

The Construction of Balloons and Aeroplanes



THE principal types of aeroplane apparatus at present under trial may be classed under two heads; those which consist of parallel plane surfaces and those with a single plane surface, writes a special correspondent of the London Times. In the former category may be included the well-known machines of Farman and Delagrange, which have met with so much success both here and abroad. The apparatus used by each inventor is similar in design and was built by Messrs. Voisin. The construction is of the cellular form devised by Hargrave, and for the purpose of sustentation, two fixed cells in the shape of two wings are employed on either side of the body of the machine which consists of a trussed frame carrying the aeronaut and the motor with the screw propeller. In front are two small jointed planes to serve for rising and sinking, and at the back is the steering appendage, consisting of a cell with a central diaphragm which gives the requisite direction. The driving is effected by an Antoinette motor. In the case of the Farman apparatus the following are the main dimensions: Spread of wings, 10 metres; length, 10.50 metres; approximate weight, 550 kilograms; supporting surface, 50 square metres; speed, 20 metres per second; nominal power of motor, 50 h.p.; and total weight of the motor, 150 kilograms. This is the first aeroplane which has carried two passengers. Captain Ferber is now actually making use of an apparatus of the same type, and it seems advisable to point out the very important services which this gentleman has rendered to the development of aviation. He it was who first drew public attention to the splendid performances of Lilienthal, and who by word and example advocated the gliding principle of the learned German as the best mode of acquiring familiarity with aerial navigation. His experiments with flight by means of planes in 1904 gave rise to the present movement, and it was his investigation which served to establish the form of the model apparatus which his pupils, the brothers Voisin, have so ably constructed and devised on behalf of Messrs. Farman and Delagrange.

Captain Ferber proposes shortly to make trial of a great monoplane apparatus, furnished with an Antoinette motor of 100-horse power. Among the machines of this type which have hitherto been tried, those which have furnished the greatest number of successful flights, carried out methodically, are those

of Mr. Bleriot and of Mr. R. Esnault-Pelterie. The difficulties arising from defective balance in this type of apparatus led to numerous accidents, but in every case Mr. Bleriot was able to extricate himself without injury, and he has devised many improvements. He has thus secured a machine which has given very remarkable results in point of speed and facility of handling.

This monoplane apparatus is fitted with an 8-cylinder Antoinette motor of 50 h.p. Its extreme width is 8.50 metres, and its superficial area is 22 square metres, the total length being 10 metres. The body is rectangular and there is a screw-propeller in front, with four flexible blades. At the back are two horizontal planes which are fixed and two that are movable. The two rigid wings are terminated in either case by a pinion or hinged blade. This very ingenious arrangement ensures transverse stability; the aeronaut, in fact, by means of a special check rope, can raise or depress the pinion; and by straining the rope tight and slightly lowering this pinion, so as to deflect the surface of the outer extremity of the plane, an additional air-resistance is imparted and the aeroplane tends to lift in that direction. The planes at the back afford the requisite longitudinal stability. The screws furnished with flexible blades are of advantage, in that they are less exposed to injury than screws with rigid blades, and they thus escape the liability to the frequent accidents which may have such serious consequences both for the inventor and for the spectators. Moreover, screws of this type do 20 per cent. more work than those with fixed blades.

The monoplane apparatus of Mr. Esnault-Pelterie has been employed for some very interesting trials at Buc, near Versailles. It consists essentially of a central body, covered with silk which is strained tight and varnished. Two wings are attached to this body, which have a spread of 0.60 metres and cover an area of 18 square metres. In horizontal projection they are each shaped as an irregular trapezium, which tapers off towards the extremities. This form has been adopted as the outcome of a long series of tests, carried out by towing the machine attached to a motor-car, driven at various speeds up to 100 kilometres per hour. The motor has likewise been specially designed for the purpose, and it was described in detail in The Times Engineering Supplement of November 20 of last year.

It is expected that a new monoplane apparatus will shortly make its appearance—namely, that of Mr. Gastambide-Mangin—which is fitted with two V-shaped wings. The body is cylindrical and is five metres in length, while the tail is feathered like an arrow. Power is supplied by an Antoinette motor of 50 h.p.; but after a number of successful trials had been completed, the experimenter has met with a series of accidents which have necessitated the cessation of his experiments for a while and will render certain modifications needful. These are now, it is understood, being considered.

