Correspondence.

Saving Life on Land and at Sea.

To the Editor of the Scientific American:

I have given some thought to two projects for saving life and property, and with your kind permission I will briefly describe them with the object of inviting discussion. One relates to the land and the other to the sea.

In reference to the first, I would say that in the frequent case of fires among warehouses and manufactories, I am led to believe that more damage is done to goods than to buildings. I would avoid this in a measure by making all the floors of warehouses perfectly tight, like the deck of a ship. I would provide, all round the rooms, waterways of metal with conduits to carry off water thrown in by engines. These conduits should lead into a cistern in or near the cellar or sidewalk, and thus save the water to be pumped up again if wanted; if the floor be properly laid on iron beams and made of plank thoroughly calked, and all floor openings duly surrounded by ledges, or "coamings" like the hatches of a ship, little or no water can get through to the floors below. I would have all brick stores plastered directly on the walls, dispensing with the laths entirely. As buildings are now constructed, much of the water poured into an upper story percolates through the floor and damages goods. Although the insurance brigade may be on hand and work diligently, many goods are damaged or spoiled. The expense of laying floors as alluded to will of course be greater than the common floors, which invite destruction, but the value of the tight floors would far more than overbalance the first cost. When we look at the massive, magnificent, palatial stores erected in late years, and see the dangerous floors and plastering, we cannot cease to wonder at the inconsistency between the polished granites and the laths and boards!

My project to save life and property at sea is simply to construct the watertight compartments of a ship as usual in first class vessels, and to pack all valuable goods in watertight packages of a form to stow close. Let me suppose that two or three of the main compartments in a steamer are filled with such packages; let us suppose that she goes on the shore and staves a hole in each compartment. Very little water would enter to fill up the small spaces between the packages, and every one of these packages, if duly immersed, instead of soaking up much water, destroying or damaging the contents, and *assisting to sink the ship* or to keep her on the rocks, would in a great measure *assist to float her*. And in the event of being compelled to lighten a ship by throwing over cargo, or landing goods in exposed places, the watertight packages would be saved. Objection has been made to the practicability (in a commercial sense) of carrying out my plan, principally on account of the extra cost. To this I answer, that if the goods are worth saving, the cost of tight packages is of little consequence. We see every day wine costing forty or fifty dollars put into well made casks costing perhaps four or five dollars; why not put into tight casks goods (now exposed in flimsy boxes) worth from $200 to $2,000?

In the days of the East India Company, all their valuable goods were packed in bales made perfectly watertight by layers of tarred canvas. I once picked up a bale of goods which had been in the water long enough to be covered by barnacles; the contents were as dry as the day they were packed! It was the custom in olden times when I went to Manila to pack goods in wooden boxes lined with copper well soldered. This, at first sight, would seem very costly; but, when it is considered that the copper went in free of duty, and was worth perhaps 25 per cent more than it cost, it will be seen that it was a cheap form of packing goods. I believe that the day is not far off when first class steamers will carry only first class passengers and first class goods—that is to say, only goods which can afford to be packed so that they will help to float the ship instead of helping to sink her. Good casks will be worth very nearly their cost, while boxes make only kindling wood.

Carry out my idea, and there will spring up at once manufactories where paper or wooden casks and watertight boxes will be made by the million.

The question of insurance has so many sides to it that I shall only touch upon it by suggesting that my idea will not be very popular with underwriters.

R. B. FORBES.

Milton, Mass., November 9, 1883.

The Mechanism of the Vertical Attitude.

Expression, which is translated by several different means—the cry, the look, the gesture, the play of the countenance, etc.—is nowhere more complex than in attitude, this permitting, better than any other expressive mode, of interpreting its most delicate shades.

