THE ALVARES AEROPLANE FLYING MACHINE.

BY THE ENGLISH CORRESPONDENT OF THE SCIENTIFIC AMERICAN.

A new flying machine has been constructed upon the aeroplane principle. The apparatus is the invention of Senhor Alvares, of Brazil, and has been constructed under his supervision by Messrs. C. G. Spencer & Sons.

In this apparatus the designer has adopted the bird with wings outspread in the act of flight as his model. As will be gathered from the accompanying illustration, the machine consists essentially of two huge aeroplanes similar in shape to the wings of a bird outstretched in a swooping position. The framework is constructed throughout of bamboo, even including the body, thereby obtaining the maximum of strength with the minimum of weight, the various members being held taut in position by wires. The front members or ribs of the two wings terminate centrally and the aeroplane material is tightly secured thereto, and being triangular in shape, the two wings terminate in a point at the rear. The two wings measure 40 feet from tip to tip and the aeroplanes have a total superficial area of 400 square feet. In the forepart of the machine are placed two out-riggers. Each carries at its forward end a two-bladed propeller or tractor 5 feet in diameter, and having a speed of 240 revolutions per minute. These are driven by belting from a 2-horse-power single-cylinder vertical gasoline air-cooled motor with a speed varying up to 1,600 or more revolutions per minute. The motor is placed centrally in the machine, about level with the operator's head, though for purposes of easy control it is within convenient reach.

In the place of the tail are two horizontal rudders, controlled by guide ropes, and these perform the same function as the tail of a bird. By the manipulation of these rudders an upward or downward course is maintained while there is an additional fish-tail rudder for directing the machine to the right or left. The gas bag is entirely dispensed with, the lifting power of the apparatus being entirely dependent upon the aeroplanes combined with the power exerted by the tractors.

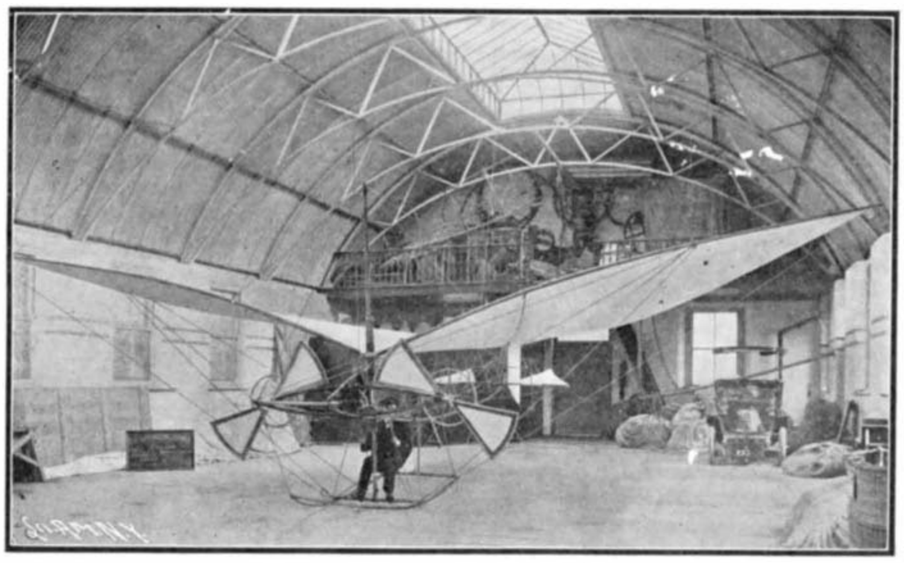
The aeronaut has a seat slung from the body of the apparatus in the fore part, and as near the estimated center of gravity as possible. Perfect control is assured by converging every controlling mechanism within the operator's reach. The aeroplane has a total lifting capacity of 150 pounds. The general design of the machine is symmetrical. The front ribs of the wings have graceful curves and they, as well as the body, taper gently away to the rear.

