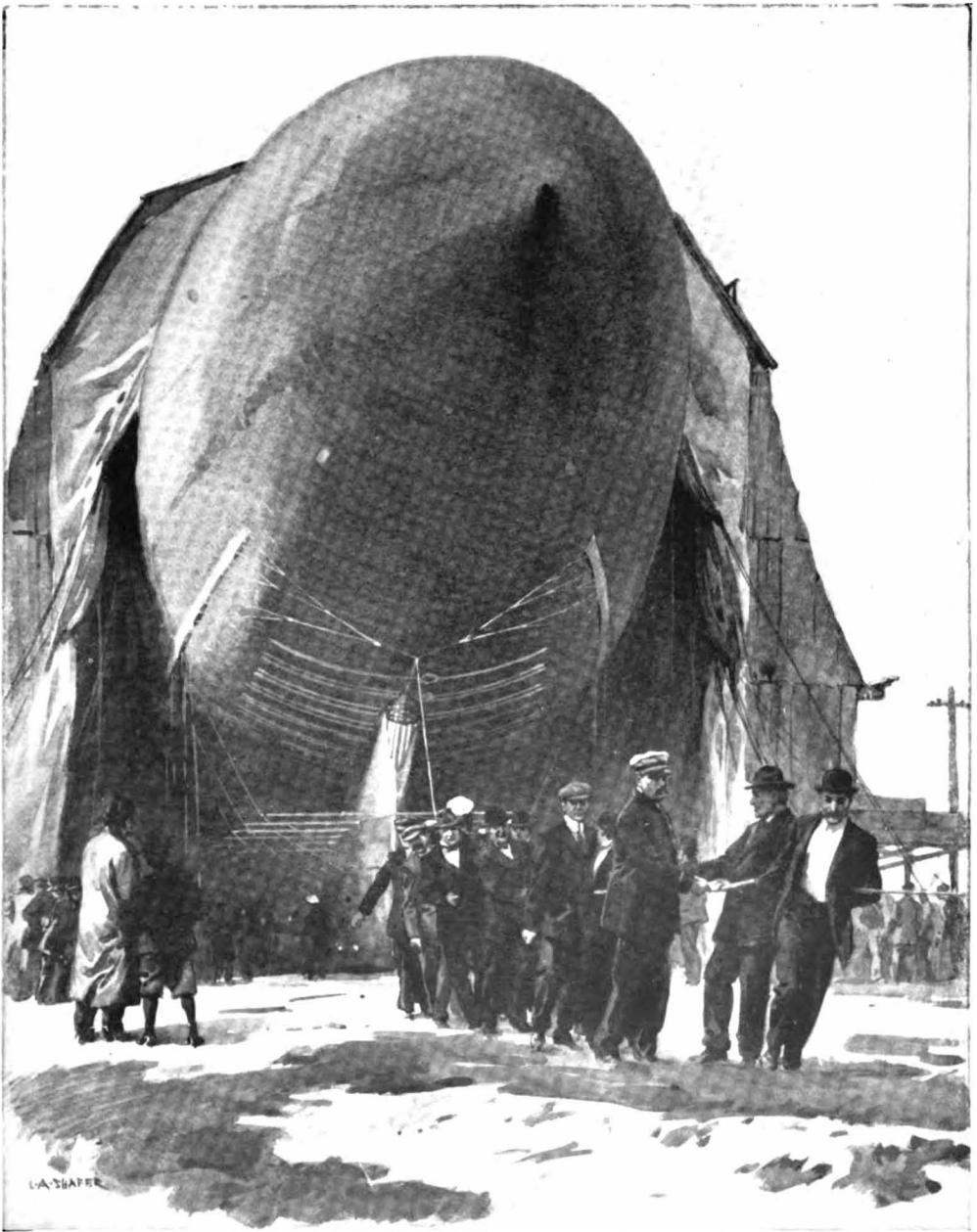
Everyone could see that such a venture was audacious, possibly heroic, probably epic. But a voyage like this, with all its danger and with the chances heavily against success the first try, should have better justification than the mere desire to perform a sensational feat. The moving spirit should be not simply a desire to astonish the world, but to confer lasting benefit upon mankind.

Our hope and aim were not primarily commercial utilization of airships. Our dreams carried us not toward the regular lines of aërial trans-ocean transportation which so many optimists see in their visions.

Whatever the aëroplane may bring forth—and that the future alone can determine

—we know full well the limitations of air travel by such motor balloons as ours. These limitations probably, we cannot say surely, fall short of the requirements of true commercial utility. Commercial use inevitably means a high degree of safety, of regularity of service, certainty of arrival at a predetermined destination—all these as elements of the indispensable operation for profit.

In our opinion, all these objections not only hold but are likely to continue to hold against the motor balloon. The operation of a lighter-than-air ship is essentially extra-hazardous. Under favorable conditions the craft may do much; under unfavorable conditions loss or disaster quickly follow. Being inevitably extra-hazardous, it is adaptable—at least in its present stage—only to purposes wherein the price of the hazard may be paid. That is not in commerce. But it is in sport, in exploration,



GUIDING THE *AMERICA* OUT OF THE HANGAR.

and in war. In all of these, extra risks being inevitable and acceptable, the motor balloon is available.