Messrs. Voisin have just completed for Mr. Farman a monoplane apparatus which differs very greatly from the foregoing. Its form is no longer based on that of the bird, but partakes rather of that of a fish, 14 metres in length. The frame or chassis is composed of four wooden battens, secured in front to a plate of aluminium which will carry the screws; and at the back they terminate in a shoe of solid wood. Being braced throughout with wooden struts and steel ties the apparatus constitutes a truss, possessed of perfect rigidity. In the centre is situated the space for the motor and for the aeronaut. In the front part and on each side of the frame are three sustentation-planes, each of which is 2.65 metres in length by 1 metre in width. The extreme width is thus 6.50 metres. Each of these planes consists of a rectangular framework made of wood, slightly turned up at the outer edges, but covered with two thicknesses of silk. The body in its general form is incurved, with a taper of 1 in 12. The three planes are not quite in line with one another, but rise slightly in stages and the apparatus ought by right to be termed a triple plane, rather than a monoplane machine. At the rear there are two additional planes of a similar kind, but only two metres in length. The one nearer the end is moveable and serves to steer up or down. At the extreme end is a vertical cellular rudder for the purpose of keeping the apparatus horizontal. It is fixed on an upright pivot, inserted in the wooden shoe at the termination of the framework, and is prolonged towards the centre of the aeroplane by the employment of a triangle-shaped sail or feathering. The machine is furnished with a Renault motor, especially designed for the purpose. This motor is not designed to be very light, but the effort has been to assure perfect regularity of working—it is rated at 35-h.p.

and weighs 130 kilograms. There are eight cylinders arranged in V-shape, in such a way that each of the cranks is driven by two piston-rods and the crank-shaft can thus be made of reduced diameter and of very small weight. The carburettor is of aluminium and for the sparking a small magneto is employed. For cooling purposes air-circulation is utilized by the aid of two small fans. The screw is constructed with two aluminium blades and is 2.30 metres in diameter, with a pitch of 1.40 metre.

The body of the aeroplane is mounted in front on a small carriage with two shifting wheels, and at the back there is a single wheel which can likewise be shifted.

The same firm are engaged, also, in the construction of three triple-surfaced aeroplanes for Messrs. Goupy, Ferber, and Florio respectively, which consist of a spindle-shaped body, 9.50 metres in length, having three sustentation planes in front with a spread of 7.50 metres. The width of each is 1.60 metre and the distance apart 0.95 metre. At the back there is a cell formed of two planes, 4 metres in total width, each of them 1.60 metre across and 1.60 metre apart. At the extreme end is a vertical rudder.

Mention should also be made of the recent appearance at Issy les Moulineaux of a strange apparatus for aerial navigation, termed the mixed "aeronef" of Malecot, which is a combination of dirigible balloon and aeroplane. It comprises a balloon with a gas capacity of 1,054 cubic metres, beneath which is a cellular aeroplane formed of a trussed bearer 20 metres in length. The planes which constitute the aeroplane consist of 20 small sails, overlapping one another. These are each rectangular in form with an area of six square metres, and are kept rigid by a bracing of bamboo poles. The trials of this apparatus last year gave encouraging results, but those which have taken place lately are not yet sufficiently advanced to enable an opinion to be formed respecting the ultimate success of this mixed system.

The various machines, already described are all of the aeroplane type, but a certain number of inventors have directed their attention to apparatus of the class of "helicoptera," notwithstanding the grave difficulties encountered at the outset with this mode of construction. Among others Messrs. Dufaux, Cornu and Leger are engaged in conducting

experiments with machines of this character.