This is especially true of the vertical attitude of man, which, co-ordinated, like that of animals, in view of equilibrium, is much more directly subordinated to the act that is being accomplished. It is especially advantageous in that it frees the upper members in view of the work to be done; and this sort of attitude is distinguished by the aptitude for work which results therefrom for man, much more than by the peculiarities of equilibrium and expression that characterize it. Nevertheless expression profits by this independence of the upper members, since these latter constitute the apparatus of gesticulation—gesture being one of the most expressive forms of language.

Attitude may be defined as the general aspect of the body *adapted* for equilibrium, action, or expression. Now this adaptation does not essentially differ in man and the lower animals. In both it necessitates an effort that exists neither in the cadaver nor the sleeping man, but which becomes evident as soon as the sleeper again takes possession of the external world. A displacement, however slight it be, of the center of gravity constitutes the body in a state of exertion, and such exertion assuredly becomes indispensabe in order that man may afterward raise himself erect upon his feet and hold himself in that position.

The co-ordination of attitude in the higher animals, and very likely in those that are lowest in the scale of being, requires, in the very first place, a more or less clear appreciation of the medium in which the animal is moving. With us the notion of this is furnished by our senses. The sense of touch gives us the notion of contact; a muscular sense warns us of the execution of a movement, while at the same time it conveys to us a notion of the changes that have taken place in our conditions of equilibrium (notion of gravity); and special sensations furnish us with the notion of the relation of objects, one of such notions being that of space.

The mutual interdependence of these different elements is such, in a normal state, that the inertia of one or the other of the apparatus of sensation or the absence of one or the other of these elementary notions often carries with it a disturbance of the attitude. In an unimpaired state of the sensations, roles are distributed in such a way as to compensate, in the movements generally, for certain superfluous wheels that have a double function. But these wheels are capable, when necessary, of taking the place of the others, and of alone bringing about a motion when the others are no longer in operation. The example of the deaf, of the blind, of the paralytic, etc., who, at an adult age, having lost one or another of their senses, can, by beginning again their sensorial education, manage to supply to a certain degree the missing sense, suffices to prove that none of the notions above enumerated is indispensable to a notion of the environment, although all contribute thereto, and that the surviving sensations are sufficient to make up for it in such measure as may be necessary.

Experiments upon animals have demonstrated the importance of tactile sensitiveness in the co-ordination of attitude. On comparing these with what we observe, in a normal state, among those that are lowest in the series, we shall be led to believe that attitudes, at least in what concerns equilibrium, are purely automatic, that is to say, they are established instinctively as a consequence of a sensorial impression and by virtue of reflex power alone. It is thus at least with some of them. Grimaces, contortions, convulsions caused by local pain, tickling, etc., are indeed attitudes that are purely automatic in the majority of cases, and these cases are sufficient to establish the importance of motions that are purely reflex in the co-ordination of attitude.

This is seen still better by an observation of the attitude and the motions generally of animals that have been deprived of brain. The experiments of Mr. Onimus have been peculiarly instructive in this respect. Under such conditions, the pigeon thrown into the air spreads its wings and flies, and a frog thrown into water swims, as if tactile sensitiveness were alone sufficient to determine attitude. In fact, the motion effected in the preceding case ceases in the surrounding medium only when the animal meets with an obstacle. Moreover, if a brainless frog, resting in equilibrium upon a board, be placed in the water, he will not swim, even though the board be drawn from under him; and, in order to set him in motion, his position of equilibrium must be disturbed. Analogous experiments have succeeded not only with frogs, but also with carp and ducks even.

It is difficult to trace clearly the role played by the will in the co-ordination of the attitude, and to determine with accuracy what are purely spontaneous attitudes and to distinguish them from those that are purely automatic. A large number of associated motions which formerly passed for spontaneous and voluntary ones are to-day considered as automatic, that is to say, they are produced mechanically, and sometimes irresistibly, as a consequence of a sensorial impression. Such, in the bird, is the action of smoothing its wings. Motions of this class are qualified as *acquired* automatism, in the sense that they are the result of imitation and habit, and are not transmitted by heredity, that they are not the result of a pure and simple evolution of the organs, and are not observed in young animals. Many attitudes belong to this class of motions. Among them there are some that are purely conventional, such as those of respect, salutation, etc., among different peoples. While these vary, in spite of the identity of feeling that calls them forth, it is because the motions that are combined to produce them are not fatally connected, as in the preceding, with the inciting sensation; and, on another hand, they are often established without reflection, and through a sort of machinal impulse, this giving them the character of automatism.

