THE WELLMAN POLAR AIRSHIP EXPEDITION.

BY THE PARIS CORRESPONDENT OF THE SCIENTIFIC AMERICAN.

Should Mr. Walter Wellman succeed in reaching the North Pole with his new airship, his performance will be counted as one of the great achievements of the age, and that he has a reasonable chance of doing so will seem apparent to any one having knowledge of aerial navigation work, after examining the problem and also the means provided for its solution. It is to be noted that Mr. Wellman is an experienced Arctic explorer, who has made several trips to these regions, and has reached as high as 81 deg. latitude; but like all the others, he did not succeed in attaining the coveted point. However, he acquired a great knowledge of the country and the conditions which were to be met with; and, being of a serious and practical, as well as of an energetic and daring nature, he desired to make use of the advanced state of aerial navigation, and considered that the time was now ripe for making a flight to the Pole in an airship. Last year he started from Paris for Spitzbergen at the head of the Wellman Chicago Record-Herald Expedition in order to establish his headquarters there. At the same time he had an airship built at Paris, but it had to be made in such haste in order to arrive by the short Arctic summer, July and August (which are the only months fitted for the trip) that the mechanical part was found unsatisfactory. However, he built a vast balloon shed and prepared for this year's work. He was fortunate in securing the co-operation of Mr. Melvin Vaniman, an experienced engineer, who undertook to redesign the nacelle and modify the balloon to some extent.

Stated most briefly, what the party wish to do is to start from Spitzbergen, at a distance of 618 statute miles from the Pole, and make the trip to the Pole and return, a total distance of 1,236 miles. Using a speed of 15 miles an hour for calm weather, with the fuel they carry they will be able to cover a distance of 2,250 to 2,700 miles, which leaves them a large margin. During the months of July and August the temperature in the polar region is not very much above the freezing point, and in many respects the region is more favorable for airship work than other latitudes, owing to the more constant conditions of weather which prevail. The ice fields allow the use of the guide rope, which is a great point.

From data obtained from observations on the "Fram" during her three years' drift about the Pole, Mr. Wellman finds that the speed of the wind varies between 6 and 30 miles an hour, with most of the winds at a low speed. He expects to start the trip in a favorable wind, which may last for some days. Even in the case of unfavorable winds, he has most of the chances in his favor. Besides, he expects to stop and anchor the airship during the most unfavorable winds, and make use of the others in general.

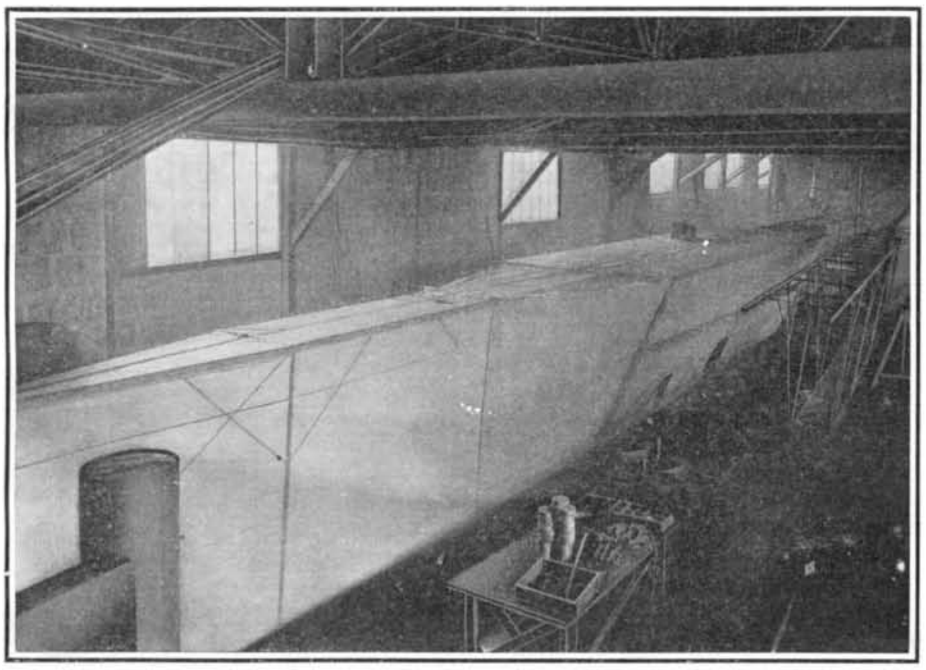
It was decided not to build an airship for high speed, but to use the guide-rope principle. With a guide rope dragging on the ice, the airship will be kept at about a constant height, and besides, the use of this principle affords some advantages which will be mentioned. In order to have gasoline enough on board to cover the trip to the Pole and return, the needed amount was found to be 1,200 gallons or 7,500 pounds, and with the nacelle, crew, etc., the total weight of the airship is 20,965 pounds. Such a great weight requires a large balloon in order to secure the lifting power.

