How the Total Eclipse of the Sun Will Be Studied; Exodus of Scientists to Points of Entire Obscuration

THE total eclipse of the sun which will occur Aug. 30 is perhaps the most important event of the kind that has taken place in a quarter of a century or is likely to occur in another equal period of time. This is because the path of totality will lie in accessible places and also because the duration of totality will be unusually long. The shadow path will begin at sunrise south of Hudson bay, enter the Atlantic ocean a short distance north of Newfoundland, cross northeastern Spain, northeastern Algiers and northern Tunis, pass centrally over Assouan on the Nile and end at sunset in southeastern Arabia.

Several astronomical expeditions have gone from the United States to points within the path of totality. The Harvard observatory, usually foremost in matters of this nature, has not sent out a special eclipse party this year, although its chief astronomer, Professor William H. Pickering, has gone to Algiers on his own account to see it. The Harvard lenses and photographic apparatus have been loaned to Lick observatory, which has sent out three parties—one to Labrador, another to Spain and a third to Egypt. The United States naval observatory at Washington sent observers to Labrador and to Spain. A party of amateurs and specialists from Hartford, Conn., will see the eclipse from a camp pitched at an elevation of several hundred feet on an island in Hudson bay. Professor John A. Miller of the Indiana State university has organized a party and gone to Spain. W. F. King, chief astronomer of Canada, has been sent by the Dominion government to conduct a series of observations in Labrador. Miss Mary Proctor of Brooklyn, N. Y., daughter of the noted British astronomer, R. A. Proctor, and herself an authority on the geography of the heavens, is at the head of an expedition whose objective point is Burgos, Spain.

Of course the liveliest scientific interest centers upon the path of total eclipse. This will be a narrow belt, eighty miles in width, extending nearly halfway around the globe. Beginning at sunrise just south of Hudson bay the moon's black shadow will sweep across the earth with a velocity like that of a cannon ball, estimated at something like 2,000 miles an hour. As it nears the equator its speed will slacken to about half that rate, but it will increase again as it reaches southern latitudes. The complete obscuration of the sun will continue for three minutes and fifty seconds. That is considerably longer than is usual, but even longer obscurations have been recorded.

In former times an eclipse was studied with reference to noting the true position of sun, moon and earth at the precise moment of contact. Nowadays the chief object is to get a better knowledge of the sun itself and of the moon. The effect on the earth, startling and dramatic as it is, is scarcely heeded by modern observers. Several special objects of study have been chosen by scientific observers for this occasion. One of them is to settle upon the nature of the corona, the brilliant halo that surrounds the sun while the eclipse is total. This has been the subject of much conjecture and discussion in astronomical circles, and there are many and various opinions. At certain periods of the eclipse this encircling aureole assumes grotesque forms, sending out streamers 10,000,000 miles long, or one-ninth the distance between the earth and the sun.

This year's eclipse is also expected to throw new light on the very unsettled question of sun spots. It comes at the time when these little understood and widely discussed phenomena are at their maximum activity, which seems to recur about every eleven years with marked regularity. At the last solar eclipse, which was in 1900, the spots were at their minimum activity, and there was but slight opportunity to contrast the effect on the sun's corona and the flaming prominences. The corona is not only the most spectacular feature of the eclipse, but it is especially fascinating on account of the mystery surrounding it. Numerous theories have been advanced to account for it. It has been described by some as an incandescent vapor of a mysterious substance not yet discovered on the earth. These observers have even gone so far as to provide a name for this purely hypothetical element—coronium.

Another theory has it that the corona is an electrical phenomenon, due possibly to cathode rays, as happens when an electrical current is passed through a vacuum tube to produce a glow. There is a marked tendency nowadays to refer all phenomena not well understood to electricity. This is especially true of phenomena connected with the sun. Even the aurora borealis has been accounted for in this way.