#### LESSONS LEARNED IN THE ARCTIC

We have nothing to do with sport in the air—dignified and admirable as it may be. We have had something to do with aerial

exploration, and we purpose having something to do with aerial warfare. The genesis of our attempted cross-ocean voyage is to be found in our recent efforts to attain the North Pole by airship.

In the race for the Pole nations had run in friendly rivalry, and I had borne a humble though earnest part therein. I

had led two expeditions far north, one to northeast Spitzbergen, the other to Franz Joseph Land, using the old method—a steamship, then sledges and dogs. At length, dreaming that the development of the arts and sciences should afford a better instrument than that of mere brutestrength, the grind of the muscle and sinew of men and beasts pulling and lifting heavy burdens over the rough ice fields—the same means the barbarian might have employed a thousand years ago—I abandoned sledging and awaited the newer agency progress might offer. Five years ago I thought I saw a practicable instrument in the modern airship—the Lebaudy in France, the earlier Zeppelin in Germany.

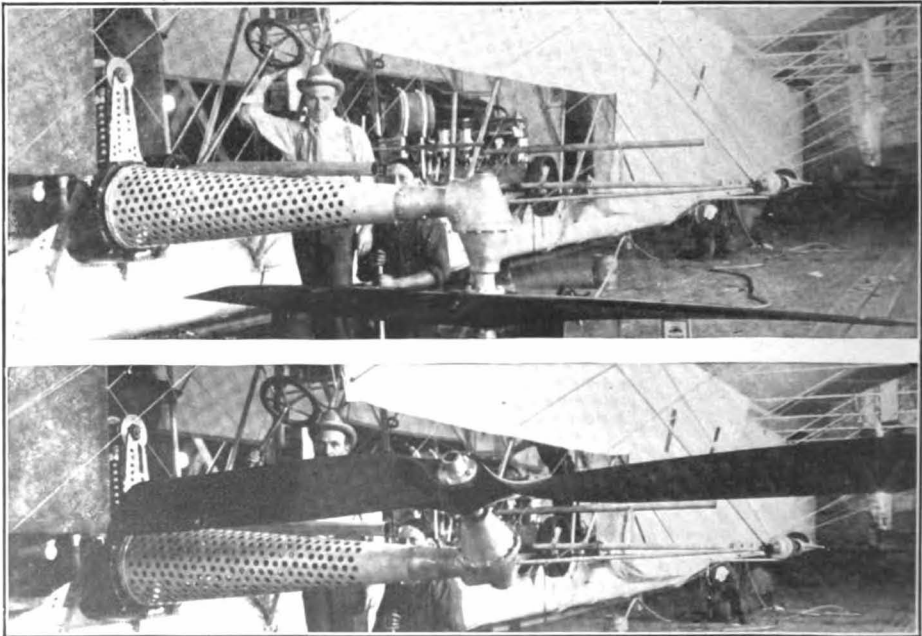
Perhaps this, too, was a dream; but action quickly followed the vision. A huge airship was constructed; a base was established at the northwest point of Spitzbergen—"a scientific village in the Arctic," a London paper called it. There we worked for three years; overcame a thousand difficulties only to run against a thousand more; made two voyages in the air out over the Arctic Sea, but fell far short of the goal. Beaten back in 1909, we were preparing to go on in 1910—still full of faith in the prac-

ticability of our project—when news came that through the pluck and persistency and splendid organization of Commander Peary the Pole had been reached. The older method, in skillful hands, had won the prize.

