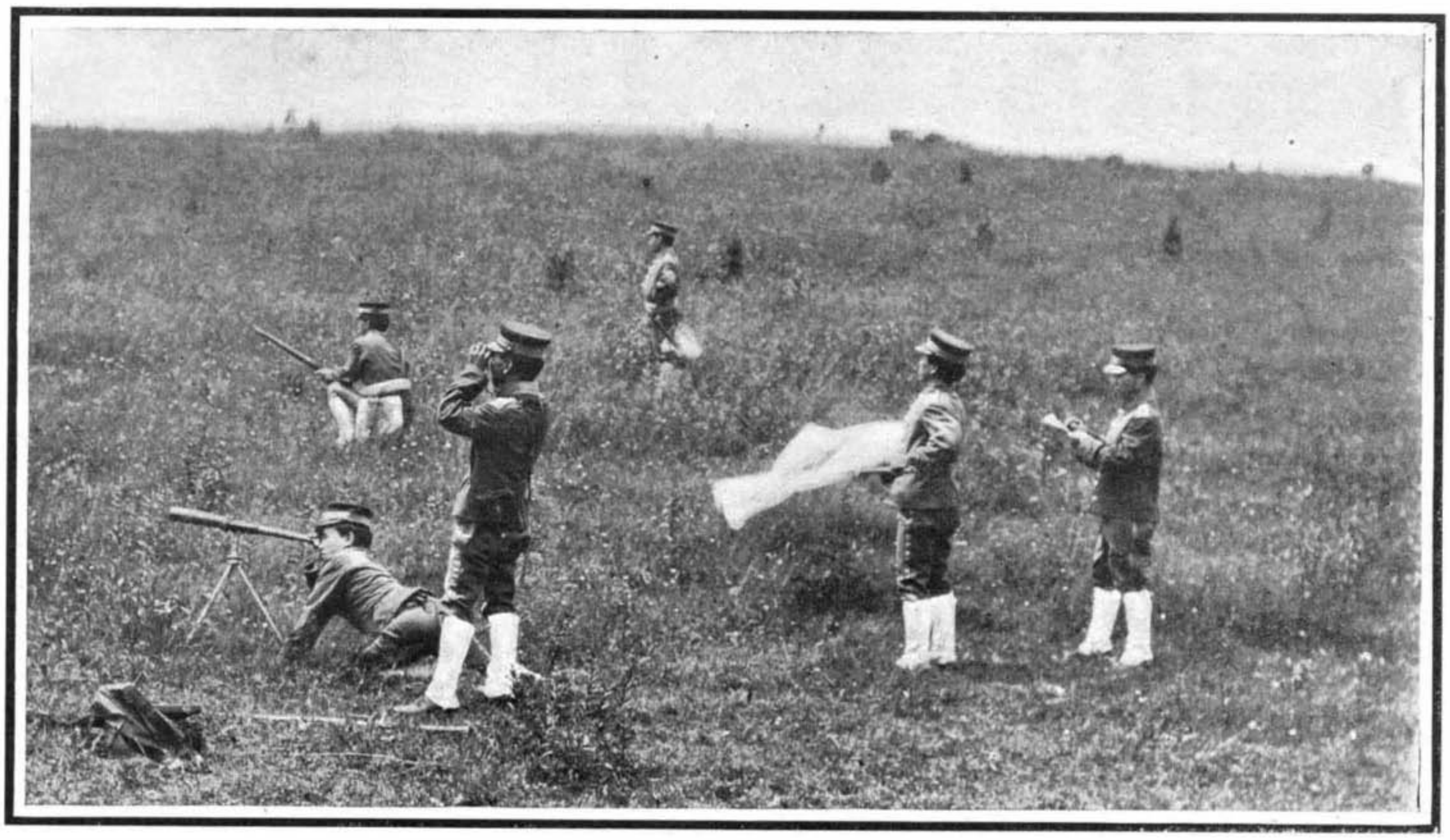
SIGNAL SERVICE IN MODERN WARFARE.

BY M. C. SULLIVAN.

The field operations of the Japanese army in the war now in progress in the Far East demonstrate that it possesses a capacity and a precision for extensive co-operation, and above all, for maintaining a successful military secrecy that is, indeed, marvelous.

