THE LICK OBSERVATORY-CROCKER ECLIPSE EXPEDITION TO SUMATRA.

It gives me great pleasure to announce that the expedition sent to Sumatra from the Lick Observatory through the generosity of Mr. William H. Crocker, to observe the total solar eclipse of May 18, was very successful. This announcement has been unduly delayed from the fact that the scientific apparatus and the astronomical photographs containing the results were sidetracked at an Asiatic port for three months, and have but recently arrived at Mount Hamilton. The expedition was in charge of Acting Astronomer C. D. Perrine. He was assisted by Mr. Ralph H. Curtiss, Fellow in Astronomy at the Lick Observatory.

A site for the observing station was selected on the race-course in the edge of the city of Padang, the capital of Sumatra, located at about the middle of the west coast of the island. The accompanying illustration will give an idea of the immediate surroundings of the camp. The great thatched tower supports and incloses the camera of 40 feet focal length for recording details of the solar corona on a large scale. This instrument was designed and first used by Prof. Schaeberle in the Chile expedition of 1893, and was the original of the long-focus instrument now so largely adopted by nearly all eclipse parties. The lens is at the top of the tower, and the plate holder, moving by clockwork, is at the bottom. The lens is supported by an inner tower, and the outer tower, completely isolated from the inner, serves both to prevent the wind from shaking the lens and to keep out the tropical rains.

The nine other instruments are located in the smaller thatched huts.

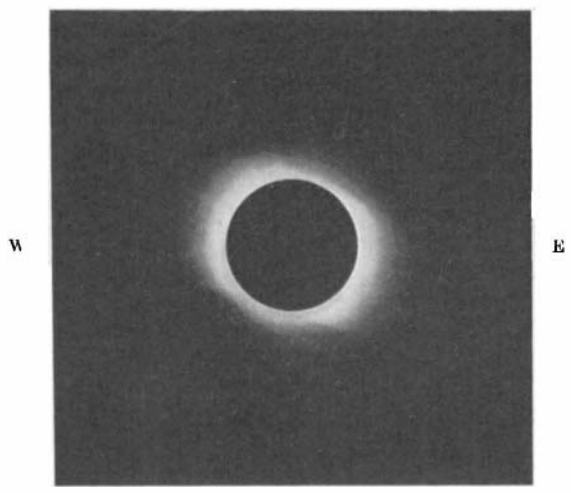
The ten instruments were mounted and in perfect adjustment a week before the day of the eclipse. The remaining days were utilized by Prof. Perrine in training his sixteen assistants, secured in Padang, so that they could take the photographs in strict accordance with the signals previously arranged, and in attending to the multitude of final details.

The morning of the eclipse dawned cloudy, and the clouds persisted until the middle of the afternoon. At the time of the eclipse, which occurred a few minutes after noon, the clouds were comparatively thin; and Prof. Perrine's cable home did not afford much hope that useful results had been secured. The negatives were developed in the week following, and a cable dispatch conveyed the very welcome news that useful results had been secured with all the instruments. The photographs have reached home in perfect condition, and a careful examination here confirms the contents of the cablegram.

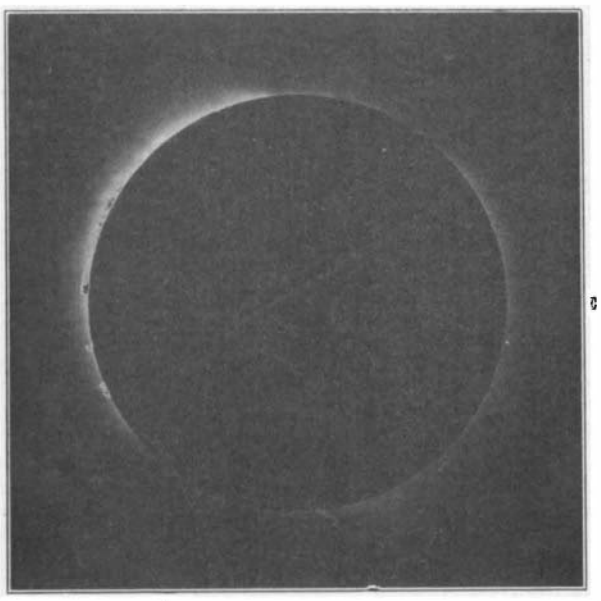
The negatives secured with the 40-foot and the smaller cameras show the inner corona as well, probably, as if there had been no clouds to interfere; but the longest recorded streamers are limited to about one and one-third solar diameters. The photographs are full of interesting details, some of their features being unique. They will be very valuable in studies looking to an explanation of the origin of the solar corona.

