

Nagpur; and by Prof. W. W. Campbell, at Jeur, with telescopes of about forty feet focal length. Next in order to these giant photographs come the standard instruments of the Joint Eclipse Committee, with their twin cameras giving images of an inch and a half and of six-tenths of an inch. These were employed by Prof. Turner at Sahdol and Captain Hills at Pulgaon. The cameras taking photographs of one inch in diameter and smaller were much too numerous to recount; but special note should be made of Prof. Burekhalter's device for obtaining both the inner and outer corona on the same plate by means of a revolving screen worked by a spindle passing through a hole in the center of the plate, which diminished the exposure given to the bright central regions of the corona so as to bring it more in accord with the faint light of the outer extensions.

At the extreme ends of the line of stations a novel experiment in coronal photography was attempted. At Buxar, on the Ganges, and at Viziadrag, on the coast, a kinematograph was employed so as to obtain a continuous series of photographs of the progress of the eclipse. The former instrument was supplied by Mr. Nevil Maskelyne, and was worked by the Rev. J. M. Bacon, the astronomer in charge of one of the two parties organized by the British Astronomical Association, and the other was in the hands of Lord Graham.

Of direct visual spectroscopic observations there were few. Mr. Newall and myself endeavored to trace the distribution of coronium—that is, of the substance which shows its presence in the 1474 K line; but the line was faint, and it could only be ascertained that it showed a general conformity to the shape of the brighter part of the inner corona, without its being possible to ascertain whether it corresponded in minuteness of structural detail. No rifts were detected in it.

The photographs of the spectrum claim the highest interest, and these were of unprecedented number and value. Capt. Hills, at Pulgaon, with two great slit spectroscopes, obtained records of the "flash," both at commencement and end of totality, which give a complete history of the spectroscopic changes seen in the various strata of the sun, from its ordinary spectrum up to that of the prominences at Viziadrag on the coast. Mr. Fowler and Dr. Lockyer were equally successful with prismatic cameras of six inches and nine inches aperture, while smaller spectrographs of extreme

beauty, and ranging from C in the red far into the ultra-violet, were secured by Mr. Evershed, at Talni.

The examination and interpretation of these photographs will be the work, not of days and weeks, but of months, and possibly years; but we may confidently look to them for a complete answer to many questions which are engaging the attention of solar physicists at the present time, and particularly for information as to the exact locale of the absorbing vapors which give rise to the Fraunhofer lines. Sir Norman Lockyer's theories, in particular of dissociation in solar and stellar atmospheres, will be put to the severest test, and our knowledge of solar mechanism can hardly fail to receive a great advance.

One inquiry which it was hoped the present eclipse would advance has failed to meet with success. Mr. Newall was endeavoring to ascertain if the spectrum of the corona, as obtained from the two opposite limbs of the sun, gave any evidence of relative motion in the line of sight due to rotation. It will be remembered that in 1893 M. Deslandres came to the conclusion that the corona rotated in essentially the same period as the photosphere. Mr. Newall had arranged an exceedingly beautiful instrument for this purpose—a spectro-

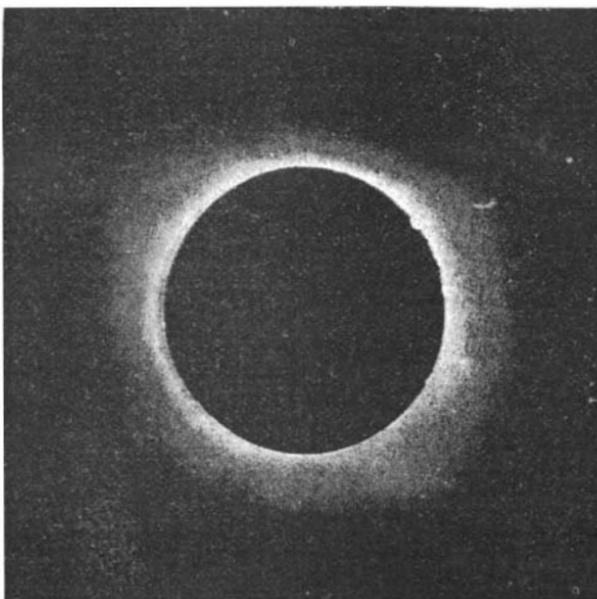
scope, the collimator view telescope of which was parallel to the polar axis. The spectroscope was also provided with a double slit, the one slit tangential to one limb and the second to the other limb; the one slit stretching from the sun's equator northward, the other from the opposite end of the equator southward. The experiment, which abundantly deserved to succeed, was, however, frustrated by the faintness of the coronal spectrum.

