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Confederate Balloon Fragment

1862

Thaddeus S. C. Lowe, a noted aeronaut and scientist, and later founder of the Lowe Observatory in California, organized the first American Air Corps in 1861. Before the Civil War he had been interested in making a transatlantic balloon attempt. In a practice ascension he landed in North Carolina and learned of the secession of that state. He telegraphed this information to President Lincoln and returned north where he assembled his aeronautic equipment for military use. His generous offer to provide aerial observation for the Army of the Potomac was accepted and resulted in great military gain. Several other balloon corps were formed and participated in some of the most important battles of the Civil War.

The Confederates realized the value of the balloon and envied those in the Federal Army. In order to obtain one of their own they requisitioned all of the silk dresses in the Confederacy and sewed them together into a balloon which was then oiled and varnished, and inflated at the Richmond Gas Works. The success of the balloon was limited. After a short period of service it was captured and turned over to Professor Lowe, who, finding it unfit for further service, cut it up. This piece is part of a fragment preserved by him as a memento. It is part of a larger piece presented to the National Museum in Washington by the son of the Civil War aeronaut.

Transfer from
U. S. National Museum
H-3

History of the Confederate Balloon, as related by General Longstreet in "Our March Against Pope"

"It may be of interest at the outset to relate an incident which illustrates the pinched condition of the Confederacy, even as early as 1862.

"The Federals had been using balloons in examining our positions and we watched with envious eyes their beautiful observations as they floated high in the air well out of reach of our guns. While we were longing for the balloon that poverty denied us a genius arose and suggested that we gather together all the silk dresses in the Confederacy and make a balloon. It was done and soon we had a grotesquely patterned ship of many and varied hues which was ready for use in the Seven Days' Campaign.

"We had no gas except at Richmond and it was the custom to inflate the balloon there, tie it securely to an engine and running it down the York River Railroad to any point at which we desired to set it up. One day it was on a steamer down the James River when the tide went out and left vessel and balloon high and dry on a bar. The Federals entered it in and with it the last silk dress in the Confederacy. This picture was the meanest trick of the War and one that I have never forgiven."

EXTRACT FROM "MILITARY MEMOIRS OF A CONFEDERATE"

By Edward Porter Alexander
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In addition to these duties, I was placed in charge of a balloon which had been manufactured in Savannah by Dr. Edward Cheves, and sent to General Lee for use in reconnoitering the enemy's lines. It was made from silk of many patterns, varnished with gutta-percha car-springs dissolved in naphtha, and inflated at the Richmond Gas Works with ordinary city gas.

I saw the battle of Gaines Mill from it, and signalled information of the movement of Slocum's division across the Chickahominy to reenforce Porter. Ascensions were made daily, and when the enemy reached Malvern Hill, the inflated balloon would be carried down the river and ascensions made from the deck of a boat. Unfortunately, on July 1, the boat—the Teaser, a small armed tug—got around below Malvern Hill on a falling tide, and a large Federal gunboat, the Maritanza, came up and captured both boat and balloon, the crew escaping.

We could never build another balloon, but my experience with this gave me a high idea of the possible efficiency of balloons in active campaigns. Especially did we find, too, that the balloons of the enemy forced upon us constant troublesome precautions in efforts to conceal our marches.

PAGE NO.

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CIVIL WAR DISPLAY

Official position Civil War for developing an aerial navigating ship for the air."

Navy Dept Aug 18, 1863 letter on Sergeant Major Cameron's Aerial Ship

"The Commission considers this proposition, as well as all others, for navigating the air, in the present state of art and science, as utterly chimerical"

Signed by CH Davis, Chief of Bureau of Navigation

AD Bache - Sup US Coast Survey

Joseph Henry Sec of Smithsonian Institution

JW Barnard Bl/Gen & Corps of Engineers

Hon E. M. Stanton Sec of War

Note from Chas J. Eaton to TSC Lowe Police Dept Washington Mar 8 1862

"Made two ascensions, Mason not arrived. Any orders for me.

Note from Lowe Apr 2, 1862 to Lt/Col JN Macomb

Engaged Mr Richard Brown to take charge of balloon.

Spanish American War

No mention of Ivy Baldwin

"Balloon ascension in Cuba with Cr. Williams & Campbell in basket."

Lt/Col Joseph Maxfield succeeded in getting the balloon to Cuba,

"In 1899, the balloon detachment was disbanded and military aeronautics failed until 1907."

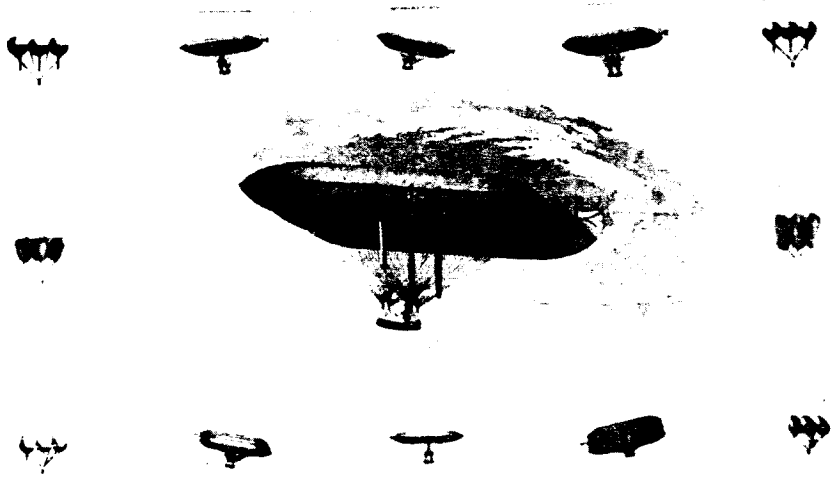
currents, for carrying of air mail, for making charts and maps of inaccessible lands, and for providing means of escape from besieged cities.[8] Making a more material contribution to the science of flying, Durant was responsible for the first specifically aeronautical instrument, a specially designed barometer for altitude reading which was not susceptible to the effects of jarring, shaking, inversion and concussions. Previously the common barometer had been used, but had proved unreliable because of air entering the column of mercury.[9] In 1836 he was presented with a gold medal for his manufacture of the first silk known to be made in the United States, and it is probable that during the years following he constructed a number of balloons on order.[10]

In 1840 Federal troops and militia were engaged in a protracted struggle with the Seminole Indians in Florida and it was suggested by Colonel John H. Sherburne that balloons be obtained for the purpose of spotting Indian campfires by night ascensions.[11] On his own authority, Sherburne proceeded to arrange for negotiations with Durant, providing for the manufacture and sale of the necessary equipment. The commanding general in Florida, however, refused to have anything to do with the suggestion, which was sidetracked for the duration of the war. Thus the first attempt at establishing military aeronautics in the United States came to nothing.

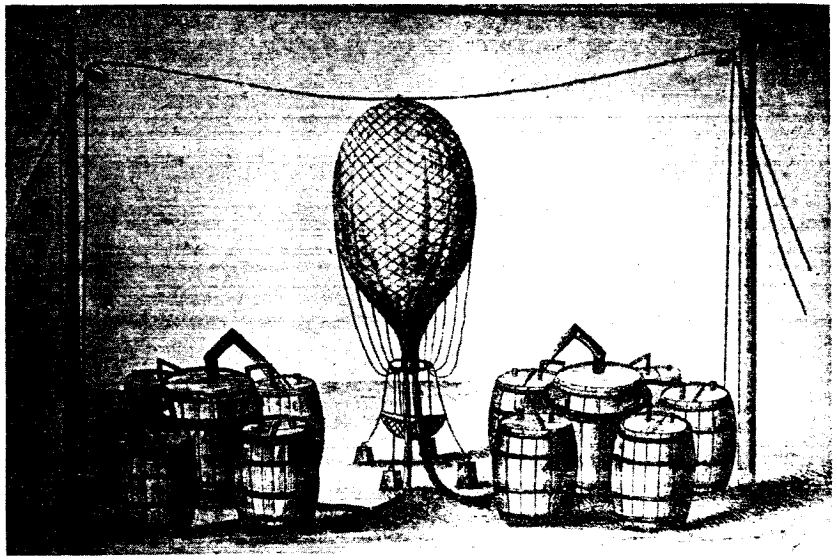
Durant never again took up flying. His brief career,

Charles F. Durant

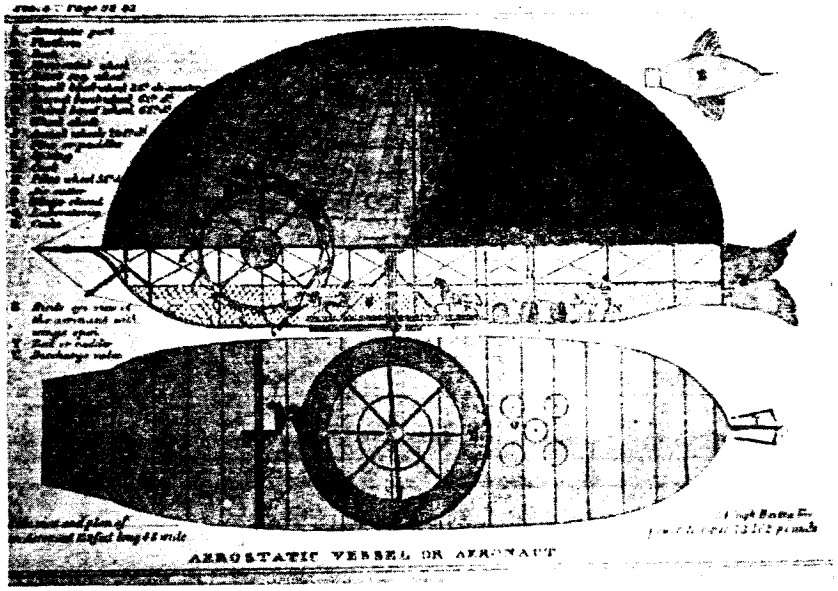
Solomon Andrews



Andrews's "Aereon," a flying airship of the 1860's



The inflation of a balloon (Diagram in Wise's *A System of Aeronautics*)



Genét's invention: a flying fish propelled by horses

nevertheless, was a powerful influence in establishing the balloon in this country, a fact of which the history of the next few years bears striking testimony.

The Baltimore Balloonists

While it may be surprising that ballooning did not become common at an earlier date in this country, it is even more astonishing to observe its phenomenal spread within a period of three or four years.

Durant had left an extremely favorable impression in the cities where he had exhibited. His name was constantly referred to in newspaper articles on aeronautics during the early 1830's, whether or not one of his ascensions was the main topic of discussion. Such was particularly the case in the press of Baltimore. In the year 1834, a number of aeronauts, professional and amateur, became active in the city, and it was not long before some citizens even began to object to Baltimore's excessive airmindedness. Outstanding among these early aeronauts were George Elliott[12] and Nicholas J. Ash,[13] while others included Samuel Wallace,[14] William A. Woodall,[15] and Hugh F. Parker.[16]

Elliott and Ash were professionals who required financial assistance in order to enjoy such an expensive occupation as ballooning. When we read of an incident like that in which a Camden mob destroyed Elliott's balloon upon its failure to ascend,[17] it is hard to believe that anyone could long afford to practice aerostation. Despite occasional demonstra-

Solomon Andrews

Perhaps the most interesting career in the history of aeronautics during this period was that of Dr. Solomon Andrews of Perth Amboy, New Jersey. Achieving success in almost every field to which his versatile mind led him, Dr. Andrews, physician, politician and inventor extraordinary, failed in what was to prove his greatest goal—the accomplishment of aerial navigation. Born in Herkimer County, New York, in 1805, he had first become interested in aerial flight while sitting in church one day, "looking out of a window at the soaring of an eagle in his winding way through the air."[39]

Several years of labor and experiments finally gave Andrews by 1830 the idea of a balloon shaped so as to offer minimum head resistance and maximum resistance to vertical movement.[40] By shifting the center of gravity, the inventor hoped to achieve an inclination which would enable the balloon to rise along an inclined path, thus obtaining a forward motion about twenty times as great as the accompanying gain in altitude. Andrews's theory thus did not differ greatly from that of Muzzi, but, although subject to the same limitations through gas and ballast exhaustion,[41] their proposed airships were actually quite unlike each other.

In 1830, the enthusiastic young inventor submitted his plans to C. F. Durant, the great pioneer aeronaut, and later to Richard Clayton of Cincinnati, but in

both cases without success.[42] Finally in 1848, after many years of working and waiting, Andrews, styling himself as the "President of the Inventors' Institute at Perth Amboy,"[43] announced the invention of an airship for "Navigation of Atmosphere." Construction work was started the following year. A public exhibition of the airship in process of construction was held on July 4, 1849, having been previously announced in the press.[44] More than 1,300 yards of silk were sewed over an 80-by-20-foot frame. The balloon was inflated and was tested inside a specially erected building, but apparently was not perfected, for it was never flown.