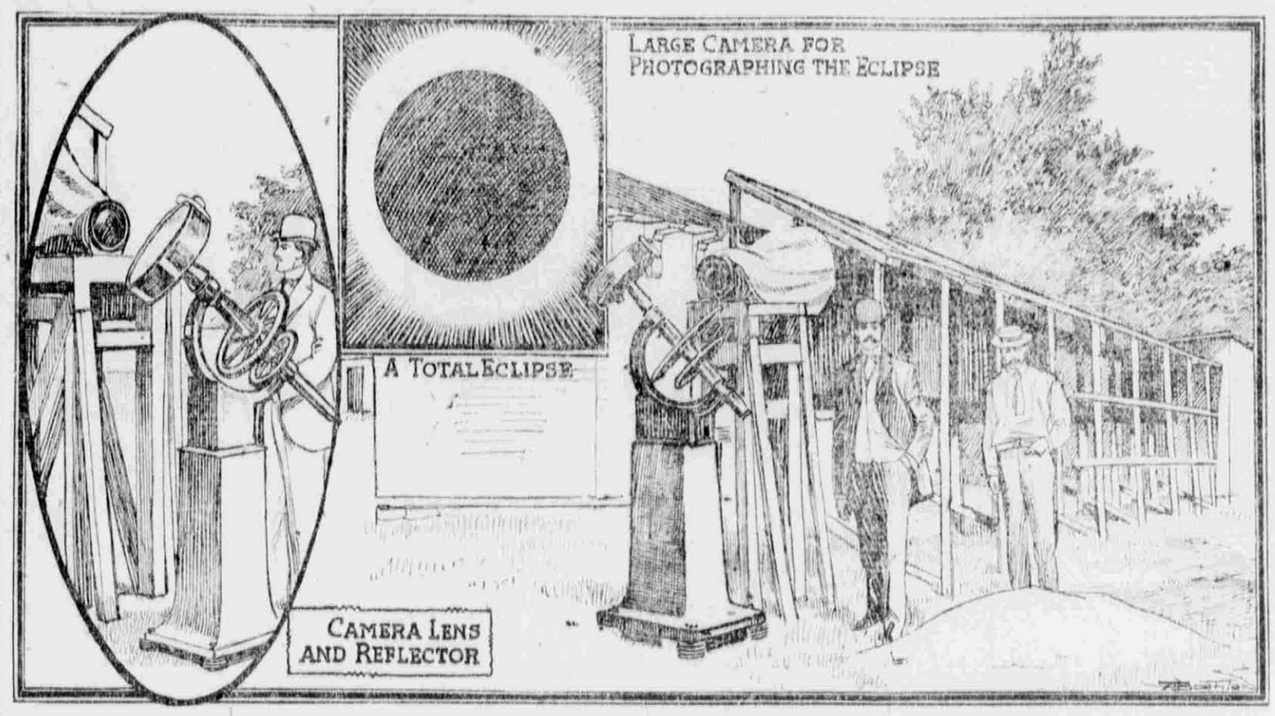
Other phenomena that will be closely studied this year will be the tongues of flame that shoot outward from the sun's disk and make a circle of fire reaching a distance of from 50,000 to 100,000 miles. The nature and cause of these outbursts of bursting vaporous matter, with their accompanying electrical effects, are now an engrossing study for scientists in all parts of the world. Professor Pickering has gone to Algiers prepared to make a somewhat exhaustive study of the moon's ragged edge, with its high volcanic mountains and its pale glimmer of light.

Perhaps the most interesting phase of observation of the eclipse will be the search for the missing planet Vulcan, which is supposed to be a miniature earth revolving within the orbit of Mercury and so close to the sun that it is impossible to locate it under normal conditions. This has long been regarded as one of the most fascinating and obscure mysteries of astronomical research. Strictly speaking, Vulcan is nothing more or less than a theoretical planet. No one claims ever to have seen it and thus far it has eluded the search of the most wonder revealing lens ever invented. All the evidence in favor of its existence is purely circumstantial, but it has obtained a certain recognition from all astronomers since Le Verrier many years ago asserted his belief in its existence and further demonstrated his faith in it by giving it the name of Vulcan. It derives its being from the fact that Mercury has a fashion of varying its movements in a way not to be accounted for by gravitation, exactly as if some unknown body were influencing its course. During the eclipse of 1878 two separate observers, Professor Watson of Ann Arbor in Colorado and Dr. Swift of Rochester in Wyoming, claimed to have seen several small planets near the sun. These claims were discredited by the astronomical world in general and more evidence was demanded. Since then the search for the elusive planet or planets has been prosecuted at every opportunity, but nothing has ever come of it. Some scientists declare that the influence that causes Mercury's erratic performances is a cloud of meteorites so minute that they never can be discovered. Modern improvements in photography, it is believed, will make it possible to solve the problem.