It is necessary also to notice the Breguet-Richet "gyroplane," which is actually under test at Douai. This is in reality a combination of the aeroplane and the helicopter. It is constructed with a rigid framework, formed of steel tubes, in the shape of a great cross, placed horizontally. At the intersection of the arms is the seat for the aeronaut, and here also is situated the 45-h.p. motor. At the extremities of the four arms are four systems of sails, or revolving blades, each consisting of a pair of superposed planes which are caused to rotate in different directions, in order to balance their aero-dynamic effect. By their rotation they impart the ascensional movement to the apparatus. The inventors assert that the gyroscopic action of these revolving blades will likewise impart stability to the machine. The apparatus is also provided with fixed planes, intended to afford sustentation and to promote stability. The total weight is 578 kilograms and on several occasions this machine has raised itself from the ground to a height of 1.50 metre.

In order to bring this review of French aeronautic achievements to a conclusion, it may be as well to allude to the remarkable communication of Mr. M. Desprez to the Academie des Sciences with respect to the flight of birds in soaring, although it has not yet been possible to give practical effect to his investigations. He has propounded a very simple mechanical explanation of the wind-hovering movements of birds with large powers of flight, and he has confirmed his theories by some admirable laboratory experiments. An artificial bird is represented by a piece of aluminium foil, slightly twisted and provided with wheels. This is placed on an inclined plane, and beneath it a current of air is caused to blow obliquely, and, on suitably regulating the strength of this air current, the foil is seen to ascend the plane in a contrary direction to that of the air. By this means it is shown that soaring birds can, without motion of their wings, travel at a great velocity against ascending air currents. It is scarcely possible to conceive the important advantages which aerial navigation may derive at some future date from this fact. Mr. Quinton has founded a prize of 10,000 francs, based on this discovery, for the first aeroplane capable of being sustained in the air for five minutes without dropping more than 50 metres below its original level.

Three Travellers in Asia



THE flood of books of Asian travel grows a little overwhelming, but not one of these three works can be called either superfluous or uninteresting. Mr. Johnston and Count de Lesdain take us to the wilds of Tibet, partly by routes that no other European has travelled. Sir Henry Craik follows the beaten track of the tourist in India, but his modest notes are agreeable reading, and he does not profess to have solved the problems of the Indian government in a single winter visit. His quiet reflections never lack freshness, and are generally sound and true. His rambles in Bombay lead to some pungent comments on Anglo-Indian architecture. He despises the meretricious Indo-Saracenic style, and calls the great railway buildings "inept and misplaced." To some extent he is justified, for the dome of the vast Victoria Terminus suggests a tipsy cake, and the Bombay-Baroda railway offices are like a cruet-stand. But the tower and dome of the municipal offices have a simple dignity, the long sweep of the public offices abutting on the Oval is impressive, and had Sir Henry Craik examined the beautiful Anjuman-i-Islam, designed by Mr. John Willcocks, he would not have given such exclusive praise to the despised town hall. The early Portuguese in India had a better conception of buildings suitable for the tropics than any Europeans who have followed them, but few travellers ever visit the picturesque remnants of Old Goa. Most of the newer blocks of buildings and offices in Bombay seem planned for the climate of Spitzbergen, and an examination of the local building regulations conveys the same impression. Sir Henry Craik appears to have been unfortunate in his experiences on the Great Indian Peninsula railway, for their newer expresses are usually extremely comfortable; but the journey from Bombay to Lahore in October is never a very joyous experience. He is amply warranted, however, in protesting against the way in which third-class native passengers are herded together. We have even seen the grievances of third-class passengers solemnly noted among those varied influences, "the causes of unrest." Oddly enough, Sir Henry Craik has a good word to say for the Indian up-country inn, and is "not disposed to think hotel life in India so bad as it is reported." We fancy his experiences of the smaller hotels must have been very few and very fortunate.

It is rather surprising to find so shrewd an observer pausing in his narrative of his journey through the Khaibar to expound "the hazards of supine inaction" on the frontier. "Are we counting its cost?" he asks. The authorities are probably more appropriately engaged in counting the cost of the subjugation of 200,000 fighting men scattered over a great

area of mountainous country. Sir Henry Craik is an industrious sightseer, and while at Delhi took the trouble to visit the titanic ruins of Tughlakhabad. Most travellers, rather indolently stop short at the Kutab Minar. He is singularly unfair to the Anglo-Indian press, and his assertion that "two or three minutes suffice for the perusal of the paper to the average Anglo-Indian" is a curious mistake. Had he spent a hot weather in a lonely station in the plains, he would have found that the daily paper was read even to the columns of small advertisements. In discussing the reluctance of the British officials to hand over their authority to aspiring Indians, he makes a lucid and perfectly accurate comparison.