With the outbreak of the Civil War in 1862, Andrews joined the Army Medical Corps. Having chanced to witness, however, what he considered the "lamentable failure" of T. S. C. Lowe's balloon reconnaissance at the James River,[45] Andrews resigned his commission in order to return home and start construction on his own airship for the use of the government. In a letter to President Lincoln he offered to "sail the airship, when constructed, five to ten miles into Secessia and back again, or no pay," and in addition to "pledge real estate, now in my possession valued at not less than fifty thousand dollars, for the success of the undertaking."[46] After several weeks of correspondence with the War Department, Andrews was finally turned down because the Chief of the Bureau of Topographical Engineers, after studying the plans, was unable "to perceive that the invention

is of practical utility, and adapted to and needed for the public service."[47]

Unsuccessful in his efforts to obtain government sanction and assistance, Andrews nevertheless continued construction on his new airship, which consisted of three cigar-shaped balloons held parallel to each other and supporting a long narrow basket beneath. By shifting his weight together with that of a small ballast car set on tracks inside the basket, the doctor expected to regulate the airship's angle of inclination and thus its flight path, while a rudder set in the rear would provide for directional control. One of the most important features might have been his novel idea of having separate cells in the balloons to prevent movement of the gas inside. However, John Wise who had been charged with the manufacture of these cells in small balloons failed to meet Andrews's specifications, and apparently the idea was dropped.[48] On September 4, 1863, Andrews at last publicly ascended in his airship for what he called his "final experiment." His success was witnessed by a startled and admiring group of spectators and was reported four days later in the *New York Herald Tribune* in such glowing but no doubt exaggerated terms as the following:

"We have this week the pleasure to record the success of the most extraordinary invention of the age, if not the most so of any the world ever saw—at least the

greatest stride in invention ever made by a single individual."

The article continues to describe how Andrews "set her off in a spiral course upward, she going at a rate of not less than one hundred and twenty miles per hour, and describing circles in the air of more than one and a half miles in circumference."[49]

Dr. Andrews continued his efforts to bring the government around to a realization of the potentialities of his invention up to the end of the war. Six letters from prominent citizens who were eye-witnesses to the demonstration failed to have effect, but in 1864, Andrews finally succeeded in bringing his proposal to the attention of the House and Senate Military Affairs Committees, and a working model was demonstrated in a room in the basement of the Capitol Building. A special board consisting of Professor A. D. Bache of the U.S. Coast Survey, Major I. C. Woodruff of the U.S. Army Engineers Corps, and Professor Joseph Henry, secretary of the Smithsonian Institution, was authorized to investigate and report on Andrews's invention.[50] The full report, finally delivered to the Secretary of War on July 22, 1864, over four months later, concluded that "there is sufficient probability of the success of the plan of Dr. Andrews to warrant the attempt to carry it into practice on a sufficiently large scale to thoroughly test the question, and would therefore recommend a suitable appropriation for that purpose."[51] Further delay in handling the

report and reluctance on the part of the House Military Affairs Committee to act upon it resulted in the frustration of the unhappy inventor's plans until the end of the war.

However, continuing to show his amazing perseverance and ingenuity, and having patented his airship in the United States as well as in France and England, Andrews next organized an Aerial Navigation Company to establish a regular line between Philadelphia and New York. This plan is similar to one which he had reputedly conceived in 1848 but had failed to put into operation.[52] Here again, however, his efforts appear to have ended in failure, probably due to financial difficulties, although two "successful" flights in the vicinity of New York are fully recorded in the city newspapers.[53] In view of the lavish contemporary accounts it is easy to overestimate the actual practicability of the Andrews airship. Certainly the unreserved plaudits of the press and complete unanimity of praise with which all comments treated the several exhibitions must be given due consideration. Nevertheless it can easily be seen how many of the spectators, unmindful of the effects produced by varying wind currents at different altitudes and perhaps unduly impressed by the radically streamlined design of the balloons, could have exaggerated the airship's velocity and maneuverability in the air. Undoubtedly Andrews's invention was capable of progress through still

air and possibly it was able to hold its course even against a light breeze. Certainly it was a new step in aeronautical design and should have paved the way for more immediate airship development on the part of others. In itself, however, it was obviously a long way from affording a solution to the problem of aerial navigation.

Despite his career of failure and frustration in aerial ventures, it is gratifying to note that Andrews's ingenuity and persistence met with signal success in other fields of endeavor. Possessor of no less than twenty-four patented inventions, the doctor numbered among his creations such items as the wickless oil burner and various types of fumigators and gas lamps. His most important contribution, however, was the first combination lock, which in 1832 he had succeeded in publicizing by an ingenious stunt. A chest containing $1,000 and sealed with an Andrews lock was chained to a city lamp-post and a public challenge issued to anyone seeking possession of that sum to break the lock and help himself. The resistance of the doctor's invention against subsequent attacks immediately established its success on the market and Andrews was assured of at least one source of income.

In his home town of Perth Amboy, Dr. Andrews was a respected citizen. While a prominent physician, he also took part in the political life of his community, serving at various times as a justice of the peace, collector of the port, and mayor for three terms. His

death in 1872 closed a long and distinguished career of public service and marked the loss to aeronautics of one of its strongest yet most disappointed advocates.

Mortimer Nelson

On May 21, 1861, patent number 32,378 was issued by the United States Patent Office. The invention consisted of an "aerial car" with a set of adjustable engine-driven propellers pointed towards its nose, a large rudder at the rear, and "an awning or parachute" stretched across its top. The inventor of this strange device was Mortimer Nelson, a resident of New York City, whose name would probably otherwise have been completely lost to posterity.

Properly the invention should be described as the earliest recorded American patent for a heavier-than-air machine, since Pennington's original device was never patented but only entered as a pamphlet in a state record bureau. While Nelson in the later development of his plans did propose propellers and wing surface alone for lift,[54] his apparatus was originally to be "applied to the car of a balloon with a gas bag," with the one reservation that application of any part of the invention was not to be limited "to any particular character of balloon," but intended to be used "wherever available."

Perhaps the most interesting feature of Nelson's patent was the arrangement of the propeller shafts which could be inclined to provide for either a ver-

tical ascending movement or a forward propulsion.[55] Propeller torque was to be compensated by having an even number of propellers revolving in opposite directions, while the problem of weight was to be met by the use of aluminum for shafts, rods, wheels, and other parts, as well as the general framework of the car.

Another feature of Nelson's invention which became of more vital significance when he eliminated the balloon[56] was his "awning" or canvas surface over the top of the car. Set at a slight inclination to the car, this surface was to provide for additional lift on the rise and give most of the sustaining power to the car when the propeller shafts were lowered to supply forward propulsion. In his pamphlet describing the invention, Nelson refers to the spherical balloons of Dr. Andrews and asserts that his own aerial car "does not present one-twentieth the resistance to the atmosphere."[57]

Perhaps the most interesting of Nelson's contributions was his analysis of the type of engine which would be most practicable for aircraft. He knew well that the common steam engine, with its great weight and small horsepower output was not adequate for any aerial machine depending on its own propellers and elevating surfaces for lift. Seeking an alternative, Nelson considered a mixture of hydrogen gas and atmospheric air to be ignited in an iron cylinder. He held a patent for a chemical compound which he called "Carbo-Sulph-Ethal." Consisting of a mixture

AN AIRSHIP OF '63

A FORGOTTEN PAGE OF AERONAUTICAL HISTORY

By ROGER B. WHITMAN, Formerly Captain, A. S. A.

". . . a spiral course upwards, she going at a rate of not less than 120 miles per hour, . . ."

THESE words might be found in any of to-day's aeronautical magazines; but as a matter of fact, they are from the New York *Herald* of September 8, 1863, and are descriptive of a flight made by an airship designed, built and flown in that year by Solomon Andrews, M. D., of Perth Amboy, N. J.

The history of flying is full of surprises not the least of which is to-day's ignorance of the fact that in 1863 and again in 1866, successful flights were made by a power-driven lighter-than-air craft that was under the complete control of the pilot. The explanation of this forgetfulness is that the work was done at the period of the close of the Civil War, when the country was struggling with more serious internal troubles than now confront it; it was in no mood to take up anything so radical as aerial navigation, and interest died when through age the inventor gave up his struggle against apathy and discouragement.

But there can be no question as to the achievement, nor of the fact that the machine actually flew and could be steered; the many accounts of it in the newspapers of the day are conclusive. Thus it seems only fair to the memory of the inventor to recall his performance, especially as because of it the United States can lay undoubted claim to the credit of producing the first dirigible airship.

Dr. Andrews was born in Herkimer County, N. Y., in 1805, and lived most of his life in Perth Amboy, which at that time rivalled New York as a port of entry. He was a man of substance, owning considerable property there, and being three times mayor. He was one of the most prolific inventors of his day, his forty-eight patents including such diverse articles as a fumigator, a power band-saw, a sperm oil lamp, a ship hull and a tobacco pipe. It was as an inventor and manufacturer of locks that he was best known; to-day's combination safe locks are based on his ideas, and for many years he supplied the Government with its mail sack padlocks.

The author of the interesting article which follows proves that Dr. Solomon Andrews of New Jersey was the first man to use a cylindrical balloon; first to use ballonets; first to start a company for commercial aerial transportation; and unquestionably the first to fly an airship that was steerable. And to-day's flyers do not even know his name!

Nor did the War Department care about his name—or his inventions.

HIS first ideas of flying came to him when he was seventeen; he finally evolved the theory that forward movement could be obtained by opposing to gravitation the pressure of the air against a flat surface. An example of this theory is a plank forced under water and released; the gravitational force floating it tends to make it take a vertical path to the surface, but the resistance offered by the water causes it to follow its path of least resistance and to come up endways. Thus it rises, not vertically, but at an angle, and in so moving it covers horizontal distance.

Dr. Andrews's general idea was a balloon designed to offer minimum head resistance, and great resistance to vertical movement; by shifting the center of gravity it could be given any desired inclination, and in rising would follow the inclined path so determined. He estimated, and later proved, that twenty miles horizontally would be gained in rising one mile vertically, the speed being proportional to the lift. Being in motion relative to the air, the balloon could be steered by an ordinary rudder. Arrived at a sufficient altitude, gas would be discharged, the angle of inclination reversed, and the balloon would slide toward the earth, gaining more horizontal distance in so moving. This undulatory flight was to be continued until gas and ballast were exhausted.

Dr. Andrews built the first of his airships, or aereons, as he called them, in 1849. He constructed it in a building that he erected for the purpose, "100 feet long, 46 feet wide at the base, and 36 feet high in the center," this undoubtedly being the first hangar ever built. A public exhibition of the "Aerial Ship" in process of construction was held on July 4, being announced in the New York *Sun* of June 21, 1849. The ship was completed that summer, thirteen hundred yards of silk varnished by a machine invented and constructed by Dr. Andrews being used; this was silk woven to his order in China. She was inflated with hydrogen, and experimented with in the building, but never flown.

On the outbreak of the Civil War, Dr. Andrews joined the Medical Corps of the Army, and on the James River in 1862 saw the "repeated attempts made by Mr. Lowe, the Government aeronaut," to use a captive spherical balloon for observation purposes. Realizing the advantages of his Aereon for reconnaissance, he resigned his commission, and went to Washington to lay his plans before the War Department. In a letter to Lincoln dated August 9, 1862, he offered to "sail the airship, when constructed, five to ten miles into Secessia and back again, or no pay," and stated his willingness to "pledge real estate, now in my possession, valued at not less than $50,000, for the success of the undertaking."

AFTER six weeks of interviews and correspondence, he was informed by the Assistant Secretary of War, under date of Septem-

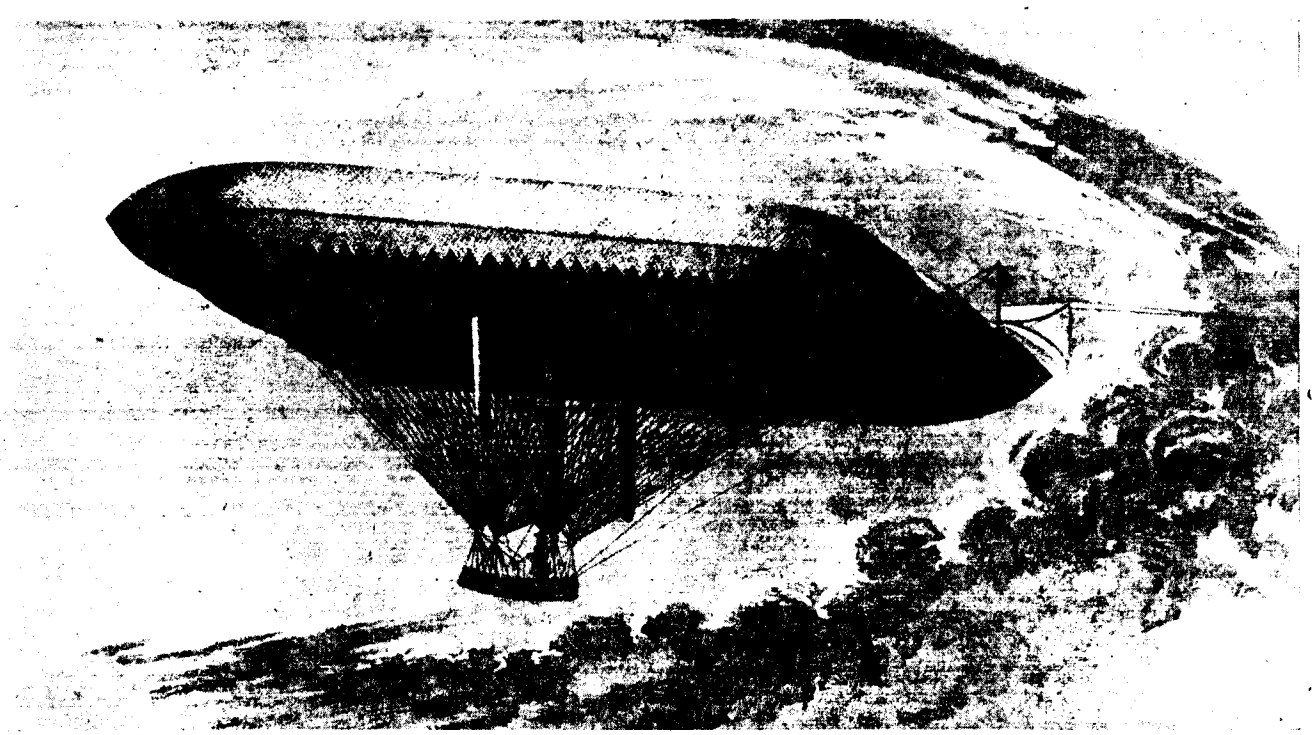
ber 8, that the Chief of the Bureau of Topographic Engineers "reports that the device appears to be ingenious in a high degree; but that not being fully convinced of the possibility of this method of locomotion, he cannot perceive that the invention is of practical utility, and adapted to and needed for the public service." He thereupon determined to build an airship himself, and so notified the War Department under date of September 22, saying that "if successful I shall present it to the U. S. Government, in the hope that it may shorten the war."

as essentials in the design, in that they acted as reversed keels; "aerial rails," he called them, and held the ship on her course.