The machine cannot acquire sufficient impetus to enable it to lift itself from the ground. In order to test its flying capabilities, however, it was intended to attach the apparatus to a balloon and to carry it to an altitude of 5,000 feet. The gasoline motor was then to be set in motion, and, while running at full speed, the aeroplane was to be cast off. Instead of carrying a passenger, ballast equivalent to 150 pounds in weight was to be attached, placed in the position the aeronaut would occupy while standing upright. By these experiments valuable data respecting the center of gravity, balance, and general behavior of the machine would, it was hoped, be obtained.

The machine is not supposed to drop vertically or to glide in the same manner as the flying machines of Lilienthal and Pilcher, but to descend gradually in a series of aerial jumps, as it were. Gravity is the power-giving motion, the motor simply exercising an accelerating or retarding influence so that the curves will be of a great radius.

For the purposes of practically demonstrating the possibilities of this principle of aeroplane construction, an open tract of country was employed. The balloon used in connection with the trial was of 25,000 cubic feet capacity. The aeroplane was attached to the balloon and when an altitude of 3,000 feet was attained the motor was set in motion and the airship was cast adrift, its progress being followed both from the occupants in the car of the balloon, and a group of interested experts on the ground below.

When the aeroplane was liberated it plunged rather erratically toward the earth for some distance. When it had regained its equilibrium, however, it sailed steadily in a horizontal direction. The propellers revolved rapidly and the aeroplane maintained its balance in a perfect manner. It traveled at a high speed for over a mile, and then came slowly and steadily to the ground as the power of the motor became exhausted. The experiment was attended with complete success, and testified to the efficiency of the design. A larger machine with a motor having sufficient power to lift the machine from the ground will soon be built.



THE ALVARES AEROPLANE FLYING MACHINE.

Composition for Cleaning Fabrics.—The mixture is formed of oil of turpentine, 264.80 grammes; ammonia, 190.20 grammes; methylic alcohol, 250.30 grammes; ether, 22.56 grammes; acetic acid, 22.50 grammes; water, 250.20 grammes.—Science Pratique.

PROF. JACQUES LOEB.

THE CREATION OF LIFE BY ARTIFICIAL MEANS.

BY ENOS BROWN.

To create life and control its form at will is, confessedly, the ultimate objective of a school of physiologists of which Prof. Jacques Loeb, M. D., of the University of California, is conceded to be its most advanced, profound, and confident apostle. Startling as this announcement of the aspirations of the modern scientist may appear to the average thinker, it is based not upon metaphysical or academical speculations, but upon infinitely minute and long-continued experimentation and convincing demonstration. Evidence, which cannot be doubted, has been accumulated, evidence that shows how life can be created by purely chemical means.

Dr. Loeb was from 1892 to 1902 professor of physiology at the University of Chicago. Before coming to the United States he studied at the German universities of Berlin, Munich, and Strasburg. In 1902 he was called to the chair of physiology in the University of California and is now with that institution.

The conclusions of Dr. Loeb, after patient and continued investigations, are incorporated in his latest work, entitled "Studies in General Physiology," a decennial publication of the University of Chicago, 1905. It is a work of an epoch and only to be appreciated by the most advanced students. In these studies the author unequivocally asserts that it is possible to control life phenomena and that such control and nothing less is the true aim of the science of biology. In taking up the problem of regeneration the idea of controlling these phenomena was the starting point, the first aim being to find means by which one organ could, at will, be caused to grow in place of another organ. As far as the problem of fertilization is concerned, the first step toward its solution consists in an attempt to produce larvæ artificially from unfertilized eggs in various classes of animals.

