BULLETINS

OF THE

Aerial Experiment Association

Bulletin No. XVII Issued MONDAY, NOV. 2, 1908

MR. McCURDY'S COPY.

BEINN BHREAGH, NEAR BADDECK, NOVA SCOTIA

BULLETIN STAFF.

Alexander Graham Bell.....Editor.
Gardiner H. Bell.....Asst.Editor.
Charles R. Cox.....Typewriter.
Mabel B. McCurdy....Stenographer.

Bulletins of the Aerial Experiment Association.

BULLETIN NO. XVII ISSUED MONDAY NOV. 2, 1908.

Beinn Bhreagh, Near Baddeck, Nova Scotia.

Bulletin No. XVII

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Mauro, Cameron, Lewis & Massie to Bell.

To Dr. A. G. Bell,
Baddeck, N.S.

Washington, D.C., Oct. 10, 1908:- We have yours of the 5th inst. with enclosed note by Mr. Edmund Lyon, and the article by Mr. Carl Dienstbach, and as you surmise, these notes will be of value to Mr. Cameron in the preparation of the specification.

Mr. Cameron has had a long interview with Mr. G. J. Bell in regard to the business situation and as to the course to be taken in the execution of the specification. In this connection, Mr. Bell got the original written agreement of the Aerial Experiment Association, in which occurs the clause that all of the members of the Association are to be recognised as joint-inventors. Probably the intent of this clause was to the effect that all of the members of the Association were to be recognized as joint-owners of any inventions that were made by the members of the Association during the life of the Association. The question as to who are and who are not joint-inventors is one that is determined by the law, and cannot be fixed by members of the Association by simply executing articles of agreement to any particular effect, though you can agree, for example, that the invention of one of you shall be the joint property of all of you. Still, under the law, the application would have to be made by the individual who was the inventor. This brings us to the consideration of the question as to who is to execute the application in the present instance. It must be executed by each of those who contributed any of the inventive ideas which are to be covered by the claims of the patent.

By inventive ideas we do not mean simply a suggestion that it might be well to do one thing or another, but the conception of the means by which the desirable thing is accomplished. If any of the particular means employed in your structure, and which are to be covered by the claims, originated with Lieut. Selfridge, then Lieut. Selfridge must be recognized as a joint-inventor, and to fail to do so would be to jeopardize the validity of the patent. The same is true as to each and every one of the other parties of the Association.

On the other hand, it would be equally as fatal to include as a joint-inventor someone who did not contribute any one of the actual inventive ideas to be protected by the claims of the patent. Mr. C.J. Bell seems to have gained the impression that the structure to be patented really originated with yourself and Mr. Baldwin, and that the others were keenly interested in the success of the enterprise and offered suggestions of one kind or another, and worked earnestly and conscientiously to help make the enterprise a success, but that they did not originate any of the ideas which are to contribute the subject-matter protected by the patent. If this is correct, then yourself and Mr. Baldwin would be the joint- inventors, and only yourself and Mr. Baldwin would need to execute the application. Mr. Cameron's understanding of the matter however, is not in accord with that which seems to be entertained by Mr. C.J. Bell. On the occasion of his visit to Hammondsport Mr. C. recognized the fact that the question of inventorship was liable to be a complicated one, and took occasion to closely

question all of the gentlemen there, including Lieut. Selfridge, and it seemed to be the unanimous opinion of these gentlemen that the structure was the result of the joint mental and mechanical efforts of all of the members of the Association, and that it would be very difficult, if not wellnigh impossible, to state just what particular parts were contributed by the several individuals, with the exception of one or two prominent features. All were working together for the accomplishment of the desired end, one suggesting one thing and one another, and the result of the joint efforts of all, gradually developed and evolved after months of work, was the June Bug. If this be the correct statement of facts, then all the members of the Association are joint inventors, of which Lieut. Selfridge is one, and it will be necessary that an executor or administrator of his estate be appointed, such executor or administrator to execute the papers. While it would be desirable to avoid this complication still if the facts are in accordance with Mr. Cameron's understanding, it is the only safe course to pursue. If they are not in accordance with Mr. Cameron's understanding, but are as Mr. C.J. Bell understands the matter, then the specification should be executed only by yourself and Mr. Baldwin, and then assigned to a Trustee to hold in trust for the members of the A.E.A.

Mr. C.J. Bell informed Mr. Cameron that at a meeting in this city, the members of the Association agreed to extend the time limit of the agreement for six months from Oct. 1, 1908, which would carry the time to the first of April 1909, and that such agreement was recorded in the minutes of the

meeting held here in Washington. The best way to accomplish such an extension would be to simply endorse on the outside of the present original agreement the following:

"The term of this agreement is hereby extended to April 1st, 1909".

and this endorsement should be signed by each membr of the Association. We do not think it need be signed by any representative of Mr. Selfridge, since Mr. Selfridge's contribution to the enterprize necessarily terminated with his death.

When the specification and claims are laid before you, you will be perhaps better able to decide as to general inventorship by a careful consideration of the subject-matter claimed and a discussion of the whole situation with Mr. Baldwin and Mr. McCurdy.

(Signed) Maure, Cameron, Lewis & Massie.

Bell to Maure, Cameron, Lewis & Massie

To Maure, Cameron, Lewis & Massie,
Washington, D.C.

Baddeck, N.S., Oct. 29, 1908:- Your note of Oct. 10 was received in due course and contents noted.

Please forward specification and claims as soon as possible. When we know what the claims are we can better take up the question of specific inventorship.

(Signed) Alexander Graham Bell.

Mr. Charles J. Bell to Bell.

To A.G. Bell,
Baddeck, N.S.

Washington, D.C., Oct. 8, 1908:- I had quite a long interview this morning with Mr. Cameron in relation to aerial matters. He appears to have quite a grasp of the situation, and to understand very thoroughly the various points brought out in your memorandum.

I have requested him to go ahead and prepare a skeleton of the application to be made for a patent, and as soon as it is finished he will forward same to you for criticism and advise. I showed him the agreement which was entered into between yourself and the other members of the Association in September 1907.

The wording of that agreement is a little unfortunate, it is headed, "Agreement to organize the Aerial Experimental Association", and all the way through apparently contemplates some other paper to be drawn to complete the organisation.

The language used should have been "we hereby associate ourselves together" instead of "hereby agree to associate ourselves together". In another paragraph it states "we agree that the Aerial Experimental Association shall be organised on the first day of October, 1907, and shall exist for one year". Another paragraph says "any applications for letters patent shall be made in the names of all the members as joint-inventors", this is contrary to law. An application for a patent must be made by the inventor, or inventors, and not signed by any other person. It is of course quite possible

to have a patent application signed by a number of persons who have each taken part in the invention, but they cannot sign the application as joint-inventors, simply because of an agreement which stated they should do so, whether they really are participants in the invention or not.