To prevent the gas from collecting in the upper ends of the cylinders when she was inclined, and also to aid in balancing, he provided seven gas-containing ballonets for each cylinder. Each cylinder had a valve on top at the midpoint, the valve cord for the middle cylinder passing down through the appendix, while the cords for the outer cylinders passed through their sides; rubber gaskets at these points, and the tal-

to do; Dr. Andrews therefore did this himself. Wise, however, built the ballonets, for which 1,300 yards of cambric muslin were used. On the first trial, in June, 1863, all but one of the ballonets collapsed, but as the outer covering was tight the trial was put through, with the ballonets a useless weight. They were removed for the subsequent trials.

THIS ship was inflated three times, and flown in June, July, August and September, 1863, Dr. Andrews, then fifty-eight years old, being the pilot.



DR. SOLOMON ANDREWS'S AEREON FLOWN AT PERTH AMBOY, N. J., JUNE, JULY, AUGUST AND SEPTEMBER, 1863

Entered according to Act of Congress in the year 1864, *by Dr. Solomon Andrews in the clerk's office of the District Court of the United States for the Southern District of New York*

He started construction in September, 1862, and produced the craft that is shown in the accompanying illustration. It was composed of three cylinders, each 80 feet long by 13 feet in diameter, pointed for 16 feet at each end, and having a total capacity of 26,000 cubic feet. The cylinders were stiffened longitudinally, and terminated in cork cones; the coverings required a total of 1,200 yards of Irish linen. He used three cylinders instead of a single gas chamber because he considered the longitudinal cavities between the cylinders, below as well as above,

lowing of the cords, prevented leakage.

The basket was 12 feet long and 16 inches wide at the bottom. It was fitted with two rails for the ballast car, which had a block and tackle at each end to hold it in position. When the pilot and the ballast car were in the center the ship floated horizontally, while by shifting these weights she could be given any desired inclination. The rudder was of the ordinary type, with 17 square feet of surface.

John Wise was engaged to make and varnish the cylinder coverings, but gave it up as being impossible

On August 26, he wrote to President Lincoln of his experiments, and said that he proposed

> To make a last trial of her power, and then to destroy her, not deeming her fit for Government service. It will require a modification of her form to keep her under control. She is too much of the clipper order to preserve a proper equilibrium in the air when only partially filled with gas. She can only be balanced when she is *full* of gas, and that is hazardous after ascending to a sufficient height to be out of the reach of bullets.

He requested that "some suitable person, the more scientific and practical the better," be sent to witness the trial, but received no response

The final flights were made on September 4, 1863, and are reported in full in the New York *Herald* of September 8. According to this account he

> Demonstrated . . . the possibility of going against the wind, and of guiding her in any and every direction with a small rudder. . . .

The method of destroying her was to set her free, with full lift and the rudder lashed to one side; this flight the *Herald* describes as follows:

> After a few short flights . . . he set off in a spiral course upwards, she going at a rate of not less than 120 miles per hour, and describing circles in the air. . . . In her upward flight could be distinctly seen her rapid movement in a contrary direction to the moving clouds, and as she came before the wind passing by them with great celerity.

Dr. Andrews took exception to this estimate of her speed, and published a letter in the *Herald* the following day, in part as follows:

> Will you have the goodness to publish for the information of scientific men, the fact that the twenty revolutions made by my aerial ship in her spiral circle of a half-mile diameter were made in the time of fourteen and a half minutes. . . . The first eleven revolutions were made in seven minutes and a few seconds. The last three revolutions were made in three and a half minutes. Hence the calculation made by your reporter on the whole number of revolutions, in the whole period of time before she was lost to view in the upper strata of clouds, falls far short of her greatest velocity. It must have been over two hundred miles per hour in the early portion of her spiral movement.

For this flight she was relieved of the weight of Dr. Andrews, 172 pounds, and also of "several 7-pound bags of ballast"; with such a lift as this speed was to be expected.

The cost of each inflation was from $300 to $530, the last being the most expensive because she was filled entirely full. The cost of construction and experiments "did not exceed $10,000."

Having this practical experience behind him he again went to Washington, and this time saw Lincoln, who asked for letters from responsible eye witnesses describing the flights. Letters from six prominent citizens of Perth Amboy were sent him, from which the following extracts are taken:

> She went upward and forward against the wind, then blowing from the north not less than ten miles an hour. She minded her helm perfectly. . . . He turned her around, came back to the place of starting, and came down to the ground.
>
> I was present at two of his experiments. I saw him go up in his car, and navigate her, steer her by a rudder, and come down again. The direction of the wind or air currents seemed to have nothing to do with it. He went against the wind or in any other direction.
>
> I saw three of Dr. Andrews' experiments. . . . The Doctor sailed in any direction, either with, by, or against the wind, the wind blowing from ten to fifteen miles an hour. He steered her as easily as a sail boat. He went off against the wind, turned her around, and came back to where he started.
>
> The distance traveled in a horizontal line much exceeded that of its elevation.
>
> In making these circles she went always bow forward, and the car was all the time hanging in its proper place below.

Of the final flight, when she was set free, these correspondents said: "I have never seen anything by a sky rocket or a cannon ball go so fast." " . . . going with very great swiftness. . . ."

"I never saw any vessel, railroad car, or other thing of magnitude go so fast."

By December the Government had taken no action, and Dr. Andrews laid a petition before Congress, following it with a demonstration to the Military Committees of the Senate and House of a gas-filled rubber model with cylinders 4 feet long and 8 inches in diameter. This so impressed the House Committee that it requested the Secretary of War to appoint a commission to investigate the matter, and after much delay Prof. A. D. Bache, U. S. Coast Survey, Prof. Joseph Henry, Smithsonian Institution, and Major I. C. Woodruff, Engineers, were named for this purpose in War Department Special Orders 119, March 16, 1864. Dr. Andrews had three interviews with this commission, and demonstrated his model in the Smithsonian Library.

The report of the commission is dated July 22, 1864; it states frankly that the prior opinion of the commission was that the plan was "entirely chimerical," but that this opinion was reversed by the demonstration and by Dr. Andrews's explanations and statements. It reaches the conclusion that "there is sufficient probability of the success of the plan of Dr. Andrews, to warrant the attempt to carry it into practice on a sufficiently large scale, to thoroughly test the question, and would therefore recommend a suitable appropriation for that purpose." There is great weight in this opinion by Professor Henry, who was the foremost physicist of his time.

This report to the Secretary of War was not transmitted to Congress until January of the following year; the war was then drawing to a close, and no action was taken.

With the war over, and no longer fearing the enemy use of his ideas, Dr. Andrews in 1865 patented his airship in this country as well as in France and England; these patents include the rights to a balloon in cylindrical form, and also to the use of ballonets. He then organized the Aerial Navigation Company to "establish a regular line between New York and Philadelphia," this unquestionably being the first company formed to place aerial transportation on a commercial basis.

The company occupied a plot on the corner of Greene and Houston streets, New York City, where it had its aerodrome, and where it built a ship of 70,000 cubic feet capacity. This ship differed from the former model in having two gas compartments instead of three, and these were lemon-shaped rather than cylindrical; due to this she was not under such complete control as her predecessor. She nonetheless made two successful flights.

On her first flight, May 25, 1866, she carried four passengers, these being the officers of the company; the flight lasted half an hour, and ended at Astoria, L. I.

As might be expected, a flight made from the heart of New York attracted a great deal of attention, and all of the city papers contained full accounts of it. According to the *World* of May 26, 1866, "she instantly and gracefully obeyed the direction of the rudder, and . . . though under but a minimum of gas, she shot at an undeviating, unswaying rate of not less than three minutes to the mile." The *Tribune* of the same date gives her speed at from 20 to 25 miles an

hour, and speaks of her being turned "repeatedly in different directions."

Her second flight was made June 5, 1866, with two passengers and 450 pounds of ballast; this flight lasted an hour and a half, and ended at Oyster Bay, L. I. Of it the *Herald* of June 6 says:

> . . . It moved before the wind in the direction of Canal street. After throwing out some ballast there, Dr. Andrews turned the machine, and with a graceful motion, alternately rising and falling, came back against the wind, apparently having the machine under perfect control, and, having passed nearly over the place from which he started, moved off in the direction of Long Island.

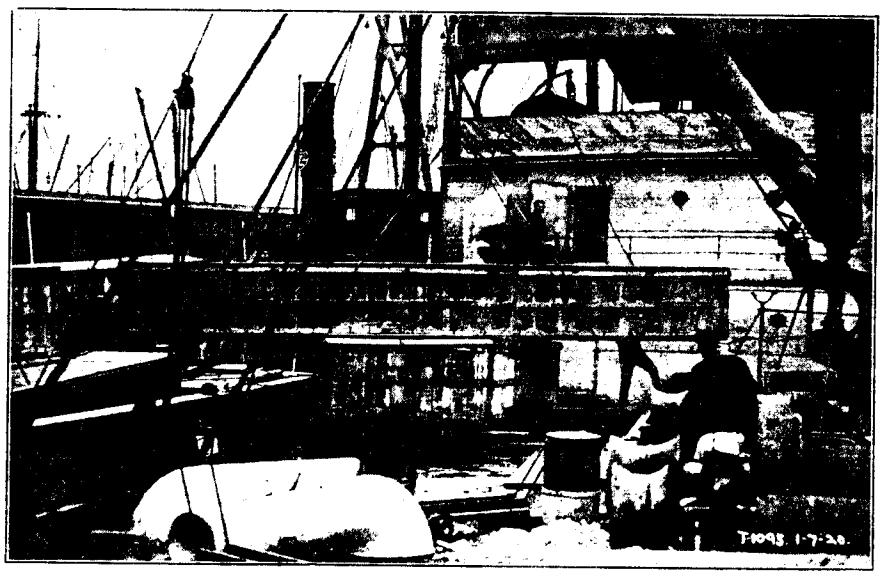
Dr. Andrews realized that the weakness of his invention lay in the necessity for the continual discharge of gas and ballast, which for a commercial line would require the establishment of frequent recharging stations. His solution for this was a method of compressing the gas at the top of the incline and releasing it at the bottom, in this manner gaining control of the lift without loss of supplies. Much of his time in his declining years he spent in searching for a material that would stand the strain, but without success.

He died in Perth Amboy in 187 2 and is buried there.

In the light of the evidence found in the newspapers of his day, Dr. Andrews's accomplishment cannot be doubted; that he flew, and was able to direct his flight, is unquestionable. His work may have been forgotten, and the principles that he demonstrated may be unheeded, but he still remains the only man who has shown that it is possible to fly under power by the application of natural forces, and without the aid of a motor.

AMERICAN AIRCRAFT IN EASTERN MARKETS

THE first shipment of American airplanes to China, and the first introduction of American planes to the possibilities which were recently indicated by the contract of $8,000,000 for military aircraft let by the Chinese Government to Vicars and Co., was represented in the $500,000 aerial consignment recently taken by the steamer *Dacre Castle* to Capt. C. E. W. Ricou of Hong Kong and Macao. The chief contents of the shipment comprised five Curtiss H-16 flying boats, two Curtiss HS2L flying boats, and four other seaplanes of Aeromarine and Boeing design.



CRATES OF AMERICAN SEAPLANES ON BOARD THE "DACRE CASTLE" EN ROUTE TO CHINA

The purchase of American planes by a former captain in the French Aviation service is partly the result of the rapid delivery which could be obtained in this country. Captain Ricou has engaged American pilots and mechanics—seventeen in all. Most of these have seen U. S. Navy service. They will operate the American flying boats as merchandise and passenger carriers along the Chinese coast and between China and the Philippines.

MUCH FLYING IN ENGLAND

FORMER Maj. Gen. W. L. Kenly, late Director of Military Aeronautics, recently made the statement that Military Aeronautics were practically at a standstill in England. In contrast to this, the New York *Times* publishes a report from England which shows that civilian flying across the Atlantic is increasing faster than ever before. The report indicates that for six months ended in January of this year, commercial and pleasure airplanes made 35,330 flights for a total of 593,000 miles covered.

In this commercial flying 403 machines were used, this number including those in the regular service and the others held in reserve. The number of passengers carried and delivered to their destinations were 64,416, and these took with them a total of 67,143 pounds of baggage.

For more than 35,000 flights a total of eighteen accidents occurred, four of which resulted in deaths, and eight in injuries. Nineteen hundred and sixty flights were made successfully for every accident. The casualty list shows that four pilots and one passenger were killed and six pilots and ten passengers were injured.

Of the machines used, it is stated that the Avro type carried the greater number of passengers. During the last four months of 1919 these machines carried more than 30,000 passengers and not one of them figured in a fatal accident.

U. S. AIR SERVICES

Devoted to the Development of Aeronautics—Civil and Military—in the United States, Birthplace of the Flying Machine, and Throughout the World

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"Balloon" Bryan, C. S. A.