We may, then, recognize three categories of attitudes: (1) spontaneous, (2) automatic, and (3) conventional; and an attentive observation of each of these, and a discussion of their analogies and differences, will allow us to estimate the role played by the brain in determining an attitude.

As regards the spinal marrow, we know that the isolation of it from the brain by a transverse section does not prevent the production of co-ordinate motions which have even the character of voluntary ones, in that they are adapted for removing the irritated part from the exciting cause. This fact has been verified more especially in batrachians; but in man himself the reflex motions that are called forth, in cases where the spinal marrow is compressed beneath the compressed medullary region, possess the same character. Certain physiognomists have concluded from this that the instinct of self-preservation is localized in the spinal marrow. The celebrated experiment of Pflüger is familiar. On placing a drop of acetic acid on the upper surface of the animal's thigh, the corresponding leg was observed to bend so as to bring the foot into a position to rub the irritated point. The foot having been amputated before renewing the irritation, the animal began again the same motion; and then, as the footless leg could not reach the point of irritation, the animal, after a few moments of agitation, as if it were seeking, says Pflüger, a new means of accomplishing its designs, bent the other leg and succeeded with that. The same facts have been reproduced by other experimenters, and have led to the belief that there exists in the spinal marrow not only an instinctive power (Prochaska), but also a perceptive or psychical one (G. Paton, Pflüger).

What is there astonishing, then, that the spinal marrow should co-ordinate to itself alone motions in general that are adapted for equilibrium? It has, in fact, been ascertained that, in frogs for example, a normal attitude is maintained in cases where a transverse section of the marrow is made; and Schiff has even concluded that the latter possesses a true sensitiveness, which is called by Van Deen sensitiveness of reflection.—*Dr. A. Nicolas, in La Nature.*

How to Cook an Old Hen.

Prof. W. Mattieu Williams gives us in *Knowledge* his practical experience with elderly poultry, as follows:

I may mention an experiment that I have made lately. I killed a superannuated hen—more than six years old, but otherwise in very good condition. Cooked in the ordinary way she would have been uneatably tough. Instead of being thus cooked, she was gently stewed about four hours. I cannot guarantee to the maintenance of the theoretical temperature, having suspicion of *some* simmering. After this she was left in the water until it cooled, and on the following day was roasted in the usual manner, *i. e.*, in a roasting oven. The result was excellent; as tender as a full grown chicken roasted in the ordinary way, and of quite equal flavor, in spite of the very good broth obtained by the preliminary stewing. This surprised me. I anticipated the softening of the tendons and ligaments, but supposed that the extraction of the juices would have spoiled the flavor. It must have diluted it, and that so much remained was probably due to the fact that an old fowl is more fully flavored than a young chicken. The usual farm house method of cooking old hens is to stew them simply; the rule in the Midlands being one hour in the pot for every year of age. The feature of the above experiment was the supplementary roasting. As the laying season is now coming to an end, old hens will soon be a drug in the market, and those among my readers who have not a hen roost of their own will oblige their poulterers by ordering a hen that is warranted to be four years old or upward. If he deals fairly, he will supply a specimen upon which they may repeat my experiment, very cheaply. It offers the double economy of utilizing a nearly waste product and obtaining chicken broth and roast fowl simultaneously.

One of the great advantages of stewing is that it affords a means of obtaining a savory and very wholesome dish at a minimum of cost. A small piece of meat may be stewed with a large quantity of vegetables, the juice of the meat savoring the whole. Besides this, it costs far less fuel than roasting.