The first question for you and the other gentlemen interested to decide and advise Mr. Cameron of is, did Lieut. Selfridge contribute towards the inventions which you propose to be patented, if so, he should join, and being dead, his place should be taken by the legal representative of his estate. If, however, he was not actually one of the joint-inventors his signature would not be proper on the application, even though you had entered into an agreement to the effect that he should sign. The mere fact that he did not sign the application would not in any way prejudice his right to participate in the result of the invention which is covered by the terms of the agreement. In any case it is absolutely necessary that an administrator should be appointed for his estate, and steps for this purpose should be taken without delay.

The agreement contains a clause that it shall remain in effect for one year from the date of organization, unless otherwise determined by the unanimous vote of the members. This apparently contemplated, not an extension of the agreement, but that it might be terminated prior to one year, provided unanimous consent was given.

I wish therefore you would send me a copy of the minutes of the meeting held in Washington September last, by which you agreed to make a further extension for six months, as I should recommend that such an agreement be put in writing and made part of the original contract with the signatures of all the parties interested thereto.

Undoubtedly any interest of Lieut. Selfridge whether such interest was obtained as one of the joint-inventors or as joint-owner in the patents, might for government use be claimed as property of the United States, he having acquired such interest while in the line of duty. This, however would not give the United States a right to claim the use of the machine without first compensating the other owners. It might, however, enable them to tie up the business of the Association if they desired to do so.

I have hurriedly taken up the points talked over with Mr. Cameron. I was very much pleased with the study he has made of the entire subject, and believe that he will prepare specifications which will meet with your approval.

(Signed) Charles J. Bell

Bell to Charles J. Bell.

To Charles J. Bell,
Pres. Am. Sec. & Trust Co.,
Washington, D.C.

Baddeck, N.S., Oct. 29, 1908.---The question of inventorship is going to be a very complicated one, as the idea of the Association was joint work; one member would contribute one idea, another another, until really it is going to be very difficult to decide who were, or who were not participants in the development of any specific idea.

Of course the inventions will be limited to the claims and when we receive from Mr. Cameron a copy of the calims he proposes to make we can more hopefully look into the question of inventorship of these specific points.

Curtiss and McCurdy will be here soon so we will be all together by the time the claims can arrive here.

You will find in the Bulletins which have been sent to you an account of the Washington Meeting in September last.

You speak of the absolute necessity of having an administrator appointed for the estate of the late Thomas E. Selfridge. None of us know how to go to work upon this matter, and we would all be very much obliged if you, as Trustee of the Association, could take up the matter with Mr. E.A. Selfridge father of Lieut. Selfridge. His address is 2615 California Street, San Francisco, California.---

(Signed) Alexander Graham Bell.

THE ADAMS COMPANY TO BELL.

COPY.

Dr. Alexander Graham Bell,
1331 Connecticut Avenue,
Washington, D.C.

Dubuque, Iowa, Oct. 6, 1908:- The writer was interested in your article appearing in Aeronautics in reference to the Bleriot accident which in all probability was brought about by the action of gyroscopic force.

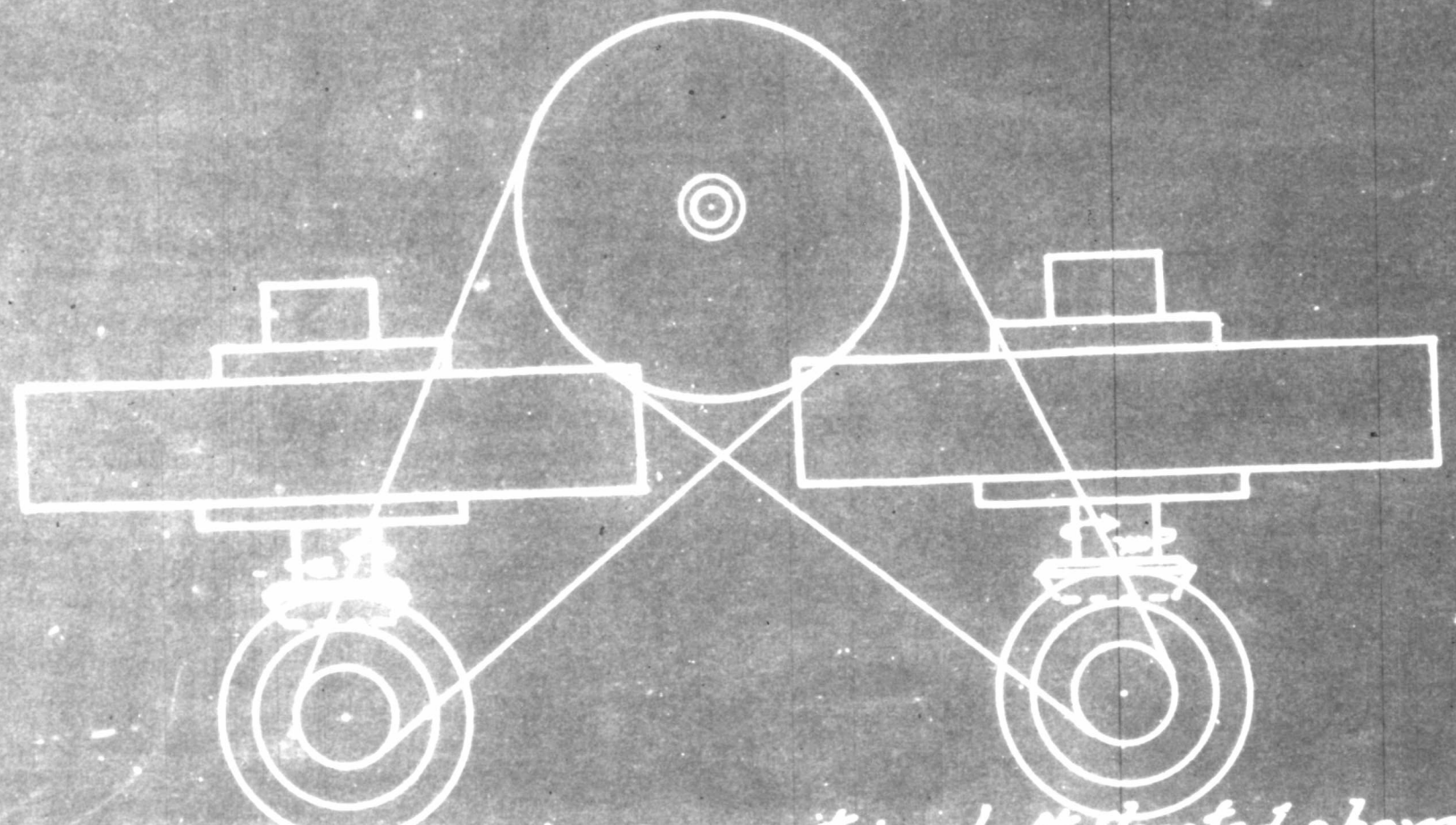
We have always contended that the maximum of safety is only secured by the use of two motors revolving in opposite directions and two propellers revolving in opposite directions, as this neutralizes all torque and gyroscopic effects.