It has perhaps occurred to some readers that the wonderful successes that have fallen to the lot of the Japanese army in its conflict with Russia, have been due in a great measure to the more intelligent use of modern methods of signaling. This is true, and it is to the successful use of the different means that may be used for transmitting intelligence rapidly on the battle-field that the Japanese generals have been able to make those strategic movements which have won the praise of military experts throughout the world.



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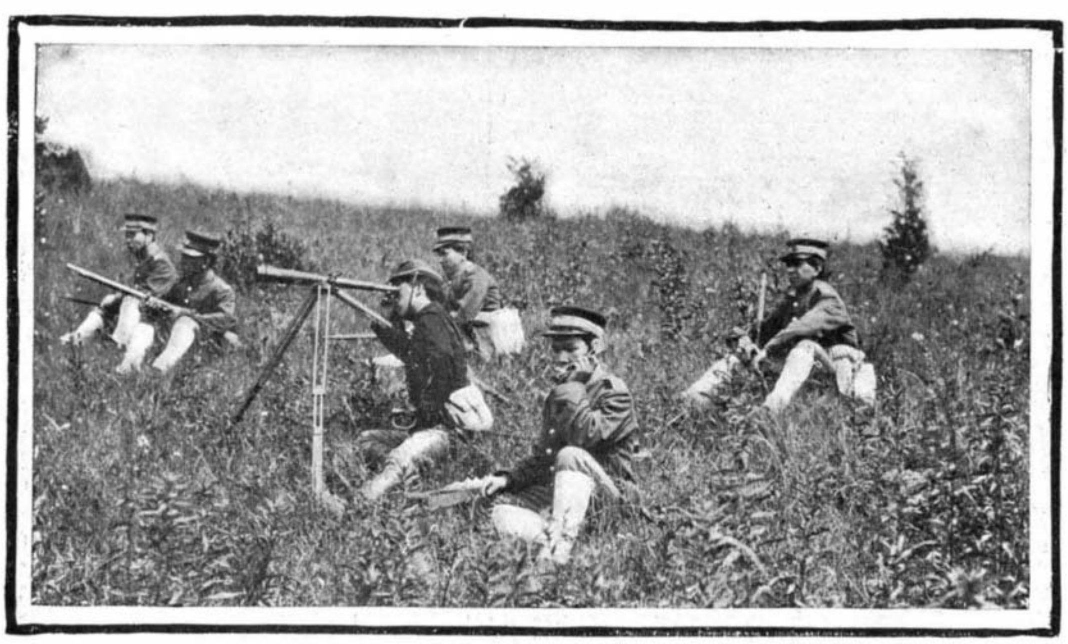
"Wig-wagging" Signals to a Distant Point.

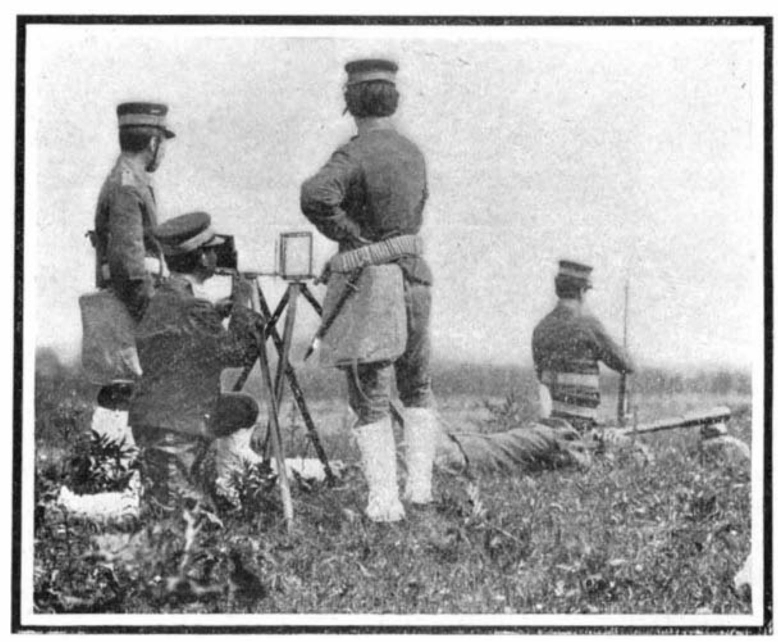
It is not alone the superior courage of the Japanese officers and men that is winning victories. The Russians, too, are brave, and in numbers they at least equal the Japanese. The great secret of the superiority of the Japs is their better application of the science of warfare.

