THE LEBAUDY AIRSHIP.

AFTER the sad accidents which last year, at a month's interval, marked the history of aeronautics with their bloody traces, we have a strong feeling of satisfaction and relief in finally registering a successful attempt at airship construction. The adverse fortune that was pursuing aeronauts seems at length to be shackled. Is the legitimate and deserved success of the Lebaudy balloon, constructed and experimented with, for the first time, by MM. Julliot and Surcouf, during last November, at Moisson, near Bonnières, and which is under trial at the present moment, due, then, to a new invention that breaks away completely from habitual practice? Not at all. Such success, justifying what wise people have always said, is, on the contrary, imputable, before all else, to the care with which the teachings of previous experiments have been taken into account (and this, in the first place, is a point upon which it is well to insist), and, at the same time, to the carefulness with which the preliminary tests have been made. The most experienced men in this new sport never tire of repeating that the conditions which regulate aeronautics and that are still quite mysterious in some points, have been so well elucidated that we do not have to confront totally unknown dangers when we try some new experiments; and that such dangers can be avoided in a certain measure through the application of the teachings of the past. It would certainly be too premature to proclaim that no more accidents will ever occur, although, by proceeding methodically, the chances thereof may be reduced to a minimum. This is demonstrated by the Moisson experiments.

If the Lebaudy balloon satisfies the conditions recognized at present as indispensable in the realization of every dirigible airship, it is nevertheless clearly distinguished from previous types, as a short description of it will show. The balloon proper is 187.5 feet in length. It is dissymmetrical, and the midship frame, 32 feet in diameter, is 82 feet from the bow and 105.5 from the stern. The elongation is 5.6 diameters. The point in front has the form of quite an elongated cone, while the stern terminates in a spherical cap. Finally, the greatest radius of curvature is 226 feet. The inflated envelope does not completely possess the form of a solid of revolution, but, at its lowest part, presents a flattening, as if it were intersected by a horizontal plane situated 11.5 feet beneath the axis. The edges of this flat portion are secured to an ovalized ring, forming a stiff frame of steel tubes, to which are attached the steel suspension cables. The platform also presents a peculiarity, and that is a sort of vertical false keel which traverses it from end to end, and of which the skeleton, of steel lattice work, is covered with a fabric at its back part. It is prolonged toward the rear by a long spar which has been found necessary for maintaining the rigidity of the rear cone, through stays, and for sustaining the rudder of 96.75 square feet. Finally, the rudder, which is horizontal, contributes toward assuring the stability on the route.

The envelope is of doubled thin cotton cloth with one interposed sheet of rubber only .004 of an inch in thickness. Rubber, as is well known, has but one drawback, and that is that it is liable to alteration under the double action of light and oxygen. In order to prevent the effect of sunlight, the fabric receives externally a dye that has given the Lebaudy balloon the popular surname of "Le Jaune" ("yellow"). In order to prevent the action of the oxygen of the air and, at the same time, to increase the impermeability, there is given to each of the surfaces from seven to eight coats of a special product called "ballooline," which consists of a solution of rubber in a mixture of benzine and sulphide of carbon. Of this, about one ounce is used per square foot of fabric. The larger part of it evaporates and leaves upon the envelope only the 120 grains of solid matter that the solution contains. The evaporation is so rapid that there results quite an appreciable cooling, which causes the two surfaces of the rubber to undergo a genuine effect of vulcanization. The fabric thus prepared weighs but 160 grains per square foot of envelope, inclusive of the stitching. It is so impermeable that the balloon, at the end of 40 days of inflation, undergoes no perceptible loss of gas. The tightness is therefore remarkable.

The car, which is suspended at 17.25 feet beneath the platform, is 15.75 feet in length and 5.5 in width. The suspension, which is very divergent, and triangulated according to the principles enunciated by Dupuy-de-Lôme, is not effected by steel wire, of which the drawbacks are manifold, but by steel cables about one quarter of an inch in diameter and 28 in number. Such suspension renders the car and balloon absolutely interdependent—a condition indispensable for stability. In order to stiffen the entire affair, there is placed upon the front of the suspension an oblique thrust-frame of steel tubing, and, under the car, a sort of inverted pyramid, of the same material, which prevents the propellers at the sides from striking the ground should the car touch. In addition to the two aeronauts, the car carries a 40-horsepower gasoline motor that drives the two lateral propellers. Each two-bladed propeller is but 9 feet in diameter, but it makes up for its small size by having a great rotary velocity, which is about 1,000 revolutions a minute. Despite the accepted ideas that attribute more efficiency to large propellers revolving slowly, the builders express themselves as well satisfied with these high-speed screws. In order to obtain all the efficiency that these parts are capable of yielding, the blades are made of steel plate so as to assure perfect rigidity. The capacity of the envelope is 80,000 cubic feet. The fixedness of its form is assured by an air compensating balloon of 10,675 cubic feet capacity, reaching almost one-seventh of the total volume. The automatic safety valves yield only to an internal pressure of eight-tenths of an inch of water, and consequently assure a proper tension of the fabric.

