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THE BALLOON IN WARFARE.

In September, 1896, a great meteorological conference was held in Paris, at which nearly every important station throughout the world was represented. One of the most important subjects discussed at this conference was the utility of the balloon for scientific purposes. A mode of equipment for aeronautic expeditions was established; and an international commission was appointed to organize experiments, upon methods previously agreed upon, and with the aid of scientific instruments accurately tested and compared.

The work of this commission has been greatly facilitated by the fact, that the interest in aeronautics has steadily increased during recent decades; this interest being due, in great part, to the exigencies of modern warfare. German military operations have necessitated the expenditure of a considerable sum of money; and a part of this has been devoted to aeronautic investigation. In this way the researches of students have received a powerful stimulus; and much valuable information, both as regards equipment and technic, has been obtained. Indeed the ascensions which have taken place at Berlin have been conducted under the auspices of the Emperor himself, with the active coöperation of the officers attached to the Engineer Corps (Aeronautic Division) of the German army. It was in this branch of the service that the writer received his practical training in aeronautical science.

In other European countries, also, scientific investigation in aeronautics has received great encouragement at the hands of the military authorities. In St. Petersburg the aeronaut Stark is in close communication with the Central Observatory; in Vienna the Meteorological Institute is actively supported by the Imperial Ministry of War; and similar gratifying coöperation exists also in Paris, Rome, Strasburg, and several other cities. Indeed, as already intimated, the entire development of aeronautical science may be traced in great part to the demands of modern warfare. An article devoted to recent achievements in this domain must, therefore, of necessity, emphasize the military side of the question.

The first troop of military aeronauts in Europe was called into being toward the close of the last century, when the young French Republic, striving single-handed against the combined forces of all Europe, was compelled to tax its ingenuity to the utmost in order to cope successfully with its enemies.

In August, 1793, the chemist Guyton de Morveau succeeded in inducing the French Government to provide for a series of aeronautic experiments in order that balloons might be eventually utilized for military purposes. Owing to the success of these experiments, the National Convention of France, in October of the same year, organized a company of military aeronauts, with orders to report at once for active service to Gen. Jourdan of L'Armée du Nord. The promoter of these enterprises, De Morveau, was at first confronted by great obstacles. At that time it was almost impossible to procure sulphuric acid in France; consequently the hydrogen necessary to the inflation of the balloon had to be laboriously manufactured by passing steam over iron filings,—a method invented shortly before by Lavoisier. In order to generate a sufficient quantity of gas in this manner, it was necessary to build a large number of ovens in the open field,—a very laborious and costly proceeding;—and it was undoubtedly the great expense thus involved that, within a few years, arrested the development of the science. But the achievements of this first French troop of aerial navigators are memorable by reason of the great difficulties encountered.

The balloons of that period were made of oiled pongee silk, varnished, and woven so closely as to admit of a very high pressure of gas. At present, a captive balloon requires refilling after about eight days. At the time of which I write, however, balloons sometimes remained in use for months without requiring to be recharged.

As the balloon always remained inflated, its transportation was a matter of extreme difficulty. In this respect, the great achievements of Coutelle are worthy of notice, as the following instance will show: When Gen. Jourdan abandoned the siege of Maubeuge, and decided to invest

Charleroi, Coutelle, with an inflated balloon, marched thither, a distance of forty-five kilometres, at night, and in the face of the opposing army. This achievement aroused the admiration even of the enemy.

Owing to our meagre sources of information with regard to methods of warfare in the last century, we cannot form an idea of the military value of the balloon for purposes of reconnaissance. We know, however, that much valuable information regarding the operations of the opposing force was obtained by aeronauts at the capitulation of Charleroi, as well as at the battle of Fleurens, where a staff officer took observations from a balloon which remained aloft for several hours. Undoubtedly also this new method of reconnaissance did not fail of its moral effect upon the enemy.