#### FOR THE SAKE OF WORLD PEACE

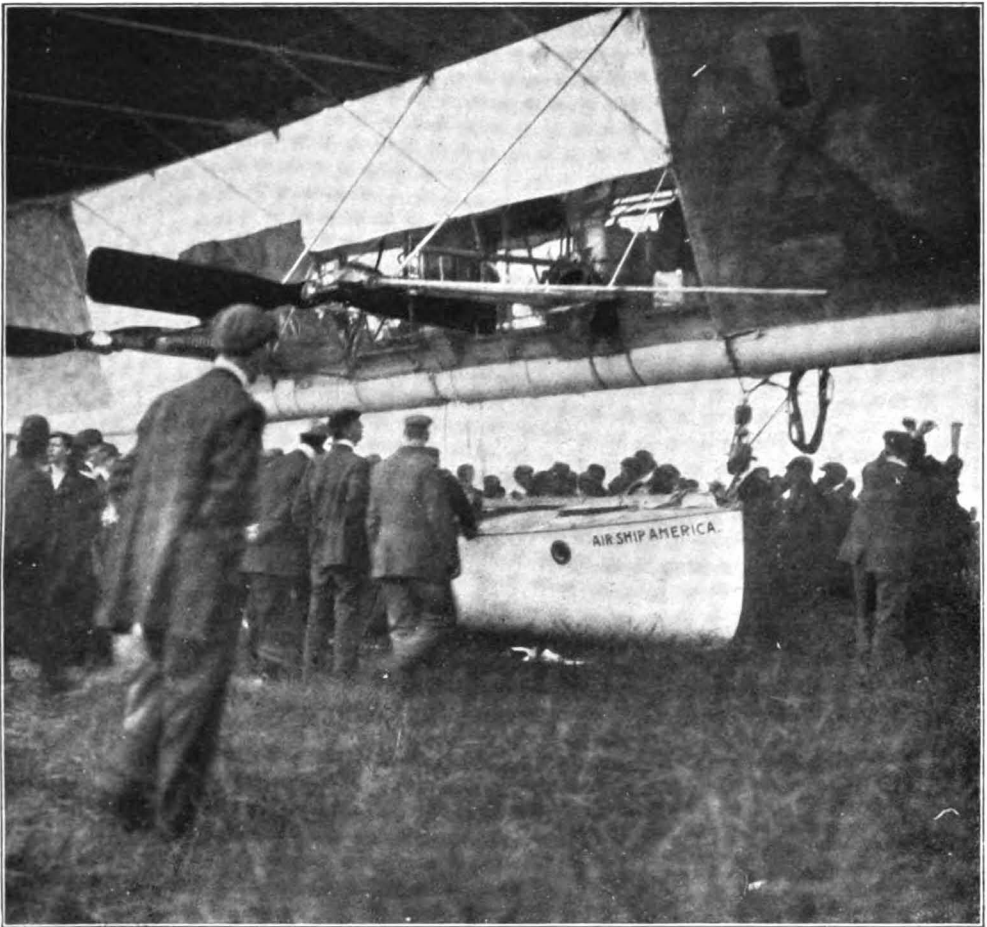
There were other worlds left to be conquered. Twice reconstructing, enlarging, and navigating a big airship, Melvin Vaniman, the engineer, and I thought we had learned some lessons—that we had evolved some new and valuable ideas concerning the application of motor balloons to the purposes of war. We believed, and still believe, we know how to make a fleet of motor balloons so terrible, destructive, and ruinous as machines of war, that once they come into being there will be no more war. We believe the plans we have—never yet even suggested in print—will contribute materially, by making war in the air awfully practicable, to the coming of the day of universal peace among the great Christian nations.

To demonstrate our plans, to gain the prestige that would command attention and perhaps enable us to play a part in this



CHIEF ENGINEER MELVIN VANIMAN (STANDING) TESTING ONE OF THE AMERICA'S GIANT TWIN PROPELLERS. THESE PROPELLERS, THE FIRST OF THEIR KIND, COULD QUICKLY BE SHIFTED TO ANY ANGLE.





Copyright, 1910, by The Pictorial News Co.

ATTACHING THE LIFEBOAT TO THE *AMERICA* OUTSIDE THE HANGAR IN ATLANTIC CITY.

game of progress that leads to peace, we deliberately planned the transatlantic voyage. Dreamers we may have been; but we had had some experience. We were not mere tyros or adventurers, and a definite and dignified aim, not bald and bold sensationalism, moved us.

So much for the soul and heart of the dream; now for the material side, the lungs, the muscles.

The airship *America* with which we had made two voyages from Spitzbergen in our efforts to reach the North Pole, one of more than a hundred miles out over the Arctic Sea, was generously lent us by Mr. Victor F. Lawson, of Chicago, president of the scientific association which had built the ship and supported the polar expeditions. But for a chance to cross the Atlantic the airship required enlargement, improve-

ment, a new steel car, new engines, fittings, appliances of all sorts, costing a large sum of money.

All my life a journalist, and proud of it, always a believer in the principle that journalism of the best sort is alert and enterprising in trying to do something for progress, I again turned to journalism for financial assistance.

I am proud of the fact that I was able to form a combination of the greatest newspaper in the old world, the London *Daily Telegraph*, with the journal which is generally regarded as being the foremost in the eastern part of our own country, the New York *Times*, and the leading paper of interior America, the Chicago *Record-Herald*, with which I have been connected all of my active life.

These great journals, assuming no direct

responsibility for the voyage, but leaving all that to the engineer, Vaniman, and me, advanced the forty thousand dollars which we had estimated to be necessary to put the project through. It was not their fault that the unexpected cost of reconstruction and outfit of the airship made it necessary for Vaniman and me to make up a considerable deficit out of our slender private purses.

To shelter the *America* during the period of assembling and outfit it was necessary to build a great balloon house, or "hangar," costing fifteen thousand dollars. The members of the enterprising Aero Club of Atlantic City, wishing to secure the attraction of a huge airship for that resort, offered to build the balloon house at their own cost. Their offer was accepted, and the nominal admission fee charged the public in part, but only in part, reimbursed them. At no point in the enterprise, from first to last, has there been, on anyone's part, the slightest touch of commercialism or money-seeking.