The hydrogen, which is of very pure quality, is manufactured in a Surcouf generator.

The weights are thus distributed:

	Pounds.
Aerostatic part.....	1,056
Metallic platform.....	660
Car, motor, screws, and mechanism....	1,760
Passengers	660
Gasoline, water, and ballast.....	1,430

With great prudence, the builders, before any free ascension, formulated a programme of severe tests of each of the parts and of the balloon itself in all the positions that it is capable of taking during the course of an aerial trip; and they endeavored particularly to assure themselves that no risk of fire would be run. With this object in view, jets of hydrogen under pressure, pure and mixed with air, were projected upon all parts of the machines. It was found that, owing to the precautions taken, no ignition was possible,

FIG. 2.—GENERAL VIEW OF THE PLATFORM WITH ITS FALSE KEEL, THE THRUST-FRAME, THE CAR, AND THE SUSPENSION.

either at the ignition contact box or at the exhaust of the gasoline motor. The same tests were made with some electric installations designed to actuate the ventilator of the air balloon during stoppages of the motor; and here the results obtained are worthy of mention. In the first place, it should be stated that it is impossible to ignite jets of gas upon the dynamo commutator under the most favorable conditions; that is to say, when, in consequence of shocks or vibrations, the brushes emit numerous strong sparks. It seems that the armature, in its rapid motion, carries along a stratum of air that prevents the contact of the jet of hydrogen; but, in return, the latter is always easily ignited at the connections of the accumulators. Under such circumstances, it was thought prudent to discard electric circuits as much as possible, and this was therefore done. The last experiments were tried in the open air. The balloon was set in motion with a guide rope attached, and a slight distance above ground. The experiment demonstrated the fact that it was perfectly stable and that its various parts operated satisfactorily.

All the preliminary experiments lasted twenty-one days, and it was not until November 13 that it was

placed at the side of the car, the balloon advanced in a straight line according to its axis. This shows how illusory it is to rely upon the inverse maneuvering of two lateral screws to produce changes of direction of the balloon and replace the rudder. The fact is explained by the shortness and slowness of pitch of the blades of each screw.

The speed obtained was not measured, but it may be estimated that the balloon under full power is easily capable of making 24 miles an hour, while preserving as perfect stability as it did at the time of the first experiments.

After three successful trips, MM. Surcouf and Julliot, desiring to study the motions of the balloon from the earth, gave way to the experienced aeronaut, M. Juchmes, who made a fourth trip which consisted in describing in the air a large and regular figure 8. The only incident to be noted is, that during an effort to turn about within a very short radius, the piece that sustained the rudder was bent under the heavy stress that was exerted upon the latter; but this did not prevent the landing maneuvers from being effected with sufficient correctness to bring the balloon to the point whence it started.

Upon the whole, the different ascensions made in a closed loop are absolutely demonstrative of the soundness of the principles followed in the construction of the airship.—Translated for the SCIENTIFIC AMERICAN SUPPLEMENT from La Nature.

THE NINTH INTERNATIONAL GEOLOGICAL CONGRESS.

By E. O. HOVEY.

VIENNA is noted among European capitals for the holding of conventions. This year the city received as its guest the ninth International Geological Congress, and for about a week (August 20 to 27) the halls of the imperial university were thronged with geologists from all parts of the world. The total number of members registered as being in attendance was 357 out of a membership of 636 for the year. These numbers are smaller than those for the Paris congress of 1900 and for the St. Petersburg congress of 1897, but the Exposition Universelle formed an additional attraction at the former city, while special facilities for visiting many parts of a country which usually is practically inaccessible influenced many to join and attend the meeting in Russia. There being no unusual feature in connection with the congress of the present year, the attendance at Vienna may be considered highly satisfactory, the number of members present in proportion to the enrollment being greater this year than three years ago. The programme was varied and the papers presented were of a high degree of merit and interest.