Their position seems to me to be comparable to nothing so much as that of scientific engineers planning, with elaborate and careful foresight, out of the most heterogeneous materials, a vast work, and suddenly called upon to entrust its guidance to the irresponsible votes of the navies engaged upon the manual labor of construction.

The difficulty is that, as in all countries, the navies believe themselves fully competent to control the complex fabric. Yet, as he points out, even the limited degree of popular control already existing is not very satisfactory in its results. The municipal councils "are distrusted by all; are kept from more flagrant errors only by official guidance; and the fact that they are elected does not give them the confidence of the native in any degree whatever." We should not care to subscribe to so sweeping a condemnation of Indian municipalities, but the view summarized by Sir Henry Craik is held by many experienced administrators. He is very far from accuracy when he says that "nothing is more certain than that the wires of all the agitation, far and near, are pulled in Bengal." One can very rarely be certain about anything in India, but the probability is that until quite recently most of the wires were pulled from the Bombay presidency.

Count de Lesdain carries us away from the burning heat of India, to the keen air and spacious vistas, the ice and snow and savage wildness, of High Asia. He marched from Peking across the little-known Ordos Desert, traversed the Chinese provinces of Shansi and Kansu, skirted the Gobi Desert, and came right across Tibet through Shigatse and Gyaangtse to India. We cannot recall any other European traveller who has entered India by such a remarkable route, and Count de Lesdain deserves ample credit for his intrepid journey. Those explorers who persist in advancing into the trackless wild with vast stores of provisions may be advised to study the example of this enterprising Frenchman, who started with no other sustenance than a

few bottles of champagne. He lived on the country all the way, and though he was sometimes on short commons, he seems to have emerged none the worse for his adventures. In the Ordos region he made a detour to visit the tomb of Jenghis Khan. The ashes of the mighty Mongol conqueror, whose empire extended from Shan-tung to the Russian steppes, are preserved today in a painted chest, kept in one of two tattered tents on a lonely hillside. The guardians of the sepulchre have no notion who Jenghis Khan was. There is something unconsciously dramatic in Count de Lesdain's description of the tomb and squalid tents which constitute this forgotten Mongol sepulchre. The writer claims to have discovered the source of the Yang-tze-Kiang, in a stream issuing from a glacier in the Dang-la mountains; but inasmuch as there are sometimes disputes about the precise source of the Thames, we fear that his claim will perhaps be a little difficult to establish. He predicts that the next war with China will cost more lives than any of its predecessors, and will raise more difficulties than the European nations have had to overcome. But why not let China alone?

Mr. Johnston is another Spartan traveller. He marched from the extreme northeast to the extreme southwest of China, over the loftiest passes in the empire, and through seven of its provinces. During the greater part of his journey he partook of "the same coarse and frugal fare as my coolies and muleteers," and only had one short attack of fever. Evidently the simple life suits travellers in Asia. His book is a far more serious and valuable contribution to the literature of travel than the other two works we have noticed. It is to some extent ethnological, for Mr. Johnston's chief purpose was to acquire some knowledge of the tribes subject to China that inhabit the wild regions of Chinese Tibet and Northwestern Yunnan. We admire, but do not aspire to emulate, the indomitable fortitude which led him to wade through the 160 volumes of the "Szechuan Chih" in search of material. The general reader will perhaps be more interested in his descriptions of the glorious mountain scenery of southwestern China. Mr. Archibald Little has already written a book about the attractions of Mount Omei, the great sacred mountain of Szechuan, but Mr. Johnston's account of his visit is engrossing. One of the most famous saints whose name is associated with the mountain was a native of India, who is locally reputed to have lived there for centuries! The possible connection between the earlier Indian races and Szechuan is worth further investigation, and Mr. Johnston thinks the ancient cave-dwellers in the province may have come from the other side of the Himalayas. Like all travellers in China, he has something to say about the missionary question. He thinks the present difficulties will cease when China, by the reform of her legal codes and judicial procedure, has earned the right to abolish foreign consular jurisdiction in Chinese territory.