The wife of the French or Swiss landed proprietor, *i. e.*, the peasant, cooks the family dinner with less than a tenth of the expenditure of fuel used in England for the preparation of an inferior meal. A little charcoal under her *bain-marie* does it all. The economy of time corresponds to the economy of fuel, for the mixture of viands required for the stew once put in, the pot is left to itself until dinner time, or at most an occasional stirring of fresh charcoal into the embers is all that is demanded.

Method of Exhausting Drugs.

Mr. Alfred B. Taylor gives the following in the *American Journal of Pharmacy:*

The process consists in using a portion of the finished preparation (from a previous operation) to macerate and partially exhaust the drug before using the new portion of menstruum, and as there is no limit to the quantity of finished preparation that can be used where necessary, it is possible to exhaust completely the drug operated on.

For example, let it be required to make two pints of tincture of arnica flowers:

Take of Arnica flowers, in No. 20 powder	6 oz. av.
Tincture of arnica flowers	2 pints.
Diluted alcohol, a sufficient quantity to make	4 pints.

Moisten the powder with a pint of the tincture of arnica flowers, and macerate for twenty-four hours; then pack it firmly in a cylindrical percolator, and gradually pour upon it, first the remainder of the tincture of arnica flowers, and afterward diluted alcohol, until four pints of tincture are obtained.

The author has used this process with great advantage in making the fluid extract and the tinctures of cinchona.

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SOME Arizona mining companies are about to use the electric light in their mines.

Some New Alcohols.

The term *alcohol* was originally applied only to that volatile and intoxicating constituent of fermented and distilled liquors which imparts to them their peculiar value. It is always obtained by fermentation, and usually separated by distillation. It is very combustible, has a burning taste, and dissolves a great many substances that are insoluble in water.

In 1812 Taylor discovered another volatile substance, possessing the same remarkable solvent powers, and equally combustible. It was found in crude wood vinegar, and is often called wood spirits, but the chemist preferred to call it alcohol, adding the prefix "methyl," to distinguish it from vinous alcohol, now called ethyl alcohol. In time other substances were discovered more or less similar to the two above described, among which was fusel oil. The chief constituent of this has since been isolated and named amylic alcohol.

When organic chemistry had advanced sufficiently to render a classification of the known compounds, these substances were grouped together into a class in which were placed all substances of similar chemical composition, although quite unlike in physical properties. The characteristic of an alcohol is that it contains an atom of hydrogen united with one of oxygen (called hydroxyl), just as caustic potash and soda do, but where the latter has a metallic atom the alcohol has a group of carbon and hydrogen atoms, with one more than twice as many of the latter as of the former. Another characteristic of all normal alcohols is their power of forming aldehydes, ethers, and acids. Formic acid is made from methyl alcohol, and acetic acid from ethyl alcohol.

There are a whole series of well known alcohols in which the number of carbon atoms gradually increases from one to nine. Here a break occurs. The next one has sixteen atoms of carbon joined to thirty-three of hydrogen, and is called cetyl alcohol. Then another break, and an alcohol is known with twenty-seven atoms of carbon, called cerotyl alcohol. The former is found in spermaceti, the latter in Chinese wax.

The first nine are liquid at ordinary temperature, the others solid; and all, except the methyl and ethyl alcohols, are more or less oily. Until very recently the number of solid alcohols was very small.

There was every reason to expect that the long break in the series between nonyl alcohol, which has nine atoms of carbon, and sexdecyl or cetyl, which has sixteen, would some day be filled up, for within this space were three acids having respectively ten, twelve, and fourteen atoms of carbon each. Not long since F. Krafft announced that he had succeeded in preparing these and several others. Ordinary ethyl alcohol is easily oxidized and converted into an aldehyde, which by further oxidation passes into acetic acid. Alcohol – H = aldehyde + O = acid $C_2H_5HO - H_2 = C_2H_3HO + O = CH_3COOH$.