In July, the airship, with all its complex parts, machinery, and auxiliary devices, was brought over from Paris, where it had been stored since our last attempt to reach the Pole. After ten weeks of the hardest sort of work, as many as forty mechanics and helpers being employed at times, it was at last made ready for a trial trip and a start upon the long voyage.

On account of these unforeseen delays in finishing the ship and its machinery, some discontent naturally arose; and in a few quarters this discontent took the form of unworthy suspicion and accusation. The truth, of course, is that no one could possibly be more eager than we were to get ready for trial trips and the proposed voyage itself.

Trial trips had been an essential part of our original programme. But the delays, the advancing season, the danger that if we

stopped for a trial there might not be a voyage at all this year, impelled us to sacrifice everything, risk all on a single cast of the die, and venture far out upon the deep in a ship which had not been tested since her voyage over the Arctic Sea in August, 1909. This was not a prudent method, but it was the best we could do under the circumstances; ours was the risk, lives included, and perhaps others have no right to complain.

As for the period of waiting and indeci-



Copyright, 1910, by The Pictorial News Co.

INTERIOR VIEW OF THE HANGAR, SHOWING THE *AMERICA'S* CAR INCLOSED IN CANVAS, THE LIFEBOAT, AND THE EQUILIBRATOR. THE SNAKELIKE SERIES OF STEEL TUBES, EACH FILLED WITH GASOLINE AND WEIGHING 100 POUNDS, IS THE EQUILIBRATOR.

sion so much talked of in a part of the press, the airship was finally made ready for a voyage on Wednesday, October 12th, and started out over the ocean early the following Saturday morning.

The airship *America* was a strange, a marvelous craft. To people who saw her for the first time she seemed mysterious, inexplicable, a nondescript, indeed unlike anything else that was ever known for sailing upon the seas or running upon the land. Imagine a huge balloonlike reservoir 228 feet long—nearly a city block in New York—sharp-pointed at one end, rounded at the other, 52 feet thick in all the central part.

When you stand underneath it, the bottom just above your arms' reach, the top is as high above your head as a five-floor building from the sidewalk. Massive, huge, yet she is as graceful as a yacht under sail or bird in full plumage.

This great reservoir is composed of cotton, silk, and rubber. Where the diameter is greatest (and the upward push of the gas within most powerful) the fabric is three-ply, with three emulsions of rubber cementing the cloth together. The silk and cotton

what will approximate a cubic foot of air. It is apparently impalpable, without substance or weight. Yet our physics tell us this cubic foot of air has a weight approximating 1.2 ounces.

Now, if we have a box containing exactly one cubic foot of air, and if we force the air out and put in its place hydrogen weighing only .1 ounce per cubic foot, the box is 1.1 ounces lighter than it was before. If the box should be made of a substance so filmy that its weight was only one ounce, it



CREW OF THE *AMERICA*. FROM LEFT TO RIGHT: MURRAY SIMON, NAVIGATING OFFICER; WALTER WELLMAN; CHIEF ENGINEER MELVIN VANIMAN; FRED B. AUBERT, ASSISTANT ENGINEER; JACK IRWIN, WIRELESS OPERATOR; LOUIS LOUD, MECHANICIAN.

give great strength to resist the outward pressure of the gas; the rubber emulsions hold the gas with but a small percentage of leakage.

Splendidly tailored is this huge bag, all seams being wide lapped, sewn, and gummed, and extra strips glued over to cover the needle holes and prevent the escape of the precious hydrogen. All told there are about 4,000 square yards of this rubberized cloth, weighing approximately a pound to the yard, and with a tensile strength of 100 pounds to the square inch.

Wonderful, indeed, is the power attained by wholesale multiplication of the seemingly insignificant. Measure off with your hands

would rise in the air, because it and its contents together are lighter than air.

Multiply our one cubic foot by 345,000—the volume of the gas reservoir of the airship *America*—and what do we have? We have taken out 345,000 cubic feet of air weighing 414,000 ounces, or 25,800 pounds; and we have put in 345,000 cubic feet of hydrogen weighing 34,500 ounces, or 2,150 pounds. By this simple means we have gained a lifting force of 23,650 pounds—the difference between the weight of the air displaced and the gas which displaces it. In the case of the *America*, the gas bag, with its valves, inner balloons for air, and other appurtenances, weighs approximately 4,700



WALTER WELLMAN, IN THE *AMERICA'S* ENGINE-ROOM DOORWAY. LOUIS LOUD AND FRED B. AUBERT (ON RIGHT) ATTACHING THE LIFEBOAT JUST BEFORE THE DEPARTURE.

pounds; hence, the net lifting force is approximately 18,950 pounds. In other words, the gas can carry the weight of the balloon and a load of nearly nine and one half tons besides.

#### COST \$5,000 TO FILL THE GAS BAG

Although hydrogen has a weight only about one twelfth that of air, it will be noted that it takes more than a ton of it to fill the reservoir of our airship. The manufacture of this quantity of gas was not an easy or inexpensive operation. A special apparatus was built in Paris, brought to Atlantic City, and there assembled.