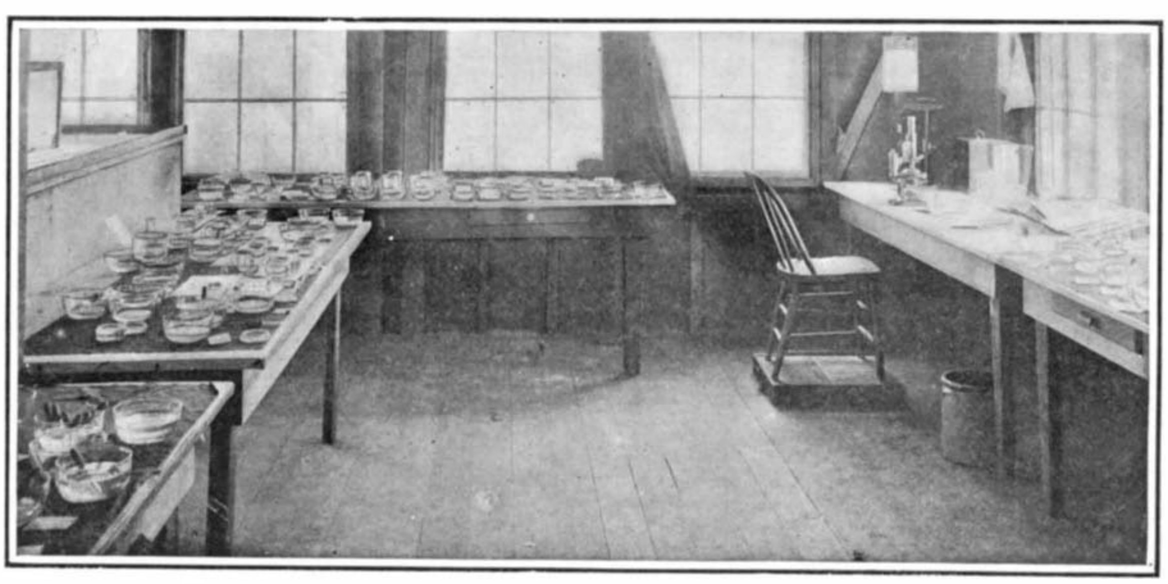
After painstakingly exact and long-continued experimentation Prof. Loeb has succeeded in fertilizing and subsequently in developing eggs of the sea-urchin by employing artificial means alone. In the earlier experiments of Dr. Loeb artificial solutions were used instead of sea water. It has been found that the results were the same when sea water was used.

The most rigid precautions were taken to prevent fertilization by active cells of the same species. To destroy all germs effectually the sea water used was raised to a temperature of 140 deg. All tools, dishes, appliances, and the animals themselves which furnished the eggs, were cleansed in running fresh water. All other precautions were taken against the possibility of developing eggs without fertilization.

The processes by which these amazing results were obtained are stated in the bulletins issued from time to time by the University of California, in which are described the methods of fertilization and subsequent development of the eggs of animals which were the subject of experimentation. One method of treatment consisted in placing the eggs for about two hours in hypertonic sea water, in which the proportion of salt was somewhat increased, and afterward placing them for a few moments in normal sea water to which a minute quantity of ethyl acetate had been added, the eggs then taken from this mixture and placed in normal sea water, when membranes formed. Almost without exception each egg developed into swimming larvæ. With such simple means as a weak solution of vinegar acid and a strong solution of common salt the experimenter may duplicate in the laboratory the results of one of the most typically vital processes.

Chemical substances in skillful hands can be made to produce effects upon eggs which imitate, in all essential respects, the results of normal fertilization. Large numbers of larvæ of sea urchins, normal and healthy, may now be produced from the egg by purely chemical and physical means.

In this the scientist is able to imitate natural fertilization completely, and the fact that a large proportion of larvæ, thus raised, seem to have the same vitality as when produced in regular order (*Continued on page 482.*)



THE LABORATORY IN WHICH PROF. LOEB'S DISCOVERIES HAVE BEEN MADE.

causes, any psychical influence, either internal or external, will result in an immediate oscillation of a sometimes enormous magnitude. Any sensation or psychical emotion of a certain intensity will reduce the resistance of the human body instantaneously to a value three to five times less.