On June 23, 1794, a new company of aeronauts was formed by the Government, and in October, 1795, the École nationale aerostatique was founded at Meudon. We possess but little information concerning the achievements of these two companies during the succeeding years. We know that the first company was attached to the army of the Sambre and the Meuse under Gen. Jourdan, and that it fell into the hands of the enemy at Würtzburg. The second company operated with the Army of the Rhine; and it was first employed at the siege of Mayence. It then accompanied Moreau across the Rhine, and proceeded with him as far as Donauwörth. Here the last ascension was made, as the materials for refilling the balloon could not be obtained in the enemy's country. When Napoleon planned his Egyptian campaign this troop of aeronauts, under the leadership of Coutelle, was reorganized. The troop could not operate, however, as the English had seized the transport-ship which was to convey the balloon-material to Egypt. In the following year both companies of aeronauts were disbanded, and the school at Meudon was closed. From this time until 1870 aerial navigation for military purposes was entirely suspended.

The revival of the science of aeronautics dates from the Franco-Prussian war. Paris, hemmed in on all sides, and cut off entirely from the outer world, sought to reëstablish communication with the provinces, and to this end was compelled to employ the balloon. Rampon, then Postmaster of Paris, organized a complete system of aerial communication; and no fewer than sixty-four balloons were despatched during the siege. These balloons carried in all one hundred and fifty-two passengers, more than four million letters, and several hundred portfolios. The voyage of Gambetta was a memorable one. Desirous of reaching the provinces in order that he might complete arrangements for the national defence, yet unable to break through the ranks of the beleaguering army, he was at last compelled to make his escape from Paris in a balloon.

Some of the balloons sent out during the siege were lost in the ocean; others were captured by the enemy, who soon became expert in the art; and a few met with adventures of the most singular nature. Worthy of mention in the latter regard is the voyage of the aeronauts Rotier and Bezier, who ascended from Paris at 11 P.M. on November 24, 1870, and landed upon one of the frozen fjords of Norway at noon the next day. Caught in one of the violent autumnal storms, they were carried, in a single night, with terrific velocity, over France and the North Sea, to the shores of Scandinavia. All attempts to utilize for defensive purposes the balloons sent out from Paris failed, owing, not to a scarcity of men, —for aeronautic companies had been formed throughout the provinces,— but to a lack of material. Nor did the German detachment, organized during the war upon French models, operate effectively. After a few ascensions, it was disbanded before Paris in October, 1870.

A complete reorganization of the Aeronautic Department of France did not take place until 1879. This reorganization was due to the energy of Gambetta. The School at Meudon was reopened; and a series of appropriations was set apart for the purpose of forming a number of balloon-parks, each of which consisted of a windlass, with cable, a machine for generating hydrogen, and a baggage-wagon for the transportation of material. Before proceeding to discuss the further development of military aeronautics, it will be well to dwell briefly upon the contributions which England, since the Franco-Prussian war, has furnished to this department of science.

England has developed an independent school, based upon new principles, which has already been prolific of excellent results. As early as 1871 a commission was appointed to organize a Department of Military Aeronautics. This commission fitted up an arsenal at Woolwich, where the technic of balloon construction was brought to a high degree of perfection.

In England balloons are still made principally of gold-beaters' skin,— a material light, though expensive, and very difficult to manipulate. Of its advantages—or rather disadvantages—I shall speak later.

It is to the Arsenal at Woolwich that we are indebted for the introduction of cylindrical steel retorts for the storage of compressed gas; and the fact, that military aeronautics is a live science to-day, is due mainly to this new method of generating and transporting the hydrogen requisite for the inflation of balloons.

In discussing the first attempts of military aeronauts in France, I stated that the greatest obstacle to the military serviceability of the balloon lay in the clumsiness of the gas-generators, which had laboriously to be erected at the various camping-grounds, or transported from place to place by means of heavy wagons. England can claim the honor of being the first to supply an aeronautic troop operating in the field with a sufficient quantity of compressed gas stored in portable retorts. By reason of this innovation, the aeronautic troop, no longer hampered by *impedimenta*, can now operate with a celerity formerly impossible. As the equipment of an English aeronautic park has been adopted by most European countries, a brief description of it may not be uninteresting.