CAPTAIN PERCY G. HAMLIN
Flight Surgeon, 29th Division Aviation

THE SPRING OF 1862 was just beginning to make the Peninsula of Virginia the wonderland of beauty which it is wont to become in May, when General Joseph E. Johnston's gray-clad soldiers manned their defensive lines stretching from Yorktown on the north, southeast to Wynn's Mill about the center of the line, then turning southwest to Lee's Mill at the mouth of the Warrick River where the right flank rested on the water. The distance from Yorktown to Lee's Mill is about ten miles. Along the roads, just emerging from the mud, the Scotch Broom was, here and there, showing a yellow blossom against the rich green background, and in the old Williamsburg gardens the lilacs and wistaria were beginning to hint of summer days soon to come, seemingly unconscious of the rude face of war which lurked close at hand.

George Brinton McClellan, U.S.A., Commander-in-Chief of the United States Forces, had assembled on the lower Peninsula an army magnificently appointed. In training, in size, in matériel, it compared with, indeed it was modeled after, the traditional European pattern. Its scholarly commander took a just pride in the highly specialized organization of his troops. It had a well trained and well equipped artillery, under a master of that arm, Henry J. Hunt; it had an air service under the scientific Thaddeus S. Coulincourt Lowe; it had bright uniforms and shining accoutrements; it had food; it had skilled embalmers.

Daily from the lines Lowe's balloons rose to observe what the somewhat less elaborately outfitted "Johnny Rebs" were doing. Daily went forward General McClellan's preparations to force the evacuation of Yorktown, to free his right flank, thus permitting the Union gunboats free access to the York River up to West Point, where there was a railroad which ran to Richmond, his objective. The lower Chesapeake, Mobjack, Hampton Roads, and the York were all alive with troop ships and their convoys coming and going, men-of-war flying the Stars and Stripes.

FACING McCLELLAN from the gray lines was a calm and imperturbable veteran, somewhat older than his Federal opponent, Joseph E. Johnston. Johnston had followed the American flag to the remotest outposts where it flew. He had fought Seminole Indians in Florida, the Mexicans at Cerro Gordo; he had led a cavalry regiment in the West. If wound stripes had been "official" in the army in his day his sleeve would scarcely have been long enough to hold all to which he was entitled. And there was a geniality in his nature and a warmth in his heart that drew his officers and men to him. With keen military eye he had watched McClellan's balloons reconnoitring his lines. He knew that the French had used them in the latter part of the Eighteenth Century, and he probably knew that Napoleon had made the mistake of disbanding his balloon corps just before Waterloo. He knew also that they had been used successfully at Solferino in 1859. Their obvious value in reconnaissance was apparent to his well trained military mind. So he ordered down from Richmond the best the Confederacy had to offer in the way of a balloon.*

True enough the scientific Lowe,† who had his own field apparatus for the generation of hydrogen, would have considered it but a makeshift affair. Yet it illustrated precisely the material difference between the rich North and the poor South. For General Johnston's balloon depended, for its ascending powers, not upon hydrogen nor illuminating gas, but upon heated atmospheric air. A generous supply of pine knots was gathered under a large flue. These were then saturated with turpentine and ignited. The other end of the flue opened directly into the cotton bag of the balloon, and the hot air, accumulating in sufficient quantities, made the balloon ready to rise. When the air in the bag cooled, the balloon, perforce, must descend. The cotton bag was coated over with some substance intended to make it air-tight. From the bag there hung suspended by a cone of cords a big hamper or basket in which the pilot stood or knelt while making observations. The balloon, when not in

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* Later in June 1862, the Confederates had a more elaborate balloon at Richmond. It was made of silk dresses and inflated with illuminating gas. It was captured while attached to a tug, on July 4, 1862, by the Federal gunboat *Maritanza*. (E. A. Alexander: *Memoirs of a Confederate*, p. 172.)

† There is an excellent short account of Lowe's Balloon Corps to be found in Joel Cook's *Siege of Richmond*.

AUTHOR'S NOTE

Last year I published in the July issue of this magazine a brief account of the first use of aerial observation ever made by American soldiers. The article dealt with the Aeronautic Corps of the Army of the Potomac, and was based upon a considerable data on the subject to be found in the Official Records of the Union and Confederate Armies. Since the publication of that paper I have been pursuing further historical investigations, my concern being chiefly the discovery of material about one of the Confederacy's most unique and colorful officers, Lieutenant General R. S. Ewell. During the course of this investigation my attention has been inevitably drawn to the mine of historical lore contained in the *Southern Historical Society Papers*. The substance of this sketch is to be found in Volume 33, Page 32 of that series of publications. In my belief it is the only existing detailed account of a balloon (or any other aerial) reconnaissance made by a Confederate during the war.

It is interesting to note that a nephew of the young Confederate aeronaut is now President of the very college upon which the eyes of his aeronautical uncle looked from his balloon. The college is William and Mary at Williamsburg, Virginia, and the gentleman, Dr. John Stewart Bryan. There is little doubt that Captain Bryan was the first and probably for many years the only Virginian or Southerner who had ever seen the Peninsula from the air. The Federal balloonist Lowe and officers of the Army of the Potomac had, however, made many ascents over the same country before Captain Bryan took to the air.

CAPTAIN JOHN RANDOLPH BRYAN (LEFT) OF THE CONFEDERATE ARMY

The First and Probably for Many Years the Only Virginian or Southerner Who Had Ever Seen the Peninsula from the Air. When General Joseph E. Johnston Complimented the 21-Year-Old Aeronaut on His Observations Made During an Ascension in a Hot-Air Balloon over the Union Lines, Captain Bryan Felt Complimented but Not Elated. Contrast the Aeronautical Activities Recalled by Captain Hamlin With the Plans Outlined in This Issue by General Andrews

This photograph was taken in November, 1862. Photograph furnished through courtesy of Dr. John Stewart Bryan, President of William and Mary College at Williamsburg, Virginia, nephew of the young aeronaut, who was one of the Confederacy's most colorful officers

use, was anchored by a long rope—probably half a mile in length—permitting an altitude of 2,500 feet or so. This rope was tied to a tree and then coiled sailor-fashion on the ground, passing thence around a windlass and finally attached to the cone of ropes which came down from the balloon bag to the pilot's basket.

THERE WERE NO EXPERIENCED AERONAUTS in the Confederate army, and probably the number of officers or men who had ever seen a balloon could be counted on the fingers of a single hand. But youthful and adventurous spirits there were a-plenty in the gray ranks, just as they were found in the United States in the years between 1914 and 1918, and of such stuff are wartime aviators made. One such, Captain John Randolph Bryan, a youth of twenty-one, was attached to the office staff of General J. B. Magruder's Adjutant General.

One day shortly after General Johnston had the balloon brought down from Richmond, this officer saw some official correspondence pass his desk which attracted his attention. General Johnston requested (in the correspondence) that an officer from General Magruder's command be assigned to him for special duty. The letter did not state what the duty was to be, but merely indicated that the officer should be one trained to interpret the meaning of military movements, and that he should be thoroughly familiar with the surrounding terrain. Bryan felt that he had both qualifications and hoping thereby to win military laurels, against the counsel of his kinsman, Major Henry Bryan of Magruder's staff, he went to General Magruder requesting the assignment. Magruder, likewise, tried to dissuade him, but seeing that he would not be denied, he issued the necessary orders.

The young officer immediately mounted and rode in hot haste to General Johnston's Headquarters to report. He handed his orders to Colonel Rhett, Johnston's Adjutant General, and while waiting his turn to see the General, he attempted to find out what the duty, for which he was clamoring, was. None of his friends about Headquarters seemed to have any idea, and Bryan still in doubt was finally ushered into General Johnston's presence. Bryan has given us an account of the interview.

"AFTER A WHILE I WAS CALLED into General Johnston's tent. The General looked at me and seemed surprised that I was only a boy. He began to question me quite closely as to what experience I had had in military affairs; how long I had been with the army; whether I could distinguish one branch of the service from another, and the like.

"Having answered the questions to the General's satisfaction, the latter laid a map of the Peninsula on the table before him, and began questioning me about the different creeks and fording places, and other topographical matters on the Peninsula. Having shown myself sufficiently familiar with the matter, the general then turned to Colonel Rhett and remarked, 'I think Mr. Bryan will do very well. You will please assign him to the balloon service to make the reconnaissance, and instruct him as to what information we want, and the kind of report we want from him.'

"On hearing this order I immediately sprang to my feet, protesting that I could ride a horse, and would gladly do anything in my power, that I had never even seen a balloon, and that I knew absolutely nothing about the management of it, and that if the General simply wanted some information as to the position of the enemy and their numbers at a given point, that I would very cheerfully go into the lines and get this information and return as speedily as possible and report. My words, however, had small effect upon the General. He told me very curtly and positively that I had been assigned to him for duty and that he expected me to perform the duty to which I was assigned without any questions. He added that he had plenty of scouts already and what he wanted was a man to go up in the balloon; and that I could now go and prepare myself to be in readiness when sent for."

Captain Bryan realizing that his desire for glory had maneuvered him into an awkward position, accepted the situation with what good grace he could summon and turned away to get the necessary instruction in his new and somewhat distasteful duty. He found that the ground crew of the balloon was entirely responsible for the inflation, the elevation and lowering of the balloon. His duties, in other words, were those of an observer. He was to determine the location, numbers, and respective arms of enemy troops, sketch their positions and indicate the location of roads, rivers, bridges, creeks, fords, and wag trains. He controlled by the waving signal flags to the ground crew, the spe of elevating or lowering the balloo Otherwise he was like the little cherubi that sits up aloft.

His First Flight, A Solo

BRYAN CANDIDLY ADMITTED that this time his burning desire for mi tary glory had cooled almost to zer Determining to make the best of it, started for the balloon station to inspe his craft and get the lay of the land. T station was located something less th a hundred yards behind the Confedera lines, just posterior to a thicket of t pines. The pines were utilized as a scre to permit the balloon to get a good cending start, and to get above t trajectory of the Federal field guns b fore becoming visible to the enemy. Bryan looked at the balloon he spec lated on his chances of surviving this first parting with Mother Earth. was not particularly enchanted at t thought of being suspended in mid- by what appeared to be a mere thre under a hot-air balloon, with the chan pretty strong that it would be burst shrapnel "when down would co baby and all."

The next day he was ordered make his first ascent. It did not take t ground crew long to inflate the balloo in fact, according to Bryan, it was do much too quickly to suit his taste. member of the crew informed him th his aerial horse was ready and he stepp among the ground boys with what no chalance he could summon. They ceived him with that critical survey a politely detached silence which seem to him to say more eloquently than wor "Too bad. He seems a nice fellow a so young too!" It was no time to dulge in disquieting reveries, howev and he quickly climbed into the bask and signaled for the takeoff.

He had hardly gotten above the to of the pine trees when he noted enemy assumed an unwonted and, him, altogether unseemly activity. Th quickly wheeled out a battery, and distinctly saw the officer elevate the g and point it at the balloon; saw h drop his arm as a signal to fire and hea the shell whistle by in unpleasant proxi ity. Shells passed and shrapnel bu about him, giving him some mighty u comfortable moments. He quickly ga

he signal "Faster" to the ground crew, nd soon passed out of range. Attaining n altitude of several hundred feet, he egan to feel more comfortable though roubled somewhat by the reflection that whatever goes up is bound to come own," and the knowledge that the nemy would prepare a warm reception or him. The hot air in the balloon as cooling and he realized that he must peedily set to work to complete his mili- ry mission.

Spread out in the glorious April sun- hine was a panorama of beauty which nomentarily made him forget his trials n the contemplation of the smiling face f Nature beneath. Serenely detached rom the hostile armies below, he saw, parkling blue, the waters of Chesapeake Bay, the York and the James. Off to he southeast he could discern Hampton nd Old Point Comfort, and riding at nchor in both rivers a large fleet of Federal men-of-war and troop ships. He ould plainly see the lines of the con- ending armies fronting each other across he width of the Peninsula.

Taking out his notebook he made a ketch showing the rivers, the roads and he creeks. Carefully he marked in the arious bodies of the enemy's troops, "I" or infantry, "C" for cavalry, "A" for rtillery, "W" for wagon trains. This vas not easy to accomplish as the balloon vould revolve and spin in the air cur- ents and from the cooling of the air in he bag. After beginning a sketch of a iven point he would have to wait for a complete revolution of the balloon to complete it. This of necessity made his vork tedious and slow.

Finally, the job completed, he sig- naled the ground crew that he wished to descend. As he approached to a length of three hundred feet or so from the ground he saw that the Yankee artillery- men had run out several other batteries n addition to the one with which they had saluted him on his ascent. These were to welcome properly his return to earth. The guns were all prepared for firing and aimed at the spot which he must pass to reach again terra firma. The sight was not reassuring. He sig- naled "Faster, Faster," and soon passed through an inferno of bursting shrapnel and whistling shells, the Federal guns firing at him by battery, four and six guns at a time. His luck held, however, and he made a safe and very happy land- ing in the Confederate lines.

Night Flight

YOUNG BRYAN, feeling very much as though he had come back from that land from whose bourn no traveler returns, rode, rather in glee, to report to General Johnston, thinking that his aeronautical activities were over, and quite prepared to enjoy a new made reputation as the Confederacy's most daring—indeed its only aeronaut! He recalls for us this interview with General Johnston:

"The General listened intently to what I told him and asked very particularly as to the position of the branches of the service and as to their numbers, and spreading out the map on the table, made me show him where the different bodies of troops, artillery, and so on, were posted. When I had finished my report the General complimented me by saying that I had done very well indeed. Therefore at leaving I felt my experiences were a thing of the past and I requested the General to assign me to the same duties which I had had before I joined him. 'My dear sir,' replied the General, 'I fear you forget that you are the only experienced aeronaut I have with my army. You will please hold yourself in readiness as we may wish you to make another ascension at any time.' I felt complimented but not elated."

