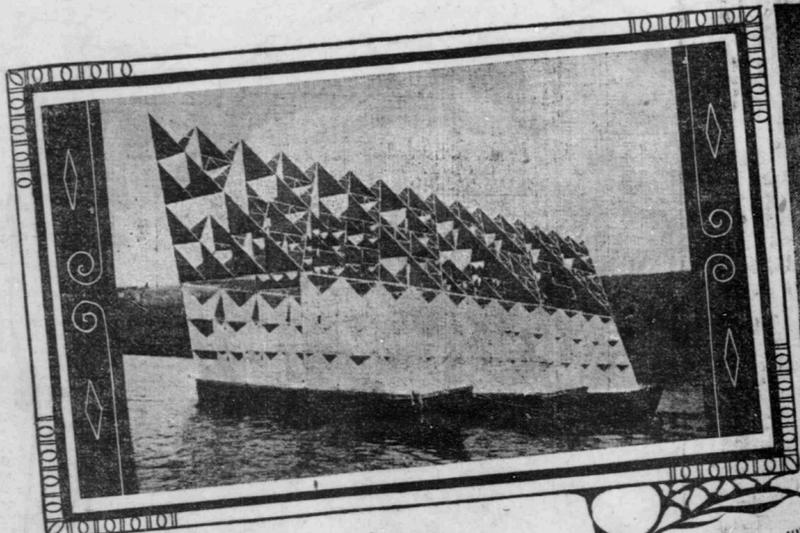


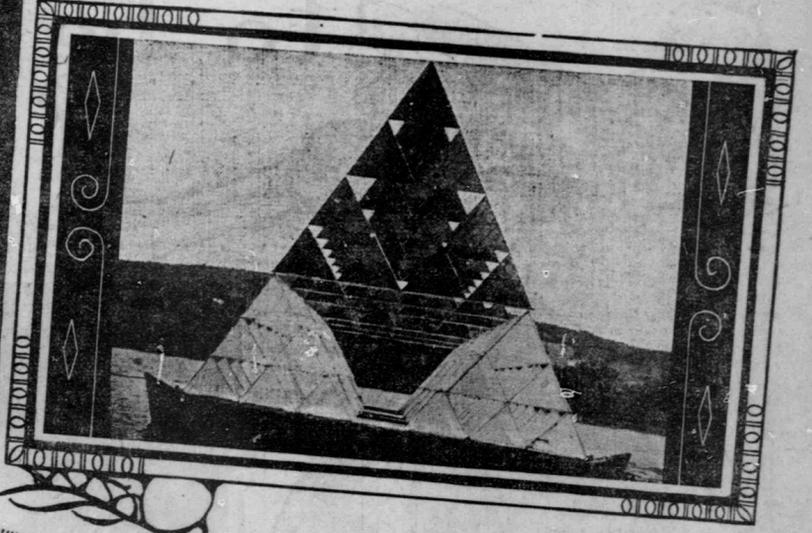
WASHINGTONIAN'S KITE TO BE FIRST FLYING MACHINE



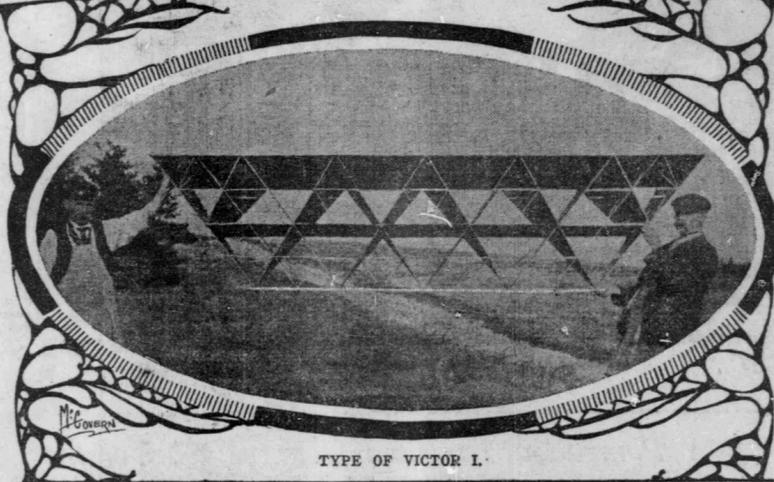
FRONT VIEW OF MABEL II.
Great kite of many cells, just before it rose from the lake at Baddeck.



