

41ST CONGRESS; }
2D SESSION. }

HOUSE OF REPRESENTATIVES.

{ Ex. Doc.
{ No. 206.

REPORT OF THE SUPERINTENDENT

OF THE

UNITED STATES COAST SURVEY,

SHOWING

THE PROGRESS OF THE SURVEY

DURING



THE YEAR 1869.

WASHINGTON:
GOVERNMENT PRINTING OFFICE.
1872.

Assistant Hilgard in Appendix No. 27 of the annual report for 1856. The several results show a good accordance, and the observed azimuth of the terminal line agrees with that brought forward from Fort Morgan, within a second of arc, checking the work in a satisfactory manner.

Mr. Oltmanns acknowledges the assistance, kindly rendered, by Captain Spencer, of the revenue steamer Delaware, in transporting his party from Mobile to the field of operations, and in returning after the close of the season. In passing from West Gulf shore-station to Fort Morgan, Mr. Oltmanns lost, by the sinking of a boat, some valuable papers and clothing of his own, but rescued the instruments and records without damage. At Fort Pickens he measured some angles additional to those connected with previous work, and examined, with reference to their preservation, the stations on the beach between that point and Perdido Entrance.

Assistant Oltmanns is now engaged with a party in topographical and hydrographic service in the vicinity of Cape Sable, on the Florida peninsula.

Solar eclipse of August 7, at Shelbyville, Kentucky.—Arrangements were made in the latter part of June for observing the total eclipse of the sun at several stations in the State of Kentucky. Assistant George W. Dean was directed to organize an astronomical party that might co-operate with a party conducted by Professor Joseph Winlock, director of Harvard Observatory, by whom ample preparation had been made for observing the special phenomena of the eclipse.

Shelbyville, although a few miles north of the central line of the shadow to be projected by the moon, was in other respects a favorable position for the intended observations. Moreover, the large equatorial belonging to the college at Shelbyville, and several rooms in the building, were placed by the board of trustees at the service of Professor Winlock for the special use of the parties on the occasion.

By the middle of July, Assistant Dean had his equipment of instruments in place in a temporary observatory. Between the 24th of that month and the 3d of August, Sub-Assistant F. Blake, jr., made a series of latitude determinations with the zenith telescope, C. S. No. 6, recording 164 observations in observing upon fourteen pairs of stars. The micrometer divisions were ascertained from forty observations upon Polaris near eastern elongation.

All being in readiness, and the weather being highly favorable, on the 7th of August Mr. Dean and Mr. Blake succeeded in recording the times of the four contacts during the eclipse, and they also observed, very satisfactorily, the occultation of six of the solar spots. These instants were all recorded on the chronograph register. The instrument used by Mr. Dean was an achromatic refractor, formerly used as a "finder" on the large equatorial at Harvard Observatory. It has a focal length of 46 inches; aperture, 3 inches; the amplifying power used was 30; and it was equatorially mounted.

In referring to the remarkable phases of the eclipse, Mr. Dean mentions that he saw within fifteen minutes after the commencement of the total phase, ten faint objects pass across the moon in a southwesterly direction. These were first pointed out by Professor Winlock, and, in his opinion, were meteors. The same phenomena were observed by Mr. Blake, and by Messrs. Alvan G. Clark and George D. Clark, members of the party of Professor Winlock.

Mr. Blake observed with the comet-seeker belonging to Harvard Observatory, and noted the last three contacts of the moon and the occultations of five solar spots.

Professor C. B. Seymour, of Louisville, had the use of a small telescope belonging to the Coast Survey, and with it made such observations as he found practicable during the progress of the eclipse.