According to the specification for 1889, an English aeronautic park, when mobilized and fully equipped, should properly consist of: One balloon-wagon with hand-winch; 1 balloon made of gold-beaters' skin (size, 250 cubic metres); 1 steel cable, 760 metres; 1 supply-wagon; and 4 gas-wagons, each carrying 35 retorts containing 3.6 cubic metres of gas each. The contents of three wagons suffice fully to inflate the balloon within fifteen minutes. The hydrogen used is manufactured in Chatham, either in liquid form or by the above-mentioned method of passing steam over iron filings. The English have already utilized their parks in the Soudan and in India. Unfortunately, however, their excellent aeronautic material has not been always supported by effective training and proper organization.

It is astonishing that the English principle enunciated in the foregoing has not yet been introduced into France. So late as 1890 a French aeronautic park consisted of the following equipment; viz., One steam windlass, with 6 horses; one tender (2,250 kilogrammes), with 4 horses; 1 balloon-wagon (2,100 kilogrammes), 4 horses; 1 gas-holder (2,300 kilogrammes), 6 horses; 2 box-wagons containing chemicals, 10 horses; 2 provision-wagons, 4 horses; and 8 two-horse wagons for the transportation of chemicals. A French aeronautic train, therefore, when complete, consists of 16 heavy wagons, 50 draught-horses, and 6 riding-horses.

Capt. Moedebeck, the experienced German officer to whom I am indebted for the foregoing figures, points to the difficulty of moving a train so long and ponderous; and he adds the following criticism:

> "France undoubtedly carried the technic of military aeronautics to a high degree of development. In consequence, however, of her failure to adopt the English invention of portable gas-retorts, her leadership in this department of science has now been lost to her."

Nor is the organization of the various divisions of the French Aeronautic Corps free from defects. Indeed, it is only since 1890 that officers have received a practical education in this important branch of the service.

I shall now give a description of the German system, which I shall treat more exhaustively for two reasons: (1) Owing to my closer acquaintance with the subject; and (2) because I believe that the German system is the most highly developed. It is scarcely necessary to add that my statements are based entirely upon facts long known in professional circles.

In Germany to-day there is a central troop, the Royal Prussian Aeronautic Division, garrisoned at Schoeneberg, near Berlin, and subject to the commands of the general staff. In the event of a general mobilization, and at every manœuvre, this central aeronautic division sends out detachments which are placed at the disposal of the commanders of the several army corps. The equipment of these detachments, though simple, is yet perfectly adapted to military service, and thus permits of very rapid evolutions in the field. As the English system of generating gas is employed, special wagons for this purpose, such as are used in France, are rendered unnecessary. Compressed gas is carried in wagons specially constructed for the purpose, and which are so mobile that they can at any time leave the main road and travel over rough ground. The gas is manufactured at central stations, and at once compressed into portable retorts. Formerly hydrogen was manufactured at Schoeneberg; both "wet" and "dry" methods being employed. Lately a new method has been discovered, by means of which a very pure, and consequently a very light, gas may be produced. It is a well-known fact that the purest hydrogen gas is obtained by means of the electrolytic system. For the rapid manufacture of gas in great quantity, however, this system is too costly; moreover, it requires an extensive plant. For these reasons it has been rejected by the German military authorities.

There are at present in Germany a number of chemical factories which employ the electrolytic system in the manufacture of such products as chlorine and potash,—products which throw off a considerable quantity of hydrogen. Formerly the hydrogen gas thus generated was considered worthless and was allowed to mingle with the air. Upon the request, however, of the military authorities, this gas is now saved. It is not only inexpensive, but—and this is of far greater importance—extremely pure.

As already stated, the hydrogen gas is stored in portable retorts; the pressure being the high one of 120 atmospheres. Formerly these retorts, particularly when stored for some time, occasionally exploded; and this rendered their transportation by rail or road somewhat dangerous. Indeed, several accidents occurred both in England and in Germany; and in consequence the development of aeronautical science in this direction was to some extent retarded. But these accidents did not dismay German scientists, whose attention was now directed toward improving the material of the retort itself. And well their efforts have been repaid. The retorts manufactured to-day are of a standard of excellence exceeding all expectation.