The formal opening of the congress took place Thursday morning, August 20, in the large assembly hall of the university under the patronage of the Archduke Rainer and the honorary presidency of W. von Hartel, Privy Councillor to the Emperor and Minister of Public Instruction. The welcome spoken by these officials was followed by the greetings expressed in the name of the university by the Pro-Rector, Prof. Schiffer, and in the name of the city of Vienna by Vice-Burgomaster Strobach. Replies in behalf of the congress were made by Prof. Capellini, of Bologna, the senior ex-president of the body, and by Prof. Barrois, president of the preceding session at Paris. Prof. Barrois also announced the election by the council of Prof. Emil Tietze as president and Prof. Charles Diener as general secretary of the congress.

FIG. 1.—THE CAR DIVESTED OF ITS ENVELOPE; AND THE PROPELLING MECHANISM. ABOVE THE CAR ARE SHOWN THE THRUST-FRAME AND THE SUSPENSION CABLES.

resolved to attempt the first free ascension, the wind at the time reaching a velocity of from 16 to 18 feet a second, at 328 feet above the ground. This experiment was a perfect success. The passengers were M. Surcouf, aeronaut; M. Julliot, engineer, and M. Oberlé, mechanic. One of the screws having got out of true on the day preceding, the navigators had to be content to proceed with a single one of these propellers, which was in a perfect state; and consequently but 20 horse power was utilized. It was found in the first place that, despite the eccentricity of this single propeller,

In order to give definite direction to the deliberations of the congress, the committee of arrangements proposed three important general topics for discussion at the meeting: The present condition of knowledge of the crystalline schists; the problem of overthrust faults and exotic blocks; and the geology of the Balkan peninsula and the Orient. The presentation of the elaborate papers on these subjects and the discussions thereof occupied three days of the convention—Saturday, Monday, and Wednesday.

The afternoon of the opening day was devoted to

four lectures on different subjects, and the reading of papers was begun by Prof. A. Baltzer, of Berne, Switzerland, who described the laccoliths of the Aar-massif, great intrusions of igneous rock which have played a vitally important part in the construction of this mountain mass of the Alps. The author explained the nearly horizontal alternations of massive and schistose rocks as being the result of lateral injections of the igneous rock into the adjoining sedimentaries, referring to the La Plata Mountains in Colorado for a parallel case. Following this speaker Dr. E. O. Hovey, of New York, gave a *résumé* of the geological observations made by him for the American Museum of Natural History on Martinique and St. Vincent after the eruptions of 1902. By means of numerous stereopticon slides there were shown the various phenomena of the eruptions, the destruction wrought in St. Pierre, the features of the ash coating on the volcanoes and of the erosion which took place between May and June, 1902, and February and March, 1903. The feature of most particular scientific interest is the pushing up of the great new cone with its enormous spine or tooth through the old crater of Mont Pelé. This spine in March, 1903, reached an altitude nearly 900 feet greater than the former height of the mountain, or 3,000 feet above the bottom of the old crater. There is no true crater in the new cone, but steam issues abundantly from all portions of it and the principal explosions take place near the base of the spine on the southwest and northwest slopes. The spine and most of the cone consist of solid rock (that is, not débris) which is sifted in every direction and which shows much incandescence at night.*

Venturino Sabbatini, of the geological survey of Italy, then spoke of the present state of studies upon the volcanoes of central Italy. His paper was the second in a series in course of preparation. He was followed by Prof. Albert S. Bickmore, of New York, who showed the geologists a series of remarkable pictures of Mauna Loa, Kilauea, and some of the extinct volcanoes of the Hawaiian Islands. Especial interest centered about the views of the boiling and spurting lava of the last eruption of Mauna Loa. These slides were exhibited as showing the manner in which material for the teaching of geography in the public schools of New York is being assembled under the direction of the lecturer at the American Museum of Natural History with the aid of a grant from the State of New York. Fifteen thousand negatives from all parts of the world are now the property of this department of the museum.