While Japan was planning for a war which she well knew was inevitable, she fully understood that her army must have something more than mere physical courage on which to rely for victory.

The world at large has for some time been aware of the ingenuity and resourcefulness which the Japanese have exercised in utilizing the great forces of nature in the building up of their country, but it required the present conflict to show how well they are able to bring these same forces together for the protection of their nation.

On account of the great rapidity with which events culminate and follow each other on the modern battle-field the ability of being able to promptly forward orders and information more than ever before enters





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The Field Telephone in Use. Scouts Studying Enemy's Movements with the Telescope.

SIGNAL SERVICE AS USED BY THE JAPANESE.

into the considerations which influence the final result.

In the previous great wars the line of battle was so contracted that the commander could directly supervise and control the entire field; but now, owing to the murderous fire of modern rifles, the disposition of troops covers an area of many miles and consequently they are less under the direction of the commander-in-chief, and this state of affairs requires great efficiency on the part of the signal service.

The Japanese military engineers made a special study of the effectiveness of the various means of signaling available for battle-field communication used in the last Soudan campaigns by Kitchener, and more recently by the United States army in Cuba, the Philippines, and China, and by the English army in South Africa, such as the flag, torch, heliograph, telegraph, and telephone, and as a result adopted the telephone as the most practical, and have used it more extensively and successfully than has ever been done before on the battle-field.

In flag signaling, commonly called "wig-wagging," there are but three motions. The signalman facing squarely the direction in which it is desired to communicate, waves the flag or other appliance to the right, left, and front. The first two motions are the elements by which the alphabet is constructed; the third being used to signal the ends of words, sentences, or messages. The flags, made of cloth of light and close texture, are square in shape and have a smaller square in the center of a different color from the body of the flag. The colors commonly used are red with white centers, and white with red centers, in sizes two and four feet square; the two-foot flags have 8-inch, and the four-foot flags have 16-inch square blocks for their centers. The color of the flag must contrast as strongly as possible with that of the background. Upon this contrast the legibility of the signals often depends.

Messages can be "wig-wagged" distances of twelve miles, under perfect atmospheric conditions, using powerful telescopes. Under ordinary conditions the range is scarcely more than half as far.

The heliograph is an instrument of great range, and consists of mirrors so arranged that rays of sunlight may be projected in any direction, a shutter being used to interrupt and control the flash. It requires plenty of sunshine, and where nothing intervenes to obstruct the flashes messages can easily be sent distances of fifty miles.

Flash lanterns, having a range of about that of the flag, are used for night signaling.

While the visual systems possess the great advantage of mobility and require little skill to operate, they are all at the mercy of the weather, and, having to be worked from elevated points, their presence in the field cannot be successfully concealed from the enemy.

The electric systems, consisting of the telegraph and telephone, when compared with the visual systems are complicated and require a high degree of skill for their successful operation, but they are available at all times, regardless of weather conditions, while concealment from the enemy is complete.

The chain of communication is divided into three parts, the permanent, the semi-permanent, and the temporary or flying lines. For the permanent lines the existing commercial telegraph and telephone lines are used as far as possible. Semi-permanent lines are used to connect the different commanders with the base of supplies located behind the zone of active operations. The temporary or flying lines, used in the zone of active operations, are intended to enable the commander to be in instant communication with every division of his army, as well as with those of the most advanced outposts. It is in this fighting zone that the Japanese are using the telephone to the greatest advantage.

The difficulties incident to maintaining telephone communication on the battle-field are many and varied. The lines are of the most temporary character, no effort being made in their construction for their preservation. Where possible the wire is reeled from wheeled vehicles, like so much rope, across fields, or if roads are followed, it is laid to one side. The telephone department of the Japanese signal corps completes its lines as fast as the troops move, even under forced marching. The wire and instruments are carried on cars whenever possible, but as the army advances into wild country, where roads cease, it is necessary for the coils of wire to be slung over the shoulders of the men and carried great distances by foot. The wire is specially insulated to withstand the hard usage to which it is subjected.