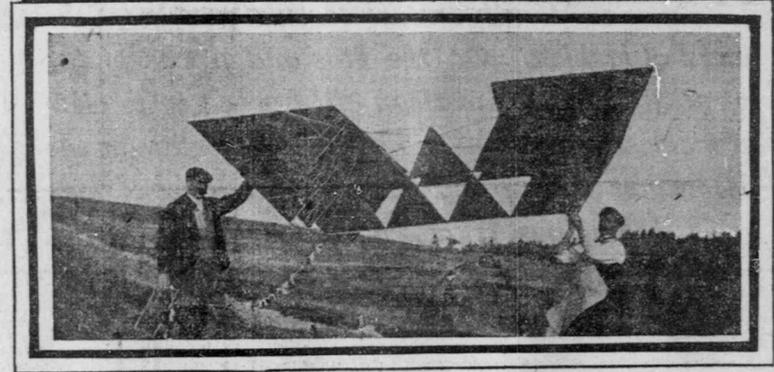
DR. ALEXANDER GRAHAM BELL.



WONDERFUL MABEL II.
Type of kite that may furnish the form for the airship of the future.



TYPE OF VICTOR I.



POWER AND GRACE COMBINED.
Victor I, the kite in which Dr. Bell himself sees the solution of the problem.
(Photographs Copyrighted by Gilbert H. Grosvenor.)

Dr. Alexander Graham Bell's Wonderful Discoveries in the Domain of the Navigation of the Air and Its Problems

WHEN over beyond Arlington next Saturday the tetrahedral kites of Dr. Alexander Graham Bell receive their first public test, an era will be marked in the development of the flying machine. There will be no indication, however, of the arduous thought and patient experiment that have made possible the brilliant success already achieved. To tell something of this and of the larger possibilities the future holds is the purpose of this article.

"A machine that will fly." That has been the dream of inventors for weary centuries, but only in dreams heretofore has it been successfully attained. The balloon, in its various manifestations, has marked the limit of achievement; flying machines, in the proper acceptance of the term, have never been built. It has remained for Dr. Bell to point out the way which he or some other inventor will go forward to the final solution of the problem.

It has been a weary trial of brain and nerve. Dr. Bell has been beset by the difficulties other investigators have encountered, so that at times he has felt almost like saying with the others, whose faith has not been as strong, "that the problem of aerial navigation will never be solved until there has been discovered a new metal or a new force." But Dr. Bell thinks he has solved it now, and though he quite realizes his investigations have been merely experimental and that time must be permitted to work out its own achievements, he is very steadfastly convinced the end is not far distant.

with great lifting ability. If this could be achieved the difficulty was passed, for the matter of motor and propeller would be relatively easy. To this problem, therefore, Dr. Bell directed his attention.

Triangular Cells Used.

His first modification of the Hargrave type was a kite formed of triangular cells. The box cells of the former did not lend themselves readily to combination, and did not fly well together. Yet Dr. Bell had already concluded that his hope lay in combining a number of small kites, rather than in building one of gigantic size. By combining the small kites he could outwit the law regulating the proportion between increased weight and increased lifting power, which had been shown to be so exceedingly unfair to the latter. The box cells would not lend themselves to this scheme. The adoption of the triangular cell followed the trial and abandonment of cells of various other shapes and types. Circular cells, polygonal cells of six, eight and twelve sides, with cells of many other shapes, were tried, found lacking, and thrown away.

Into the chaos of discouragement thus evolved, the idea of the triangular cell came to Dr. Bell with the grace of a benediction. It proved immediately an immense advantage over the rectangular Hargrave, being stronger in construction, lighter in weight, and offering less head resistance to the wind. The triangular cell needed bracing in one direction only, on its flat surface; in a transverse direction it is self-braced, so that internal bracing, which causes head resistance, was found to be unnecessary.

Problem But Half Solved.