As you may not be familar with the details of our revolving motor we are mailing a copy of our aeronautic catalogue under separate cover and enclose herewith blue prints showing a few of the methods of using two such motors to drive various transmission mechanisms.

We call your attention in particular to the fact that our motor weighs only 2.7 pounds per horse-power including the carbureter, oil tank, oiler and timer. We employ no cooling device whatever but believe that we have the only motor in existence that is perfectly and automatically cooled at all times.

Although it would be possible to revolve these motors in a vertical plane, we have never built them to run in that way with the exception of a three cylinder of 3 1/2" bore which we are now designing for direction connection to an electric generator, making a very compact portable generating plant.

THE ADAMS COMPANY
DUBUQUE IOWA



Two motors driving concentric shafts (located above motors) in opposite directions

As you are probably aware Mr. Emile Berliner has been experimenting with a couple of our motors for some time and is so well pleased with the results that he wishes us to build a special motor of higher power for him.

We hope that you will find our motor interesting and assure you that we will be pleased to hear from you in regard to same.

(Signed) The Adams Company.
Glenn Muffly, Sales Agent.

Bell To Adams Company.

To The Adams Company,
Dubuque, Iowa.

Baddeck, N.S., Oct. 29, 1908:- Your note of October 6 has been forwarded to me here, and I am very much interested in your motors, especially in the blue print submitted showing two motors revolving in opposite directions, operating two concentric propeller shafts also rotating in opposite directions.

I should like to have some details concerning the weight of such an arrangement giving about 40 H.P. in all, and some idea of the price.

(Signed) Alexander Graham Bell.

Russell Thayer to Bell.

To Prof. A.G. Bell,
Baddeck, N.S.

Philadelphia, Pa., Sept. 25, 1908:- I enclose herewith a paper on Dirigible Airships which I think will be interesting to you. I am certain of the fact that the principle that I have discovered, solves the matter of Aerial Navigation, so far as the dirigible is concerned, and I am very anxious to have one of them constructed.

I have worked out all the details, and am ready to build. A dirigible can be built, that can travel all over the United States, at the cost of an ordinary automobile, viz, $4000.00. I want to interest some one to furnish say $5000.00 to build one of these.

Nobody seems to realise it, but this is really a wonderful thing; with your large experience you must see its value to the World.

(Signed) Russell Thayer.

P.S. I enclose a bent card. Lay it on your table and first blow on the flat side of the bent part; and then turn it one quarter around, and blow on it, and you will see that it proves my statement. R.S.T.

Bell to Russell Thayer.

To Russell Thayer,
Broad and Arch Sts.,
Philadelphia, Pa.

Baddeck, N.S., Oct. 21, 1908:- I have been away from home and your note of Sept. 25 has just been brought to my attention.

Allow me to assure you of the very great interest that the members of the Aerial Experiment Association take in your idea of developing and utilising gyroscopic force to provide, as it were, a lever in space without any fulcrum on the earth so as to utilize wind pressure upon a balloon as a means of propulsion.

While our attention is more particularly directed to the development of heavier-than-air machines so that we cannot assist you directly in developing experimentally your important ideas relating to balloons, we can at all events express sympathy with your work and appreciation of the central thought that guides it.

If you can suggest any means by which this Association could assist you in making known your ideas to persons who would be willing to give you the means to test them we feel that we might thereby be instrumental in opening up a new field of experimental work that might prove of great practical importance.

Why not write to General Allen, Chief Signal Officer of the U S Army, who is now experimenting with dirigible balloons. You are at liberty to say to him that, while we cannot endorse all the points you claim until demonstrated by experiment, we think your ideas are eminently worthy of practical investigation and should be tested.

Your little experiment with the kite card is interesting and suggestive.

(Signed) Alexander Graham Bell

THAYER DIRIGIBLE AIRSHIP:
By Russell Thayer.

An aerial vessel that can be propelled through the atmosphere with the same facility and in the same manner as a ship sailing upon the ocean.

This new discovery for the propulsion of dirigible airships, is based on the development and application of gyroscopic forces, in combination with the forces developed by the wind pressure on the sail of the airship.

The following well known law of Mechanics may be taken as the basis of this discovery. It is one of the laws which govern the motions of the celestial bodies, the Sun, the Planets and the other Stars in their revolutions through space.

A body suspended in space and free to move in any direction, if acted upon by two or more extraneous forces, will take up a motion of translation in the line of its least resistance, due to the resultant of the forces acting upon it.

The following law also, relating to andgoverning the movements of rotating bodies, may also be here referred to viz: When a body rotating upon a principal axis, is subjected to a force tending to produce another rotation not parallel to the former, the resultant effect is such displacement of the axis of the original rotation, with respect to its support, as is most favorable to the parallelism of the two rotations, and such displacement is at right angles to the direction of the disturbing force.

I have discovered, that by utilizing the reactive gyroscopic force manifested upon any attempt to change the

direction of the axis of a rotary body, in combination with the wind pressure upon a balloon floating in the atmosphere and carrying said body; that the movement of the balloon may be variably determined and controlled by correlation of the force developed by the gyroscope and the force of the air current.

TRAVERSE DIRIGIBLE AIRSHIP.

In other words, my invention provides means, whereby wind pressure tending to diverge a balloon from a predetermined direction of traverse, may be variably opposed by the gyroscopic effect of a rotary body carried by the balloon, under the control of the operator, so that such wind pressure may be utilized to propel the balloon in directions oblique to the wind pressure, as in ordinary marine navigation.

The gyroscopic effect that I refer to, is due to the fact that a rotary body tends to maintain constant its plane of rotation, and consequent direction of its axis of rotation; such effect being increased or diminished in correspondence with the speed of rotation of the body.

It is important to note, however, that to render such reactive effect available, it is necessary to so mount the rotary body, that its axis of rotation, is free to oscillate, to a limited extent, in a direction parallel to the direction of said axis.

It is interesting to here note the various commercial uses to which the gyroscope has been adapted, in order to utilize its curious powers.

To the untrained mind it seems to possess mysterious faculties. It will support itself, for instance, suspended in space, at right angles to a cord, resisting continuously the constant force of gravity, while it is spinning at high speed.