The present balloon, which is of cigar shape with a pointed front end, is practically the same as was used last year, but it was overhauled at Paris during the winter and the length increased, making the total length no less than 183 feet, while the large diameter is 52.5 feet. It is one of the largest airship envelopes which has been built as yet, and its capacity is 265,490 cubic feet. When filled with nearly pure hydrogen from the gas apparatus, the lifting capacity of the balloon will be nearly ten tons. The envelope alone weighs about two tons, and is composed of three layers of rubber-coated cotton, or else two layers of cotton and two of silk in the middle part where the strain is the heaviest. At the ends there are two layers of rubber-coated cotton.

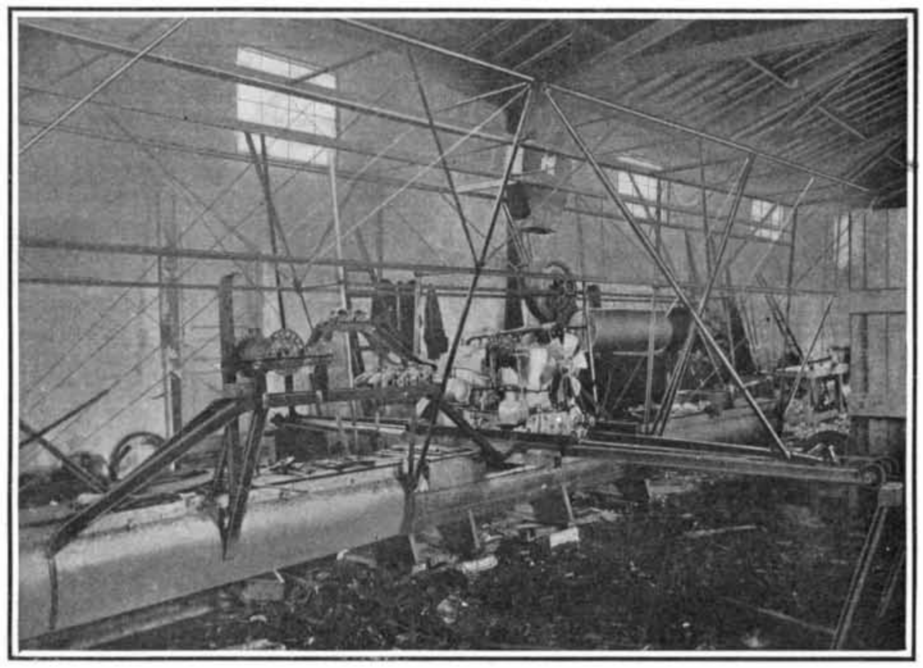
The balloon has been built according to the best experience in this class of work in France, and apart from its great size, it does not show any marked difference from the well-known methods. But when we come to the body framework or nacelle, we find that while in some points it follows what has gone before, it differs from this in most of the features, and owing to its original design, it is of great interest.

Seeing that the form of the balloon was already fixed, the nacelle had to be designed accordingly, and it was found preferable to give it a long and narrow form and suspend it directly below the balloon and quite close it, departing from the design which was used before and also from the Lebaudy pattern, which consists of a nacelle suspended from a flat framework forming the bottom of the balloon. In the present case the nacelle is hung by steel wires from the balloon itself, and in this way a much more even distribution of the load is obtained. One who should have the opportunity of examining it in all its details, as the writer had occasion to do, would be impressed with the engineering skill which Mr. Vaniman has shown in its design and construction. Taken as a whole it is a fine piece of work. It is built of light and strong steel tubes and braced by steel wires. What is the most original feature of the nacelle is the fact that the gasoline reservoir itself forms an integral part of the design of the framework. Because a tank containing 1,200 gallons of gasoline had to be carried, it occurred to Mr. Vaniman that the metal used for the tank might be incorporated into the frame of the nacelle itself. This was done by making a long cylindrical steel tank 18 inches in diameter and of the same length as the nacelle. This forms the under part or keel, and owing to its tubular form, it has great strength. The section of the nacelle is triangular, using two steel tubes attached to the keel and spreading upward in V-shape, joined across at the top by a like tube 3 feet in length. A number of such triangles are placed at intervals throughout the whole length of the nacelle. The corners are joined by long angle-iron beams, the whole being braced by steel wires. At a point near the front a second set of triangular pieces, but having a much wider angle, gives an enlarged part which contains the motor and other apparatus, also lodgings for the crew and the drums for the guide ropes.