The inflated balloon is held by steel cables in which strength and lightness are combined. Experiments with hempen ropes were also made; but these proved unsatisfactory, and were consequently abandoned. By means of the steel cable, the balloon is enabled to ascend to a great height. I have often taken observations from a captive balloon at a height of 800–1,000 metres. The cable is wound upon a windlass which is attached to a heavy wagon, and which can be operated by hand or steam power. The steam windlass, however, is rarely employed, as it cannot be used at a moment's notice; moreover, it is extremely heavy and, consequently, difficult to transport. As men are always plentiful, the hand-windlass for military operations is in every way preferable. By means of this windlass—when operated by fifty men—the balloon may be easily drawn down from a height of one thousand metres in ten to fifteen minutes.

We now come to the main feature of the aeronautic park,—the balloon itself. Formerly balloons were made almost exclusively of silk,—a material selected because of its lightness. The silk was rendered gas-tight by the application of several coatings of linseed-oil varnish, which was applied to both sides of the material, and, after penetrating every fibre, became perfectly dry. Owing, however, to the costliness of silk, it is now rarely, if ever, employed in Germany. Moreover, new processes of manufacturing gas-proof materials have been discovered. At present the material most extensively used for this purpose is rubber—a material scarcely heavier than silk, and greatly preferable to the latter by reason of its superior cleanliness. The rubber used in the manufacture of balloons is subjected to the following process: Pure caoutchouc is dissolved in benzine; the product being evenly distributed in thin layers upon the cloth, and then vulcanized. The cloth consists of double layers of cotton, which contain the vulcanized rubber in the form of an intermediate layer. Such balloon-cloth is strong and very durable, particularly when the double layers of cotton run diagonally to each other. Indeed, under these conditions, a rent in the cloth is almost an impossibility. It can be readily understood how serviceable this material must be in the case of captive balloons exposed to a high pressure of wind.

In England—and in England only—balloons are still made of gold-beater's skin, a material prepared from the gut of calves or horses. It is composed of many pieces, and is remarkable for its lightness. A great many layers of this skin are required to give the balloon a sufficient power of resistance; and thus the advantage of lightness is counterbalanced by the great expenditure of time and labor involved.

Judging by my own experience, I should unhesitatingly declare in favor of vulcanized-rubber cloth for balloons subjected to hard usage. The material is powerfully resistant and easy to handle and to fold; and above all, it admits of repairs in the field. A rent or a hole may be patched in a very short time; and this, from a military point of view, must be considered a very great advantage.

The German army is the only one which has departed from the original globular form of the captive balloon. This departure may, perhaps, be regarded as the greatest improvement hitherto introduced in the department of military aeronautics. Notwithstanding the advantages accruing from improved material, superior technic, and facilities of transportation, the Aeronautic Troop has been, until very recently, dependent upon atmospheric conditions. A heavy fog was a calamity which at once interrupted all observations, and affected skirmishing parties of horse and foot, as well as the Aeronautic Troop itself. Wind and rain also acted as serious hindrances to aeronautic observations,—more particularly in the case of globular balloons,—inasmuch as they frequently rendered the ascension difficult, if not impossible. Only a very experienced aeronaut can remain in a balloon for hours when it is exposed to a wind-velocity of eleven miles an hour. As the pressure of the wind produces constant oscillations or pulsations, a balloon ascending during a very powerful gale performs the most extraordinary evolutions. Within a very short time the balloon-car swerves hundreds of metres from its altitude. At one time, the balloon almost touches the earth. At another, it rapidly ascends in a vertical direction; tugging at its cable, and straining the steel strands to their utmost tension. The undulations of a ship on a rough sea are a pleasant lullaby compared with the experiences of an aeronaut in a gale. Nevertheless, even under the most trying circumstances there have been officers willing to undertake an ascension; and their deeds bear witness to the almost unlimited powers of human achievement. Unfortunately, the material of the balloon can offer but a fixed amount of resistance. With the velocity of the wind above seventeen miles an hour, the atmospheric pressure exerted upon the globular balloon becomes so great as to render its ascension an impossibility. The steel cable unwinds, it is true; but the balloon only sways from side to side, and does not rise. Such atmospheric conditions are frequent on the open sea in the vicinity of the coast, where the balloon is employed for taking marine observations; and whenever they occur, the ordinary aeronautic outfit is rendered useless.