The United States naval observatory eclipse squadron, conveyed to the points of observation by the cruiser Minneapolis and accompanied by the transport Caesar, which carried all the instruments and necessary outfit, landed its scientists and their freight at two Mediterranean ports — Valencia, in Spain, and Bona, in Algeria. At Valencia the party formed two sections, one camping about twelve miles from the city and the other going to a point in central Spain near Saragossa. Hotel accommodations being somewhat uncertain in Spain, the scientists carried a supply of khaki tents and all the most approved conveniences for making a comfortable camp. The African section of the expedition proceeded to the western boundary of Tunis, where the most elaborate preparations for eclipse observation ever devised were made. Apparatus more powerful than any ever before constructed will have been on the ground long enough for the various operators to become perfectly familiar with its working, so that every instant of the precious moments of total obscuration may be utilized in the most profitable manner. Arrangements for this eclipse have been making for two years and every point has been canvassed thoroughly. A series of drills is being held at the camps daily and nothing is being omitted or forgotten.

Rear Admiral Colby Mitchel Chester, superintendent of the United States naval observatory, is in charge of the eclipse expedition and has made excellent use of the $5,000 appropriated by congress for the purpose. He is a native of Connecticut, born in 1844, and was graduated from the Naval academy. Rear Admiral Chester is a veteran of the civil war, having participated in the operations against Mobile. He has been commandant at Annapolis and was commander of the south Atlantic squadron in 1897-98.

CHANNING A. BARTOW.



The Successful Transmission of Photographs by Wire; A Bavarian Scientist Has Finally Solved the Problem

THE recent success of the French telegraph service in transmitting photographs, handwriting and photo engravings by wire seems to have established the practicability of the invention. For several years it has been well known in electrical circles that the development of this discovery into practical utility was only a question of time. At varying intervals during the past decade announcements of its perfection have been made, but subsequent trials proved that the claims were premature. Now, however, the actual results obtained by the French experimenters on the line between Paris and Rouen indicate that the obstacles have been overcome.

It is admitted by all of those concerned in the matter that the mechanism employed in this remarkable process is extremely complicated. By way of balancing matters, however, it is stated that the principle adopted is quite simple. It is the invention of Professor Arthur Korn of Munich, a Bavarian electrical engineer who has devoted several years to the study of this new marvel among electrical possibilities. He claims to have transmitted photographs over the wire against resistance equivalent to a distance of 5,500 miles.

Solution of the problem was found in the construction of special apparatus for the transmission and reception of the subjects. It was necessary to secure a medium that would measure automatically the high lights and more shadowy parts of a photograph and, according to the lights and shadows, correspondingly change the electric current flowing from the transmitter to the receiver. In the photograph of a person, for instance, a different flow of current was required to carry the impression of dark hair or beard from that which would indicate the lighter impression of the forehead or face.

Professor Korn's process was made possible by the discovery that one elemental substance experiences a change in its electrical condition by the action of light. That substance is selenium, a chemical element discovered by Berzelius in 1817. It was first obtained from crystals formed in the lead chambers of sulphuric acid works. It is also found in many crude mineral forms, but in small quantities. It occurs in several forms, that used by Professor Korn being a black crystalline solid. This variety of the element conducts electricity, its resistance increasing when heated, but diminishing considerably on exposure to light, especially red rays. The change of conductivity is instantaneous and is almost doubled in sunlight, although the light from a small lamp has a perceptible influence. It is upon this property that the construction of the new invention is based.

The image from a photographic film is thrown upon a selenium cell, which is made of platinum wire wound on slate and covered with selenium. This is then mounted upon an axis within a glass cylinder. A beam of light is then thrown through a lens so as to pass through the negative film fastened on the cylinder and affecting the electrical resistance of the selenium cell according to the amount of light which passes through. A motor keeps the cylinder revolving and sliding to bring all parts of the film under the light. The varying current is conveyed by the wire to which the axis is attached to the receiving station. This, in brief, constitutes the mechanism of transmission.

At the receiving station another cylinder, covered with a sensitive sheet, revolves synchronously with the cylinder at the transmitting station. The variation of the resistance of the selenium cell at the sending station acts upon a Geissler tube, varying the amount of light projected by the tube through a slit in the dark cover upon the sensitive sheet on the cylinder, thus causing the photograph to appear.

The discovery will at once take its place among the most valuable devices ever invented to promote long distance communication. It is certain to prove useful in a variety of ways and the transmission of accurate information will be immensely facilitated. In the single item of personal identification it will be invaluable in the detection of crime, the establishing of fact and the doing away with long and uncertain inquiry. The subjoined specimens furnish only a mere hint as to the multiple uses to which this discovery is likely to come in the near future:

From the Chief of Police in New York to the Chief of Police in San Francisco:

I wire you photograph of man held here for identification. Is he the one you want—E. J. Smith, forger and bank wrecker? Nabbed him as he was boarding European steamer.

From the Cashier of Sundown National Bank, Seattle, Wash., to Cashier of Twentieth National Bank, New York:

Will you identify the man herewith wired as J. J. Jones? Has referred us to you.