That evening the balloon crew was ordered to move their equipment north along the line closer to Yorktown (the first ascent had been made from a point near the James River end of the line—in the neighborhood of Lee's Mill) as it was not considered safe for the balloon to ascend again from the same spot. A device for increasing the speed of descent, in the meantime, had been perfected. What the Confederates lacked in equipment (and that was a great deal) they made up in ingenuity. The device was simple. It consisted entirely of hitching six artillery horses to the rope as it came from the windlass, and driving them at breakneck speed down the road to haul the balloon down.

ABOUT TWO DAYS after the first ascent a second was made by General Johnston's "only experienced aeronaut." This gentleman was now becoming somewhat used to the business, and he stepped into his basket with an air of easy nonchalance—not simulated. His comrades had already nicknamed him "Balloon" Bryan and indicated by not very subtle innuendos that they thought he must have a "screw loose somewhere."

On the night of April 15th, the Balloon Corps was awakened at midnight by an order from General Johnston to fire up the balloon for an immediate reconnaissance. It was near the full of the moon and the night so bright that one could read a letter out of doors. The courier who brought the General's order informed Bryan privately it was rumored around Headquarters that the enemy was moving, which, he supposed, accounted for the General's midnight haste.

As soon as the balloon was inflated the young officer in the pink of satorial perfection (like many another aviator), with tight-fitting shining boots, stepped into the car and ordered the ascent. Now the Confederate infantryman, blasé as he was in battle, was as naive as a child when confronted with balloons and other new-fangled inventions. The soldiers crowded around like farmers at a fair and made remarks not complimentary to the entire proceedings and particularly dubious as to the mentality of the young man in the car. These inquisitive "Johnnies" thronged in such numbers that the balloon crew was unable to keep them back. Just as the craft was beginning to rise above the treetops, one of the spectators, more inquisitive even than the rest, crowded so close he stepped into a coil of the rope going to the windlass. This tightened upon his leg, dragging him toward the windlass, whereupon he let out such terrible howls that a comrade seizing an ax standing nearby, slashed the rope in two, releasing the now chastened soldier, but also releasing the balloon with its solitary occupant.

THE AERONAUT, who had risen about two hundred feet above the ground, was feeling unusually comfortable as he began to survey the surrounding country, when he felt an upward wrench as though a giant hand had reached down from the radiant sky and suddenly pulled the balloon and him up two or more miles "into the blue." He did not, of course, know what had happened, but he surmised that the rope had broken and in that belief he took no joy. He has vividly described his feelings at the moment:

Now there I was feeling as if I was a couple miles up in the air, absolutely helpless, with no idea of how to manage my runaway steed, and with every prospect that I would eventually very reluctantly land in the enemy's lines, which meant a long term of imprisonment, or else that my balloon would come down in Chesapeake Bay with no means of my regaining the shore, which perhaps meant being drowned but which I preferred to the former.

One thing I was certain of, that when the heat died out of the balloon, I must make a graceful descent, but as to where I should land I could not even guess. To say that I was frightened but faintly expresses it, for the almost instantaneous ascent I had made had not only taken all the breath out of my body, but it seemed also to deprive me of my nerve and courage for the time being. However, after a while I recovered my breath and found upon careful examination that my heart was beating much as usual. The balloon had now reached its equilibrium and was apparently standing quietly (for there was but little air stirring) over the Confederate Army. I could look down to where far below me lay the York River and the surrounding country which I knew so well.

HE COULD NOT LONG ENJOY his contemplation of the moonlit scene spread below him for the wind had freshened, and to his dismay he saw that he was being blown in an easterly direction toward the Union positions. His feelings were terrible as he believed he was leaving home and friends forever, and heading for a northern prison. But as the balloon settled to a lower altitude, he obtained a wind in the contrary direction and to his delight was driven back towards the Confederate positions. (The exact spot of this ascension had been a point just back of Dam No. 2—Wynn's Mill a few miles east of Williamsburg.) The balloon was cooling and settling rather rapidly. He welcomed the idea of the approaching earth as a weary traveler welcomes the sight of an inn in the night.

The balloon was now some three or four hundred feet above the earth over the Confederate lines but over an entirely different sector, held by strange troops, the Second Florida Regiment. These soldiers, not aware of any Confederate balloon in the vicinity, mistook their aerial visitor for a Yankee, and began assiduously and gleefully taking pot shots at him. All in vain the aeronaut shouted to them that he was a good Confederate. His only answer was the whistle of their bullets.

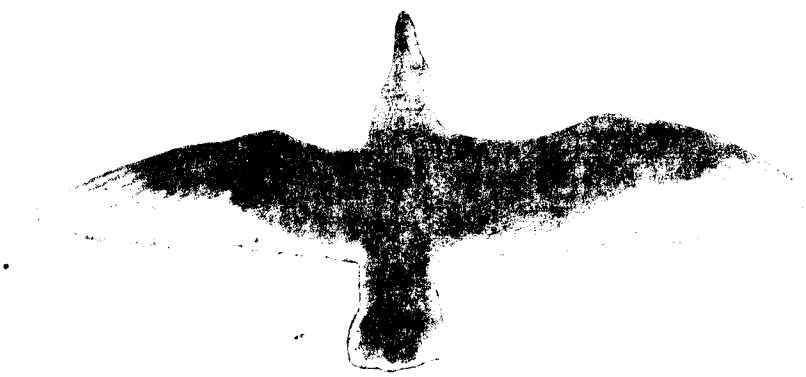
Luckily a cross current carried the balloon from this dangerous neighborhood out over the York River, which, though pinched in to a mere half-mile width at Yorktown, both below and above that point expands into a stream two miles or so wide. Out to the middle of this expanse Bryan and his balloon were now carried. The balloon was settling rapidly and the prospect of an early swim seemed imminent. He made preparations accordingly, beginning to undress. And here his vanity came home to plague him. The boots which had been his pride and joy refused to come off. Rapidly searching through his pockets he found a knife; opening the blade he ripped first one, then the other of the shining boots up the back, and threw them without a sigh into the waters beneath.

SO NEAR TO THE SURFACE of the river had the balloon descended he could now hear the sound of the dependent rope swishing through the water. His prodigious luck still held, however, and a gust of wind came down from the north and blew him back to the Williamsburg shore. The balloon had traveled but a short distance inland when he observed that it was quite close to the ground. Climbing over the side of his basket he seized the hanging rope and slid quickly to the ground. How wonderful to his feet the feel of the soil in that apple orchard! Running with the rope in his hand, as the balloon passed low over a tree, he quickly wound it several times around the trunk of the tree, and the balloon, quivering a time or two, sunk impotently to earth. This is his final comment on his experience as an aeronaut:

"I dressed myself as quickly as possible and made my way to a neighboring farmhouse where after quite a hot discussion with the farmer, I succeeded in securing a horse and rode back to General Johnston's Headquarters, a distance of about eight miles. I made my report as to my experience, and as to what I had seen. On this trip my balloon (so far as I can judge) made a half moon circuit of about fifteen miles, about four miles of which was over the York River. As to the height which I attained I cannot well compute.

"The information which I was able to give General Johnston as to the roads upon which the enemy were moving, enabled him to prepare for an attack early the next morning just before day."

NOTE. There were one or two spurious attempts to construct heavier-than-air "flying machines" in the Confederacy between the years '61 and '65. These efforts seem to have achieved no substantial results, and one appears to have been a down-right fraud. Reference is made to these ventures in *Southern Historical Society Papers*, vol. 37, pp. 302-3, and vol. 28, pp. 303-5.



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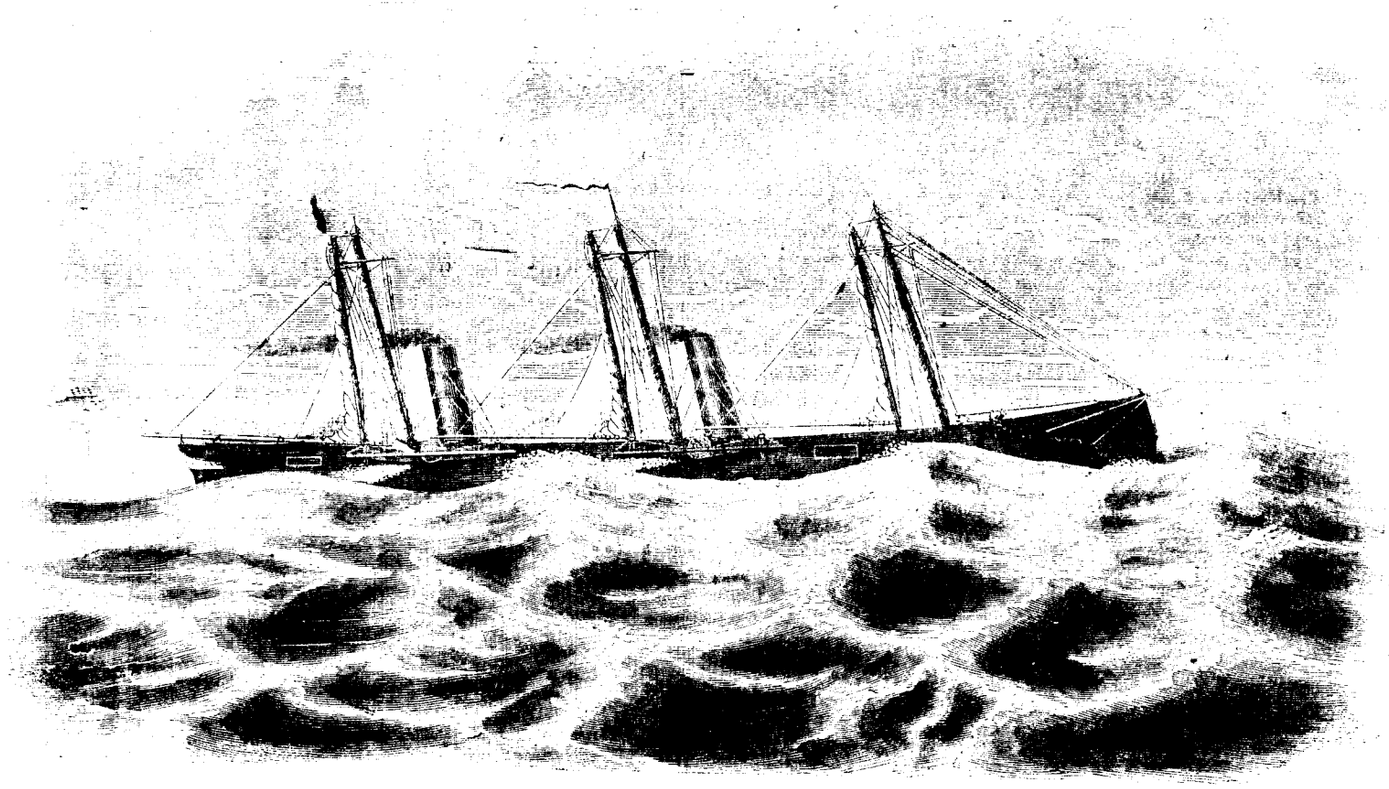
Composite Ships.

In view of the future for our country, a most important problem is that which has to be solved in the matter of ship efficiency. It has long been apparent to earnest students that this whole question of ship-efficiency must resolve itself finally into one of speed—highest possible speed at any cost for purposes of war, and the highest speed that will pay, for commercial use. The people, Government or capitalist, having at command this element, speed, in its two phases, absolute and economical, will bid defiance to all comers upon the seas. Excelling speed of ship, in fact, is to be maritime supremacy. Battery, armor, complement of men for war-ships, capacity of hold for merchantmen, subsidies for mail vessels—these are but elements of secondary consideration to successful maritime adventure in the future. Speed will make its commercial voyage unscathed by the enemy's cruisers and running his blockades with impunity, Speed will fight just where, when and how it pleases, or at its own option will decline fighting. Speed will destroy, in quick time, the whole mercantile marine of any enemy that has it not; and speed will transport past, around or through the ocean, lines-of battle of such an enemy, armies that may seize his depots and desolate his home ports. The *sine quâ non* of prosperity to a maritime community must be speed in its ships. Wanting speed we are helpless against every foe, false friend and competitor at sea. By what combination of mechanical means, then, shall this supreme efficiency be reached? This is the practical question. And it will be the part of wisdom to bear in mind that whilst expending now, nationally, vast sums for the attainment of effectiveness in less important particulars, this all-important one has not received due attention, either in our navy or our mercantile marine. The iron screw-steamship of the present day is not perfection for our purpose. Steam as a motor for ships and iron as the material for steamships, we fully accept; but here we stop; contending that in the adaptation of form and size to the hull, and especially in the application of motive power to the ship, very much yet remains to be done. Large ocean-going ships, for almost all purposes, must very soon be propelled either fully or in part by steam. On all long voyages and in cruising, economy will be greatly served by the use on steamships of a full sail-power. Then, as a general rule, where absolute high speed under steam has to be attained, ships must have very great length upon a minimum mid-section. This they may have and yet retain sufficient stability for sails, if applied immediately above the hull, of a sufficient power to afford high speed under canvas alone. An inevitable weakness in the consequent form of hull must have its compensation supplied in the strength and disposition of the material used. The model must be of the finest, and the immersed dimensions should coincide closely with those natural to a wave of the velocity required from the ship.