Four cameras of 11 feet focal length were used in making an examination for a possible planet nearer the sun than the planet Mercury. Photographs of the portion of the sky to be occupied by the eclipsed sun were obtained on Mount Hamilton the night before the apparatus was shipped to Sumatra. Photographs of this same region of the sky were secured at the time of the eclipse. During the first half of totality, when the clouds were thin, the negatives show stars down to nearly the ninth magnitude; but during the latter half of the eclipse, with thicker clouds, no stars were recorded. For about half the area to be examined the results were, therefore, very satisfactory; but for the other half nothing was secured. A comparison of the photographs made here and in Sumatra should lead to the detection of any unknown bodies.

The photographic results from the polarigraph and the two spectrographs were better by virtue of the clouds than they would have been with a clear sky. In new work of this kind there is very little to guide the observer in forming his estimate of the length of exposure required. In this case it has happened that the reduced brightness of the sky gave proper density to the negatives, whereas with a perfectly clear sky the photographs would have been over-exposed, and some of the desired results thereby lost. These fields of work are highly technical in their nature; but it will interest many to learn that the outer part of the corona shows a large percentage of polarized light, whereas the light of the inner corona is polarized much less strongly. The conclusion to be drawn from these results is, that the light from the outer corona is largely reflected or diffused sunlight, whereas that from the inner corona originates from the incandescent corona itself.



PHOTOGRAPH OF CORONA WITH FLOYD TELESCOPE.



PROMINENCES AND EXTREME INNER CORONA FROM NEGATIVE SECURED WITH 40-FOOT TELESCOPE.

The spectrum of the outer corona as recorded on the photographs appears to be identical with the solar spectrum, whereas the spectrum of the inner corona is entirely different in that it shows no trace of dark lines. The conclusion to be drawn from these extremely valuable results is precisely the conclusion drawn from the polarigraphic results.

The general conclusion to be drawn from the many valuable results obtained by the expedition is, that the coronal structure surrounding the sun is made up of matter, probably very finely divided, ejected from the surface of the sun with great velocities, just as we have matter ejected now and then from terrestrial volcanoes with comparatively small velocities. This conclusion is entirely in accord with that reached by Prof. Schaeberle in 1893 from a different train of reasoning, and from an entirely distinct set of facts.

Illustrations herewith show the details of the extreme inner corona as secured by a short exposure with the 40-foot camera; and of the different features of the corona as photographed with the Floyd camera of 70-inch focus. W. W. CAMPBELL, *Director*.

Mount Hamilton, November 2, 1901.

SOME EXHIBITS AT THE AUTOMOBILE SHOW.—II.

Continuing our notice of this year's most excellent exhibit at Madison Square Garden, we draw attention to the fact that if these annual displays are a correct indication of the year-by-year advance made in the industry, the past twelve months must be conceded to be by far the most progressive and interesting in the history of the automobile in this country. In our previous notice of the Show we referred to the fact that the freak machine was conspicuous by its absence—a gratifying fact in itself, and doubly so when we remember that the fine assemblage of machines on exhibit was marked by really extraordinary improvement in every respect, and in none more so than in the general contour and finish. For simplicity, grace and harmonious proportion of parts we think the time will soon come, if it is not already here, when the American-made automobile will be pronounced the handsomest on the market.

Although not many motocycles were shown, those on exhibition appeared to be serviceable machines. The recently-completed 6-horse power Marsh motorcycle for pacing purposes cut quite a figure at the Show on account of a sign in front of it declaring it capable of 60 miles an hour. As a matter of fact, the machine has made a trial mile in 1 minute 2 3-5 seconds on a State roadway near Brockton, Mass., and we presume that the sign was intended to make it known that a speed of a mile in one minute or a rate of 60 miles an hour was expected. If the machine accomplishes a mile in one minute the feat will not be surprising in view of the great power of the motor. The lines and unusually rigid construction of the wheel are sure to make it a favorite with those who wish to emulate the speed of the swiftest of high-power automobiles.