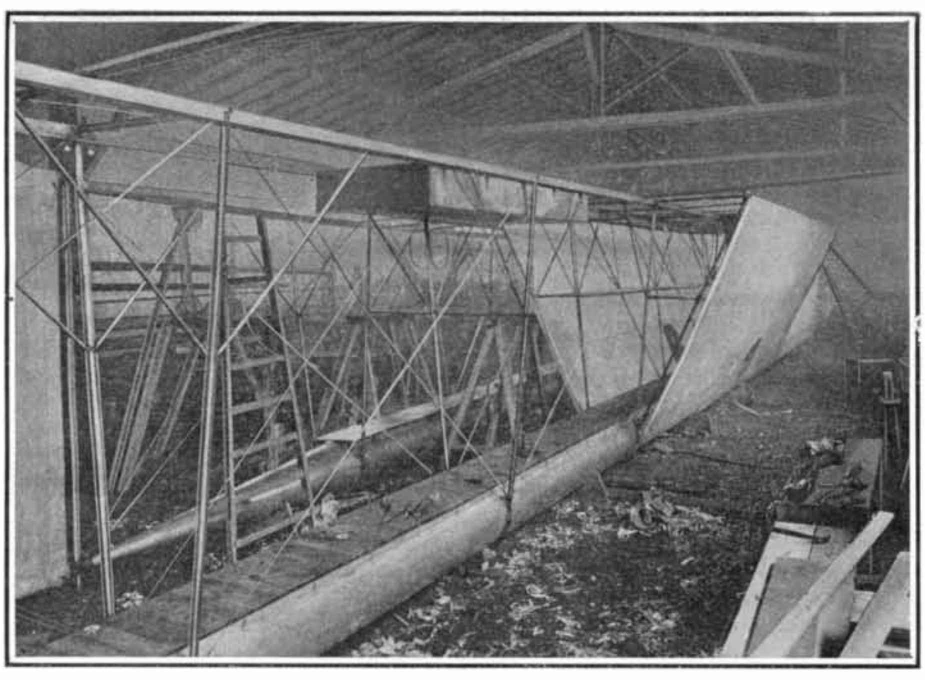
Leading along the top of the keel is a narrow plat-



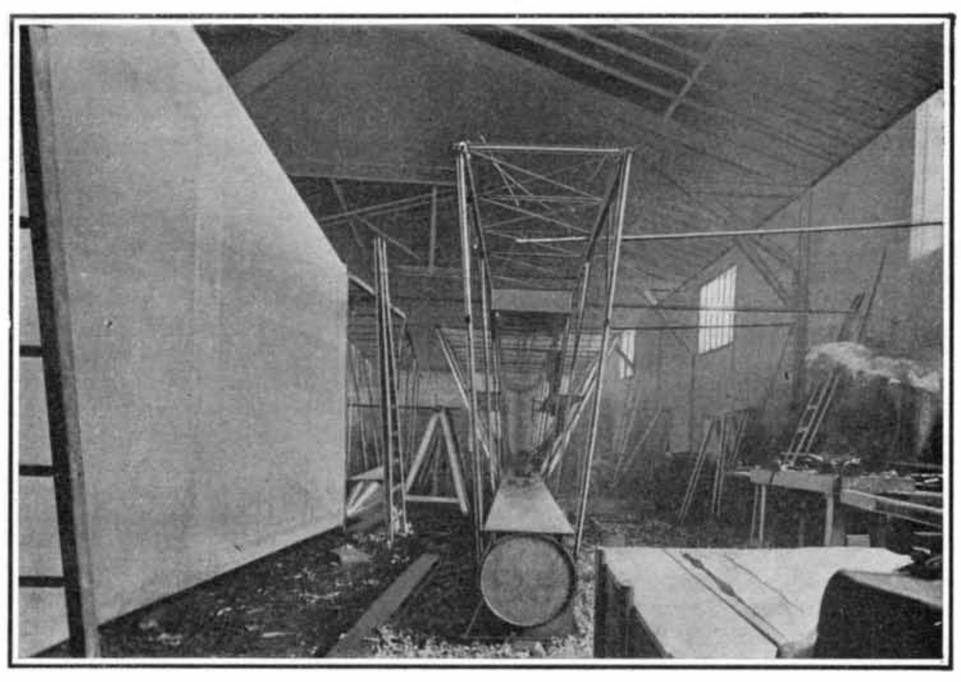
The Nacelle is Entirely Covered with Fire-proof and Water-proof Silk Canvas.