More than one hundred tons of sulphuric acid, sixty tons of iron turnings, and hundreds of tons of water were used in the generating process. Ten men in each shift worked night and day for a week feeding the apparatus. The total cost of one filling of the gas reservoir, for labor and material, was \$5,000.

Before being admitted to the balloon the gas was thoroughly washed with water and dried by passing through cylinders of coke,

permanganate of potash, and calcium of lime, thus making it light of weight, and taking out all acids which might destroy the costly fabric of the balloon. Pure hydrogen is odorless. If it escapes from a receptacle it gives no sign of its presence. Therefore we used several gallons of oil of peppermint to perfume it.

#### THE "AMERICA" A TRUE SHIP OF THE AIR

The *America's* buoyant force in the atmospheric ocean was nearly twelve tons, or nine and one half tons in addition to the hull or gas reservoir. Some place must be provided for the engines and fuel, for the crew, their provisions, all the machinery and instruments. Some way must be devised to take up the lift of the gas bag, nine and one half tons. To meet these two needs a great steel platform or car was constructed to swing underneath the balloon.

I suggested that the bunkers of the ship, that is, a huge steel tank for carrying the tons of gasoline needed for the engines, be made the backbone of this car, giving it

strength and rigidity. Engineer Vaniman at once perceived the value of the idea and proceeded with marvelous ingenuity to utilize it. He fashioned a frame of the highest-grade steel tubing and wires, strong as a bridge, capable in places of withstanding strains of ten tons, the whole 156 feet long, 8 feet wide at the top, V-shaped, and at the bottom of the V throughout all the central section a stanch steel cylinder two feet in diameter, divided into ten compartments, and with a capacity of 1,500 gallons of gasoline.

This huge steel frame, inclosed with varnished canvas, was hung up under the balloon and attached thereto by eighty steel cables coming down from the *relingue* or attach belt sewn in the cloth about ten feet below the equator. No net or hood was used upon the gas reservoir to add to its resistance whilst moving through the air, and the outer skin of the balloon part of the ship was as smooth and tight as the head of a drum.

The nine and one-half tons of car, machinery, and cargo were lifted by 188 hempen cords, attached at as many points to the big reservoir and terminating in eyes from which hung the cradle of suspension cables passing under the car. Celluloid windows were placed at intervals in the canvas sides of the car inclosure; and about the engine room steel gauze re-

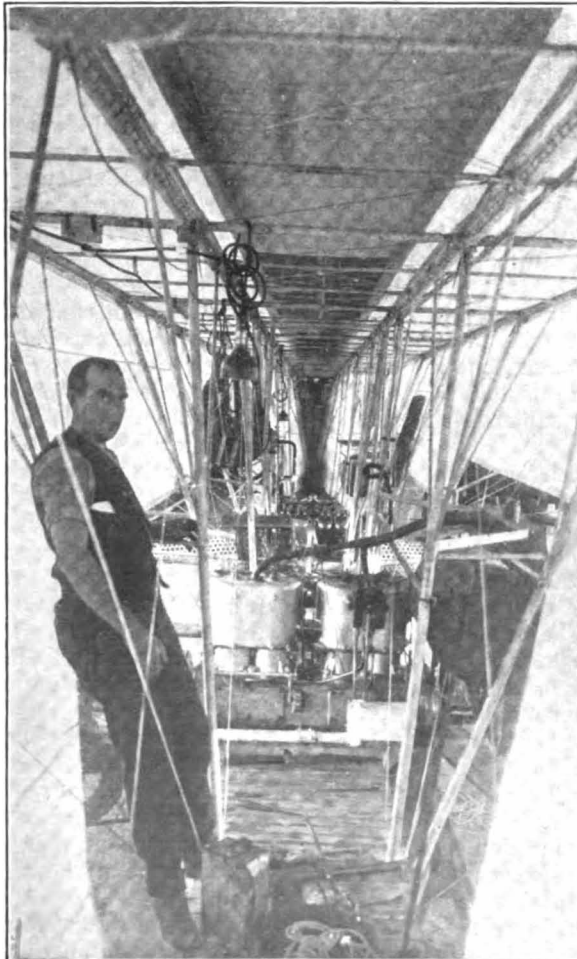
placed the canvas, and asbestos and asbestos paint were employed to minimize the danger of fire.

When we came to rebuilding and enlarging the airship *America* for a voyage from the United States to Europe, it may be easily imagined we had many things to think of—so many I do not dare to number them.

First of all, we tried to arrange a general scheme of engineering and forces that should be adequate and appropriate, precisely as the engineering of a *Mauretania* is designed to secure certain predetermined results. The first problem was to give the ship, enough endurance in propelling force and buoyance to enable her to make a voyage of at least the 3,500 statute miles from continent to continent.

We knew from our two voyages in the Arctic that a motor of 80-90 horse power, running at an output of 70, would drive the *America* about twenty statute miles per hour at a cost of forty-five pounds of gasoline, or less than 2.5 pounds per mile; and that therefore with this power and speed we could theoretically motor the 3,500 miles which separate Europe from America with about 8,000 pounds of fuel.