Of other observations it is scarcely possible to speak as yet. It should, however, be added that the polariscope, which has been almost forgotten in eclipse work for the last fourteen or fifteen years, was very successfully used, both at Sahdol and at Pulgaon, and the clearest indications were secured of strong radial polarization.

Such is a very brief outline of the principal results (so far as we yet know them) of this the most completely successful eclipse on record. The above article was contributed by E. Walter Maunder, F.R.A.S., to Knowledge.

The Correspondence Schools' Car.

A handsome car for the International Correspondence Schools of Scranton, Pa., has just been built at Wilmington, Del., and will shortly be sent on a tour through the manufacturing cities of the country. The length of the body of the car is fifty feet and the width is nine feet eight inches over the sills. The interior is divided into compartments as follows: A reception room eighteen feet long, furnished in quartered oak and fitted with bookcases, center table, wicker chairs, couch, etc. There are four sleeping sections of upper and lower berths, eight in all. The seats forming the lower berths are covered with plush and fitted with head rests. Tables are provided, to fit between the seats, for holding books, writing materials, etc. At the extreme end of the car there is a toilet salon. On the panels between the windows there are suitable inscriptions accompanying the names of the various inventors and scientists, such as John A. Roebling, George H. Corliss, George Westinghouse, Jr., Sir Henry Bessemer, Abram S. Hewitt, Thomas A. Edison, Michael Faraday, etc. It is proposed to locate the car for a time in the immediate vicinity of large manufacturing establishments, thus affording those interested a practical demonstration of the methods in which the work of the schools is carried on.



THE SUN'S CORONA, TOTAL ECLIPSE, JANUARY 22, 1898.

RECENTLY PATENTED INVENTIONS.

Engineering.

ROTARY ENGINE.—Frank A. Boyd, New Rochelle, N. Y. This invention provides an engine of comparatively simple construction which is designed to be of high efficiency and not liable to derangement of working parts in service. In a suitable casing, the driving shaft carries a bucket wheel, on the sides of which and near the periphery are track rings having V-grooves in their outer edges, while in an adjustable concave-faced bracket block supported from the casing, there being side plates on the block, are induction and exhaust passages having communication with the buckets of the wheel, there being adjustable gates in these passages.

Railway Appliances.

CAR DOOR FASTENER.—Reynolds H. Johnson, Long Island, Kansas To hold a sliding car door in place and prevent its rocking or jarring back, the fastener is, according to this invention, applied near the rear edge, pivoted bolts engaging the adjacent door jamb having bifurcated lever arms, a bar connecting the arms of the bolts, and the bar sliding in a mortised keeper. A drop key engages the keeper to hold the connecting bar at either end of its throw, and is provided with a lateral spur to prevent accidental displacement. All parts liable to be displaced and lost are dispensed with, and the arrangement is such that the seals cannot be tampered with nor the bolts disturbed without its being readily discovered from the outside of the car.

RAILROAD SWITCH AND FROG.—Charles E. Harris, Ellwood City, Pa. This invention provides a peculiar construction of the rails by which objects which lodge between the fixed and movable rails will be raised out of the groove by the operation of the switch. In the complementary rails for the switches and frogs, one rail has a horizontal recess opening to one side and extending beneath the tread portion and the other rail has a side projecting flange fitting and adapted to enter the recess, one of the rails having the opposed surface of that part above the flange beveled away from the other rail.