A 60-70 H. P. Lorraine-Dietrich Motor is Used. The Shaft Runs Across the Nacelle and Drives the Propeller Shaft by Bevel Gears.



The Nacelle is Built of Light and Strong Steel Tubes and is Braced by Steel Wires.



Fuel is Stored in a Long Tubular Tank Running the Entire Length of the Nacelle and Forming Part of It.

THE WELLMAN POLAR AIRSHIP EXPEDITION.

form which runs for nearly the whole length of the nacelle, and as the inner height is over six feet, one can walk the whole distance quite easily. The nacelle is entirely covered over with a special waterproof and fireproof silk canvas, which serves to diminish the air resistance as well as to give a comfortable housing for the crew.

Although lying very near the balloon, there will be practically no danger from fire. As the balloon keeps a practically constant altitude above ground, there can be no accident like that which happened to Severo. His airship took fire, no doubt, from the fact that he rose quite suddenly to a great height, which caused the gas to be forced out owing to the expansion, and also be drawn down onto the motor. Here the case is quite different, and there can be no such leak of gas, and what little may leak out (this is shown by tests to be very small) will be taken away from the nacelle as the airship runs through the air. Besides, the nacelle is not only quite covered, but an air-fan is constantly sending air out of the interior so that no gas can enter from the top, and the canvas covering is itself quite fireproof. As some doubt has been expressed upon this point, we may say that any one having the slightest knowledge of actual airship practice will see at once that there can be no danger from this cause under the present conditions. As to the motor itself taking fire, this would happen as often as in a motor car, that is, practically never.

Very ingenious methods are used for the hot air supply. Air is drawn in by a motor-driven fan, first through the radiator of the motor and then through a specially-designed muffling box. The hot exhaust from the motor escapes into a cylindrical box which has a set of tubes, like those of a tubular boiler. When air is drawn past the tubes it is heated considerably. This hot air can be used to warm the quarters of the crew and keep them at a comfortable temperature, and also for filling the two ballonets of the main balloon. By an appropriate device of fan and flues, the hot air can be forced by the blower into one ballonet and the cold air can be drawn out of the second ballonet at the same time. The ballonets have 500 cubic yards capacity each. This causes the balloon as a whole to be somewhat warmed, and even a few degrees above the freezing point will be enough to melt off all snow or sleet. Rain is taken care of by the outer rubber covering. The dimensions of the nacelle are: Length, 115 feet; height, 8 feet; and width at the top, 3 feet. All included, except the guide ropes, the weight of the nacelle is 15,360 pounds, while the weight of the balloon body is 4,190 pounds, making a total of 19,550 pounds. The guide rope, or serpent, lying on the ice, weighs about 1,415 pounds. The motor is of the 60 to 70-horse-power Lorraine-Dietrich four-cylinder type, and was chosen on account of its reliable qualities, this being one of the best motors made on the Continent. Its shaft runs crosswise through the nacelle and is supported to two bracket pieces running outside, as will be noticed. There is a propeller on each side of the nacelle, and the propeller shafts are driven from the motor shaft by bevel gears. With a motor speed of 1,000 revolutions per minute, a propeller speed of 380 revolutions per minute is obtained. It was not found best to use a specially light-weight motor, as this type consumes much more fuel, and with the gasoline on board, the heavier motor will go the farthest distance. As to the propellers, they are of all-steel construction, 11½ feet in diameter. In dynamometer tests they have shown a thrust of some 600 to 650 pounds. It is expected to secure at least a speed of 15 miles an hour, which is all that is desired. A small 5-horse-power motor is used to run the air fan, and there is also a special friction clutch for connecting the propellers to the motor. In the rear of the nacelle is the main rudder, which has 27 square feet of surface. There will be two horizontal planes of small size added to prevent pitching when at anchor.