But the problem, even now, was only half solved. Combinations of triangular kites must be arranged in two sets, with a powerful connecting framework. The larger the sets, the farther apart they must be, and the connecting frame, therefore, becomes exceedingly stout and heavy. Further improvement was necessary. The necessity of even the limited amount of bracing that remained as an inherent weakness of the triangular cell was to be obviated, and some method of doing away with the heavy connecting framework was a patent need. Dr. Bell reasoned that a cell could be made self-bracing in every direction by making it triangular in all directions or tetrahedral in form. This was the germ of the successful idea.

Astonishing results were attained. They are summed up as follows by Gilbert H. Grosvenor, editor of the "National Geographical Magazine," and Dr. Bell's assistant in most of his investigations:

The Wonderful Tetrahedral.

"First—A tetrahedral cell has astonishing strength even when composed of very light wooden stocks. As Dr. Bell has expressed it: 'It is not simply braced in two directions in space like a triangle, but in three directions like a solid. If I may coin a word, it possesses three-dimensional strength; not two-dimensional strength like a triangle, or one-dimensional strength like a rod. It is the skeleton of a solid, not of a surface or a line.'

"Second—A large kite constructed of tetrahedral cells is as solid as a small one, for it is likewise self-braced in all directions.

"Third—A kite built of tetrahedral cells is an almost perfect flyer; it is steady in squalls, a good lifter and flies almost directly overhead. Tetrahedral cells when combined do not interfere with each other in the least or hurt each other's flying ability as box or triangular cells do when combined.

"Fourth—By the use of the tetrahedral cell it is possible to build kites unlimited in size and in which, however gigantic the kite, the ratio of supporting surface to weight remains the same as in a small kite. The successive doubling in size of the kite may be carried on indefinitely without the weight increasing faster than the winged surface. The cells all act in harmony; no part of a kite built of tetrahedral cells

has to be strengthened to counterbalance an opposing force or a weakness in some part of the kite; no weight is thrown away."

Work Done at Baddeck.

On this basis, from experiment to experiment and from test to test, the investigations proceeded. The work was done and the experiments made at Dr. Bell's laboratory, at Baddeck, Nova Scotia. Here Dr. Bell and his assistants spend each summer, and thousands of tetrahedral cells have been constructed and kites of every imaginable shape and size have been made.

That kites constructed on this principle have lifting power sufficient to carry a man, or several men, has been amply demonstrated. One of the first of the kites lifted two men off their feet in a squall and on another occasion snapped the new three-eighth-inch manila rope with which it was connected with the earth, as easily as it could have done had the rope been a thread. Kites much more powerful have since been built and proved beyond a question that a practical, efficient and powerful method of combination of small forces has been discovered. The use of aluminum instead of black spruce, in the construction of the frames, which has been begun by Dr. Bell, has largely increased the strength of the kite, without material addition to the weight.

The cells are covered on two sides with silk or nainsook, the remaining sides being opened to the air. The softly yielding silk or cotton, very light in weight, resembles in its response to the wind the feathers on the wing of a bird.

The Great Desiderata.

Steadiness in the air and lifting power have been the ends toward the attainment of which Dr. Bell has aspired. Some of the kites are of immense size, exceeding twenty-five feet in length and twelve and fifteen feet in height and width. Notwithstanding their size and apparent unwieldiness, however, they respond to the direction of the operator perfectly, and can be launched into the air and drawn back to earth with most astonishing ease.

One thing Dr. Bell's experiments have conclusively shown. That is that small cells are much to be preferred to larger ones, responding better to the varying pressure of the wind during a squall, and preserving with a nearer approach to perfection the equilibrium of the kite of which they are the constituent parts.

Dr. Bell's most recent experiments, after he had covered the preliminary work of investigation and the determination of forms and values, was the construction of a kite of large size and man-lifting power, that would rise from the surface of the ground or a lake. This feat he has successfully accomplished.

He recognized that it would be necessary to provide some means of giving the machine sufficient momentum to enable it to begin its flight—the momentum that all large birds gain by running along on the ground. For purposes of this experiment an immense machine

was constructed, which was christened Mabel II, which was built upon a float on the lake at Baddeck.

With tetrahedral frames Dr. Bell had built three long boats, covered with oiled cloth to make them water-tight. The

boats possess great strength and yet, because of their tetrahedral structure, are so light as not to overweight the kite. The three boats were then ranged parallel to one another and the giant Mabel placed upon and fastened to them.