Other interesting phenomena may be demonstrated by its means. The laws of rotating bodies however, are well understood by mathematicians, and while it is quite true that the mathematics of the gyroscope are complicated and obtuse, nevertheless there is no mystery about the matter, and the forces developed by the gyroscope follow the established laws of rotating bodies, which are free to move and rotate at high speed, on what I may term <u>elastic axes.</u>

The peculiar property that the axis of a rotating gyroscope possesses of continuously pointing in a fixed given direction, notwithstanding the motion of translation of the Earth through space, and its independent rotation on its own axis, has been used by the astronomer for the usefull purpose of maintaining the axis of his astronomical telescope constantly trained upon a star, that he may be observing, thus being able to observe it continuously in the field of view, while otherwise, in a few seconds it would pass across the lens.

One of the first uses to which the gyroscope was adapted, after its discovery, was in Marine Navigation; in order to provide an artificial horizon on a moving vessel, in order to make observations. For this purpose the gyroscope is caused to revolve on a vertical axis; this was in use for

some time, and I believe is still in use in certain navies in the world.

The gyroscope is used very effectually and almost universally in controlling the direction of traverse of the Submarine war torpedo, known as the Whitehead torpedo, that deadly instrument of destruction, now in general use in all the Navies of the World.

In this instance it is placed inside the casing and near the stern of the torpedo, and by an ingenious arrangement operates two small rudders which maintain the direction of traverse of the torpedo on its predetermined course.

This result is effected by utilizing the same force that I use in aerial navigation, but of course, in an entirely different manner.

The Mono-Rail system of Mr. Louis Brennan, uses the forces of the gyroscope to balance the cars on the single rail roadway that is employed in this system.

The well known and costly experiment of Sir Henry Bessemer made by that distinguished and accomplished engineer about 25 years ago, to utilize the principle of the gyroscope to prevent the rolling of ships in a sea-way at Sea, may also be referred to. Sir Henry however failed in the experiment, for the reason that he overlooked one of the essential laws of the revolution of the gyroscope, and it is said that he expended about a million dollars on this work.

Dr. Otto Schlick, a German engineer of Berlin, first demonstrated the practical utility of the gyroscope, in preventing a ship from rolling in a sea-way.

In July 1906, with the sea so rough that the ship (the Sea-Bar) rolled through an arc of thirty degrees, when the gyroscope was not in revolution, the arc of rolling was reduced to one degree, when the gyroscope was set spinning and its secondary bearings released.

In other words it practically abolished the rolling motion of the Craft, causing its deck to remain substantially level, when the ship as a whole heaved up and down with the waves.

The Dirigible Balloon as now universally used, particularly in the various Armies of the World, is propelled through space by means of fans or propellers, which as may be readily understood are very ineffectual in propulsion.

There is an enormous waste of power, due to the slip of the fan blades etc., and in a wind of any considerable velocity the structure is quite helpless.

The problem of the navigation of the air, after the invention of the balloon has always been to devise some point of support upon which we can take hold, so to speak, in order to utilize the propelling effect of wind pressure.

This of course (until my discovery) it has been impossible to do, as the entire structure is drifting in a fluid, in which the structure itself is immersed.

The use of the gyroscopic forces that I have described, solves the problem, and gives us a line of support against which we may apply and utilize wind force to propel our craft.

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Developing and utilizing the forces of the gyroscope in the manner that I have described, actually provides a lever in space without any fulcrum on the earth, and the results following from this fact are evident and far reaching.

By the proper use of sail and rudder and gyroscopic forces, our dirigible airship may be propelled in any direction except against or close to the wind, when the wind is blowing at variable speeds, and, as we are navigating an ocean some five miles in depth, without rocks or other obstructions, the possibilities of the dirigible airship, particularly for war purposes are very great.

(Signed) Russell Thayer.

Am. Soc. C.E.

VAUGHN TO BELL.

COPY.

U.S.S. Yorktown, 3rd Rate,
Valdez, Alaska,
Sept. 15, 1908.

Dr. Alexander Graham Bell,
Hammondsport, N.Y.

Dear Sir:

Being an enthusiastic admirer and student of Aerial Navigation, and more especially of the "Aeroplane System" of navigating the air, I take the liberty of presenting to you some of my ideas in the construction of aeroplanes with hopes that some of them will be of value to you and help to solve the universal problem of soaring the air.

While I have never seen an aeroplane at close quarters, I have made a careful study of the photographs and articles about airships, which are published from time to time in various magazines. In all of the machines, except the ones you and the Wrights are constructing, I find one great fault, and that is not having full control of the wings, and not having them so arranged that they can be made to meet the different currents of air and ensure stability under any circumstances. Another fault is: I may be wrong, most of the machines have a tremendous vertical rudder for steering the ship. Take Dumont's machine, Delagrange's machine, Farman's machine and others, and you will find that they all have a large vertical rudder, with me it seems as though it would be impossible for them to steer across a strong current of

air for any distance without heading into it. Take Farman's machine with its big box kite tail, nearly as large as the wings themselves. Do you think that it is hardly possible for him to steer across a stiff wind with ease? Take for example one of the oldest inventions, the windmill, it has a very large vertical rudder which keeps the mill headed toward the wind in order to run. Also suppose that a ship, say 100 feet long, had a rudder attached to it 100 feet from its stern, do you think this ship could steer across a strong current of water, and not head up stream instead. I believe it a good idea not to have a vertical rudder if you could possibly do away with it. If the machine tends to zig-zag a very small vertical rudder could be placed astern to prevent this until something else is invented to stop the zig-zag motion. The rudder could be so arranged that if the machine does not go straight the rudder could be set at an angle to correct this error in construction. For making short turns I think my idea about the window shade vertical rudder (see description of drawings) attached to each end of the wings a good idea. When one rudder is opened it causes a resistance at that end which swings the machine around like a turn-table For long turns the flexible steel wing tips can be used. Incline the planes in the direction you want to go, and if I am not mistaken, the machine will make the turn. Take for example a bird, it has no vertical rudder, all it does is incline its body in the direction it wants to go and he

makes the turn. Take an expert bicycle rider, he can ride in any direction without holding the bars, by simply inclining his body in direction he wishes to go. Why wont an aeroplane do the same thing if handled right.

Another of my ideas, not in the drawings, is about the horizontal rudders astern. I believe the horizontal rudder should be used only in preventing the machine from pitching, correcting the fore and aft inclination, and making a landing, and NOT to be used in raising or lowering the machine from or to the ground. The horizontal rudder in front is for lowering or raising the machine and the horizontal rudder aft acts as a kind of tail to prevent the machine from pitching. When the machine alights the rudder aft is inclined in such a way that the tail wheel touches the ground first. In watching birds light in the water or on ground, I find that the tail is always a great deal lower than the wings, and by alighting in this position the tail and wings form a kind of air-brake to stop their forward motion.