A rather showy machine of compact appearance was the Searchmont touring car, designed for long and continuous runs. The framework, especially heavy, is provided with a flexible joint to accommodate inequalities of the roadway. The car is driven by a 12-horse power, double-cylinder motor, and has two speeds ahead and one reverse. The wheels are 32 inches in diameter, and the wheel base measures 5 feet 6 inches. It is furnished with a touring basket in front, for which, if desired, a cushion may be substituted providing an extra seat. The approximate weight is 1,800 pounds.

Among the more massive machines in the exhibition was the Desberon steam lorry, which is constructed on the lines of the Thornycroft steam lorry, but with improvements and modifications introduced by the present builders. The boiler, which is located at the front, is of the water-tube type. The engine, which is of 25 to 30 horse power, is geared for two speeds, and the truck, which weighs 4½ tons, has a capacity of 4½ tons of freight, making a total weight of 9 tons. The construction is simple and, of course, massive, as may be judged from the fact that the wheels have a tread of 6 inches, and the steel tires are 1 inch in thickness. It may be mentioned as an item of

LICK OBSERVATORY-CROCKER ECLIPSE STATION, PADANG, SUMATRA.

interest that when the company's shop was moved from New Rochelle to New York the whole of the plant was transported on the lorry shown at the exhibition. On the same stand was a light voiturette driven by a 4-horse power, gasoline, air-cooled motor, with a water-cooled head.

Some of the makers this year showed an excellent arrangement of the front end of the body, in which the seating capacity can be doubled by a simple operation. One of these is the model No. 1, Prescott steam automobile, of which we present two illustrations, one showing the front end of the body, corresponding to the dashboard of a horse-drawn vehicle, closed, and the other open. The casing is hinged, one-half of it containing the back rest and the other half forming the foot rest. When these are thrown back and down a cushioned seat is drawn forward, thus providing a thoroughly comfortable extra accommodation for two persons. This machine has been built in response to the demand for a heavier construction than is afforded by the ordinary steam runabout or Stanhope type. The wheel base has been extended and measures 5 feet. The water tank has a capacity of 32 gallons and the fuel tank of 12 gallons. The boiler measures 16 by 13 inches, and is provided with a superheater and a 16-inch two-piece burner. A feature in the design of the 7¼ horse power engines is that the bearings are all plain and of exceptional width. The running pressure of the boiler is 200 pounds to the square inch. This machine, whether with the front let down or closed, presents a very neat, attractive and well-balanced appearance. Its weight with the tanks filled is 1,050 pounds.

Another automobile of the let-down type that attracted much attention was the locomobile touring Model B. This has a seating capacity for four passengers, a 73-inch wheel base, a capacity for 21 gallons in the fuel tank, 49 gallons in the water tank, while the boiler and engine are of large capacity, the diameter of the boiler being 20 inches. The latter is of the upright fire-tube type, and is composed largely of copper. The running pressure is about 180 pounds. Some changes which will be appreciated have been made in the burner, the top plate being constructed in one piece, while an excellent shut-valve permits the fire to be turned off without the operator having to get out of the carriage. In this year's type the differential gear has changed from bevel gears to spur gears, and the device is completely inclosed and runs in grease, the spur gears being keyed instead of pinned to the axle. The locomobile also used a double-acting brake which arrests the backward as well as the forward motion of the carriage.

Particular interest attaches to the Pierce motorette knockabout, a shapely little car which has the distinction of being the smallest vehicle that took part in the endurance run from New York to Buffalo. Two of these little fellows were entered, and although they are only provided with a 2¾-horse power De Dion motor, they climbed all the hills without assistance. This is not only the smallest-powered, but also considerably the lightest machine that took part in the run, since its weight is but a little over 500 pounds when in ordinary running order. Sufficient gasoline is carried for a run of over 100 miles, and from 30 to 35 miles can be run on one gallon of gasoline, the distance, of course, being dependent upon the condition of the roads and weather. The motorette is capable of a speed of 20 miles, while from 10 to 14 miles an hour can be maintained over ordinary roads.

In our last issue we showed an autocar complete, ready for service, and we now present a view of the same car with enough of the framework removed to show the running and driving gear. The running frame is of one-inch tubing, and stoutly trussed. The lower frame is of hickory and the body frame of oak. The tank of cooling water will be noticed behind the seat, while six gallons of gasoline are carried beneath the forward hood. The double-cylinder gasoline motor is seen below the seat, and the illustrations show well the compact arrangement of the driving mechanism.