It is not our purpose however, just now, to descant upon the merits of materials or of related form and size in ships. We herewith present illustrations of a ship in which are embodied two remarkable innovations—one in the rig and sails, the other in the means of propulsion by steam. Of the latter we exhibit only the external appearance, with the intent of showing the connection between the two improvements. Our object is to give a full general idea of the improved rigging and sails. The inventor is George T. May, of Tompkinsville, Richmond County, N. Y., and the invention is secured to him by Letters Patent dated respectively April 28, 1857, July 15, 1862, and July 22, 1862. He is the author, also, of the projected mode of propulsion by steam. Mr. May contends—and this view he has repeatedly expressed during the last six years—that the true principle of naval propulsion resides in a harmonized combination of the two motors, steam and the wind; so that both may be applied on the ship to the extent each of a full power, and either be used, as conditions favor or require, independently of the other, and unimpeded by the presence of the other's machinery:—the mechanical requisites for the accomplishment of the object, being, first, a *rig* that would afford an effective sail power when required, and be easily disposed of when not needed; and, secondly, a *propeller* that would be wholly "featherable" or removable from the water quickly, when not wanted, and be again available for use without loss of time when required.



MAY'S PATENT RIGGING AND SAILS.

The accompanying illustrations will enable our readers to understand the distinctive characteristics of the improved rig. Some description of the leading points only will be necessary here. In the first illustration a ship is shown as steaming against a head wind and sea, under steadying storm sails and divested of all other canvas and top-hamper. In the second engraving the same ship is shown, with a

Correspondence

Balloon Controversy.

MESSRS EDITORS:—On page 246, Vol. VIII. (new series) of the SCIENTIFIC AMERICAN I find a communication relating to my balloon and written by an aeronaut, Mr. John La Mountain, who states as follows:—

"Mr. Shaw claims that he can 'trim' and 'tack ship,' in his air-vessel, as he would with a pleasure yacht, so that with a wind traveling in one direction he can haul close to it and move in another."

I make no such claim, and therefore what Mr. La Mountain has to say about lifting oneself from the floor by the rounds of an arm-chair, while sitting in it, is wholly uncalled-for and gratuitous. What I do claim is this:—That my balloon has a flattened surface on two sides, so constructed and stayed by cords that it will retain its shape; I connect the car and the balloon with a spur-wheel and pinion, so that the balloon can be revolved independent of the car; the latter being formed of two cylinders with a pumping apparatus, so that small quantities of the gas may be compressed so as to allow the aeronaut to elevate or depress his balloon at pleasure, without the use of ballast. With the wheel in one end of the car, like the wheel of a wind-mill, I claim that, by revolving it, I will be enabled to check the headway of the balloon and cause a circulation on the flattened surface, thereby enabling me to turn it in any desired direction and move *with* or *out of* the current. It is not my purpose to make head *against* the current, but to so control the direction of the balloon as to go *with* it or diagonally across it; so that when the balloon strikes a current blowing due east, I may so control its direction (by the use of the wheel) as to travel to the south-east or the south-west; and to accomplish a similar result when a current is encountered which moves to any of the cardinal points of the compass. In a word, I claim that, by means of the controlling power afforded by this wheel, I can travel west, south-west or north-west in a current blowing directly west; also east, south-east or north-east in a current blowing due east; and the same as to the currents blowing to the north or to the south. I do not propose to make head against a hurricane, as Mr. La Mountain intimates, but merely to so far control the direction of my course as to reach any desired point by the *aid* of the currents, and not in spite of them.

The balloon employed by Mr. La Mountain is identical with the original which was sent up from Paris in 1782—nothing more, nothing less. By means of hydrogen and sand-bags he raises and controls his air-ship, and notwithstanding all the "patient and elaborate study" which he has bestowed upon the subject, we find that he has thus far made not the slightest improvement upon the first paper balloon with which Montgolfier astonished the Parisians nearly a century ago. It is not strange that, under such circumstances, Mr. La Mountain should be somewhat jealous of innovations, especially when they emanate from a humble mechanic in an unpretending territory west of the Missouri. But time will vindicate or explode my theory, and I dismiss the subject for the present; promising that, so soon as a balloon of the proper dimensions can be prepared, with the apparatus for compressing the gas and governing the direction, &c., a test will be made of the practical working of my theory. If it meets my expectations and is found to work well, I trust *the* "aeronaut" of Lansingburgh will "come down" from the high position he has assumed, with less disaster than has sometimes resulted from rapid descents from his aeriel flights.

THOMAS L. SHAW.

Omaha, Nebraska, June 25, 1863.

[We have now permitted each of our aeronautic friends to have a fair hearing through our columns, which must terminate the controversy so far as we are concerned. Let them now turn their attention to the real practical question and see which will be the first to make aerial navigation of some value to the world. These ricketty discussions on the subject amount to nothing.—EDS.

The "Scientific American" in the Navy.

MESSRS. EDITORS:—It is nearly eight years since I first noticed your widely-known publication, under the title of the SCIENTIFIC AMERICAN, and I state with pleasure that I have always been much pleased with it, and I cannot do otherwise than recommend it to every working man for perusal. It brings light to the minds of those who are seeking after scientific truth, and it seems nearly impossible for me to do without it. During my two years' experience with the navy in the South, I made it a part of my business to notice how many of the vessels had the SCIENTIFIC AMERICAN on board, and I am happy to say that I found them on nearly all of them, and in every instance it was spoken of in the highest terms. It is the duty of every earnest reader of the SCIENTIFIC AMERICAN to encourage all within his reach to read it.

PETER SMITH, First-class Fireman, U. S. N.

New York, July 7, 1863.

Will Vulcanized Rubber corrode Iron?

MESSRS. EDITORS:—In reply to the letter of "Civil Engineer," on page 404, Vol. VIII, of the SCIENTIFIC AMERICAN, I would say that vulcanized rubber should never be used when the temperature exceeds that of boiling water. The leakage your correspondent refers to, as having taken place, appears to me to have been caused by the india-rubber packing having been destroyed (or partially destroyed) by the action of the heat; and the water that was forced through the then-imperfect joint, combining with the fire, caused the destruction of the plate around the joint. Cement should be used to make such joints.

W. T.

Schenectady, N. Y., June 30, 1863.

[Vulcanized rubber may be successfully used at temperatures not exceeding 230° Fah; at that point sulphur fuses and destroys the union between the rubber and itself.—EDS.

Novel Steamship Machinery.

By referring to the subjoined letter (addressed to the editor of the London *Engineer*) it will be seen that some reporters in this country, who try their "prentice hand" at reports of steamship trials, and who frequently astound the mechanical community with cylinders of "40 inches bore and 40 feet stroke" or similar inaccuracies, have their counterparts in England:—

SIR:—In an account given in the *Times* to-day, of the launch of the London and South-western Railway Company's steamship *Normandy*, I find the following:—

The engines will be supplied with improved surface condensers, arranged with separate cylinders, so that a vacuum can be maintained without the assistance of the main engines.

This I attempt to smooth over by imagining the air and circulating pumps worked by an auxiliary engine. But how am I to explain the following?—

The boilers are of a large size, fitted with brass tubes, the whole of which are of the feathering description, fitted with wood bushes, and also with the peculiar link motion applied to work the slide valves, so as to enable one man to start and stop the engines without difficulty.

I wish *Mr. Punch* was an engineer; perhaps he is. But, laying aside jokes, can any one conceive the *Times*, with its staff of clever reporters, sending a man (if it did send one) to report on the trial of a steamship, when it is evident he does not know a boiler from a paddle-wheel, and yet it is so, and not only so, but the report is published, and no doubt credited by many as a wonder! If these engineering descriptions are so faulty, is it likely that any other scientific reports given in that paper can be trusted? I know some of them are excellent, especially those connected with the navy. M. O. A. H.

London, June 18, 1863.

WHY COAL IS DEAR.—The suffering coal-miners who indulge in strikes so often, instigated doubtless by the bulls and bears of the stock market, now earn in La Salle, Ill., the modest amount of from $3 50 to $6 per day of seven hours; or $1 25 for every tun mined. The president of the coal company states that they have been obliged to pay $1 50 per tun during some parts of the season. The exaction is owing to a combination among the miners in that section of the country, by which they have bound themselves not to work at lower rates. The coal from La Salle is exclusively bituminous we believe.

The New Postal Law.

A new postal law, making a number of impo changes in the old system, was passed at the la sion of Congress, and went into effect on July Subjoined is an abstract of the law:—

No mail matter is to be delivered until the age is paid. Box rent is to be paid one quar advance. Letters uncalled-for are to be publis papers having the largest circulation. Lette foreign citizens are to be published in papers language. Letters of value sent to Dead Office are to be kept for four years if the writ not be found.

Carriers are to receive salaries from $800 to per annum, provided the local letters be suffic pay the same.

All domestic letters or transient printed whether passing through the mails or oth must be prepaid by stamps.

The maximum standard weight for sing postage, is one-half ounce avoirdupois. The rate of postage is three cents per half ounce paid by stamps. For all drop letters, two ce paid for each half ounce or frictional part extra postage or carrier's fee is required.

Where letters are sent without prepayment rates will be required before delivery.

Soldiers and sailors may send duly certified without prepayment.

When any writer shall endorse upon a pre ter his name and address, and a request fo turn if not called-for within thirty days or l letter shall not be advertised nor treated as letter, but returned, charged with postage paid rates.

Upon regular weekly, tri-weekly, sem and daily publications and all other regular tions, issued from a known office of public stated periods and sent to regular subscrib age is required to be paid quarterly in advan

The maximum standard weight for single on printed matter, will be four ounces avo the postage on which will be two cents, pr stamps. Rates to regular subscribers payable ly in advance for weekly papers, five cent weekly, ten cents; tri-weekly, fifteen cen thirty five cents.

Postmasters employing carriers may with publishers of newspapers for delivery subject to the approval of the Postmaster

No package weighing over 4 pounds ca veyed by mail, except public documents.

Publishers may enclose in their publicat to regular subscribers, the bills for sub thereto without any additional charge fo and may write or print upon their publi upon the wrappers thereof, the name and the subscribers thereto, and the date when scription will expire; but any other enclos dition, in writing or in print, shall subject to letter postage, which shall be collected livery thereof.

AN OSCILLATING CYLINDER LOCOMOTIVE.—*Engineer* contains an engraving of a locom with oscillating engines, which is entirel regards its actual projection, although th been suggested to us many times. The c four in number, two in one, on each side outside connected and supported by the a ing. The motion of the cylinder causes t open for the supply of steam. "The princi says the inventor, Mr. Joseph Faulding, viate the inertia and momentum of th parts." We do not learn that any step taken towards building a large engine on ciple.

GUNS FOR CHARLESTON.—Orders have b from the Navy Department directing th to Port Royal of a large number of heav for our *Monitors*. Several of these imm of ordnance have already been put on bo at the navy yard. They are to replace guns now on board the *Weehawken*, *Naha* armed ships.

IN New South Wales there is a population and 800 public schools, in which 35,000 receiving instruction.

Scientific American.

A WEEKLY JOURNAL OF PRACTICAL INFORMATION IN ART, SCIENCE, MECHANICS, CHEMISTRY AND MANUFACTURES.

VOL. VIII.—NO. 13. (NEW SERIES.)

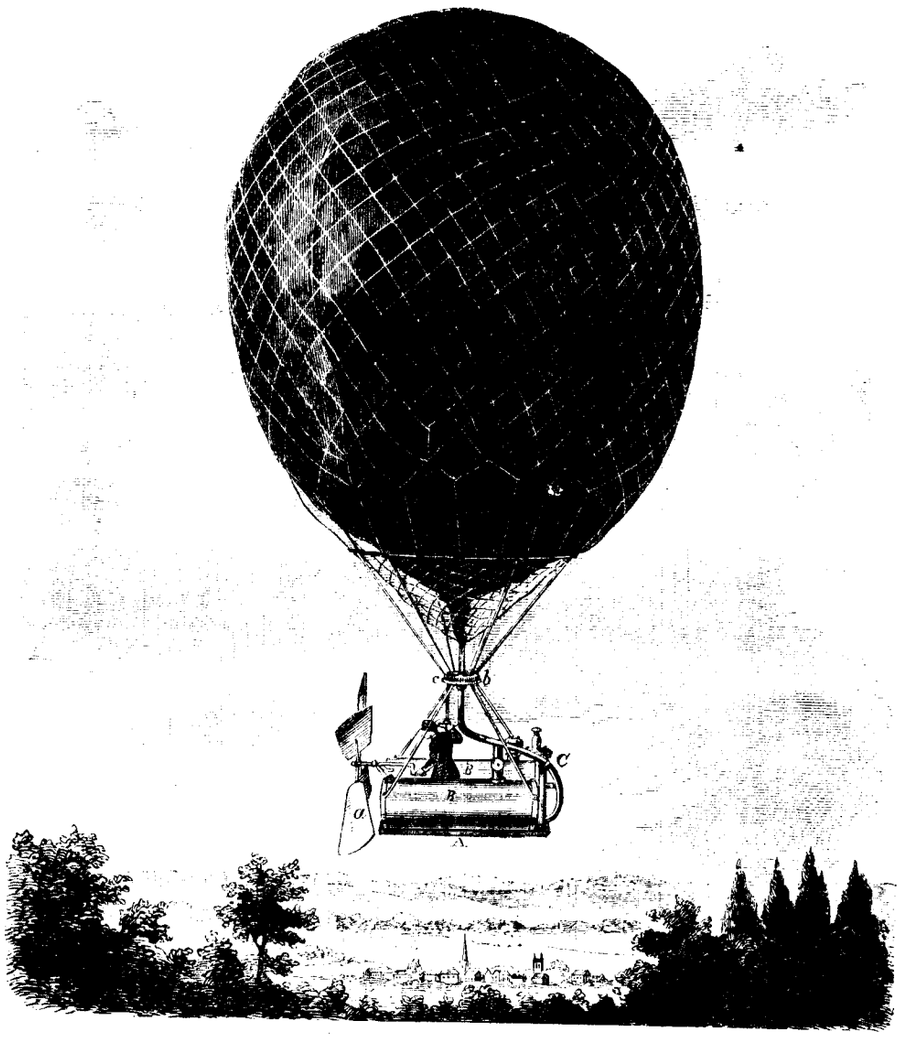
NEW YORK, MARCH 28, 1863.