I believe that in the future, if my ideas about flexible wing tips etc. prove successful that a machines stability in the air will be entirely governed by the gyroscope, or by a weight suspended and attached to the wing wires in such a way that if the machine tends to capsize, the weight or gyroscope will curve the wings to such an extent that the machine will right itself again. Why not use the operater and passengers in place of the weight. Have the seats so arranged that if a person sits on them he will be the same as a suspended weight. All of the miner details such as arrangement

of the machinery to do this work can very easily be done. Most machines rise in the air, but very few stay on account of not having arrangements made to overcome the different currents of air.

In order to have a light streng machine, I believe that all of the joints should be wrapped in different ways with streng cord, and covered with a thick coating of good glue and then painted. This is where seamanship comes in. If the frame is steel or iron wrap the joints with wire. I believe the canvas covering for the planes should be put on the bottom of both upper and lower frames, and not on top, (see drawing), as it offers less resistance and makes the frame stronger.

Doctor, if in writing this letter and submitting to you my plans and ideas, I seem to criticise your most highly appreciated and valued work, I wish to assure you that it is purely unintentional. I trust that it will not be taken as a criticism, but as ideas of a person who knows very little about aerial navigation, and from one who is anxious to become a student and to learn, with hopes that his ideas are not in vain.

Whenever the opportunity offers itself, and I am in a position to experiment with that line of work, I hope that some day I will be a close competitor for some of the big prizes which are now offered to the public in general.

Trusting that these ideas will be of some value to

ou in your experimental work, I wish to remain

(Signed) Sidney P. Vaughn,

United States Navy.

P.S. If you write please address me, U.S.S. Yorktown, care Post Master, San Francisco, California, and your letter will reach me O.K. I have other ideas which may prove of help to you.

P.P.S. Since writing this letter I have received the Scientific American, dated August 22. On page 124 they give photographs of the latest foreign aeroplanes. I think Gastambide is still on the wrong track. Capt. Ferber's machine is a good improvement, having a very small vertical rudder, but I don't think much of the rest of his design. Zen's aeroplane, as they say, is a great improvement over the rest. He has no vertical rudder, but his after horizontal rudder is too large. I don't like his idea about using the front rudder in rising and turning. He should use his wing tips. Am I right?

S.P.V.

Bell to Vaughn.

To Mr. Sydney P. Vaughn,
U.S.S. Yorktown,
c/o of Postmaster, San Francisco, Cal.

Baddock, N.S., Oct. 29, 1908:- There has been some delay in the delivery of your registered letter of September 15, which was forwarded from Hammondsport, N.Y. and only reached me here October 10.

All of the ideas contained in your letter seem to me to be eminently worthy of serious consideration.

It may be interesting to you to know that one or two of them had already been discussed by members of the Association and experiments instituted long before we heard from you. I allude especially to your proposition of wing tip controls placed at each side between the aeroplanes, and the idea of using the aviator himself on a swinging seat to control automatically the equilibrium of the machine, also the idea of using the wing tip controls to steer the machine in place of a vertical rudder.

This does not, of course, in any way detract from your merit in making the suggestions, nor from your generosity in communicating them to us.

(Signed) Alexander Graham Bell.

Chairman A.E.A.

DESCRIPTION OF DRAWINGS.

These drawings are not accurate in proportions and construction, and are made merely to point out new and perhaps useful ideas in the construction of aeroplanes.

Fig. 1-2 are partial drawings of aeroplanes pointing out positions of ideas which can be attached to any style of frames.

Like letters refer to like parts.

Fig. 1 is a simple drawing of an aeroplane frame showing position and construction of horizontal rudders between upper and lower planes. They also can be called a third plane which is moveable between the upper and lower planes. Also shows method of placing the canvas on the under side of plane framework.

Letters A-A^1 point out moveable horizontal rudders or third planes to which are attached wires working through block D to spools C-C^1-C^2 on shafts B-B^1. The rear end of these rudders swing clear of all framework and are supported only by the rear wires which work on rear shaft. The front end of planes are so arranged that they can slide up or down between the front stanchions and rod C (attached to stanchion) which forms a kind of slide. The wire on spools C and C^1 is wrapped differently. On spools C it is wrapped from you and on spools C^1 it is wrapped toward you. This permits the rudders being moved to meet different currents of air. When the rear end of plane A is low the rear end of plane A^1 is high and vice versa. The wires working the front part of planes are all wrapped one way on the spools C^2 on shaft B^1 . When the shaft B^1 is turned

it causes the front end of horizontal rudders A-A[1] to be raised or lowered. This causes the machine to rise or fall at the will of the operater. The opposite motion on the back part of the rudders is supposed to keep the ship on an even keel. Both shafts B-B[1] are worked by wires runing from spools C[3] to steering wheels handy to the operater. These horizontal rudders do away with the horizontal rudder which is used out in front of the machine and at the same time it keeps the machine from tipping or turning over. It can be used in turning curves and helps to do away with a large vertical rudder. Note particularly the way the wire is wrapped on rear spools.

Letter K shows a form of slat that supports the canvas. These slats are placed on <u>under side</u> (not on top) of both upper and lower parts of frame as shown in drawing. The canvas is put on the under side (not top side) of these slats. This makes the machine stronger and offers less resistance to the wind.

Fig. 2 is a drawing showing method of having flexible wing tips A-A and A[1]-A[1] with wires running to the steering wheel.

Letters B are flexible steel slats (tapering) attached to plane slats K. At the end of these steel slats are tapering steel rods or slats B[1] attached so that if the corner is pulled down it will take on a kind of spiral shape. The wires C-C[1] run opposite from corners, upper left hand corner and lower right hand corner, and meet on a steering wheel in such a way that if the wheel is turned it will cause the upper left

hand and lower right hand corner of flexible tips to form a spiral toward the opposite corners. The wires D-D[1] are worked the same way. If worked right these flexible wing tips will keep the machine on an even keel and it will be almost impossible to capsize it. In addition to this it does away with the vertical rudder in the rear. The flexible wing tips will turn the machine in any direction if worked right. To raise and lower the machine a flexible horizontal rudder attached to the upper and lower planes in front, as shown by dotted lines H, worked by wires should do the work of the horizontal rudder which is on a heavy frame in front on most machines. It is a good idea to use flexible wing tips on every part of the planes where they can be put to use. For making short quick turns with the machine, have two (one at each end) vertical rudders that opens and close like a window shade, connected to a steering wheel by wires C, as shown by F at right hand corner of Fig. 2. If the operator wishes to make a quick turn he opens up the shade or rudder, which causes a great resistance at the end of plane, and the machine will spin around like a turntable. By having these rudders on each end the operater can turn quickly in any direction. To keep the machine from zigzaging a very small vertical rudder (stationary) could be hung on behind with a small horizontal rudder to act as a kind of tail. S.P.V.