The steam-driven Surrey exhibited by the Lane Motor Vehicle Company, weight 1,325 pounds, is a machine of substantial build and pleasing appearance. It has 34-inch wheels, 3-inch tires and an 8-foot wheel base. There is fuel capacity for from 40 to 50 miles over ordinary roads, and the air pressure is pumped direct by the engine. Devices are provided for the absolute protection against a dangerously high water level, while a low-water alarm is also supplied. As the exhaust is direct to the water tank there is a saving of a considerable percentage of the water, and a return of heat to the boiler.

The Stearns Steam Carriage Company have taken a decided step in the direction of the perfect steam carriage by introducing a compound engine with water pump and air pump attached to the crossheads. The radius of action of the steam carriage to-day is limited by the water supply, and any devices that will reduce water consumption will be welcomed. There is no reason why the compound system, even in such a small size as this, in which the cylinders are 2 inches and 3 inches by 3½ inches stroke, should not show its usual economy over the simple engine, and the makers claim a saving of 20 per cent in fuel and water. The engine, which is completely incased, was one of the most attractive pieces of mechanical work in the Show. A feature of great value for touring is that by means of a distributing valve the engine can be turned at once into a simple engine, thus greatly increasing the power of hill-climbing. If the Stearns Company will follow to its logical conclusion the line upon which they are working we shall yet see their carriages fitted with a condenser—a device which would bring the radius of steam carriages up to that of any type of automobile extant.

Among the Stearns carriages there was none of more pleasing appearance than Model B, a trap or dos-a-dos carrying four persons, back to back. It has a let-down back and footboard, by closing which it may be turned into a single-seated vehicle having the trim appearance of a runabout.

A decidedly attractive vehicle was the Knoxmobile, a particularly easy-riding car, whose comfort is due to the introduction of the old side-bar spring with pivot connections at the end of the springs to the axles. The 7-horse power engine is cooled by air, the draft being intensified by a small fan. The exterior of the engine is entirely covered by 3,000 3-16-inch pins. Ten gallons of gasoline giving a capacity of 250 miles are carried. The engine is horizontal, single-cylinder, and three brakes are provided which hold the vehicle in either direction.

The Century Motor Vehicle Company are makers of a steam carriage which is the only one that makes use of a bevel drive. This is incased and is dust-proof, and a set of gears was exhibited which showed an excellent state of preservation after several thousand miles of service.

The new mobile touring carriage, shown for the first time at the Madison Square Garden exhibition, had just returned from a 250-mile run between New York and Washington, in which the 100 miles from New York to Philadelphia was covered in eight and a half hours of night riding. The machine has been built with a special view to strength, and a successful effort has been made to get rid of some of the objectionable features of European machines. It has sufficient power to climb the heaviest grades and sufficient gasoline is carried for a run of from 125 to 225 miles, according to the difficulty of the road. Particular attention has been paid to those features which experience with steam-driven vehicles has shown to require special attention, and during the New York city and Washington run referred to, we are informed that the operations of pumping air and water, oiling, etc., were conducted while the machine was running and without interruption. Water was renewed at intervals of from 25 to 35 miles. A notable change has been made by getting rid of the by-pass and rendering the regulation of water in the boiler purely automatic. Another notable carriage shown was a 12-passenger vehicle, a dozen of which type have been in operation during the past six months in New York city. In spite of its large capacity this wagon weighs but 1,900 pounds. It has been built to do work of an omnibus character, but with greater speed and regularity than usually characterize that class of vehicles.

The Packard machine, exhibited by the Ohio Automobile Company, attracted considerable attention from the fact that out of five entries of these machines in the Buffalo endurance run, four received first-class certificates, and one a second-class certificate. The makers claim that their very handsome models are not in any sense a mere copy of other existing vehicles. Model C, the original machine made by the company, and Model F, were both on exhibition. The first-named is a horizontal single-cylinder, four-cycle engine of 12 horse power. Connection is made with a clutch and gear shaft, by a spring transmission. The jump-spark ignition is used, two sets of dry batteries with a double-throw switch being provided. The gasoline tank holds sufficient fuel for a 150 to 200-mile trip, according to the roads, and the working speed varies from 7 to 22 miles. In Model F the essential features of Model C are retained; there are three direct-geared speeds ahead and one reverse, and both lever and pedal clutch control are fitted.