At the request of Professor Winlock, his party was attended by Mr. J. A. Whipple, an experienced photographer of Boston, with all the appliances needful for taking photographic pictures of the phenomena that might be successively presented. For this interesting and important branch of operations, Mr. George D. Clark, of Cambridge, gave his services as an assistant to Mr. Whipple. The photographic apparatus was used in connection with the small equatorial telescope of Harvard College Observatory, provided with an excellent clock movement. The aperture of the instrument is five and a half inches, and its focal length seven and a half feet. Eighty good "negative" pictures were made by Mr. Whipple during the progress of the eclipse, of which three were taken during the total phase, the instants in all cases being recorded on a chronograph register. Prints subsequently made from the negative representing the corona, plainly show its symmetrical

arrangement about the axis of rotation of the sun, and its relation to the axis was at once recognized by Professor Winlock, the corona being flattened at the poles and enlarged at the sun's equator, as was also indicated in the photographs made at Springfield, Illinois, under my immediate direction. Many other particulars of great interest will be found in the comprehensive report made by Professor Winlock to the authorities of Cambridge observatory. The details observed at my request were such as would connect with the observations of precision. His researches with the spectroscope, independent of those just referred to, will doubtless be of great value. In that branch of research and in the observation of physical phenomena generally, Mr. Charles S. Peirce, of the Coast Survey, co-operated at Bardstown, Kentucky, and was assisted by Professor N. S. Shaler, of the School of Mining, Harvard College. Professor J. Lawrence Smith also observed with the spectroscope at Bardstown.

The station at Shelbyville was in the southwestern part of the grounds belonging to Shelbyville College. Several rooms in the college were placed at the disposal of the observing parties by the board of trustees. Assistant Dean expresses his acknowledgments for the aid also rendered by the Rev. Dr. Waller, Dr. Baker, Colonel William Winlock, Colonel M. C. Taylor, Joseph W. Davis, esq., and R. C. Tevis, esq. The gentleman last named volunteered his services for recording the temperature, readings of the barometer, &c., and made records at intervals of fifteen minutes during the eclipse.

Sub-Assistant F. H. Agnew, of the Coast Survey, had charge of the chronograph registers and obtained excellent records of the instants at which observations were made with the instruments of the observing party. Unfortunately his eyesight had been so much impaired by severe duty in the longitude party at Salt Lake City during the previous winter, as to make it impracticable to observe with a separate instrument.

Falmouth and Oakland, in the State of Kentucky, were regarded as favorable points for observing the eclipse just within the limits of the shadow. The requisite arrangements were made at Falmouth by Mr. Arthur Searle, of Harvard Observatory, and he was fortunate in securing the co-operation of several gentlemen of intelligence at that place. The chief object was to determine the duration, more or less, of the total phase. Mr. Searle's observations, by an accident, were not well recorded on the Morse-Fillet register, but he reports that Captain W. E. Arnold, who was assisted by Messrs. Johnson, Yelton, and Woodson, determined the duration of totality to be forty-five seconds at Falmouth. Judge Hudwall and Mr. R. W. Grant observed from the hill just north of Falmouth Station, and from their observations the time of the total phase was forty-one and a half seconds.

At Catawba, a few miles north of Falmouth, Mr. D. Crozier, jr., determined the duration of totality to be twelve seconds. All these subsidiary stations were marked by Mr. Searle, for determining, when connected with stations near the south limit, the breadth of the shadow projected by the moon.

At Oakland the observations were conducted by Professor S. P. Langley, director of the observatory at Allegheny, in Pennsylvania. He was assisted by Graham Wilder, esq., and Mr. N. DeBree, of Louisville. The observations gave for the duration of totality only two seconds.

The stations at Falmouth and Oakland were connected by telegraph, and clock signals were sent from Oakland to all the telegraph stations in the vicinity, and thus many of the operators were enabled to determine the duration of totality with a fair degree of precision.

Assistant Dean in his official report acknowledges his obligations to John Van Horn, esq., general superintendent of the Western Union Telegraph Company, and also to Messrs. Carter and Boyle, telegraph managers at Louisville, for facilities of great value to the success of the operations in Kentucky. The preceding occupation of Mr. Dean will be referred to under the head of Section X. His report on the observations made by the party under his direction at Shelbyville is given at length in the Appendix, No. 8.