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AEROPLANES

-IMPROVEMENTS ON-

Sept. 12-1908

Fig 1.

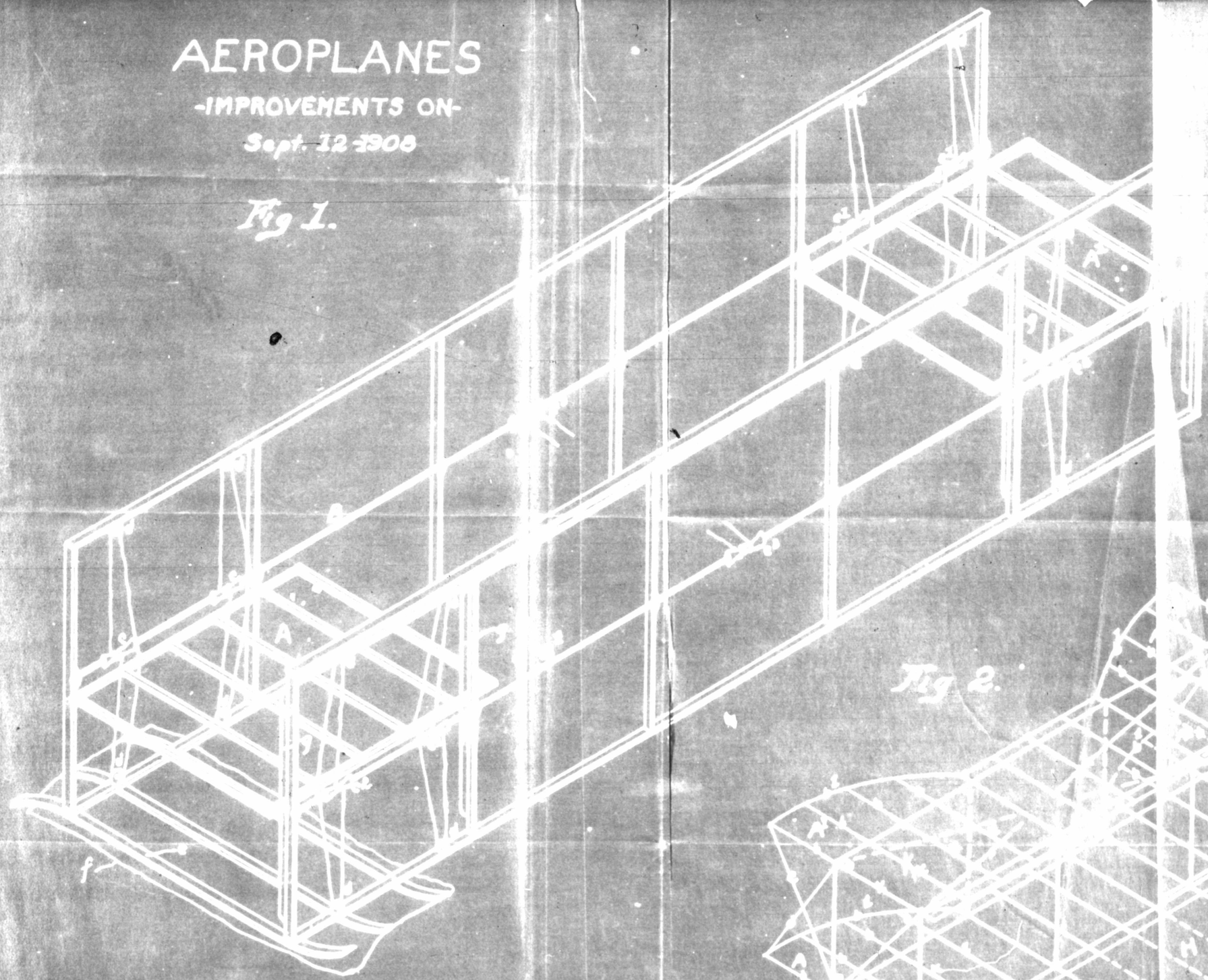


Fig 2.

S.P. VAUGHN
Designer

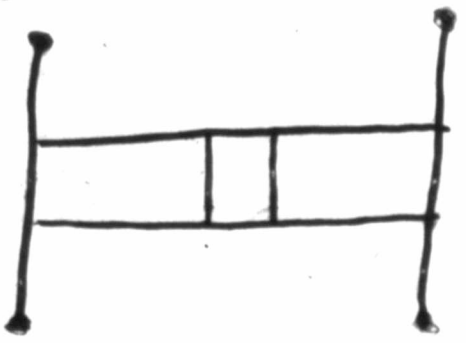
Robertson to Bell.

To Dr. A.G. Bell,
Washington, D.C.

Mt. Vernon, Indiana, Sept. 20, 1908:- I beg to submit for your consideration some crude ideas of mine on aerial craft. I do this for the benefit of the cause, and not with the hope of realizing anything in a financial way.

Formerly, while in the Government service at Washington, I used to occasionally consult with the Smithsonian Officials on this subject, but was never in sympathy with Prof. Langley's aeroplane ideas; and since the deplorable accident at Fort Meyer lately. I am more thoroughly convinced that of itself the aeroplane will never be a success, for war purposes. Nor am I in sympathy with Count Zeppelin's ideas of such a large dirigible balloon. I believe the successfull aerial machine of the future will be a "composite" embodying the three types, aeroplane, dirigible and helicopter, somewhat on the lines of the enclosed rough drawing.

I do not go into the minute details of construction in this, but you can get a good general idea of the design and will, I think, readily understand them. You will notice my idea is to have two small cigar-shaped balloons, each made in three separate sections, laced together and the two balloons harnessed together by a bamboo and aluminum frame like this



with two propellers for propulsion, hung on a center line between; and one lifting propeller (reversible) and several aeroplanes, as shown by blue lines: Also a small steering propeller fixed on a universal joint attached to the engine shaft.