About four or five hundred feet above ground is the height at which the airship will be kept by means of the guide ropes. Inasmuch as these would have to run over ice or in water, a steel cable would not answer very well, so that a special form of guide rope was designed by Mr. Vaniman which is quite ingenious. It is made of a waterproof leather tube six inches in diameter and 130 feet long, covered on the outside with steel scales like a snake and holding a great weight of provisions, so as to carry no useless material. It can glide easily over the ice and will also float in the water. In general, they will travel with part of the guide rope on the ice, and run at as high a speed as possible. Should the balloon suddenly strike cold air, and drop too quickly, the guide rope falls on the ice for a greater length and lightens up the balloon, thus giving an automatic balance, and the airship cannot vary too much in height. A second guide rope, known as the "retarder," can be used to hold the airship at anchor. This is like the first one, but is provided with sharp hook teeth which catch on the ice. There will be some slip on the ice, however, so as to avoid jerking. Each guide rope weighs 1,300 pounds, of which 80 per cent is in the shape of provisions. Special winches suspend the guide ropes by steel cables.

Among other features which can only be mentioned, are the balancing counterweight which runs upon rollers along the top rails of the nacelle, and is loaded with 600 pounds of provisions; also the bunkers for the crew, who will be comfortably lodged during the trip. Should they be obliged to stay in the Arctic regions to wait for a return the following summer, they have provisions for many months on board. An original feature is that of burning the hydrogen of the balloon in the motor, instead of letting it escape by the valve, as usual. Mr. Vaniman has shown that this can be done easily, of course with all the needed precautions to insure safety.

The party is to be made up of four persons, comprising Mr. Wellman, chief of the expedition; Major Henry B. Hersey, the well-known government meteorologist connected with the United States Weather Bureau; Mr. Melvin Vaniman, chief engineer of the expedition, and a fourth person who has not as yet been selected.

DOUBLE-DECK STREETS AS A RELIEF FOR TRAFFIC CONGESTION.

There is no city in the world in which the volume of travel is increasing so rapidly as in New York; nor is there any leading city where the natural configuration of the site upon which it is built is more unfavorable to the rapid inflow and outflow of the multitudes which gather for the daily transaction of business. In respect of traction facilities, the best location for a city is one in which there are no natural features, such as rivers, seas, lakes, or lofty mountains, in the vicinity of the city to hinder the construction of highways and railroads. The ideal condition is that of a city built in an open plain, with railways and trolley lines radiating in every direction from its business center; and this for the reason that in the case of each line the area served will increase as the square of the distance from the center. But if a city be located by the sea, or upon the shores of some lake, so that the radiating lines of travel are confined, say, to a sweep of 180 degrees, each railway will have to carry its passengers twice as far to secure the same amount of residence area per passenger as it would in the first-mentioned case, in which the railways were free to radiate in every direction from the business center.

The transportation and traffic problem in New York city is rendered specially difficult by the fact that the business district lies mainly at one end of a long and narrow island, and that the majority of the morning and evening travel is confined to certain parallel lines running in a north and south direction. As the tide of morning travel sets in toward the downtown business district, it gathers volume and density as it goes; but during the six to ten miles which have to be traversed down the length of Manhattan Island, although the density of the traffic increases with every mile that is traversed, at least in the earlier stages of the journey, there is no increase in the number of lines of traffic available. Similarly, when the city disgorges its busy workers at night, they are unable to scatter at once to the four quarters of the compass; but must, perforce, the majority of them, move northward for several miles along certain restricted avenues before they begin to scatter.

But the configuration of Manhattan Island, its restricted area, and the high price of real estate, affect the traffic problem unfavorably in another respect, namely, that these conditions have brought about a great increase in the number of exceedingly tall office buildings. This, of course, conduces to the density of population, as will be seen from the fact that, wherever a twenty-story office building takes the place of an old building of five stories, the number of people per unit of ground area is at once quadrupled. If any former resident of New York were to take a walk down Broadway after an absence, say, of fifteen or twenty years, a single glance at its almost endless line of buildings, from twelve to twenty stories in height, would satisfy him that the population of busy workers abutting immediately on this great thoroughfare is at least three times as great as it was at his last visit.