It is natural to suppose that human ingenuity can reverse the process, converting acids into aldehydes, and these again, by reduction, into alcohols.

Krafft first prepared the barium salt of *capric* acid, $C_{10}H_{20}O_2$, and mixed it with the formate of barium, then subjected the mixture to distillation under reduced pressure. The result was an aldehyde, $C_{10}H_{20}O$, which he then dissolved in ten parts of glacial acetic acid and added three or four parts of zinc dust at long intervals, heating to gentle boiling for a week. On pouring out the acid solution and adding water the acetic ether of the desired alcohol separated as an oil, which was rectified to purify it. The alcohol was obtained from it by saponification.

This normal decyl alcohol is a strongly refracting, intensely sweet smelling, unpleasant tasted, thick oily liquid, which crystallizes in large rectangular plates that melt at 7° C. (44½° Fahr.).

The dodecyl alcohol, $C_{12}H_{26}O$, was prepared from *lauric* acid in a similar manner. It was found to melt at 24° C. (75° Fahr.) and boil at 143½° C., under 15 mm. pressure.

Tetradecyl alcohol was made from *myristic* acid; it is also a solid alcohol, and melts at 38° C. (100° Fahr.).

The next alcohol of the series, $C_{16}H_{34}O$, was prepared from *palmitic* acid, and found to be identical with the natural cetyl alcohol.

Octadecyl alcohol, $C_{18}H_{38}O$, was prepared from *stearic* acid, as in the manner before described. It melts at 59° C. (138° Fahr.).

These five new alcohols are of interest in many respects; and it is to be hoped that Krafft will soon add the other missing alcohols, at least to the thirtieth member of the series.

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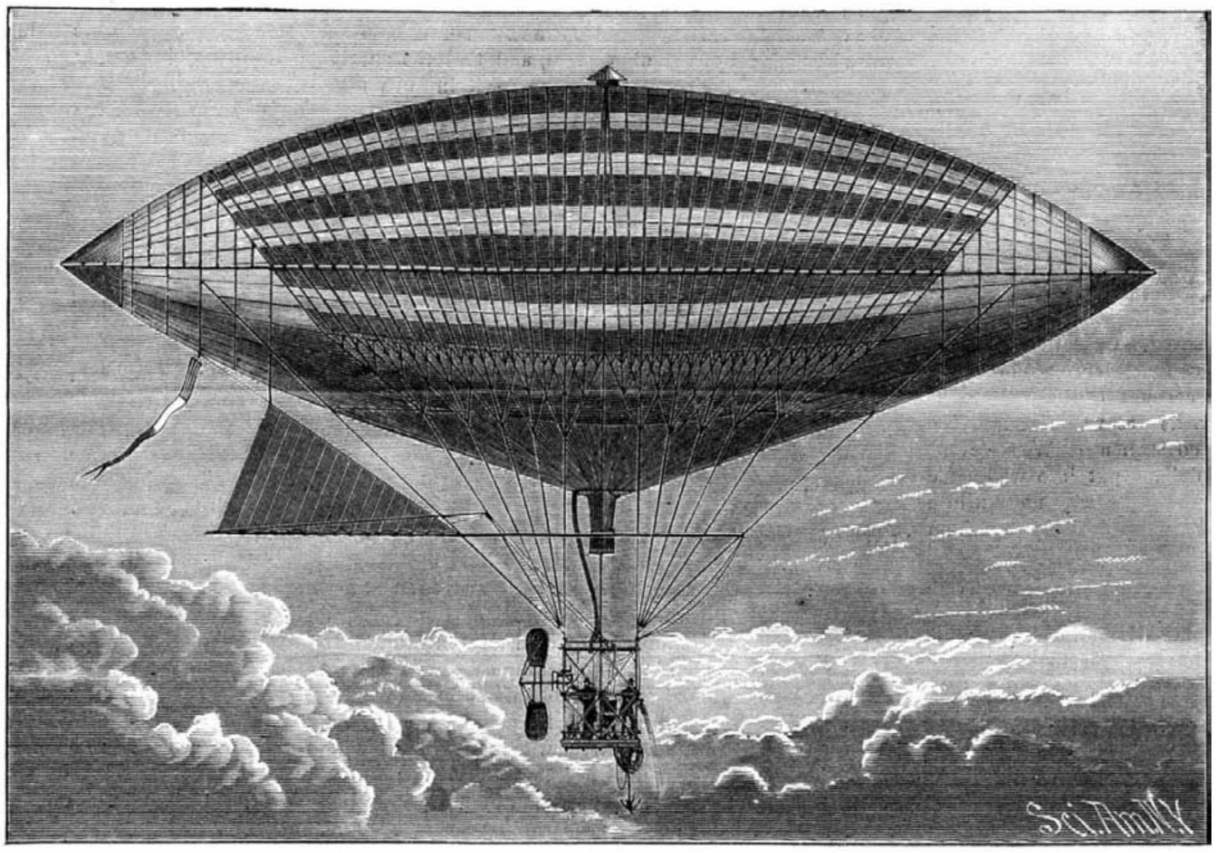
A Live Walrus in London.