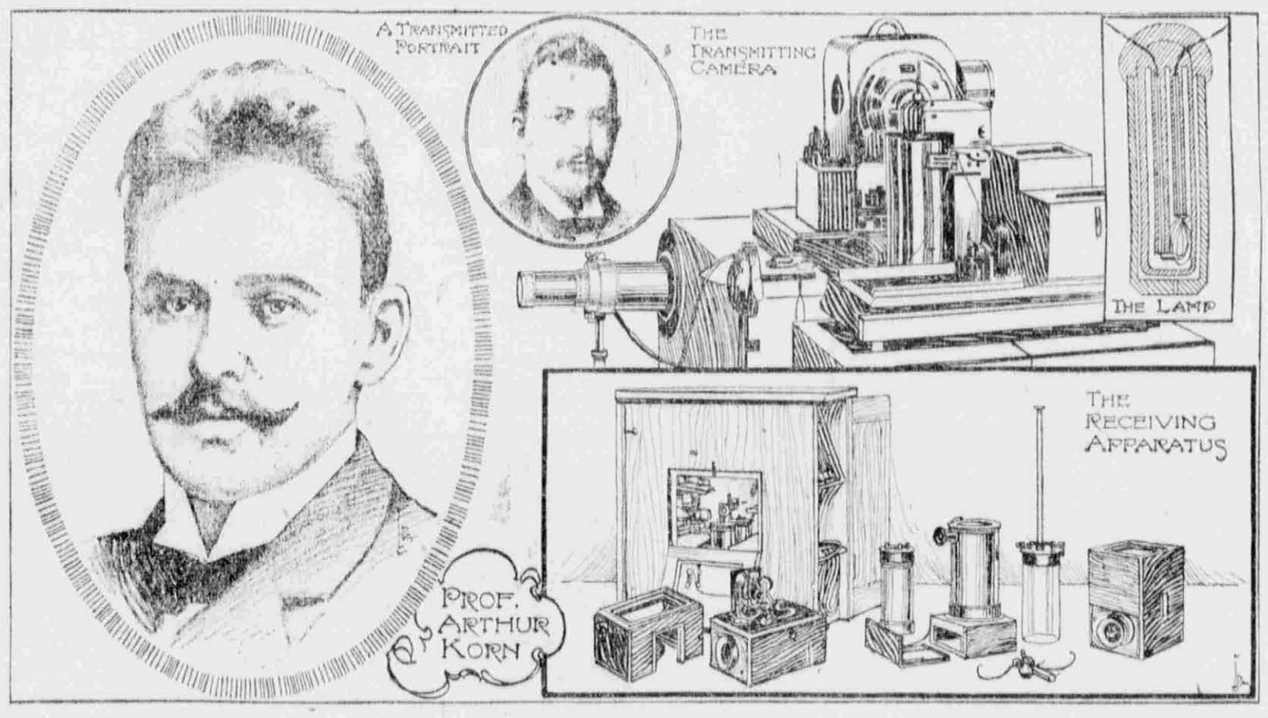
From the Catchem Detective Agency, Chicago, to U. B. Sharpe, Detective, Boston, Mass.:

We wire you the person in question. If you have her, bring her right along.

From J. Pierpont Morgan, New York, to Charles Wertheimer, Art Dealer, London:

Do you identify photograph of alleged pearl-blow vase herewith cabled as the real thing? I can buy it for $50,000.

JAMES L. TREVATHAN.



Prince Charles of Denmark and His English Wife; The Couple That May Become Sovereigns of Norway

PRINCE Christian Frederick Charles George Waldemar Axel, known in ordinary parlance as Prince Charles of Denmark, who has become prominent recently on account of the suggestion that he assume the Norwegian sovereignty, is the second son of Prince Frederick, heir apparent to the throne of Denmark. He is thirty-three years of age, having been born in the old feudal palace of Amalienborg, the early home of so many of the members of the aristocratic Oldenburgs, on Aug. 3, 1872.

His grandfather, Christian, the reigning king of Denmark, is probably the most prudent and economical monarch of his age. Although he has never been in actual straitened circumstances and is now regarded as a rich man, as riches go in Denmark, he has always descanted upon the virtues of poverty and has been to it that there are no royal spendthrifts in his large family. Although "Prince Charlie," as he was known, was the son of the crown prince, he was not surfeited with the good things of life. The beggarly income voted the crown prince by the rigsdag was hardly sufficient for housekeeping expenses at Amalienborg, and there was nothing for luxuries. Even governesses and tutors were too expensive and the children were sent to the public school.