SINGLE COPIES SIX CENTS. $3 PER ANNUM—IN ADVANCE.

The Science of Aerostation.

Most of the great inventions of the age have been perfected only through patient and elaborate investigation. Successive steps in constructing models or in studying out philosophical laws and principles, have brought the steam engine, the sewing machine and other inventions, to their present condition; and it is only through pursuing a similar course that ideas and plans, which seem at present chimerical, will ever be made useful to man. Aeronauts have for years endeavored to bring the science of ballooning to a practical basis; but, as yet, the only benefits derived from them have been those experiments which Government has instituted in military operations for observing the position or force of the enemy. The difficulties encountered in navigating the air are mainly those arising from the absence of any machinery for controlling the direction of the balloon. Modern science has supplied a gas for inflating the machine sufficiently light to maintain a great altitude above the earth for several hours in succession; but, as before remarked, no control can be exerted on the balloon, and it is wholly dependent for its direction upon the currents of air that blow at certain seasons of the year. Balloonists, indeed, maintain that by rising from one current to another they can move from a stated point and back to it again by taking advantage of this peculiarity in the atmosphere; these assertions are without any practical results; and remain—mere theories.

Mr. Thomas L. Shaw, of Nebraska Territory, has been engaged for some time in making experiments with aerial machines, and thinks he has discovered a method by which he can control the direction of the balloon and move wheresoever he listeth. Our engraving represents his device. It consists of an oval balloon, and the platform, A, on which are two light metallic cylinders, B, and a pumping apparatus, C; there is also a fan or propeller at the stern of the balloon, which is to be worked by the aeronaut. At *b* there may be seen a large spur wheel, in which a small pinion *c*, works; this pinion has a long shaft which is provided with a wheel at the lower extremity. The operation of this apparatus is as follows:—The aeronaut having ascended to any desired hight, is impelled by the current of air then blowing; if that direction is the one which he is desirous of taking, he can sail leisurely along to his destination. Let us suppose, however, that celestial business calls an aeronaut to an opposite point, he can then trim his balloon to the opposing current, and *tack to larboard and starboard*, just as a ship on the ocean does. This is done in the following manner:—The balloon, having two flat surfaces (it being oval), is worked up into the wind by the operation of the propeller; the hand wheel is then turned, and the balloon itself moves, by the action of the pinion in the gearing, to any angle required, the car remaining stationary by the action of the propeller on the atmosphere; the machine then sails off diagonally through the atmosphere by the current impinging on the flat surface. When the aeronaut deems that he has journeyed far enough he "trims his sail to the favoring gale," and goes off upon the starboard tack, and so reaches his journey's end; in other words, the apparatus here illustrated, the inventor says, can, by his arrangement, "tack" in the air to the right or left according as the balloon is regulated. The condensing cylinders are used instead of ballast; when the balloon is ascending too rapidly, the gas is pumped out of the flattened sphere into the cylinders; or is discharged from them into the same when the reverse is the case. The inventor of this balloon is a practical mechanic, and he says that a small model, from which this view is taken, answers the expectations formed of it. He is quite sanguine of success, and thinks that ballooning is destined to become one of the greatest of modern inventions for annihilating time and space. Whether his anticipations will ever be realized is more than any one can say. Fulton was derided and Fitch was called a maniac; George Stephenson was held in no higher estimation when he first broached his plans and projects for railway machinery; but time has shown that these men were not fools, although their scoffers were. Who shall say that "The Overland Balloon Company" will not yet be established? The inventor's address is Thos. L. Shaw, Omaha city, N. T. The apparatus was patented on Feb. 10, 1863.



SHAW'S PATENT BALLOON.

A Costly Experiment.

A correspondent informs us that fifty ten-inch columbiads have been selected from the Government stock, by the War Department, to be rifled and then fired until they burst. Twenty-five of them are to be strengthened by the addition of the wrought-iron band upon the exterior of the breech before firing. The firing has been carried on daily for some time past, near Cold Spring, N. Y., and some weeks must still elapse before the experiment is concluded. It is found, that at about the one-thousandth round, the plain rifled gun bursts, while the banded gun, after subjection to the same test, remains apparently as strong as ever. The object of the experiment is to ascertain the comparative strength of the guns, after rifling, with and without the re-inforce or strengthening band. The Government is in a fair way to possess itself of the knowledge, but the process is most slow and expensive. It is said to cost $10,000 to burst one of the guns!

Scientific American.

KLY JOURNAL OF PRACTICAL INFORMATION IN ART, SCIENCE, MECHANICS, CHEMISTRY AND MANUFACTURES.

—NO. 16. }
ERIES.) }

NEW YORK, APRIL 18, 1863.

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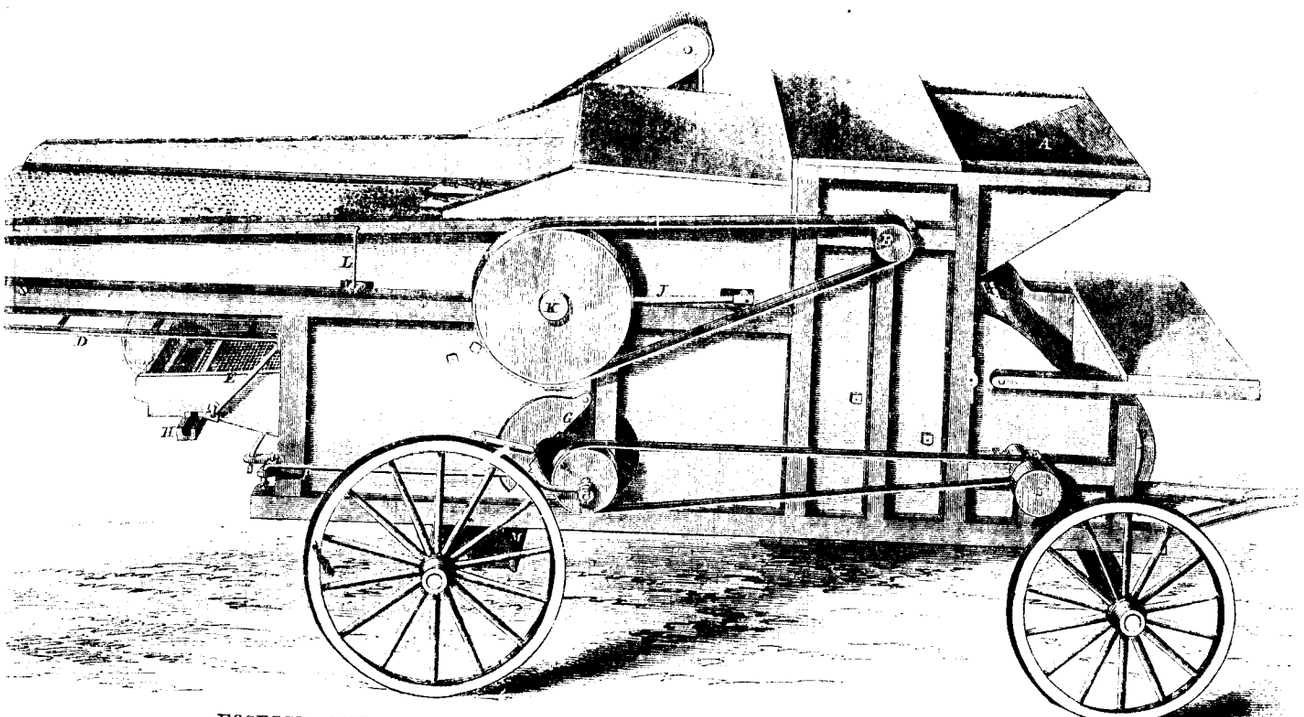
ıproved Clover Thrasher and Huller.

s of men are more indebted to the inven- s of the country than our farmers. For rs the SCIENTIFIC AMERICAN has illustrated al machinery having the latest improve- l usually of the best kind; as the demand the number of improved machines brought ice keeps pace with it.

bine here illustrated is mounted on wheels ins every appliance needful to separate from the head. It thrashes, cleans, and



FOSDICK AND CRAWFORD'S CLOVER THRASHER AND HULLER.

pares the seed for use. The clover to is thrown into the opening, A, and revolving cylinder, whose pulley and is seen at B. This cylinder, and the beneath it, is provided with a num- teeth or spikes, which tear open the nit the seed to fall out on the perfor- straw-carrier, C. Below this table er, over which the endless apron, D, aws the clover-seed to the screens, E. re placed one over the other and are crank and rod, F; this arrangement notion by which the dirt and chaff is fan-wheel, G. One end of the screens lide-ways, H. The trough at the end eceives the partially cleaned seed, and d up by the elevators to the perfor- nd goes through the cleansing process or as often as is deemed necessary to peration. Three serrated bars, I, are pper table; these are for the purpose straw and holding it loosely so that or work underneath it without clog- le has also a reciprocating motion h the medium of the connecting rod, J, worked from an eccentric on the shaft, K. The ends of the table are supported by the pendent rods, L. When the seed is thoroughly cleaned it is dis- charged into bags or other receptacles, placed be- neath the chute, M. The whole process is extremely simple and efficient, and the work is done, we are as- sured, in the most thorough manner. The machine is driven by either horse or steam power, and can be readily transported to any point of a field or from one farm to another for use. It was patented on Dec. 16, 1862, through the Scientific American Patent Agency; further particulars may be obtained by ad- dressing the patentees, Messrs. Fosdick & Crawford, at Dowagiac, Mich.

New Material in the Arts.

We have recently seen samples of a new substance lately perfected, which promises to become very use- ful. The principal material is wood dust, combined with other substances in such a manner as to render it extremely plastic; so much so that it can be readi- ly molded into every conceivable form. The inventor has succeeded in combining the finely-granulated portions of several kinds of precious woods in such a manner as to closely imitate the natural appearance, and this process he says he can repeat at will. The specimens we have seen are moldings, arabesques, and reproductions of various ornamental figures from the dies wherein the material was pressed. The dies were only experimental ones, made from plaster of Paris, and the pressure applied simply that which could be exerted by an ordinary copying press; yet with these crude tools very fine samples of carving have been produced. The articles can be afforded, we are told, at an unprecedentedly low price. From an inspection of the material used, and the manu- factured articles, we think this new process is des- tined to become extremely useful and desirable. The love for the beautiful, which all our people possess in such a remarkable degree, can be gratified by the expenditure of very small sums; and we may expect to see furniture, ornamented with figures molded from this substance, sold at prices within the reach of all. The great variety of uses to which the molded wood may be adapted is not the least remarkable feature of it. Among the articles which can be made from it we may specify stereotype plates, figures of birds, beasts and reptiles, toys, picture frames, chair backs of all kinds, in fact almost everything usually made from plastic substances. When properly prepared it is not affected by heat or cold, and withstands the action of the atmosphere, so we are assured by the inventor. Various modifications in the manner of applying this material have been suggested to us, but we cannot allude to them in detail. Those in- terested in the matter will do well to consult the business notice of it on our advertising page.

The Stevens Battery.

We should be very glad to hear that the Govern- ment had decided to accept the very liberal propo- sition recently made to it by E. A. Stevens, Esq., in regard to the completion of his battery. We have been looking daily for some public announcement to this effect, but have not seen any as yet. The provisions of the obligation Mr. Stevens places him- self under are, ostensibly, fair enough; and we do not see how the Navy Department can excuse itself from accepting this splendid vessel. It is rather a singular spectacle to see that Department protesting against being made the recipient of a first-class war vessel when the country needs them so much.

Correspondence

"The Science of Aerostation."

MESSRS. EDITORS:—On page 193, current volume of the SCIENTIFIC AMERICAN, you presented an elaborate article, illustrated by an engraving, in which it was stated that a gentleman named Thomas L. Shaw, of Nebraska Territory, "thinks he has discovered a means whereby he can govern the direction of the balloon, and move wheresoever he listeth." In commenting upon that claim, you remark that "most of the great inventions of the age have been perfected through patient and elaborate investigation," but with a very proper and wise caution you refrain from expressing an opinion that the "investigation" of Mr. Shaw has produced any practical fruit. An experience covering a number of years, and embracing as much of "patient and elaborate" study as was ever devoted by any other person to the subject, has given me some claim to speak in reference to it. As a result of my observation, I venture to affirm, with a confidence which I am well assured no future events will prove mistaken, that thus far every invention made with the object of reducing the navigation of the air to a mathematical certainty is a failure, and that every apparatus devised for the purpose of controlling balloons in the "ether sea" as ships are governed on the "waste of waters" is a labor-lost experiment. In pronouncing this opinion, in which I include Mr. Shaw's device with all others, it is proper that I—who have as much interest as any other living man in the success of those endeavors—should state why I have been led to entertain it. I will do so, very well knowing that in making contribution to your valuable sheet, "brevity is the soul of wit."