The credit of inventing an air-ship capable of overcoming adverse atmospheric conditions belongs to two German officers,—Von Parseval, a Bavarian captain, and Lieut. Bartsch von Liegsfeld, of the Prussian aeronautic service. After repeated experiments and numerous modifications, these officers at last conjointly succeeded in constructing a balloon, designated as the "Drachenballon" (kite-balloon), which is capable of ascending during the heaviest gale, and which, indeed, receives an increased impetus according to the atmospheric pressure exerted upon it.

In this new invention, the qualities of the balloon and the kite are admirably combined. Its gaseous content gives the balloon its permanent buoyancy, and enables it to rise in a calm, while its peculiar form—so unlike that of the globular balloon—enables it to stand like a kite against the wind, by which it is not depressed, but driven upwards. But the most admirable feature, perhaps, of this new contrivance is its peculiar construction, which enables it to retain its distended form amid the varying conditions of atmospheric pressure, and despite the loss of gas entailed by diffusion through the rising and falling of the balloon. Strange as it may seem, this stability of form has been secured without resorting to any mechanical aids or appliances whatsoever; it is maintained solely by means of the equal distribution of pressure exerted within the balloon itself.

The kite-balloon has the form of a long cylinder, terminating at each end in a hemisphere of exactly the same diameter as the cylinder itself. The balloon is secured somewhat like a kite, and placed obliquely against the wind. Moreover, it is divided within by a horizontal gas-tight partition which virtually separates it into two distinct compartments; the upper and larger compartment receiving the gas. The inner partition contains sufficient material (balloon-cloth) to admit of its distention. Indeed, when the upper compartment of the balloon is entirely filled, this partition is pressed tightly against the lower wall, or belly, of the balloon, so that the entire cylinder, with its hemispherical appendages, is fully distended.

The inner partition being depressed against the outer wall of the balloon, the volume of the lower compartment — technically known as the "ballonet"—is reduced to *nil.* Now, as soon as the balloon ascends, an expansion of gas takes place; the excess being discharged by means of an automatic safety-valve. In consequence of this discharge, a vacuum is created in the lower compartment. This, however, is connected by a clack-valve with the outer air, which at once rushes in to fill the vacuum caused by the escaping gas. This clack-valve, which is fastened to the belly of the balloon, is always exposed to the wind, and works automatically; permitting the entrance of the air, but preventing its escape. By means of this device, the balloon always remains fully distended—at first with pure gas, and afterward, according to the condition of the ballonet, with gas and air. Owing, however, to the partition in the interior of the balloon, these two gases always remain entirely separated; the heavier gas — the air — remaining below, *i.e.*, in the ballonet. Thus, the balloon, in course of time, constantly increases in size.

Another important feature of the kite-balloon is known as the steering-ring or steering-pouch. This is disposed about the lower part of the balloon in much the same manner as the belly-fins are attached to the body of an eel. A clack-valve attached to the upper end of this contrivance admits the air, which escapes through an opening at the lower end. In this way the steering-pouch can be distended and the balloon placed in the direction of the wind—an arrangement indispensable to the proper operation of the two clack-valves.

The experiments made with balloons constructed upon the above principle have proved most satisfactory. The balloons possess remarkable stability; and they can ascend and remain aloft during a heavy gale. In this respect, indeed, the performances of the captive balloons have exceeded all expectation. The first attempts, it is true, were not entirely free from drawbacks. Probably the most serious of these were the oscillations of the balloon itself. These oscillations,—resembling those of a pendulum, — although not violent, nevertheless acted as a disturbing element, and occasionally interfered with the observations of the aeronaut. To obviate this difficulty, a kite-tail and a small globular balloon have been attached to the lower end of the balloon; and by this means a perfectly steady motion has now been secured. A firmer and more quiet aerial observatory, even in the heaviest weather, than that furnished by the kite-balloon to-day, is scarcely conceivable.