In organizing their signal department the Japanese engineers learned that men who were skilled in electricity could be made acquainted with the details of army work much easier than those who had acquired familiarity with soldiers' duties could be trained into electricians. The plan followed by them has been to utilize the available operators and electricians who, as civilians previous to the war, were engaged in transmitting commercial intelligence by the means of the telegraph and telephone. These electricians, as a result of their experience, knew the telephone, and being skilled in all the details of its construction and operation have in a short space of time accomplished results with it on the battle-field that have established a permanent place for it in modern warfare.

The operations leading up to the battle of the Yalu River, and the battle itself, brought to the front in a forcible manner the advantages to be secured by telephone communication.

Ten days prior to the battle a small Japanese advance guard was patiently forcing back the Russian scouts who were on the Korean side of the Yalu, twenty-five miles north of Wiju.

The Russians, who were strongly intrenching on the Manchurian side around Antung and Kiu Lien, never at any time saw the Japanese in force, not more than a handful of Japanese soldiers being in view at any time, and they moved about in a most unguarded way. The Japanese whom the Russians did see were in telephonic communication with the troops held to the rear of mountain ranges several miles away from the river. Whenever the troops moved it was at night, acting on detailed information which was sent over the hastily-constructed telephone system.

During the battle an incident occurred which demonstrates the value of this instantaneous communication with all parts of the army, particularly during an engagement. When the right and left wings of the Japanese army, after crossing the Yalu, were closing in on the Russian flanks, the Japanese left found itself under fire of its own artillery. With their telephone system it was but the work of a moment to call up headquarters at Wiju, which was in telephonic communication with all of the batteries, and have the direction of fire changed, thus saving many lives and permitting the infantry to continue their advance.

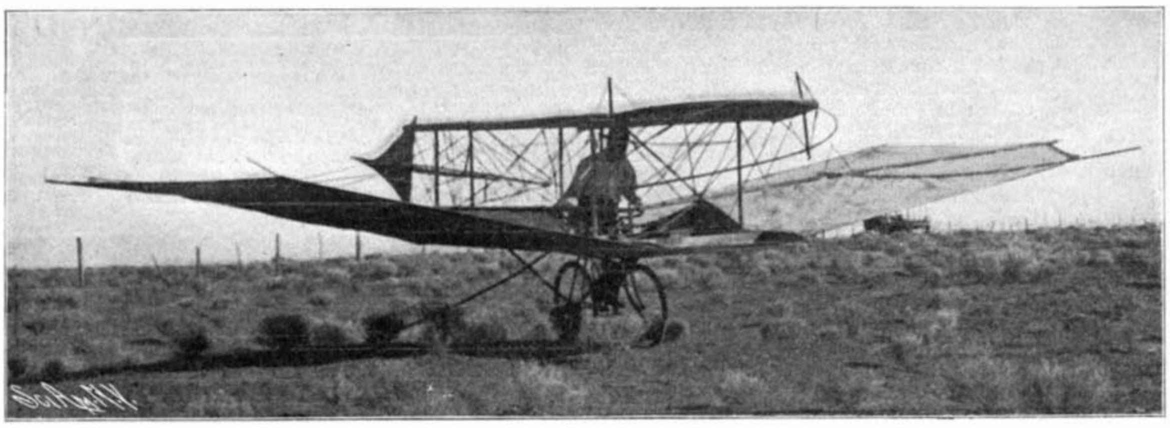
A NOVEL GLIDING MACHINE.

Mr. S. V. Winslow, of Riparia, Wash., sends us the accompanying photograph of a flying machine, which, he assures us, has proven perfectly successful so far as balancing is concerned. The inventor hopes ultimately to use the contrivance as a gliding machine.

In most aeroplanes, as our readers are doubtless aware, the problem of overcoming inertia is that which presents the greatest difficulty. More or less complicated launching devices have been invented which have not always been successful. The most common method, perhaps, of starting an aeroplane is to drive it down an inclined track, allowing it to soar of its own volition after the momentum acquired has overcome the inertia. Lilienthal, it will be remembered, simply held his gliding device with his arms, ran down a hill at a considerable speed, then drew up his feet and soared for a hundred yards or more. Mr. Winslow has adopted a novel method of attaining the same end. His bicycle is certainly as rational a soaring device as Maxim's track or Prof. Langley's complicated launching device of springs. Furthermore, by a very ingenious system of levers, and by connecting his handle bars with the vanes, Mr. Winslow has provided himself with a controlling mechanism that really forms a part of the starting device.