A live walrus has just been introduced to the Westminster Aquarium. This animal, which is about five months old, is believed to be only the second of its race which has been captured alive, and it was taken at its mother's breast. The steam whaler Polynia, which came into the Tay on Thursday week, brought it, and Captain Walker, who commands the ship, gives a most interesting account of the capture of the "infant." He states that the vessel was slowly steaming up Davis Strait less than a month ago when a full grown walrus was observed floating on the top of the water, apparently asleep. The captain shot the animal, and a boat was lowered to harpoon and save the body. While engaged in this work, the baby walrus, which had been sucking the sleeping mother, made its appearance, and was at once dragged into the boat. The little creature uttered terrible cries, which brought two male walruses to its rescue. They attacked the boat ferociously. Being armed with formidable tusks of more than 2 feet in length, they placed the boatmen in great jeopardy, and the Henry's "express" rifle, which had killed the mother of the baby, was again brought into requisition. This killed the two males. Captain Walker fed the creature on salmon, of which the ship laid in a stock, and on this food it flourished, becoming quite docile and a playmate with the sailors. The fact of the capture was telegraphed from the Shetlands, and on Wednesday, when the ship was expected in the Tay, there were agents from the American, German, and largest English exhibitions waiting in Dundee. The ship was boarded at sea by Mr. Farini, who acquired the animal for the Westminster Aquarium, and it had its first introduction to London public life on Saturday last. It was not seen to the best advantage, as it had been confined in a box, and, as it had not had the use of water, its skin was not in its natural state. The young walrus is between four and five feet long, is a male, and has beautiful scarlet eyes. It is now cutting its tusks, and this condition gives it as much pain as cutting teeth does a child, and the rubbing of the gums gave it evident ease. The creature has caught a little chill in coming from the extreme northern latitudes to our milder climate; but otherwise it is healthy, and gives promise of offering an opportunity for an interesting study of its race, which attains the length of 15 feet. It is fed entirely on fish. The walrus formerly taken was fed on pork, and came, therefore, to an untimely death. The tusks of the mother walrus are also exhibited.



TISSANDIER'S NEW ELECTRIC BALLOON.

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A Gigantic Organ.

The largest organ probably ever constructed was lately completed at Ludwigsburg. It is destined for the cathedral church at Riga. There are in it 7,000 pipes, 124 stops, with pedals, etc., proportionately numerous. A very complete "swell" arrangement allows the increase and diminution of sound to be effected with singular perfection and delicacy of effects. The filling of the pipes could not be carried out by organ blowers, but is effected by machinery worked by a gas engine of 4 horse power. This organ is 20 meters high, 11 broad, and 10 deep (about 65½ ft., 36 ft., and 33 ft. respectively). The largest wooden pipe is 10 meters (32¾ ft.) high, and its cubic contents are 70·6 cubic feet; while by a curious contrast the smallest pipe is made only a centimeter and a half high, and is attached to the greatest one.