The initial velocity was secured by attaching the floating flying machine to the stern of a small steambot, which had been chartered for the purpose. As the steambot gained headway the great kite trembled for a few moments and then rose gracefully from the water and flew steadily the full length of the line. Mabel II had been shown fully capable of carrying both a man and the engine, and Dr. Bell has concluded that if the initial velocity necessary for flight can be given by a pull it can be given just as well by a push. In other words, that a motor attached to the machine and operating propellers can supply the momentum just as well as an outside force.

One of the beauties of Dr. Bell's models is that in every one there is a large, roomy space in the center where the operator and his passengers may sit. This position is much safer and more comfortable than sitting in a chair suspended some yards below the machine, and as the ultimate machine to be used in time of war, will be constructed of tougher material than wood and silk, the operator and the motor would be hidden, instead of offering a splendid target for ever-shotted from below. Dr. Bell is now trying to devise a kite of largely greater lifting power than those of the models he has constructed in the past. The product of this thought, Victor I, has been declared by a competent authority to be "the most wonderful kite ever devised and put together." It is built like the letter H, with great wings that flare away from the center.

Kite of a New Model.

This great kite rose from the land, without running, in a breeze so light that a flag on a pole fifty yards away hung limp and motionless. It glided up and up until it was flying six or seven

hundred yards above the earth, steady as a table top. In a breeze of fifteen miles an hour it flew as steadily as before, but nearer the perpendicular and with a tremendous pull.

The attachment of the motor and propellers will be the next step of the experiments, and it is not doubted that a motor sufficiently strong and light may be obtained. Indeed, there are such now on the market. Within a year or two at the outside Dr. Bell expects to have built a flying machine, which can be propelled through the air, at the will of the operators, without dependence upon the wind and in whatever direction is desired. He does not regard this as at all problematical, but as an absolute certainty.

Experiments at Arlington. The experiments beyond Arlington are not designed to go deeply into the subject, but merely to illustrate to scientists and others interested in the project of aerial navigation what has been accomplished in this direction with the aid of tetrahedral kites.

The kites that will be used are not of the largest size or the most recent type. Most of these are at the laboratory at Baddeck and could not be brought to Washington without some trouble. The experiments will illustrate, however, the vast lifting power of the tetrahedral kites and to point out the results that may confidently be expected to follow. Dr. Bell rather resents the color of intense importance that has been given the experiments in newspaper articles that have assumed to be descriptive of them.

The real work of final experiment will be done at Baddeck during the approaching summer. A larger kite of the model of Victor I will be built and to this a motor and propellers will be attached. Success at an early date is hoped for, but at any rate it cannot be long delayed. As Dr. Bell says, "The end is in sight."

Colors that blend with the sunshine. The woman who makes an art of dressing must consider her gowns with relation to the time and place of wearing. Almost any becoming light color looks well in a drawing room, and almost any becoming color that is not too brilliant or striking looks well on the street in the winter; but there are certain colors particularly beautiful with the summer, and these things should be remembered when shopping for summer clothes. Some colors, discordant indoors, have a great charm in an outdoor setting.

The woman who wore a red dress to the opera last winter found herself on very bad terms with her background, for the red boxes not only deadened the effect of a red gown, but made it positively disagreeable.

Yet the bright soft red, a raw and uncomfortable color indoors, has a delightful effect upon the golf links or tennis court, and the indispensable sweater when that color is pleasing for such use in spite of the fact that red is not, in most cases, an agreeable summer color.

The bright apple green—the old fashioned green—which is such a beautiful

Attachment of a Motor and Propellers All That Remains to Be Done to Make His Invention a Complete and Final Success.

boats possess great strength and yet, because of their tetrahedral structure, are so light as not to overweight the kite. The three boats were then ranged parallel to one another and the giant Mabel placed upon and fastened to them.

The initial velocity was secured by attaching the floating flying machine to the stern of a small steambot, which had been chartered for the purpose. As the steambot gained headway the great kite trembled for a few moments and then rose gracefully from the water and flew steadily the full length of the line. Mabel II had been shown fully capable of carrying both a man and the engine, and Dr. Bell has concluded that if the initial velocity necessary for flight can be given by a pull it can be given just as well by a push. In other words, that a motor attached to the machine and operating propellers can supply the momentum just as well as an outside force.