Whenever the person experimented on is talked to or caused to concentrate his attention in some way or other, oscillations of the resistance will be produced. Any effort made for hearing a distant noise, any volition, any effect of self-suggestion, will exert a material influence, the same being true of any excitation of the senses, any light rays striking the closed eye, any body the smell of which is perceived (even where the smell or the body is fictitious). Any physiological action of some intensity such as breathing, stopping the breath, etc., is found to exert an analogous effect.

By making experiments both before and during the sleep, the author observed some characteristic variations according to the character of the latter and the vivacity of the dreams.

Any pain, either real or suggested, will modify the resistance, the feeling of pain being preceded and followed by an oscillation.

The individual resistance of the human body depends also on the nervous susceptibility and on the conditions the person is living in. Nervous persons, as well as strong smokers and drinkers, show an extremely low electrical resistance. The variability and temporary behavior of the resistance is also shown to depend on these factors.

Fig. 1 shows the measuring room which has been fitted out especially at the Salus Electromedical Institute, Zürich, for measuring the individual resistance of patients. The experimental outfit comprises a mirror galvanometer, having a strong damping coefficient susceptible of regulation, a scale for objective reading and electrical lighting, a standard resistance, an accumulator, commutator, and milliamperemeter, etc. This is put in connection by means of wires with "isolation rooms," where the persons to be experimented on put themselves in connection with the measuring outfit, by dipping their hands (during 10 to 15 minutes) into glass tanks containing a salt solution of low concentration or else by seizing cylindrical nickel electrodes.

The isolation room limits as far as possible any outside noise or processes liable to excite the attention of the person experimented on, thus altering the results of measurements. According to circumstances, the natural lighting of the insulation room is damped, softened by blue glass, or else replaced by glow lamps. The figures and curves thus obtained hardly ever show any alteration, so that they may be said to ascertain in a reliable manner the degree of nervous susceptibility (being inversely proportional to the individual resistance), the behavior of the person in question in regard to mental activity, and finally the frequency and intensity of painful feelings in the patient during measurements.

Fig. 2 represents the outfit for checking in an objective manner the action of an electromagnetical treatment, for instance in the case of a patient suffering from a headache. The head of the person is "radiated on" by an alternating magnetical field, thus becoming free from pain gradually, while at the same time the individual electrical conductivity of the body is found successively to decrease (the resistance increasing), and the oscillations in the measuring current, as observed before radiation, to disappear.

The behavior of the resistance curve corresponds to the state of pain and excitation of the patient, the purely subjective state thus being ascertained objectively by the measuring outfit.

Tube-shaped electrodes of zinc sheet, the bottom of which is perforated and coated with bladder, are filled with salt solution and tied to the palm of the person experimented on, thus insuring a perfectly uniform and safe contact, even in connection with prolonged experiments.

From the above the possibility is seen of ascertaining the nervous excitability of any given person and the alterations undergone by this factor under the most various conditions. It would seem possible also to find out from a number of investigations and measurements a given average resistance for what might be termed "standard" men. On the other hand, the action of electricity with therapeutical applications might be verified objectively.

Any experiments so far made bear out the hypothesis that in the case of the action of electromagnetic lines of force, an increase in the individual resistance occurs.

THE CREATION OF LIFE BY ARTIFICIAL MEANS.

(*Continued from page* 480.)

arouses the hope that it will soon be possible to undertake the solution of the various problems for which the raising of parthenogenetic larvæ in large numbers is a prerequisite.

Repeated experiments on the fertilization of the eggs of the sea-urchin with the sperm of starfish yielded the result that these eggs can be fertilized and caused to develop not only with the sperm of Asterias but also with the sperm of a brittle star and the sperm of the twenty-ray starfish. Furthermore, mollusks are added to the list of animals in which it is possible by physico-chemical means to cause the unfertilized eggs to develop into swimming larvæ. The hope of students of heredity, who have been looking for the means of raising animals in large numbers for experimentation, which should possess the hereditary traits of one parent only, has been at least attained.