The next session of the congress (Saturday) was devoted to the first of the set questions proposed by the committee, and the following papers were read and discussed. By Prof. Becke, of Vienna, "On the crystalline schists with special reference to their structure;" by Prof. P. Termier, of Paris, on "The crystalline schists of the western Alps;" by Prof. A. Sauer, of Stuttgart, on "The crystalline schists of middle Germany;" by Dr. F. E. Suess, of Vienna, on "The schistose rocks of the Alps and vicinity;" by President Charles R. Van Hise, of Madison, Wis., on "The crystalline rocks of the United States of North America;" by Dr. J. J. Sederholm, of Helsingfors, Finland, on "The present state of knowledge of the crystalline schists of Finland;" and by Prof. L. Mrazec, of Bucharest, on "The crystalline schists of the southern Carpathian Mountains." This difficult but highly interesting and important theme was followed on Monday by the second set theme, which is almost as interesting and mooted: Overthrust faults and exotic blocks. Papers were read by Profs. V. Uhlig, of Vienna; M. Lugeon, of Lausanne; E. Haug, of Paris; F. Kossmat, of Vienna; A. E. Toernebohm, of Stockholm; Bailey Willis, of Washington, and C. L. Griesbach, of Calcutta. These discussed the phases of the subject as presented in the Carpathians, the Swiss and the French Alps, Carniola (Austria), Scandinavia, the United States, and the central Himalayas.

Wednesday was devoted to papers on the geology of the Balkan peninsula and the Orient. Prof. Toula, of Vienna, led with a summary statement of the geology of the region under discussion, illustrating his remarks by means of three manuscript maps, combining all the facts brought out in the literature. The author stated that the most important field work in the Balkans had been done by the Austrians, Tietze, Diener, and Schaffer, and by the Germans, Philippson and von Buch. The speaker considered doubtful the extent to which the great longitudinal fault and dislocation plane of the central Balkans could be correlated with the transverse fault near Scutari (Constantinople). The Balkan Mountains themselves diminish toward the Black Sea, but the principal features of the peninsula continue through the northwestern embayment of the Black Sea. Every line of shallow water of the Black Sea can be regarded as a submerged delta. The author closed by saying: "This region for centuries has been the battle ground of the nations. It has been and will continue to be a region of geological contest, with fair promise that in the end the knowledge of its structure will constitute fundamental and important progress in our science."

Prof. Cvijic, of Belgrade, discussed the tectonics of the Balkan peninsula. He said in part that the Rhodope Mountain mass formed a new type of the old masses in that it occurred between younger folded mountains instead of on the outside. The dynamic phenomena are characteristic, and indicate the courses of the younger fold-planes. This mountain mass was the starting point of these folds, and the younger dislocations of the Dinaric and Balkan systems bend away therefrom, those of the former as overthrust folds and those of the latter as inclined flexures. Between the old mass and every one of the mountains showing the later folding there occurs a transition zone, which indicates a differentiation of the older mass. In the Balkan system one must distinguish an old pre-Permian nucleus from a younger Oligocene-Miocene series. To the latter belongs the whole eastern portion of the Balkans, which is characterized by a new kind of folding called "intermittent" fold-

ing. At the base of the folded Balkans on the north there are overthrusts and reversed folds or flexures. In the Bulgarian plateau there are transverse synclinal and other faults. In the western Balkans especial interest attaches to the fundamental structure lines which have served to determine the formation of the transverse valleys. Cvijic distinguishes four tectonic elements in eastern Serbia; he finds that the southern Carpathians and the Balkans are not related, and that the sedimentary zone of east Serbia passes in contorted fashion into the Banat Mountains. Three old lines of torsion have a sheering influence upon the direction of the younger folds.

The third paper upon this interesting subject was by Dr. F. Katzer, of Sarajevo, Bosnia, and dealt with the present state of knowledge of the geology of Bosnia and Herzegovina. After referring to the work done in the region under peculiar difficulties by Tietze, von Mojsisovics and Bittner, Dr. Katzer continued: The chief question in the region was the relation of fundamental masses to the younger rocks. As fundamental rocks in Bosnia the Palæozoics are united with the lower Trias, but in the western part of the region upper Triassic seems to be distinguishable. From the Trias onward the Mesozoic strata are only incompletely exposed. It is an important fact that the youngest Jurassic rocks are always found in connection with the rocks of the so-called Bosnian serpentine zone. This serpentine series also has furnished the material for the conglomerates of the early Cretaceous beds. It follows that the Bosnian serpentine, which is generally considered to be of Tertiary age, must be older than the Cretaceous. It is even older than upper Jurassic, since beds of the Tithon period overlie it. There is nothing to indicate an age greater than Triassic and the probabilities are that the serpentine belongs to lower and middle Jurassic age. The speaker further called attention to the development of Cretaceous and Eocene strata, to the recently discovered distribution of massive igneous rocks, to the importance of the correct interpretation of the relations of the coal-bearing freshwater middle Tertiary beds, and to the geologically recent tectonic phenomena of the mountains. The succeeding papers by Prof. A. Philippson, of Bonn, Prof. L. Cayeux, of Paris, and Dr. G. von Bukowski, of Vienna, dealt with the geology of Greece, of the island of Crete, and of Asia Minor.