At the age of nineteen Prince Charles became a lieutenant in the royal Danish navy. He was put in command of a cruiser and sent to Iceland to enforce the fishery regulations against foreign steam trawlers engaged in illegal acts on the coasts of that island. He did the work so satisfactorily that the citizens of Reiklavik thanked him publicly and banqueted him and his fellow officers. There was little opportunity to distinguish oneself in the Danish navy, but Prince Charles made a very creditable sailor. He was also stationed for awhile in the Danish West Indies and made a good record there. At twenty-three he was over six feet in stature and correspondingly muscular in development. The Danish royal family, the most enthusiastic and successful matchmakers in Europe, determined that it was time Prince Charlie was married.

His grandfather and grandmother, the aged sovereigns of Denmark, knitting in hand—these estimable royalties are reputed to have presented stockings of their own handiwork to every baby of royal lineage in Europe and to multitudes of children of lower degree—sat by the fireside at Dannesborg and discussed all the marriageable princesses in the civilized world. The Princess Louise, the young man's Swedish mother, was equally busy and not less ambitious to have her son make a brilliant alliance. All the Denmark royal children had married well. The Oldenburgs were not only the most aristocratic family among rulers in point of antiquity, but also by virtue of fortunate matrimonial ventures. Louise of Denmark knew no reason why her second son, with his good looks and vigorous constitution, should not become the husband of a reigning sovereign. With that end in view, she declared in favor of Wilhelmina of Holland.

Leading Dutch statesmen, carefully approached in reference to the business, were inclined to favor the scheme. Both nations became aware that preliminary negotiations were pending, and there was universal satisfaction over the prospect. Even the capricious little ruler of Holland herself seemed willing to acquiesce. She had seen Prince Charlie in his sailor clothes and had spoken favorably of his appearance. It began to look as though the prince's matrimonial future was pretty definitely mapped out.

The prince, however, although he was entirely willing to yield to the family determination to marry him off, maintained a stubborn preference. Between the royal families of Denmark and Great Britain there had existed the most friendly and intimate relations ever since the marriage of the Danish Alexandra to the heir to the English throne. Once a year at least there was a family reunion at Copenhagen, and the Danish cousins were often seen at Sandringham. The sailor prince declared that when he married he should wed the one woman in the world who had long held his robust heart in safe keeping—his cousin, Maud of Wales.

His mother was furious. It mattered nothing to her that the youngest daughter of the future king of England was really a very important young woman and as agreeable and clever as she was highborn. She was a dozen removes from a crown, and her son might have a queen for the asking—that was quite enough to ruin Princess Maud's chances with the crown princess of Denmark. She made up her mind that it should never be. First, she interposed the close relationship—nothing but disaster, she averred, could result from such a sinful alliance. The prince declared that he would take the risk. Then she urged the disparity in their ages, the princess being three years older than Prince Charles. Her exasperating son replied that he needed a wife older than himself and that such marriages were fashionable in England.

As a last resort Louise appealed to the British relatives. To her amazement and disgust, she found them ranged against her. The Princess Maud declared that she was fond of her Danish lover and meant to marry him. The Prince of Wales was devoted to his youngest daughter, and so was her powerful grandmother, Queen Victoria, who made no secret of the fact that she regarded it as an excellent match. Most potent of all, the British people took a fancy to the match and set up a clamorous demand. The Dane was well liked in England, and "Princess Harry," as her father dubbed her, was a prime favorite. King Christian and his amiable queen were won over and the lovers were married in the Chapel Royal in the presence of a great gathering of relatives and friends. The entire British nation smiled benignly and gave itself up unreservedly to a general holiday.

Everybody was satisfied except the Danish crown princess. She had failed ingloriously in her attempt to become the mother-in-law of a queen, but she still retained the power to become the mother-in-law of tradition, and she embraced the opportunity with avidity. She declared that her English daughter-in-law should never have a crown of her money—which was not a meaningless threat, for the crown princess is very wealthy. She was so inhospitable that if the Princess Maud's father had not taken the precaution to have it put into the marriage settlement that the young couple were to live at least half of each year in England the unwelcome bride would have had a rather trying time of it. As a result of Louise's ill treatment, her son and his wife remained in England most of the time. The Prince of Wales gave them a pleasant little home near his own at Sandringham called Appleton House, and there their son was born. After her father ascended the throne the princess received more assistance from him. He made it one of his first duties to see that his favorite "Princess Harry" was made comfortable.

JOHN E. MCGREW.

PRINCE CHARLES PRINCESS MAUD.