The University of California has published from time to time the papers of Dr. Loeb in which is given at great length the progress of the experiments from which the results, often disappointing but at least convincing, have been finally attained. The immense labor involved can be understood only by advanced scientists, and do not appeal to popular interest. What the outcome may be, only the future, and not a very near future, can decide. The subjection of all Nature's forces has taken centuries to perfect, progressing little by little at a time. To create life may be one of the victories of science over nature for the future to achieve.

While occupying the chair of physiology in Chicago, Dr. Loeb had a laboratory at Holmes Holl, a site on the Massachusetts coast. In California, by the courtesy of the faculty of the Leland Stanford, Jr., University, the Johns Hopkins laboratory at Pacific Grove, located at the extreme southern point of the Bay of Monterey, has been placed at his disposal. At this point conditions the most ideal are at the command of the scientist. Probably no body of ocean water on the globe of similar extent is more prolific of marine life in all its forms. The buildings are close to the shore and equipped with every appliance for successful investigation.

Carded E. F.

MINES AND ENTANGLEMENTS IN THE RUSSO-JAPANESE WAR.

In the aftermath of correspondence that flows in from the seat of a great war subsequently to the occurrence of the leading battles and most decisive events of the struggle, there is nothing quite so interesting as the arrival of photographs taken on the spot by men who do not hesitate to risk life and limb in the pursuit of their profession. Sometimes with only a little pocket kodak, and at other times, as in the case of the veteran photographer whose pictures are shown on our front page, with a large 8 x 10 camera, the artist pushes his way up to the very front line of battle and snaps the shutter on the most critical scenes of the battlefield.

The Russo-Japanese war will always be noted by the historians as having seen the first practical test on a large scale of the many military and naval inventions which were produced in such prolific numbers in the closing years of the nineteenth century. But although many new weapons were put to the test, it was remarkable what an extended use was made by both belligerents of methods and implements of warfare that are as old as history itself. Port Arthur, which the Japanese expected to succumb to high-explosive shell, the hail of machine gun and rifle bullets, and the overwhelming sweep of charging battalions, proved to be absolutely impregnable against any such method of attack. It was only when Gen. Nogi resorted to the time-honored method of approach by digging parallels and approaches, and mining beneath the walls of the fortress that Port Arthur gave way; and it is a curious fact that in the assaults on the fortress, the soldiers on both sides when they got at close quarters made free use of that ancient missile, the hand grenade.

What could be more mediæval than our front-page picture showing the barriers thrown across the main road into Port Arthur from the north? Our minds are instantly carried to the curious old cuts in our school books showing the seemingly impassable barriers, by which in early times it was attempted to break up the charge of heavy cavalry or throw an assaulting body of men into confusion. In the immediate foreground of the picture is shown a series of "wolf-holes," concealed with diabolical skill among a forest of sharpened sticks. These holes are laid out on a diamond pattern and each is between three and four feet deep. In many cases a sharp stake is driven firmly in the ground at the bottom. Usually they have a wire entanglement running parallel with them. In some cases they were built without the usual forest of stakes being driven around them at the surface of the ground; in which case the openings were concealed by grass and brushwood, and the attacking force knew nothing of their existence until the men crashed through to be impaled on the stakes below.

Of the two extraordinary photographs, showing the explosion of mines, one was taken at the instant of setting off a Russian mine, containing 600 pounds of explosive in the siege line near the base of Nantezhan Fort. The other represents the explosion of a mine on one of the battlefields in Manchuria. The rocket-like threads of smoke and the black objects seen against the sky are flying pieces of burning powder and fragments of the boxes containing the powder. Although a considerable number of casualties of the war were due to the explosion of mines, the Japanese in several cases, when storming the fortified positions, succeeded in finding the wires leading to the mines, and by cutting them, rendered the ground perfectly safe for troops to pass over.