But while the modern city, especially in lower New York, provides accommodations for two or three times as many people as formerly, it seems never to have occurred to anybody that no extra provision is being made to accommodate this added population when it is disgorged into the various thoroughfares. Moreover, with the great increase in the size and number of the business houses, there is necessarily a proportionate increase in the vehicular traffic, both in the number of heavy trucks, drays, delivery wagons, etc., and in the number of public conveyances and private carriages, whether horse-drawn or gas-propelled. Like causes have produced like results, and the congestion on the Subway, the Elevated Road, and the street-car lines is fully equaled, in its resulting delays and inconveniences, by the congestion in the streets themselves. Indeed, had it not been for the good work done in recent years by the Traffic Squad, it is safe to say that by this time some of our leading thoroughfares would have become at certain hours of the day practically impassable. Even as it is, there are sections of Fifth Avenue and Broadway, such, for instance, as the intersection of Forty-second Street with these two thoroughfares, and the crossing of Broadway by Canal Street and Chambers Street, where, despite the excellent work done by the Traffic Squad, the congestion of traffic has become very serious indeed.

There is no question that the chief hindrance to the easy flow of traffic is the presence on our leading thoroughfares of slow-moving trucks and drays, which not only keep down the average speed both of the street cars and lighter vehicles, but provide a most serious obstruction wherever they stop to unload at the sidewalks. The removal of heavy trucking from the streets would do more to expedite traffic than any other change that could be made; and the most effective way to make this change would be to double-deck the streets, reserving the upper surface for the street cars, light vehicles, and pedestrian traffic, and relegating the heavy trucking to a subway built immediately below street level. This arrangement would have the added advantage that freight could be delivered direct to the basement of the business houses, where, in any case, it has to be stored, even when delivered from the street level. There would be a distinct gain in the fact that a large amount of handling and elevator service would be eliminated, while the sidewalks would be rid of the intolerable nuisance which is now occasioned by unloading and transferring freight at the street level.

On the front page of the present issue is shown the constructive details of a plan by which the above suggestion of a trucking subway could be carried out. Immediately below street level is the proposed subway, and below that a standard four-track subway for the Rapid Transit trains flanked by a couple of pipe galleries. The whole of this construction is built of armored concrete. The trucking subway is divided by a heavy longitudinal wall running down the center, with wide openings at the cross streets to accommodate the crosstown traffic and enable trucks to pass from one side of the subway to the other. At the sidewalk line, the roof is supported on lines of heavy columns, an arrangement which permits the trucks to back directly up to the basements of the buildings. At the cross streets access is gained to street level by means of easy inclines, which, in every case, occupy only the right-hand half of the street looking in the direction of travel. At intervals, on the more important crosstown streets, the trucking subway could be extended for one or more blocks to the east or west. It would be a hard-and-fast rule in this subway that all moving trucks must keep to the right hand, traffic on the inclines leading to and from the subway always being in one direction. The construction of trucking subways beneath our most crowded thoroughfares would immediately loosen the street traffic, and greatly reduce its present inconvenience and danger. The schedule of the surface cars could be greatly improved; it would be possible to make a rapid journey up and down town in carriage or automobile; and the gain from a sanitary standpoint would be enormous.

The Current Supplement.

The current Supplement, No. 1642, contains a number of articles of a practical nature. Godfrey M. S. Tait records recent progress made in producer-gas installations. A paper by M. C. del Proposto describes an electrical method of power transmission, developed by the author in connection with the use of irreversible internal-combustion engines for the propulsion of ships. George P. Hutchins writes instructively on the storage battery and battery plates. Some novel house-moving operations are described by Edward H. Crussell. There is an element of uncanniness about some of the recent developments in plant growing. The adventurous impulse of the times is leading the modern scientific gardener to experiment in many different ways. He is bringing all sorts of previously unheard-of influences to bear (electric force, electric light, colored lights, germ inoculation, anesthetics, and what not) in the hope of raising a product superior to anything that has gone before. These experiments are admirably summed up in a popular way by G. Clarke Nuttall. "Our Most Destructive Rodent" is the title of an article which will surely open the eyes of those who do not realize how terrible a pest is the rat. Jacques Boyer tells how soft French cheeses are made. A. D. Hall's excellent paper on artificial fertilizers is continued. This instalment is devoted to nitrogenous manures. The paper by E. F. Lake entitled "How to Build a 5-Horse-power Stationary Gas Engine" is concluded.

A French statistician estimates that about 550,000 motor cars have been manufactured in the nine years since the experiments of self-propelled road vehicles first succeeded.