Lures Money From Public



HERE is one man in the world who can actually talk money out of your pockets.

Ask anyone of the hundreds of men and women at the Old Orchard camp meeting about the Rev. Mr. A. B. Simpson, says the Boston Saturday Post.

Ask them about the \$300,000 contributions taken up after one of his famous missionary sermons, about the jewels and gold watches showered upon the platform.

The scene under the pine trees of Old Orchard is one so fraught with intensity and emotion, so almost weird in its abandonment, that once seen it is never forgotten. Even the Philistine is swept along on the tide and not until afterward does the marvel appear. Some thousands of people, men, women and children, sit closely packed on the wooden benches. Each leans forward as though to draw nearer the speaker. On the platform stands a tall, angular man with a keen, fierce face. His features are irregular, not even well proportioned, but the holding power of the eyes makes up for the lack of harmony in the face.

They are densely brown and expressive, pleading, demanding, defying, sternly accusing and conciliating in turn.

He has the appearance of faking in every individual in a circle at once, and grown men shrivel or expand under the influence.

No one of the vast throng before him is conscious of anyone but that dominant figure on which every eye is fastened. Often they speak, sometimes even cry out aloud in the violence of their approbation of what he says, but the one who cries and the ones about him seem oblivious to it. There is such revilement, such ferocity of scorn in his arraignment of the mediocre life of the average Christian that you can almost see the poor people squirm for fear that the odious coat is cut out after their own fashion.

Mr. Simpson's voice is not unmusical, and it has great carrying power. His English is pure and simple, the words forceful and well chosen. His sentences are short, pointed and picturesque.

As he speaks his body leans far out toward his audience, and his gestures are wide and sweeping, somewhat awkward, but they tell the story.

At the end of an hour and a half or two hours, during which the people before him have run the entire gamut of human emotions he calls for the collection for the heathen, the heathen whom the Christians must save, thereby saving themselves.

"Anything may be given," he announces—"It is all for the Lord, all to redeem you from the consequences of your sins—to lay up riches in Heaven."

After the pledges, baskets are passed around and at the end they are filled with bills,

checks, rings, pins, watches,—everything that could be converted into cash. With a perfect passion of giving they fill the baskets.

At the end of one such collection after the famous missionary sermon the amount came to over three hundred thousand dollars.

The vastness of the amount is due to more than the hysteria of the summer people, who go out of curiosity and stay to fling at the speaker's feet all their jewels.

Mr. Simpson himself has analyzed it, and his conclusions are enlightening. "Some of the money is due to the emotionalism of the sensation seekers who come out of curiosity," he says.

"The great bulk of it is due to the people who have been here previously,—people who deny themselves the luxuries of life, even the car fares, so that they may come here and give to the missions.

"We are undenominational, you see, just a gathering of people who do not compromise with the devil. There are so many worldly Christians who do as those of the world do nowadays. We call our organization the Christian and Missionary Alliance and those who are sincere and earnest and willing to give everything naturally draw near us.

"People come here who have saved every cent they could get for two and three years, not even taking money to come here every year, and when they do come they give all they have. These are the people the bulk of the money comes from.

"We have over two hundred missionaries in India and about one hundred in China, then we have them in Japan, the Philippines, Palestine, South America, Africa. The average income for a missionary is a thousand dollars a year. Our missionaries get three hundred dollars a year. They go into the foreign field to preach the gospel, not for the salary they receive. It is possible to live in these foreign countries on that amount and our missionaries are willing and glad to do it.

"It is not that I hypnotize the people to give up money to the missionary cause. If I went to Boston or Swampscott I should not be able to get such a collection. It is that this is the special time for the believers in the uncompromising Christian life to come together and these people feel moved to give all they have."

Although "changing the face of nature" is a remark frequently used to describe some important work of man upon the earth, it is usually little more than a figure of speech. In a newly-developed oil-field, however, the remark might be applied with some justice. Through the carelessness of a workman, fire was communicated to the subterranean reservoirs of oil some weeks ago. Explosions followed which tore up the whole surface of the earth for a space of a square mile.



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