PROF. BOTTS'S FLYING MACHINE

BY J. MAYNE BALTIMORE.



A BICYCLE AEROPLANE.

Prof. R. H. Botts, who for nearly twenty years has carefully studied the great problem of aerial navigation, is the inventor and constructor of a new kind of flying machine. His invention represents the results of his long and scientific study, investigations, and experiments.

The Botts plan involves the combination of a perfectly circular-shaped aeroplane together with two propellers that work on a horizontal plane. The aeroplane is 62 feet in circumference—a fraction more than 20 feet in diameter.

There are two hoops to which the aeroplane is attached, an outer one of light, strong steel tubing, and a smaller one of flexible wood. The diameter of the latter is about 6½ feet. The aeroplane is made of parachute cloth—light and very strong. By means of aluminium wire and strong hempen cords, the cloth is stretched as tight as a drumhead.

In the center is placed a circular frame composed of bamboo, wood, and aluminium. This frame composes the car, where the operator sits; also contains the boiler, two engines and the beveled gearing, by means of which the system of propellers is operated. By means of wires and cords, the frame, car, etc., is very securely lashed to the aeroplane and the propellers, shafting, etc.

Above the aeroplane are placed two propellers working horizontally. These two propellers are neutralizing—that is, they run in opposite directions, but the vanes are so placed as to apply the power in one given direction—upward. These two propellers are the "uplifters," supplementing the aeroplane in ascending or descending.

The upper propeller is smaller—5 feet and 1 inch in diameter. The lower wheel is 6 feet and 2 inches in diameter. Fore and aft are placed a propeller (working vertically at the end of a shaft)—each being 6 feet and 2 inches in diameter. Like the other propellers, they are neutralizing, moving in opposite directions—one pushing and the other pulling. These constitute the driving power—also operating in conjunction with the aeroplane.

Prof. Botts claims that one great advantage of using these neutralizing propellers is that it prevents the entire machine from moving sidewise, or, in a circular direction; that the neutralizing forces hold it on a steady course. He says long study and repeated experimenting has demonstrated this principle.

These propellers are constructed on the bicycle principle, but having an inner and outer rim (wooden) between which are fastened strong aluminium blades or vanes arranged in groups of eight in the larger, and of four in the smaller wheels.

The combined weight of the four propellers is only 43 pounds. By means of the gearing, they are capable of making over 500 revolutions per minute. However, this very high rate of speed will be unnecessary.

The propellers are also placed in linear sections. So when in motion they will cut or pass over different air currents at the same time, thus affording the results of several wheels combined in one.