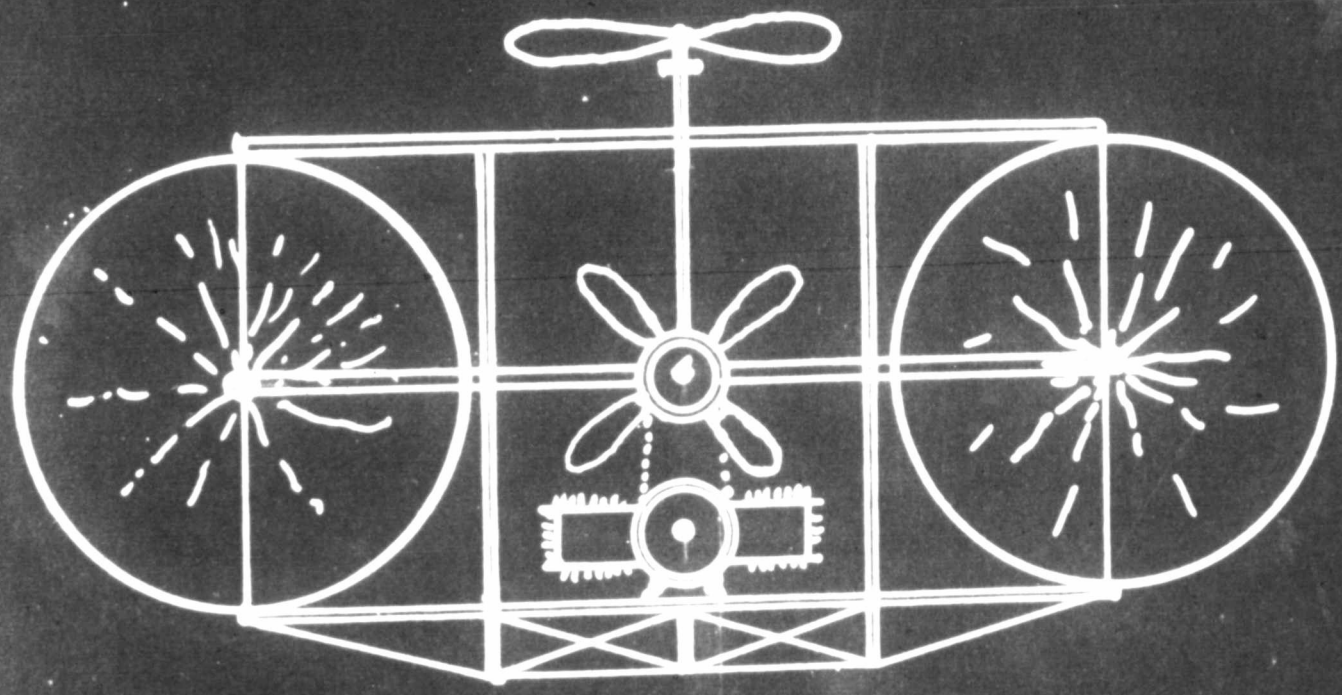
The balloons need not of themselves be large enough to raise the machine, but would assist the horizontal propeller, and give stability to the whole thing, and prevent a rapid descent in case the motor should stop.

The engine on the lower platform would help to balance the balloon, and the two vertical propellers placed on a center line between would have a straight forward pull on the nose of the balloons which is not possible with the single bag dirigible having the engine and propellers hung so far below.

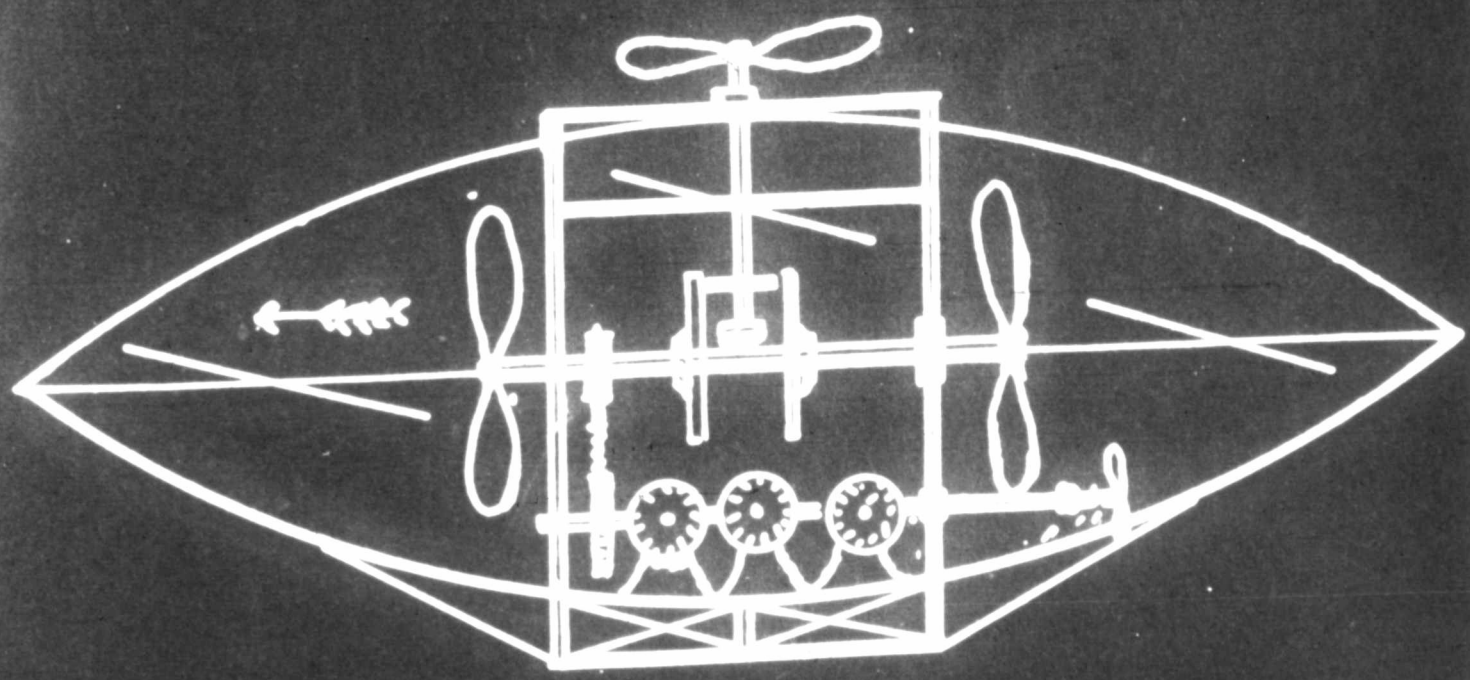
After the machine had been raised to the desired altitude, the lifting propeller could be disconnected and the two pushing propellers put in action, and these with aeroplanes and small gas bags would hold the whole machine up.

One advantage of this construction would be that in case it should be compelled to descend on the water, it would float with the engines above the water line.