Of the sixteen papers read before the four sections of the congress during the morning of the last day, two were of particular general interest, one by Dr. Othenio Abel, of Vienna, on "The extinction of species," and the other by Claudius Angermann, E.M., of Lemberg, on "The occurrence of petroleum at Boryslaw in its relations to the dynamic geology of the region."

Dr. Abel began by recalling the theory of Cuvier of a century ago, that the faunas and floras of earlier geological periods were entirely different from those of the present. Cuvier and his disciples contended that the extinction of these life-forms was due to great catastrophes affecting the whole globe, and that after each of these catastrophes entirely new plants and animals peopled the earth. Lyell and his school denied this theory on the ground that changes in and on the earth had been gradual and without general cataclysms. Darwin, who was a disciple of Lyell, advanced the idea that the struggle for existence had been the principal cause for the disappearance of species. Recent palæontological investigations lead to conclusions which are not in accord with Darwin's theory. Weismann also is against the teaching of Darwin. In discussing the question, however, it is important to consider whether the forms which have disappeared have left successors which have endured to the present day, or have left no such successors. In the latter case we are dealing with a true extermination, whereas in the former we are considering the same animals or plants only in different forms. Dr. Abel then discussed in brief the laws of evolution, and went on to say that at the first appearance of a given stem the species are always small. One line of evolution is always increase of size, until at last the species becomes extinct. With different stems, as in the case of the ammonites, one can observe degeneration toward the end of the development. Extinction or extermination of species therefore depends not only on external, but also on internal causes, upon which finally the ability of change and adaptation to revised conditions depends. There is no predetermination of the disappearance of a species, nor is there any guarantee of its duration. The extinction of a species is dependent upon various causes, but in general it is safe to assert that the nearer the form of a species remains to the original stock, the longer it will endure, and the more it differs therefrom and becomes specialized, the less able it becomes to withstand changed conditions of life, and the sooner it disappears.

Mr. Angermann's paper on the petroleum deposits of Boryslaw in Galicia gave the results of extended study of the numerous borings, barren as well as productive, which have been made in that district. Some of the borings are more than 3,000 feet deep. In addition to petroleum the Boryslaw district furnishes a large amount of ozocerite or natural paraffin. Heretofore the Miocene age of the Boryslaw oil-bearing beds has been conceded, but the abundance of typical menilite in the exposures in the region of the borings leaves no doubt that the beds should be referred to the Oligocene. Pumps are not used in the field, siphons being found sufficient for raising all the oil. The upper sands are poorer in oil than the deeper. The seams of ozocerite closely accompany the oil and the indications are that boring for oil can be pursued profitably everywhere that these seams are found. The ozocerite is the residue left in fissures which at first were the courses of mineral-bearing waters, and then permitted the escape of gas and later of petroleum. Gradually the paraffin separated from the oil and finally filled the fissures.

The afternoon of the last day of the sessions, Thursday, August 27, was occupied in the first place by the reading of the reports of the standing committees. For the committee on the geological map of Europe Prof. F. Beyschlag, of Berlin, stated that the sheets covering Turkey and Asia Minor had been published since the Paris Congress, although at first it

was thought that the incompleteness of the knowledge of those countries would make it necessary to omit them. So great has been the demand for the central sheets of the map, that the edition of 2,000 has been exhausted and a new edition must be printed. Sir Archibald Geikie, of London, presented the reports of the committees on the coast lines of the northern hemisphere and on the question of international co-operation in geologic work. Prof. D. Oehlert, of Paris, spoke for the committee on "Palæontologia universalis," a work which is to republish figures of all early type specimens, and Prof. S. Finsterwalder, of Munich, presented the report of the committee which is studying the glaciers of Europe. Prof. Charles Barrois, of Lille, announced that the Spendi-aroff prize (established at the St. Petersburg congress) had been awarded to Prof. W. C. Brögger, of Christiania, for his classic work upon the rocks of the Christiania region. Mr. S. F. Emmons, of Washington, brought to the attention of the congress the great need of the establishment by some government or by some institution of learning of a thoroughly equipped geo-physical laboratory, where many of the fundamental problems of geology could be worked out along physical, chemical, and astronomical lines. After receiving and considering invitations from Mexico and Canada, it was voted by the congress to hold the tenth International Geological Congress in the city of Mexico in 1906. Votes of thanks were tendered then to the Austrian government, Archduke Rainer, Minister von Hartel, the city of Vienna, the university officials, and the organization committee, and then the official life of the ninth International Geological Congress came to an end.