Correspondence.

Iron Used as a Money Medium.

To the Editor of the Scientific American:

I am a constant reader of the Scientific American, though not a regular subscriber, on account of the fact that I can get the paper at an earlier date from the news stand than if sent to me direct.

In your issue of April 22 I have read with interest an article by Prof. Alex. Del Mar, entitled, "Our Heritage of the Mechanical Arts." In giving the history of iron, its scarcity, usage, etc., the writer among other things says: "Both iron and steel were certainly very scarce in the West at the periods mentioned. Homer, tenth century, mentions poleaxes, shipwright's tools, plow shares, sheep hooks, and chariot wheels in the Troad; yet in Lacedæmonia, in the time of Lycurgus, ninth century, iron was still so valuable that he employed it as a material for money."

The writer seems to emphasize the point that Lycurgus used iron for money on account of its scarcity and value. It is true that Lycurgus did use iron for money, but not on account of its scarcity or value. On the contrary, he made use of iron for money to aid him in his new system, by which he wished to destroy the avarice of his people.

Plutarch says: "Not content with this [the equal division of the lands, etc., of the Lacedæmonians] he [Lycurgus] resolved to make a division of their movables too, that there might be no odious distinction or inequality left among them; but finding that it would be very dangerous to go about it openly, he took another course, and defeated their avarice by the following stratagem: he commanded that all gold and silver coin should be called in, and that only a certain kind of money made of iron should be current. A great weight and quantity was of very little worth; so that to lay up twenty or thirty pounds, there was required a pretty large closet, and to remove it, nothing less than a yoke of oxen. With the diffusion of this money, at once a number of vices were banished from Lacedæmonia; for who would rob another of such a coin? Who would unjustly detain or take by force, or accept as a bribe, a thing which was not easy to hide nor a credit to have, nor indeed of any use to cut in pieces? For when it was just red hot, they quenched it in vinegar, by that means spoiling it, and made it almost incapable of being worked."

Clare in his "Universal History of the World," vol. ii., page 585, says: "To render the state dependent only on its own territorial products, and to prevent any individual from accumulating an undue amount of wealth, he [Lycurgus] prohibited the use of any money except an iron coin, with so small a value in comparison with its bulk and weight, that the necessity of using it as a medium of exchange would make it difficult to carry on trade, especially foreign commerce. By subjecting this iron coin to a process rendering it brittle and unfit for a [an] other use, Lycurgus endeavored to destroy every desire to hoard it as a treasure."

Rollin, in his "Ancient History," vol. i., page 687, says: "First he [Lycurgus] cried down all gold and silver money, and ordained that no other should be current than that of iron, which he made so very heavy, and fixed at so low a rate, that a cart and two oxen were necessary to carry home a sum of ten minæ [five hundred French livres, about $88.80] and a whole chamber to keep it in."

This was done for the purpose of sapping the foundation of avarice.

From the above quotations, it would seem that while iron was much more valuable than it is now, still it was not so valuable as to justify its being coined into money. It seems that a team of oxen could haul about $88 worth of iron. I presume the same sort of team might haul one-fifth of that value of iron at the present date.

As stated, the idea conveyed by Prof. Del Mar in his article seems to be that iron was so scarce as to justify its coinage into money. I do not think that history will bear out this statement.

I do not know whether you care to have letters of criticism of this sort or not, but at any rate, venture to give you the facts as stated by ancient historians.

L. M. Neblett.

Fort Worth, Texas, May 25, 1905.

News comes to us from the Harvard Observatory at Arequipa, Peru, that Eros has been photographed there with the Bruce telescope. Eros, be it remembered, is the nearest of all the heavenly bodies, with the exception of the moon.