Limitations of space prevent any further reference to this most successful exhibition, in which the quality of the exhibits, almost without exception, was of such a high standard as to cause the opening year of the century to remain always the real starting point in the history of the thoroughly successful inauguration of the practical automobile in this country.

A Tropical School for Medicine in London.

A determined attempt is being made to establish a large Tropical School for Medicine in London, replete with every modern convenience and up-to-date appliances. The exigences of the colonial expansion of commerce in the tropics, especially of those dependencies infested with malaria, demand the foundation of such an institution. For this purpose no less than $500,000 are required. Many wealthy gentlemen, who have great interests in the tropics, are lending their strong financial assistance to the scheme. The Right Hon. Joseph Chamberlain, the British Colonial Secretary, has always evinced a strong interest in the matter, since the development of many of the British African colonies depends upon the successful subjugation of the various malarial maladies indigenous to these climes. The present school is wretchedly inadequate to fulfill the necessary requirements, since it has only six rooms available for the accommodation of students. The large mercantile companies are always demanding competent men, and these cannot be provided owing to deficiency of means. It is desired to erect a large building with more living rooms for students, enlarged laboratories, museum, and a library. Dr. Patrick Manson, the medical adviser to the Colonial Office, opines that in the course of one generation the blood of the Barbadians can be entirely freed from elephantiasis and cognate diseases. Sir Francis Lovell, who is also deeply interested in the scheme, proposes visiting India, Burma, Ceylon, Straits Settlements, China, Japan, New Zealand, Australia, Canada and this country, in order to emphasize the objects of the school and to obtain assistance, since it will be of universal importance and benefit. An expedition is at present being organized to visit Christmas Island, to investigate beri-beri and to study the pathology of other diseases. They will remain on the island for two years.

THE OPOSSUM.

BY A. C. CARSON.

The American opossum, representing the genus *Didelphys*, is one of the most curious animals in the United States. It is the only one carrying its young in a pouch or marsupium, like a kangaroo. It is the only animal which can feign death perfectly in order to escape its enemies, and the expression "playing 'possum" is a well-known phrase. It is also remarkable in that it hangs by its tail like a monkey. Its hands resemble those of a human being. It is most liberally provided with teeth, and has a snout like that of a hog, eyes like those of a rat, and hisses like a snake.

Mr. Edward Decker, an agriculturist residing near Columbus, Ohio, caught a female opossum last spring, and discovered that his captive had in her pouch an interesting family of twelve little ones. His dog had been investigating a rail-pile, and suddenly raised a tremendous outcry. Mr. Decker found the dog worrying the old opossum and delivered her from the jaws of death, but not until after she had been severely bitten. He dressed her wounds, took good care of her and succeeded in raising to maturity every one of the twelve young ones.

When first discovered, the baby opossums were about two inches long, hairless and sightless.

The dozen grew slowly at first, their progress being retarded by the injured condition of the mother. It was several weeks before the boldest of them, having had his eyes unsealed, timidly poked his white snout through the opening of the pouch and reconnoitered. By and by he ventured to crawl outside and hung by the long fur of the mother. Soon another and another followed the leader on a tour of inspection. After that the twelve came out daily, but were exceedingly timid, scuttling back into the pouch at the slightest noise or the approach of any person.

One of the twelve managed to escape from the old corncrib where they were confined and was gone for ten days. Upon his return he was immediately set upon by his brothers and sisters as a renegade, and had his large, fan-like ears bitten off close to his head.

The method of feeding the mother consisted at first of throwing in a pigeon, and later a fowl from the barnyard. The young opossums used to have fierce fights over their nocturnal meals, and in one of these wrangles one of their number lost her ear, after the style of punishment visited on the renegade. This seemed to be the vulnerable point of attack in a 'possum fight.

When they had attained the size of rats the young bore a remarkable resemblance to these rodents, and when all climbed upon their mother, clinging to her hair, neck and legs, she staggered under the load. No other mother among the animals of North America bears such a burden, and her patience and tranquillity under her manifold cares were admirable. The photographer who succeeded in taking the half dozen fine views of mother and family has given an insight into the domestic arrangements of the opossum family such as the world has never had; for the opossum, although far from uncommon in the United States, seems to be little understood. Owing to the nocturnal habits, comparatively few people have ever seen a female with her young.

The writer obtained from Mr. Decker four of the young opossums when they were about one-fourth grown, and he made a close study of their habits.