One of the beauties of Dr. Bell's models is that in every one there is a large, roomy space in the center where the operator and his passengers may sit. This position is much safer and more comfortable than sitting in a chair suspended some yards below the machine, and as the ultimate machine to be used in time of war, will be constructed of tougher material than wood and silk, the operator and the motor would be hidden, instead of offering a splendid target for ever-shotted from below. Dr. Bell is now trying to devise a kite of largely greater lifting power than those of the models he has constructed in the past. The product of this thought, Victor I, has been declared by a competent authority to be "the most wonderful kite ever devised and put together." It is built like the letter H, with great wings that flare away from the center.

This great kite rose from the land, without running, in a breeze so light that a flag on a pole fifty yards away hung limp and motionless. It glided up and up until it was flying six or seven

hundred yards above the earth, steady as a table top. In a breeze of fifteen miles an hour it flew as steadily as before, but nearer the perpendicular and with a tremendous pull.

The attachment of the motor and propellers will be the next step of the experiments, and it is not doubted that a motor sufficiently strong and light may be obtained. Indeed, there are such now on the market. Within a year or two at the outside Dr. Bell expects to have built a flying machine, which can be propelled through the air, at the will of the operators, without dependence upon the wind and in whatever direction is desired. He does not regard this as at all problematical, but as an absolute certainty.

Experiments at Arlington. The experiments beyond Arlington are not designed to go deeply into the subject, but merely to illustrate to scientists and others interested in the project of aerial navigation what has been accomplished in this direction with the aid of tetrahedral kites.

The kites that will be used are not of the largest size or the most recent type. Most of these are at the laboratory at Baddeck and could not be brought to Washington without some trouble. The experiments will illustrate, however, the vast lifting power of the tetrahedral kites and to point out the results that may confidently be expected to follow. Dr. Bell rather resents the color of intense importance that has been given the experiments in newspaper articles that have assumed to be descriptive of them.

The real work of final experiment will be done at Baddeck during the approaching summer. A larger kite of the model of Victor I will be built and to this a motor and propellers will be attached. Success at an early date is hoped for, but at any rate it cannot be long delayed. As Dr. Bell says, "The end is in sight."

Colors that blend with the sunshine. The woman who makes an art of dressing must consider her gowns with relation to the time and place of wearing. Almost any becoming light color looks well in a drawing room, and almost any becoming color that is not too brilliant or striking looks well on the street in the winter; but there are certain colors particularly beautiful with the summer, and these things should be remembered when shopping for summer clothes. Some colors, discordant indoors, have a great charm in an outdoor setting.

The woman who wore a red dress to the opera last winter found herself on very bad terms with her background, for the red boxes not only deadened the effect of a red gown, but made it positively disagreeable.

Yet the bright soft red, a raw and uncomfortable color indoors, has a delightful effect upon the golf links or tennis court, and the indispensable sweater when that color is pleasing for such use in spite of the fact that red is not, in most cases, an agreeable summer color.

The bright apple green—the old fashioned green—which is such a beautiful

ing to pick out the shell under which the pea was reposing as to eat, and they took a positive joy in three-card monte and the knives with the five-dollar Williams wrapped around the handles. They never wanted anything more joyous and entertaining than the chance to blow in the savings of six months of hard work against these festive propositions, and what they liked they did. Take 'em now, and they have got hold of the idea that their whole duty is done when they pay one admission to the big tent and do a fifteen-minute elastic neck exhibition at the freaks in the side show. It makes me real weak.

"It's the same way with the show people. They have got so blamed honest that a man hasn't got a chance, and if somebody connected with the outfit started out to do a little business on his own hook it's a copper-riveted cinch he would find himself off the sawdust, and probably doing a thirty days' turn in the village Tombs.

"I'm sore on the whole lot," said the old ticket butcher. "The only place a man stands a chance is out beyond the tall timber, and there ain't much doing even there. Blamed if I don't think I'll quit."

SOME TYPES.

Story of the Disgruntled Ticket Butcher, Who Didn't Like the Way Things Were Going.

THE old circus ticket butcher turned a reflecting and gloomy eye upon the gorgeously adorned wagon that stood across the lot, around which a howling mob of merry-makers pushed and clawed and shrieked, in wild anxiety to secure the pieces of cardboard that would gain them admission to the tent. The old ticket butcher scowled; one could almost imagine he sighed.