Each of our motors was rated at eighty to ninety horse power, according to the number of revolutions per minute. One was a Lorraine - Dietrich automobile



INTERIOR VIEW OF THE *AMERICA'S* STEEL CAR, SHOWING MOTORS, ELECTRIC LIGHTS, AND CONSTRUCTION.

engine, heavy, trustworthy, enduring, solid, economical of fuel. It weighed, with its radiator and equipment, nearly one thousand pounds. It drove, at 500 revolutions per minute, a pair of twin wooden screws each twelve feet in diameter, placed at either end of the engine shaft, that is, on either side of the steel car. The other was an E. N. V. automobile or aeronautic engine of eight cylinders, an admirable engine that runs almost without vibration and is capable of working a long time at a stretch. It drove a pair of wooden propellers, 10.5 feet in diameter, 750 revolutions per minute.

These propellers, by an invention of Engineer Vaniman's, patented in Europe, could at any moment be turned to any angle of thrust we might desire. That is to say, that while normally they work, as do the pair on the other engine, in pushing the ship straight forward, if we wished to utilize all or a part of the thrust to send the craft upward or downward, we were able to do so, while the engine was running, by turning a wheel which operates a miter gear.

Men who thought there was danger that the *America* might be torn to pieces by a storm had not reflected well upon the physical conditions surrounding a ship of the air. A steamship or sailing vessel is buffeted by wind and wave; but it is partly immersed in an ocean of fluid which offers great resistance and subjects it to violent shocks.

An airship is completely immersed in a medium which offers so little resistance that shocks are impossible. It is not an easy fact to grasp—but is still a fact—that the only resistance an airship offers to the wind, the only strain or pressure upon her parts, is that which she herself creates with her engine and propellers.

To understand this principle, imagine the *America* in the air far out over the ocean. It is calm; no engine is running; the crew, perchance, is asleep. Up springs a gale, fast gathering force till it reaches a velocity of fifty miles per hour. Nothing whatever in the motion, the vibration, the pitching or rolling of the ship alarms and awakens the crew. The *America* being a "free balloon," because no engine is turning, simply becomes a part of the wind, so to speak, moves with the wind, offers no resistance to it, floats along as peacefully

as if it still were dead calm. A member of the crew awakes, rubs his eyes, goes to his post; but, if it be night, and he cannot see the ocean, he has no idea whether the ship is standing still or moving fifty miles per hour. If he strikes a match to light his pipe, the flame curls straight upward, precisely as if he were in a closed room—an experience which many of us have had in ordinary spherical ballooning.

Suppose, now, the crew be roused. An engine is started, a pair of propellers set in motion. Then, and then only, does the ship offer resistance to the wind; and the measure of her resistance is the energy exerted by the propellers—just that, no more, no less. Nor does it make any difference whether the velocity of the wind be ten or a hundred miles per hour; nor yet any difference whether the ship be headed into the wind, or with it—the result is the same. Obviously, as long as the ship had sea room—could keep herself up in the air—no storm that ever blew could hurt her. But it makes a tremendous difference as to the course and destination of the ship from what quarter the winds come and with what force they blow.

#### STUDYING THE WINDS AND THE WEATHER

What the winds might do to help or hinder the *America* on her long voyage was an exceedingly important factor. Before this effort was decided upon, a thorough study was made of wind and weather conditions over the Atlantic Ocean. The United States Weather Bureau, under the direction of the eminent practical meteorologist, Professor Willis L. Moore, publishes monthly forecasts of the winds of the North Atlantic, based upon reports from vessel masters during the past twenty-five years.

In these admirable and comprehensive records the sea is divided into rectangular spaces each containing five degrees of latitude and five degrees of longitude. In each of these spaces a diagram, known in meteorology as a wind rose, gives the probabilities of wind movement for the month in number of hours out of one hundred, from the various points of the compass, with the force of the wind on the Beaufort scale.

Analysis of these "roses" told us just the sort of wind we might expect. We found the general trend of the air currents to be from west to east throughout the months of

July, August, September, and October, there being little difference between the months, as to prevailing direction, but the winds growing in force as the autumn comes on.

Along the trans-Atlantic steamer routes in September the winds blow about 60 per cent of the time from the western semicircle, and are somewhat stronger than those from the eastern semicircle. In October the time percentage is a little greater for the winds from the west, and the force of all winds markedly increases.

We found that the prevalent direction of the winds was not only favorable to our voyage, but that the conditions were remarkably well distributed throughout the whole of the prospective course. Careful analysis in detail showed that in September (the month in which we reckoned upon being able to start) we might expect an average wind of from six to eight miles per hour in our favor.

Upon these facts we based our hope of a successful voyage. With our airship equipped to cross the ocean, theoretically, at least, with her own power and fuel, considering the winds as neutral, or helping as much as they hindered, it seemed reasonable to hope for a fortunate outcome at a time of the year when the wind resultant was distinctly in our favor.