I have as yet made no further attempt towards developing this idea, than the construction of a small model about

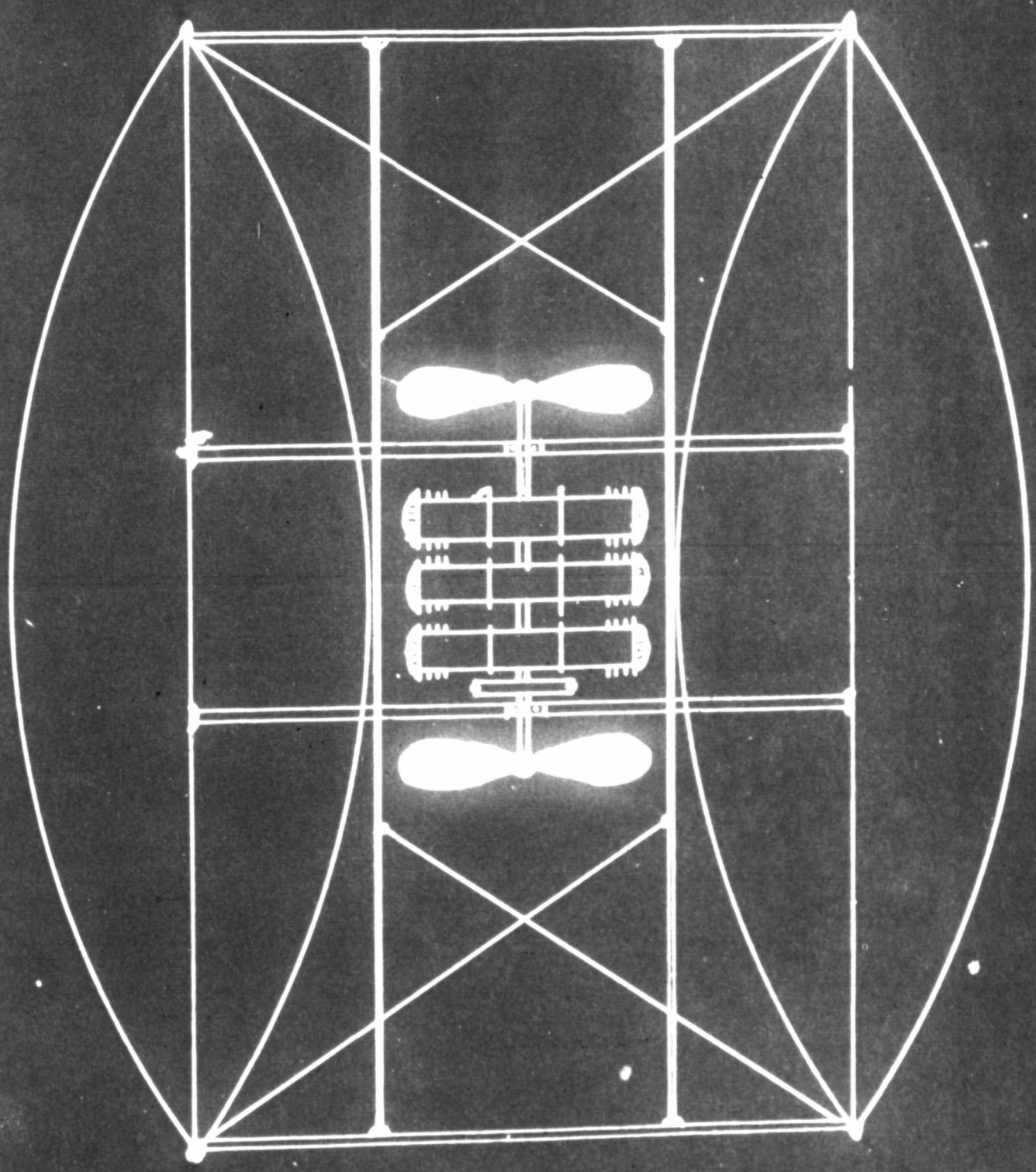


END VIEW



SIDE ELEVATION

GEO. W. ROBERTSON
INDIANA



PLAN

G. W. Robertson
Indiana.

24 x 36 inches.

I should be pleased to have you look into this design and perfect it, and give it a trial, if you think it worthy of consideration; and should you desire further details, as they occur to me, I would be pleased to give them in so far as I can.

As an Ex Navy Officer, I should be pleased to see the United States lead the world in matters of this class, as well as in battleships.

(Signed) Geo. W. Robertson.

Bell to Robertson.

To Mr. Geo. W. Robertson,
Mt. Vernon, Indiana.

Baddeck, N.S., Oct. 7, 1908:- Allow me to thank you for your note of Sept. 20 with accompanying illustrations of your suggested aerial craft.

The Aerial Experiment Association, of which I am Chairman, is as you probably know, an "Experiment Association" pure and simple carrying on experiments, not for gain, but to promote the art of aviation in America.

It would give me great pleasure to submit your ideas relating to an aerial craft to the members of this Association for discussion and consideration, if you so desire, but we cannot, of course, receive or consider communications of a confidential nature or be interested financially in them Any printed material or manuscripts that are not confidential we are always glad to receive and discuss.

I presume that your note to me and the illustration accompanying it are not intended to be confidential, and I will therefore communicate copies to the other members of the Association for their consideration unless I hear from you to the contrary. Although our Association is devoted mainly to experiments relating to heavier-than-air machines we are, of course, interested in all plans for aerial flight, and I have no doubt that the other members of the Association will be as much interested in your plans as I myself.

(Signed) Alexander Graham Bell.

Robertson to Bell.

To Dr. A.G. Bell,
Baddeck, N.S.

Mt. Vernon, Indiana, Oct. 15, 1908:- Your favor of 7th inst. in answer to my letter of Sept. 20 has been received. My suggestions on aerial craft were not for gain, but to promote the art of aviation in America; and it would please me to have you submit my plans to the members of the Association for discussion and consideration, as my letter was not intended to be confidential. I have never tried to take out any patents on this idea, and do not intend to.

I should be pleased to give you any further suggestions on the subject, as they may occur to me should you desire. The little model I have constructed (about 24" x 36") would show up the idea much better than the drawings, and I will ship it to you by express if you wish.

The point I stated in my letter of Sept. 20, that the gas bags need not necessarily be large enough to lift the machine depending on the horizontal propeller for a part of the lift, was with the idea of giving it greater speed when going forward and using the aeroplanes. In cases where speed was not desirable additional sections  of balloons could be inserted, so it would have more buoyancy and the bamboo harness frame lengthened. I am of the opinion that aeroplanes may be so perfected in time that they could probably be used as "Scouts" in war, but I think for real military service the aerial craft must be able to move slowly and steadily at times; or hover over any desired spot for a while and then move back to its headquarters rapidly.

(Signed) Geo. W. Robertson.