First: Mr. Shaw claims that he can "trim" and "tack ship" in his air-vessel as he would with a pleasure yacht; so that, with a wind traveling in one direction, he can haul close to it and move in another. The fallacy of this assumption must be instantly manifest to any one acquainted with the elementary principles of science. If Mr. Shaw had said that a man could sit in an arm chair, and, by taking hold of its rounds, lift himself off the floor, the declaration would have been quite as truthful. Why is it that a ship can tack against the wind? Clearly for the reason that the hull or body of the vessel is immersed in the water, while the sails, or propelling machinery are in another element, the air. The vessel has a center board, or keel, well down in the water, which presents a resisting force and keeps it from drifting, while the wind bears away the sails and imparts motion. If the ship and sails were all under water, would this be the case? The balloon, net, car and fixtures are all enveloped by a single element, in which and with which it travels, and must necessarily do so. The horse gets a foot-hold and draws, the ship gets a foothold and travels against the wind, but the only foothold for a balloon is a shifting or variable current, with which it must travel.

Second: Mr. Shaw talks about condensing cylinders, but very much like a man who has no practical ideas on the subject whatever. You understand perfectly well, of course, that in order to condense gas a very powerful apparatus is necessary. Nothing else than a steam engine will avail, and for several very cogent reasons. To reduce a thousand cubic feet of gas to fifty feet—the pressure of the atmosphere being fifteen pounds—would require, in order to do it as rapidly as necessary, a steam engine of twelve to fifteen horse-power; no manual apparatus would avail. The cylinder to contain this diminished bulk—the elasticity of the element being considered—must be strong enough to resist a pressure of five or six hundred pounds to the square inch. The best locomotive boilers are capable of withstanding a pressure of only one hundred and twenty to thirty pounds to the inch. [You are mistaken, Mr. La Mountain, boilers of the kind in question bear nearly twice that pressure, or two hundred and twenty pounds to the square inch, working pressure.—Eds.] To reduce a single thousand feet of gas to thirty-two feet, would call for a pressure of four hundred and eighty pounds to the inch; and as the bulk increased, the pressure must do so necessarily. You can imagine how powerful the apparatus called for must be. Mr. Shaw may say that he would "gear up." The answer to this would be, that what he thus gained in power he would lose in time; and in aerostation time is an all-important consideration. Does your inventor propose to carry up a steam engine, the needful fuel, the water which will be evaporated, and a heavy cylinder and compact pump, to retain and condense the gas? Then his apparatus would be so heavy as to require a "flattened sphere" of such size that it would be entirely unmanageable in the wind. Probably the managers of some of your New York gas manufactories could give the gentleman information that would be novel to him, respecting the difficulty of condensing gas.

Third: To have his balloon "tack to the wind," Mr. Shaw proposes to make it with a flat surface. Is not this rather ridiculous? Every amateur who has studied the philosophy of aerostation must understand the fact that balloons are made globular because in that form they present the greatest possible surface, with the least resistance to the atmosphere. If you fashion one 30 feet in diameter, it has a capacity of 14,137 cubic feet, and an ascensive power of 884 lbs.; but one having twice the diameter, or 60 feet, has a capacity of 113,098 cubic feet, and a lifting force of 7,069 lbs. Increase your diameter to 100 feet, and you get a capacity of 523,599 cubic feet, and an ascensive power of 32,725 lbs. It follows that, by retaining this form, you might, if you saw fit, make your balloon of boiler iron, weighing two pounds to the square foot, and by a sufficient increase of diameter, would still have ascensive force to lift it. How with the flattened sphere? It is not possible to make one with a breadth of 20 feet at the equator, however light your material, which will do more than lift itself, and no matter how much you increase the size, you gain nothing. If its diameter extended from New York to Dunkirk, it would hardly elevate itself. Where would Mr. Shaw get power to carry up his steam engine, fuel, water, and condensing apparatus? Again, how does he propose to keep the sides of his sphere flattened? Are they to be made of boards, or zinc, or some other non-yielding material? Otherwise, the "upward tendency" of the gas would inevitably "bulge" them out, and neither Mr. Shaw nor "any other man" would be able to make a net to prevent it. For the "mission" of the net is not to give shape to the balloon, but to hold it in equipoise, and afford fastening for the attendant car.

Fourth: I do not make these remarks in the character of an "old fogy." On the contrary, I have been considered somewhat of a balloon enthusiast myself. I have simply to say that I have practically tested every idea which Mr. Shaw advances, and proved its fallacy. It is quite possible to dispense with ballast to a great degree, and to elevate or depress a balloon by a fan-shaped apparatus, if power can be got to run it; and for this purpose the "perpetual machine" with which you humorously propose to make a voyage to the moon is a desideratum. I had a small model of such a contrivance rigged to my monster balloon "Atlantic," with which I made the longest trip by far on record, from St. Louis, Mo., to Watertown, N. Y., nearly twelve hundred miles. The propeller can, however, only be run by an engine. This occupies room, makes weight, uses fuel. It is perfectly practicable to navigate air, with a reasonable degree of certainty, but this is to be done—not by such means as your inventor proposes—but by taking advantage of certain atmospheric peculiarities, as well defined and fixed as the precession of the equinoxes. There is always traveling from West to East—as I have demonstrated in scores of ascensions with this express object—a current which belts the earth, and the aeronaut has but to enter it, and his direction is fixed. Upon this fact I have often staked my reputation and my life. Of it I am as well well assured as of the flow of the Hudson or, what is better as an analogy, of the great Gulf stream. By this current I am fully resolved—so soon as I shall have completed preparations which I am now making, and events shall leave the public mind free to attend to such matters—to hazard a voyage across the Atlantic ocean, which I am certain I shall accomplish. Meanwhile, understand I do not say that "perpetual motion" machines and "flying apparatuses" and "railroads to the moon" are impossible; I assist that no practical contrivance of the kind has been devised.

JOHN LA MOUNTAIN,
Lansingburgh, N. Y., April 10, 1863.

Boiler Explosions.

MESSRS. EDITORS:—I have long been some such explanation as that contain 210, current volume of the SCIENTIFIC to account for many boiler explosion cur without any ascertained cause. the minds of most engineers a con many explosions do not occur from d struction or inability to withstand working pressure. With this idea t theories have been invented, and acc want of something better, until destroy sults of practical experience. One of that by Mr. Z. Colburn, which certai very plausible, and great credit was Late experience, however, with our gun tended to confirm that theory. In three cases shots have penetrated the the boiler, and the escaping steam has of the crew to death. According to boiler ought certainly, to have explod sult, however, has not followed. Neit that more than a small proportion say 25 per cent, occur from defective seen a 4-feet boiler with ⅜-inch plate pounds. I have also seen an old 4-fe ing 40 pounds, which, after it was found to be only 1/16th of an inch thick erable length along the junction of brickwork. The majority of explosio the engine is started, or when the wa or the safety valve eased. The rise of any heated surface by any of these make steam so rapidly that it would at the safety valve some seconds befor The result would be still more slow means of the cold-water pump. Be sons it is questionable if the over-hea make steam enough to raise the pr siderably. Mr. Colburn gives figures could not. We must look to some those above-mentioned for many exp a fact, as you state, that water may open vessel to 360°, and then taneously, the same result might pressure. We want no other ex while discussing the subject, I wil connected with it, which came under A hand-pump which was used for fi its inlet to the boiler in the ste using it when the steam was up, water was injected it occasioned a ports, like those of a pistol shot this was occasioned by water or unable to say. Perhaps some of observed the same results.

Philadelphia, Pa., April 7, 1863.

Questions to Mille

MESSRS. EDITORS:—In a late nu TIFIC AMERICAN you suggest to par portunity to try various burr dres ing, and report the results; and a doubt, be liberally responded to, few questions of experienced mill burr (say 3½ feet) make more mi one? Does a deep-furrowed burr dlings than shallow furrows? W middlings on, a dull burr or a s yields the greater proportion of or a close burr? Which will gr what proportion of middlings is to a bushel of sound fall wheat extra or family flour, when no Is a bran-duster economical wit some miller will answer these qu will confer a lasting favor on m

A B.

Wyandott, Kansas, March 31,

A NEW sewing-machine manuf lished in East Bridgeport, Conn. from Mr. Barnum. We understa Jr., is the chief proprietor.

Correspondence

"The Science of Aerostation."

ERS. EDITORS :—On page 193, current volume of ENTIFIC AMERICAN, you presented an elaborate , illustrated by an engraving, in which it was that a gentleman named Thomas L. Shaw, braska Territory, "thinks he has discovered a whereby he can govern the direction of the n, and move wheresoever he listeth." In com- ng upon that claim, you remark that "most of eat inventions of the age have been perfected gh patient and elaborate investigation," but very proper and wise caution you refrain from sing an opinion that the "investigation" of haw has produced any practical fruit. An ex- ce covering a number of years, and embracing ch of "patient and elaborate" study as was evoted by any other person to the subject, has me some claim to speak in reference to it. As lt of my observation, I venture to affirm, with idence which I am well assured no future events prove mistaken, that thus far every invention with the object of reducing the navigation of ir to a mathematical certainty is a failure, and every apparatus devised for the purpose of con- ng balloons in the "ether sea" as ships are ned on the "waste of waters" is a labor-lost iment. In pronouncing this opinion, in which lude Mr. Shaw's device with all others, it is er that I—who have as much interest as any living man in the success of those endeavors— ld state why I have been led to entertain it. I lo so, very well knowing that in making contri- n to your valuable sheet, "brevity is the soul t."

rst: Mr. Shaw claims that he can "trim" and k ship" in his air-vessel as he would with a sure yacht; so that, with a wind traveling in direction, he can haul close to it and move in her. The fallacy of this assumption must be in- tly manifest to any one acquainted with the entary principles of science. If Mr. Shaw had that a man could sit in an arm chair, and, by ng hold of its rounds, lift himself off the floor, declaration would have been quite as truthful. y is it that a ship can tack against the wind? rly for the reason that the hull or body of the l is immersed in the water, while the sails, or elling machinery are in another element, the air. vessel has a center board, or keel, well down in water, which presents a resisting force and keeps om drifting, while the wind bears away the sails imparts motion. If the ship and sails were all er water, would this be the case? The balloon, car and fixtures are all enveloped by a single ment, in which and with which it travels, and st necessarily do so. The horse gets a foot-hold draws, the ship gets a foothold and travels inst the wind, but the only foothold for a bal- a is a shifting or variable current, with which it st travel.

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JOHN LA MOUNTAIN, Aeronaut.

Lansingburgh, N. Y., April 10, 1863.

Boiler Explosions.

MESSRS. EDITORS :—I have long been looking for some such explanation as that contained on page 210, current volume of the SCIENTIFIC AMERICAN, to account for many boiler explosions which occur without any ascertained cause. There is in the minds of most engineers a conviction that many explosions do not occur from defective construction or inability to withstand the ordinary working pressure. With this idea theories upon theories have been invented, and accepted for the want of something better, until destroyed by the results of practical experience. One of the latest is that by Mr. Z. Colburn, which certainly appeared very plausible, and great credit was given to it. Late experience, however, with our gunboats has not tended to confirm that theory. In some two or three cases shots have penetrated the steam drum of the boiler, and the escaping steam has scalded many of the crew to death. According to his theory the boiler ought certainly, to have exploded; such a result, however, has not followed. Neither is it likely that more than a small proportion of explosions, say 25 per cent, occur from defective plates. I have seen a 4-feet boiler with $\frac{3}{8}$-inch plates tested to 400 pounds. I have also seen an old 4-feet boiler working 40 pounds, which, after it was taken out was found to be only $\frac{1}{10}$th of an inch thick for a considerable length along the junction of the boiler and brickwork. The majority of explosions occur just as the engine is started, or when the water is turned on, or the safety valve eased. The rise of the water over any heated surface by any of these means could not make steam so rapidly that it would not be indicated at the safety valve some seconds before the explosion. The result would be still more slowly attained by means of the cold-water pump. Besides these reasons it is questionable if the over-heated plates could make steam enough to raise the pressure very considerably. Mr. Colburn gives figures to prove they could not. We must look to some other cause than those above mentioned for many explosions. If it is a fact, as you state, that water may be heated in an open vessel to 360°, and then explode instantaneously, the same result might also occur under pressure. We want no other explanation. And while discussing the subject, I will mention a fact connected with it, which came under my observation. A hand-pump which was used for filling a boiler had its inlet to the boiler in the steam space. Upon using it when the steam was up, every time the water was injected it occasioned a series of loud reports, like those of a pistol shot inside—whether this was occasioned by water or air entering I am unable to say. Perhaps some of your readers have observed the same results.

E. BROWN.

Philadelphia, Pa., April 7, 1863.

Questions to Millers.

MESSRS. EDITORS :—In a late number of the SCIENTIFIC AMERICAN you suggest to parties having the opportunity to try various burr dresses, &c., for grinding, and report the results; and as it will, I have no doubt, be liberally responded to, I would here ask a few questions of experienced millers :—Does a sharp burr (say 3½ feet) make more middlings than a dull one? Does a deep-furrowed burr make more middlings than shallow furrows? Which is best to grind middlings on, a dull burr or a sharp one? Which yields the greater proportion of middlings, an open or a close burr? Which will grind the fastest, and what proportion of middlings is the common yield to a bushel of sound fall wheat in making double-extra or family flour, when no bran-duster is used? Is a bran-duster economical with steam power? If some miller will answer these queries correctly, they will confer a lasting favor on many persons.

A BACKWOODS MILLER.

Wyandott, Kansas, March 31, 1863.

A NEW sewing-machine manufactory is to be established in East Bridgeport, Conn., on land purchased from Mr. Barnum. We understand that Elias Howe, Jr., is the chief proprietor.