An airship sets forth on a voyage. It is, say, the afternoon. As night comes on the temperature of the air falls. The gas, which has been warmed by the sun during the day, rapidly cools by radiation. All gases expand or contract  $\frac{1}{273}$  part of their volume for each degree Fahrenheit of heat or cold. Gas within a balloon subjected to hours of warm sunshine will absorb heat, much as a greenhouse does, till it is far warmer than the surrounding air. If the temperature of the gas in the afternoon should be  $100^{\circ}$  Fahrenheit, and during the night it were to cool to  $50^{\circ}$  Fahrenheit, it would suffer a contraction equal to about one tenth of its volume.

#### RAIN MAY DEPOSIT 1,000 POUNDS OF WATER ON THE SHIP

This is an extreme case; but a contraction of one twentieth of the volume is not improbable. With the *America*, that would mean a loss of approximately 1,200 pounds of lifting force. In other words, to keep the ship from going down to earth 1,200 pounds

must be taken from the load which she carries.

At the same time the atmospheric pressure may increase, still further contracting the gas. Rain may deposit 500 to 1,000 pounds of water upon the 4,000 square yards of the balloon and its appurtenances. To lighten ship under such circumstances ballast is usually carried in the form of sand or water to be thrown overboard.

Assuming that the ship by these means has weathered the night, the following morning the sun comes out bright and warm. The gas absorbs heat and expands; air is expelled from the balloonets or inner balloons when the pressure passes the fixed point and opens the valves of the air compartments; every cubic foot of air out lightens the ship 1.2 ounces; the accumulated moisture upon the envelope and the car is evaporated by the sun's heat, and under all these influences the craft rapidly rises in the air.

For many reasons it is not desirable to go very high. Chief among these is the fact that if a ship is at great altitude when the gas begins to contract and starts her upon a descent she acquires momentum going down, and desperate measures must be adopted to avert disastrous collision with the earth's surface. To prevent rising to an undesirable altitude the valve cord is pulled, and gas deliberately let out at the commencement of a period of expansion.

It is obvious that an airship operated by the usual means—throwing over ballast on the one hand or letting out hydrogen on the other—must not only carry a heavy weight of water or sand, thus reducing the quantity of fuel that can be taken for the engines, but that her vitality and endurance will be quickly exhausted by these alternating drafts upon her resources. For the reasons just set forth an airship depending upon the usual means could not hope to make a voyage of more than two or three days' duration.

#### ORIGIN OF THE "EQUILIBRATOR"

For the equipment of our polar airship I long ago suggested and experimented with various devices for utilizing the old principle of the trailing guide rope, which is really weight used as ballast, but ballast which can be used over and over again.

Engineer Vaniman and I have worked together upon the development of this principle into a safe and practicable instrument,

and it was largely due to his inventive and constructive skill that we had for this campaign the much-discussed steel equilibrator, or stabilizator. It consisted of a series of steel reservoirs, each about four feet long and nine inches in diameter.

Each reservoir had a tube lengthwise through its center, and all of them—there were thirty in all—were strung upon a staunch steel cable passing through these tubes. Each reservoir was concave at its forward end and convex at the other, so that one fitted into the other like a cup joint, which was padded with felt to take up shocks and prevent wear and abrasion. A special clamp held each tank to the cable at the required place, and the cuplike joints gave to the series great flexibility.

All of the reservoirs were filled with gasoline, and each tank and its contents had a weight of about 100 pounds. Gasoline was not put in because we wished to carry fuel in this manner, but because the equilibrator, to be effective for the purpose for which it was designed, must have a certain weight, and it was far better to have that weight made up largely of a useful material rather than of such dead weights as steel or wood.

The whole was so arranged that after the 1,500 gallons of gasoline carried in the car were exhausted the reserve supply in these reservoirs became available, it being contrived so that one tank after another might be lifted up to the engine room and its contents utilized in the motors.

The reader will readily understand the purpose for which this strange device was constructed. More than 200 feet in length, with a total weight of nearly two tons, its lower end was to ride upon the surface of the sea. This lower end was composed of forty solid wooden blocks tapering to a small diameter, much like the tail of a snake.

The wooden blocks, and the steel tanks as well, were buoyant and flexible, and the whole was designed to swim in the wake of the *America*, partly upon the surface of the sea, partly lifted in the air—a giant steel sea serpent with a wooden tail, its head erect, and moving toward Europe as convoy of the first ship of the air ever seen over the waters of the broad ocean.

#### BALLAST THAT IS NEVER LOST

Suppose half of our great snake of steel, his belly full of gasoline, is upon the water

and half in the air. Night comes on; the gas cools; rain falls; the *America* drops more and more to the sea. As she goes downward, one after the other of the constituent steel tubes of the serpent is deposited upon the surface of the ocean. The ship is relieved of 100 pounds of weight plus the slight weight of the cable for every four feet of descent; and this continues until she is again balanced in the air, perhaps the greater part of the equilibrator now floating along behind us.

In the morning the sun rises bright and hot. The reverse process follows—the expanding gas sends the ship upward. As she rises, one after another of the steel reservoirs must be lifted from the sea, 100 pounds more weight upon the ship for every yard and a third of her ascent.