The balloon has been tried in all kinds of weather. It is said that during the manœuvres at Kiel, an ascension took place, although the wind blew at the rate of forty-two miles an hour. A kite-balloon, used for meteorological observations at Strasburg, remained aloft during a snow-storm of great violence for two days and three nights; and, although somewhat depressed by its weight of snow, the usefulness of the balloon was by no means impaired.

Owing to the increased strain of the kite-balloon, the tensile strength of the cable has been greatly augmented; and by reason of the great improvements now made in cable construction, it has become possible to obtain greater tensile strength without a corresponding increase of weight.

Under these circumstances it is not astonishing that the achievements of German aeronauts should have proved extremely satisfactory. During the manœuvres the balloon was always stationed at the front, where it proved a valuable post of observation; moreover, owing to its facility and rapidity of motion, it was used as the most suitable vehicle for conveying important despatches to the commanding general. In this connection, I wish to refer to an excellent feature of aeronautic training in Germany. In addition to their technical education, the officers of our Aeronautic Corps must pass through a course in tactics, in order that they may be able immediately to utilize the results of their observations. In France and Russia it is different. There the education of the officers in the aeronautic branch of the service is confined solely to the technic of the science. The superiority of the German method is obvious. It is impossible to take observations from the car of a balloon successfully, without practical training. The eye of the observer must become accustomed to gauge distances. The configuration of a landscape as seen from the car of a balloon is an entirely different thing from what we imagine it to be; and many details, such as the outlines of fortifications, etc., are visible only to the experienced observer. In short, the aeronaut, like the navigator, gradually acquires a peculiar power of vision which enables him to detect objects that escape the scrutiny of the layman.

The science of military aeronautics has proved particularly useful to the foot artillery; while its serviceability in the siege of fortresses can scarcely be overestimated. One ascension frequently suffices to observe the fortifications, as well as the batteries to be attacked; and these are at once cartographically registered. What a valuable adjunct a well-equipped and carefully organized aeronautic troop would have been to the American army in the recent war with Spain! Had some of the American vessels engaged in blockading the harbors of Cuba been equipped with a complete kite-balloon outfit, the task of investment would have been greatly facilitated, the enemy's fortifications would have been immediately exposed to view, and the position and number of the Spanish boats at once definitely ascertained.

To the enemy, the captive balloon becomes an object of attack, upon which the fire of both musketry and artillery is frequently trained. The question here involved is obviously of the highest importance; and considerable time and labor have been devoted by the German Government to its solution. Investigation has now shown musketry-fire to be quite ineffective; for, owing to the difficulty of measuring height and distance, the balloon is hard to hit. Moreover, a few bullet-holes entail but a slight loss of gas, and cannot, therefore, inflict much damage. In the case of heavy guns, however, the matter assumes an entirely different aspect. Cannon loaded with shrapnel have proved very effective,—more particularly when the balloon has been stationary, the range not too short, and the distance approximately known. Capt. Moedebeck states that at long range the destruction of the balloon by the batteries is a comparatively simple matter. At short range, heavy guns are too unwieldy to be effective. Krupp, in 1870, sought to obviate this difficulty by the construction of a "balloon-gun"; but of his experiments with this weapon I have as yet been unable to obtain any information.

What has been said of the effectiveness of battery-fire applies to the stationary balloon only. By a constant change of position and altitude, the security of the balloon is greatly increased. Such a change of position is by no means difficult for our German aeronauts, whose equipment permits of great mobility. One of our most experienced aeronauts, Capt. Gross, has expressed the opinion, now generally accepted, that the effectiveness of field-pieces or heavy guns is greatly diminished so long as the balloon is kept in constant motion. Experiments have proved the advisability of keeping the balloon at a distance of 5 kilometres from the batteries,—a distance which still affords the aeronaut excellent facilities for observation.