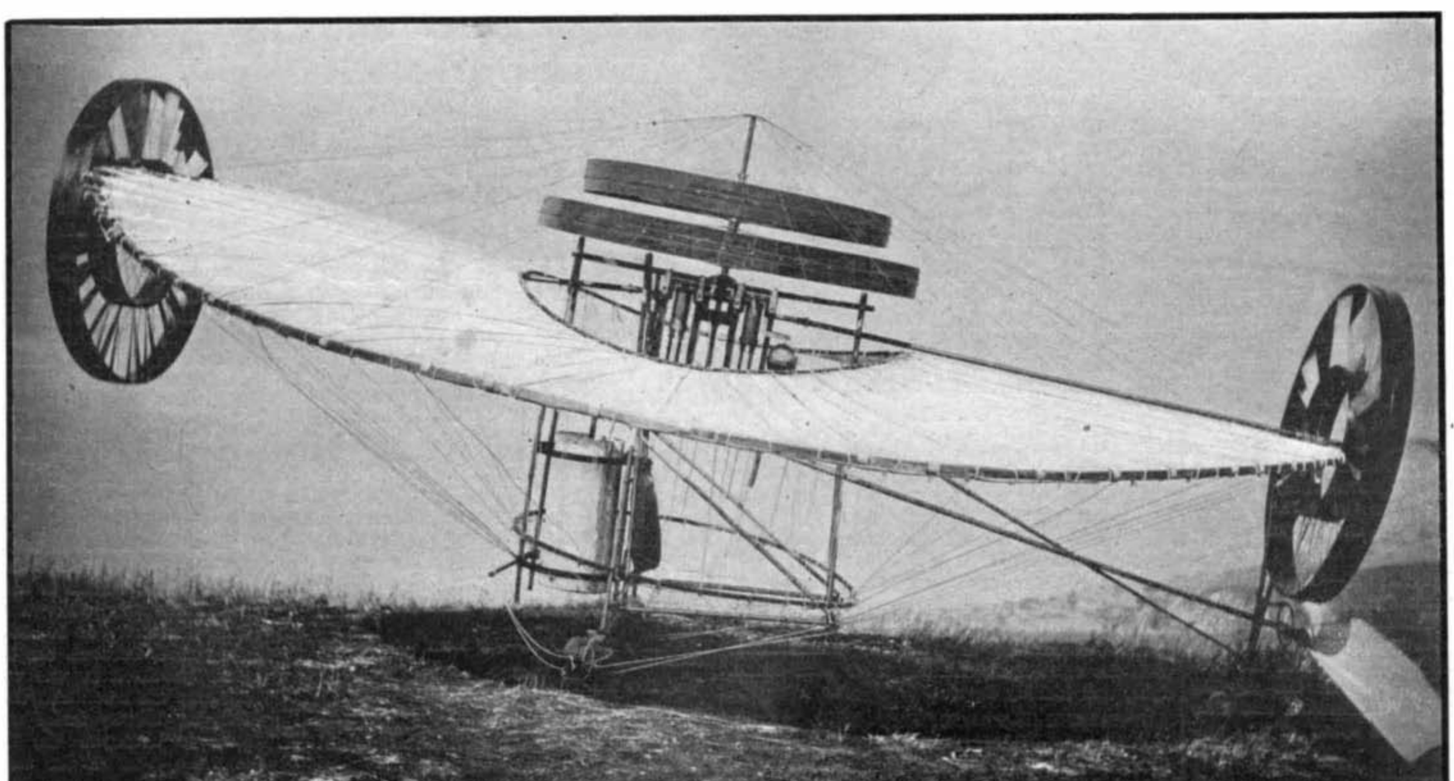
The aeroplane is so rigged that, like a sail, it may be partly or entirely reefed, in case of very high wind, or for other reasons. It may serve the secondary purpose of a parachute in making descents, or in the event of an accident to the machinery while in flight.

In setting sail, the neutralizing, lifting, and advancing propellers, with the aeroplane tilted upward at a marked angle, enable the machine to glide, or sail through the air, since the latter contains more than one square foot for every pound of weight carried.

In the Botts machine the boiler is placed in front of the operator's seat, affording a complete balancing of the entire machine. It would be almost impossible for it to capsize.

There are two engines each of 6-inch stroke and 3⅛-inch cylinder diameter. Total weight of the two engines is 33 pounds. The boiler has 60 feet of fire surface. Steam will be the motive power. The total weight of the machine, including the operator, is about 214 pounds.

The rudder is made of strong cloth—somewhat fin-shaped. It is so pivoted that by moving a lever it can be thrown at any desired angle, vertically or horizontally. The neutralizing propellers avoid the use of a large rudder to prevent the machine from twisting in the air. Prof. Botts has entered for the prize at the World's Fair, and expects soon to start for St. Louis with his invention.



THE BOTTS FLYING MACHINE.

The discovery of important coal deposits in European Russia and Siberia has made it possible to substitute coal for wood on the locomotives of the Trans-Siberian Railroad. Upon 2,000 miles of track the locomotives are now using Siberian coal and in 1903 as high as 500,000 tons of it were consumed. The coal comes for the most part from Tscheremchow and Shudschenka, in the Tomsk region. In the Siberian mines the coal deposit lies at a great depth and generally has but little thickness. It is often penetrated by water. Those of the Tomsk region are nearer the surface and can be easier worked. But the transportation of the coal to great distances is difficult to carry out. Accordingly it is proposed to supply a part of the road from the new mines which have been opened at Kaltschagin.