"Things ain't what they were in the good old days," he murmured. "I believe in being honest, all right, all right, but when it comes to playing that game like a wise guy plays cases, with never a little jaunt out into more uncertain territory, it's about the time I lay down my hand."

"Look at that bunch of mugs in the wagon, I'm willing to make a small gamble they wouldn't know a short change racket if it was shoved up against them, and it's an even bet they get the small end of the purse as often as the gay and giddy public. What's the use? Uh?"

"Now, the way I regards this circus proposition, the population raises and soaks a stake for each and every performance of the greatest show on earth that is due to strike the burg, and the population just naturally expects to be separated from the cash. If one of them should wake up the next morning and find more in his rags than a Canadian dime and a bone collar button he'd feel like he'd been conned. There would be a sort of hazy impression in his thinking that something had gone wrong, and that he had overlooked a bet. Now, I call it a shame to let any of the benefactors of the circus accumulate a grouch.

Good Old Days Have Gone. "They never had any when I used to scatter paper for some of the one-ring outfits that toured the South and West ten years ago. When one of these shows got through with a town the savings banks cashiers would all call for a new deck. I've seen a drove of locusts that were heading in our direction put their heads under their wings and weep—they

were that sore on themselves. There never was any kick coming, either. The Rubes would buckle up the pockets where they were accustomed to keep their money, and it was them for the plow and the strenuous life until the next time the circus came to town. They were happy at it, too.

"Old man Jim Smith, who ran one of the greatest shows on earth in those days, always had the talent submit bids for the privilege of running the ticket wagon. It cost anywhere from \$100 to \$500 a month, and it was worth the money. The ticket butcher accounted to the management for so many tickets for each performance, and whatever little amounts he could sorter gather in for himself were his—and no questions asked. It was bad going when the butcher couldn't soak away a hundred a week for himself. Sometimes the Rubes would make a small holler, but it never mattered much, for the only satisfaction it was the custom to hand out was a swift punch. It's wonderful what consolation a good husky canvasser, with fists like a pair of sugar-cured hams, can deal out in this way.

Gentlemen of Grace. "We had a number of professional gentlemen connected with the outfit that were just about the smoothest ever. They could separate the weary and unfortunate from their money with a rolled ease that made the operation a relief to all concerned. They were Socialists, in a kind of a way, and believed in the division of the circulating medium among the people.

"Billy Hester, who dispensed the literature that was said to contain the jokes of the clowns and all the songs sung in the 'unparalleled array of European and American musical novelties' that made up the concert, had a way of beguiling time and the rustics with a neat little trick that was common enough then, but about which one hears nothing now.

"When business got slack around his part of the tent Billy always produced a gold double-eagle and whirled it around in the air until the natives began to stop and rubber. Then he would

COLORS THAT BLEND WITH THE SUNSHINE.

color, is better in town or in the house than in the country. Almost all vivid greens are unpleasant in combination with the green of grass and trees, whether the color is in a house or a garden seat or in a woman's dress. The effect is somehow chemical and discordant.

A faint green or grayish green, however, is attractive and harmonious outdoors, and is a very delicious looking color in print, organdie, or gingham.

All pale and dull blues are pleasant outdoors; pale pink and yellow are also harmonious. White is the most beautiful and effective of all against a background of green grass and trees. White, with a touch of red, has a great picture-making quality outdoors. The bright clear blue that comes in linens and madras is beautiful in the strong sunlight upon the seashore. Here, also, the touch of red with the white—for those whom it may become—delightful.

Dark colors—black, brown and dark blue—have little beauty outdoors, as they absorb without giving out light. Light gray and tan in tweeds or covert cloth is more agreeable and summery in effect.

Where the Money Went. "Billy always forgot to tell them, though, that when the money went between the leaves it went all the way through and was neatly palmed away, where it could do no harm and would contribute nothing to the accumulation of that sordid pelf reputed to be the root of all evil. And it would have done your heart good to see the look of pleased surprise that used to envelop Billy's rising-sun countenance when none of his customers succeeded in picking out the lucky book. He was a real artist, was Billy, and if he's where he ought to be now, I'll bet there's a whole room in his mansion filled with harps and crowns.

"People have got too wise, anyhow. Time was when they were just as will-