When attached to a vessel, the mobility of the balloon is greatly increased; and it must be regarded as an invaluable adjunct to a blockading fleet.

I have hitherto confined myself to a discussion of the captive balloon, solely because of its serviceability for purposes of military reconnaissance. This article would be incomplete, however, without a reference to the achievements of our military aeronauts with the free balloon, so frequently used in every part of the world.

Ascensions with the free balloon serve, above all, to increase the technical knowledge of the aeronaut in every possible way. To pilot a globular balloon successfully through the uncertain currents of the air is an extremely difficult task, for which the aeronaut must be qualified by long study and practical experience. As the course of the balloon is affected by atmospherical conditions, the aeronaut must acquire a knowledge of the fundamental principles of meteorology; while, at the same time, a familiarity with the laws governing the direction of air-currents is absolutely essential.

But it is not practical technical knowledge alone which is benefited in this way. All the attributes, such as energy, keenness of observation, and rapid decision, are prominently called into play. The diverse conditions under which a landing must be effected demand rapid judgment. The aeronaut must, at a glance, scan the ground, and choose his landing-place. He must also open the valve at the given moment, and pull the life-line at the very instant the balloon touches the ground. The drag-anchor, with which balloons were formerly equipped, has now been supplanted by a very simple device. By means of a life-line, the aeronaut, on touching ground, can rip open the balloon from pole to equator, in such a way as to effect an almost instantaneous discharge of the gas; by which means, the monster, whose death-throes were formerly fraught with serious danger to the aeronaut, is at once despatched.

Owing to the ever-varying conditions and the constant dangers incurred, ascensions with the free balloon have proved splendid tests of the nerve and character of our military aeronautic officers. Indeed, the ascensions, both altitudinal and long-distance, which have taken place at Berlin within the last few years may be ranked among the foremost achievements in modern aeronautic science. Voyages were undertaken in all kinds of weather,—the order given, its execution became imperative. Thus, ascensions were made in snow, wind, and rain; and on several occasions the balloon was driven to a height of 6,000–7,000 metres. That the investigations of our military aeronauts have been rendered available to science generally, is due to the initiative of His Majesty, our broad-minded Emperor.

H. HERGESELL.

ISOLATION OR IMPERIALISM?

THE year 1898 will be one of the epoch-marking years in the history of the United States. In this year is to be decided the great question whether this country is to continue in its policy of political isolation, or is to take its rightful place among the great World-Powers, and assume the unselfish obligations and responsibilities demanded by the enlightened civilization of the age.

Many of our statesmen, forgetting that *prestige* is as dear to nations as to individuals, and underestimating the inherited racial instincts, the restless activities, and the aggressive enterprise of our people, wrongly imagine that they can remain contented with political and commercial isolation, and satisfied, as are the Chinese, to be guided in questions of immediate and world-wide importance by quotations from obsolete texts from the wise sayings of remote ancestors.

When Washington wrote his justly celebrated Farewell Address, nations were as distant from each other in time, and communication was as slow and difficult, as at the beginning of the Christian era; but steam and electricity have so drawn the ends of the earth together that civilized society is fast becoming one highly organized and interdependent whole.

Each generation has the power to shape its own destinies; and had Washington and his fellow-patriots been governed by warnings against a departure from traditions, our present form of government would never have been established, the Constitution would have been rejected by the States, and untold evils would have resulted. Madison, when arguing for the adoption of the Constitution, met arguments very like those now being made in favor of political isolation, in the following language:

> "Is it not the glory of the people of America that, whilst they have paid a decent regard to the opinions of former times and other nations, they have not suffered a blind veneration for antiquity, for custom, or for names, to override the suggestions of their own good sense, the knowledge of their own situation, and the lessons of their own experience? To this manly spirit posterity will be indebted for the possession, and the world for the example, of the numerous innovations on the American theatre in favor of private rights and public happiness."

In answer to the arguments that there is no constitutional provision