DUST GUARD AND AXLE WIPER.—James S. Patten, Baltimore, Md. The dust guard proper, according to this invention, is composed of two metallic members, preferably flexible cast brass, and helical springs arranged in inclosing keepers which are composed of integral semicircular portions formed on one member, and an integral face on the other member, the portions being opposite and adapted to slide on each other, the upper member having lateral lugs which form supports for the springs and slide with them into the keepers or pockets when the guard is adjusted to an axle. An integral lateral flange has angular wiping portions that are flush with the concave edge, while intermediate bridging portions serve as caps for the spaces between the wiping portions.

RAILWAY TRACK TIE AND FASTENING.—William A. Detwiler, Cincinnati, O. This invention re-

lates to means for quickly locking rails to metallic ties, the fastening being easily removed, if desired. The tie may be of cast or sheet metal, with a concave body and pendent integral angular flanges having in their horizontal portion an opening with convergent or beveled sides, while rail clamps fitting loosely in the top openings have claws to engage the tie, wedges holding both the clamp and tie in locked position. A firm and cheap fastening is thus provided, which can be applied with great rapidity.

UNCOUPLING LEVER.—Robert H. Munger, Quimby, Ia. To facilitate lifting the coupling pins of car couplings of the Janney type, this invention provides a pin lifter comprising a two-part rock shaft supported to rock on the end of the car, one part of the shaft having a crank arm loosely shackled to the coupling pin, and the other part of the shaft being flattened at the outer end and provided with a handle lever, a coupling box loosely connecting the two sections of the rock shaft, and there being means for loosely connecting an arm on the cranked sections of the rock shaft with a pin-lifting device on the roof of the car. Means are provided for temporarily maintaining the vertically slidable coupling pin in elevated position, to be automatically dropped by the impact of two meeting cars.

Mechanical.

TURBINE WATER WHEEL.—Samuel and Arthur C. Martin, Muddy Creek Forks, Pa. The hub of this wheel is carried on a vertical shaft, and is curved inwardly from the top and bottom, the blades consisting of metallic plates running throughout the height of the wheel, and the lower portion of each blade having an extension which forms the bucket, the buckets being below the plate where the water is introduced to the wheel at the upper side of a horizontal platform, there standing on the plate a series of tangential partitions forming sluices through which the water passes. With the special form of blade employed, the water received on its upper curved portion is forced downward, so that water from one sluice cannot come in contact with the water from the next sluice and destroy its force.

Agricultural.

CHECK ROW FOR PLANTERS.—Firman S. Breckenridge, Caledonia, Mo. A simple and inexpensive attachment is provided by this invention, the markers being adjustable so that the rows may be checked with great accuracy at any desired distance apart. The attachment comprises a marking wheel having a hub made in sections capable of adjustment one upon the other, there being locking devices for the sections and arms projected from one of them, points being adjustable upon the arms. The device can be applied to any two-horse corn planter, and to those having revolving seed drops as well as those having reciprocating slides.

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WHAT IS LIFE? OR, WHERE ARE WE? WHAT ARE WE? WHENCE DID WE COME? AND WHITHER DO WE GO? By Frederick Hovenden. With cuts and diagrams. London: Chapman & Hall, Limited. 1897. Pp. 290.

This work is based on the author's previous book entitled "What is Heat?" Indeed, it is a sequel to that work. The author says that the practical purport of this book is the suppression and prevention of human suffering, so that institutions for the mitigation of human suffering may not be required to the present extent. The writer says that the facts in the text may be regarded as authoritative as well as up to date. The co-ordination and the deductions from the facts are the author's.

OBSERVATIONS UPON THE HERRING AND HERRING FISHERIES OF THE NORTHEAST COAST. WITH SPECIAL REFERENCE TO THE VICINITY OF PASSAMAQUODDY BAY. By H. F. Moore, Ph.D., Assistant United States Fish Commissioner. Washington: Extracted from United States Fish Commission Report for 1896. 1897. Appendix 9. Pp. 387 to 442.