TISSANDIER'S ELECTRIC BALLOON.

The construction of the electric balloon included that of three distinct apparatus, to wit: 1. That of the balloon, properly so-called; 2. That of a hydrogen apparatus for inflating it. And 3. That of an electric motor designed for moving it by means of a screw which in revolving takes its purchase upon the air.

The construction of an aerial ship of elongated form presents serious difficulties, and can have as a guide only two previous experiments—that of Mr. Henri Giffard in 1852, and that of Mr. Dupuy de Lôme in 1872. In the small balloon that we operated at the time of the Exhibition of Electricity, says M. Gaston Tissandier in *La Nature*, we adopted as a mode of suspending the car a longitudinal rod beneath, like the one in Giffard's steam balloon. It has seemed to us since then that it would prove advantageous to place the helix behind a large parallelopipedic car that had sufficient height to protect the propeller against the danger of a shock on descending. The car, in this case, would be connected with the balloon by oblique suspension cords, and the affair would be prevented from getting out of shape by means of flexible rods fixed to the two sides of the balloon.

The construction of a balloon thus conceived was undertaken in the shops of Mr. H. Lachambre, who assumed the responsibility of manufacturing it. A small model of about 15 cubic meters capacity had previously been made, and it was only after studying the working of this in a captive state that the construction of the large one was begun.

The electric balloon is in shape like those of Messrs. Giffard and De Lôme, and is 28 meters in extreme length by 9·2 meters in diameter at the center. It is provided beneath with a conical neck that terminates in an automatic safety valve. The fabric is percaline, this being rendered impermeable by a new varnish of excellent quality. The capacity of the balloon is 1,060 cubic meters. The suspension covering is formed of ribbons sewed to longitudinal elliptical pieces that keep them in the geometrical position that they are to occupy. The ribbons, thus arranged, fit perfectly to the inflated fabric and form no projections, as would be the case with a netting. We reproduce in Fig. 1 the diagram that was used for shaping the pieces of the balloon and the different parts of the suspension covering. This latter is fixed, at the sides of the balloon, to two lateral flexible rods, which follow its contours accurately from point to point, in passing along a line with its center. These rods are formed of thin walnut laths adapted to longitudinally-sawed bamboos, and strengthened by strips of silk. To the lower part of the covering is fixed a network that terminates in twenty suspension cords, which are attached in groups of five to the four upper angles of the car. The latter is cage shaped, and is constructed of united bamboos consolidated by cords and copper wires covered with gutta-percha. The lower part of the car is formed of cross-pieces of walnut which serve as a support for a basket work of osier. The suspension cords entirely envelop the car and are woven into the lower basket work. They had previously received a coating of rubber, so that, in case of accident, they might be preserved from contact with the acid contained in the car for supplying the piles. The suspension cords are connected horizontally by a ring of cordage situated two meters above the car.

The stoppage apparatus for descent (the guide rope and the anchor line) are attached to this ring, which, in addition, is designed for distributing the traction equally during a descent. The rudder, which is formed of a large surface of unvarnished silk held beneath by a bamboo, is affixed behind.

The following is the weight of the different parts:

Balloon, with valves	170	kilogr.
Suspension covering, with rudder and suspension cords	70	"
Lateral flexible rods	34	"
Car	100	"
Motor, helix, and piles, with the liquid for operating them during two and a half hours	280	"
Stoppage apparatus (anchor and guide rope)	50	"
Weight of fixed material	704	"
Two excursionists and instruments	150	"
Weight of ballast	386	"
Total	1,240	kilogr.

The ascensional force, reckoning 10 kilogrammes excess for the ascension, was 1,250 kilogrammes. The capacity of the balloon being 1,060 cubic meters, the gas therefore gave