During the progress of the congress opportunity to see the geology of the region within reach of Vienna was given by means of several excursions. In this manner were visited the Miocene terranes of the Alpine basin of Vienna as exposed in the marine beds of Atzgersdorf, Vöslau, and Baden. Another excursion was to Eggenburg, to examine the Miocene beds of the extra-Alpine portion of the Vienna basin. Mineralogists and petrographers spent a day among the archæan rocks of the Waldviertel. The Semmering Pass with its marvelous scenery and its noted railroad were visited by one party on the same day that another party went to the Schneeberg. On the two days following the congress geographers went to Wachau, Kerms, Wienerberg, and Inzersdorf to study the valley of the Danube and its development, while another party visited Heiligenstadt, Nussdorf, and Kahlenberg. Before the sessions of the congress, there were offered to the members extended excursions in Bohemia, Galicia and Austria proper, while after the sessions opportunity was given to visit the places of chief geological interest in Bosnia, Herzegovina, Dalmatia, and the Tyrol.

The social features of the Vienna congress were particularly pleasant, and they evinced the hospitality of the Austrians. On Saturday evening the ladies in attendance and some of the men were invited to a gala performance at the Court theater, while others of the men were invited to dinners given by Profs. E. Tietze, president of the congress, Max von Guttman, treasurer, Edward Suess, R. von Mojsisovics, and G. Tschermak. Monday evening the city of Vienna tendered the congress a formal and elaborate banquet in the great dining hall of the beautiful Rathhaus. Complimentary luncheons and dinners were given in connection with several of the excursions. During the week the court library officials displayed their choicest treasures to the members of the congress, and in the Court Natural History Museum Profs. Fuchs and Berwerth at stated times showed members around the geological collection and the collections of rocks, meteorites, and minerals respectively. The meteorite collection is the most celebrated in the world, and some of its features were made the subject of a special lecture one afternoon by Prof. Berwerth.

The only exhibit made in connection with the congress consisted of a remarkable relief model of the Sântis Mountain region in Switzerland, constructed by Prof. A. Heim, of Zürich. Relief maps are not new; but this work of Prof. Heim's is more than a mere map, it is a reproduction of nature, as close as time, patience, and skill can make it. Most relief maps or models are copies in plaster of Paris of a topographic map, with the vertical scale exaggerated to from two to five times the horizontal, but this model of the Sântis group reproduces nature with scrupulous fidelity and the vertical and horizontal scales are the same. The scale is sufficiently large, 1:5000, or about 1 inch to 416 2/3 feet, to permit the representation of many minute details. The model is two meters (or 6 1/2 feet) square, representing an area of about forty square miles. Prof. Heim and two assistants were at work on this model for more than three years, in the course of which more than 400 sketches were made and 800 photographs taken. The maker states that there is not a place a quarter of an inch square on the model which has not been fashioned in accordance with one or more photographs or sketches, and comparison with the photographs carried out his assertion. Conventional geological coloring was not adopted for the model, because it concealed the topographic effect; instead, colors conforming as closely as possible to those of nature were adopted. In order to get these colors as they should be, and to gain an accurate conception of the region from the same relative position as that from which the model would be viewed, Prof. Heim made four balloon ascensions. The geological as well as the geographical features of the region are shown on the model, the various overthrusts, overthrown folds, faults, etc., forming an instructive study in tectonics. So accurate is the model that every chalet and hayhouse is shown in exact size, form, and position.

Agricultural Machines in Russia.—According to the St. Petersburg Times, the demand for agricultural machines in the Siberian country beyond Lake Baikal is to be very large. New houses are opening up for business and the old firms are enlarging their plants. Farmers are having their orders filled as fast as the machines can be put together, and the demand is constantly increasing.

*For further discussion of the West Indian eruptions see SCIENTIFIC AMERICAN for August 16, 1902, and SCIENTIFIC AMERICAN SUPPLEMENT for September 13, 1902, and July 15, 1903.