Thus the steel serpent becomes an automatic governor upon the upward and downward movements of the ship due to meteorological changes. Hence its name.

It was unnecessary to carry sand or water to throw overboard. Our serpent, if he had behaved as well as a well-made reptile ought, should have held the *America* at an altitude of from 100 to 200 feet above the ocean, saving us ballast—which means fuel—on one hand, saving gas on the other, and enabling us to prolong the voyage from the forty-eight hour practicable without a serpent to the seven or nine or ten days which we figured would be required for crossing the Atlantic.

How would this equilibrator serpent work in the rough sea? This was the question we often asked ourselves. We confess we did not know. We believed, but we were not quite sure, that it would be so "soft" upon the waves as to give us little trouble in the way of shocks or jerks upon the airship. We feared it might interfere to some extent with the steering, or reduce the speed of the ship through the air. We had previously tried the same principle over the Arctic Sea, and there the device rode smoothly and, being a continuous body, made no considerable resistance to the progress of the ship towing it.

But the Arctic waters were not rough, and we were very curious as to how our new and improved sea serpent would behave upon the Atlantic. Would he serve or sting us? At any rate, a voyage of 3,500 miles by airship is impracticable without the aid of some such device; and this one



was the best we could do out of our experience and study.

We aimed at no particular port or even country. We feared no collisions with other ships, except that we should not have liked to have our serpent run foul of a vessel.

We have had some experience with airships, and the *America* seemed to us a pretty staunch shiplike craft. She was well arranged and well equipped, as aircraft go. In the forward part of the car was the navigating deck—the bridge. Here were the compass binnacle, the leeway indicator, the steering wheel. From the latter the rudder cables ran to the stern and moved the wonderful triplane rudder built by Engineer Vaniman of steel tubing and varnished canvas—light as a feather and strong as a young ox. Here also were carried the meteorograph, barograph, thermograph, telescope, and other instruments.

Near by was one of the two winches which worked the equilibrator cables. Speaking tubes led to the engine room, just aft, where two men were to be always on duty. Here, in addition to the two driving engines already spoken of, was a 10 to 12 horsepower motor, our donkey or service engine, used principally for starting or forcing air into the balloon without cranking either of the larger engines.

Here also was the dynamo which operated ten twelve-candle power electric lights distributed throughout the ship and in the lifeboat swung underneath the car. It also charged the accumulators in the lifeboat, and this provided power for the wireless installation, which was placed in the lifeboat.

The steel frame of the car was used as the wireless radiator, and the equilibrator cable gave the earth connection or ground.

J. R. Irwin, an American by birth, long in the service of the Marconi Company, and lately running on the *St. Louis*, was the wireless operator. He was selected by the Company, out of many volunteers, on account of his skill and pluck.

#### NONSINKABLE LIFEBOAT SERVES MANY PURPOSES

The lifeboat was twenty-seven feet long, six feet beam, and three and one half feet

depth amidships. Each end was decked and made into a large watertight compartment. Midships was a cockpit protected by a canopy. The hull was of three thicknesses of veneered mahogany and two layers of canvas stitched together, ribbed and strengthened. In the bottom was a manhole, which served two purposes: one to enable us, with the airship in flight, to bring up from below the reservoirs of gasoline composing the equilibrator; the other to bail the boat automatically.

Down in the lifeboat was our kitchen—a gasoline stove with aluminum utensils. We carried provisions and fresh water for thirty days, and most of these were stored in the lifeboat. Here also were kept a compass and other instruments, so that the craft was ready for use at any moment.

For food we took ship's bread, beans, bacon, coffee, malted milk, boiled hams, eggs, tinned meats. The lifeboat was also the smoking room of the ship, and in it were two beds. Two more hammocklike bunks were in the car near the engine room.

Our crew as we set forth was six men. Melvin Vaniman, of Illinois, but long a resident of Paris, whose skill has contributed so much to the perfection of the ship, was in immediate charge of the motors and the mechanical equipment. He had as his assistants Louis Loud, also of Illinois, who was with us in last year's voyage over the Arctic Sea, a man tried and true; and Fred B. Aubert, a competent young mechanic from Washington, D. C.; now to have his baptism in the air. Jack Irwin was the wireless expert, and F. Murray Simon, an experienced and resourceful young officer, from the steamship *Oceanic*, kindly lent us by the White Star Company, was the navigator.

Asked at the moment of departure from Atlantic City for a parting sentiment expressive of our hopes and feelings I seized a pencil and wrote:

"All of us have striven and shall strive with the best that is in us. We are proud of our ship, proud of our crew. Let us in all humility and full realization of man's impotence against the great forces of nature pray that it shall not prove to be the pride that goeth before a fall."

EDITORIAL NOTE.—In the January number Mr. Wellman will tell of the *America's* record-breaking, thousand-mile voyage above the ocean. The tale of this unprecedented seventy-two-hour voyage makes one of the most absorbing and thrilling adventure stories of modern times.