

Before another impression of the Herald shall be in the hands of your readers, there will have occurred an astronomical event which, for the last few years, has excited in a high degree the interest of the scientific world. I allude to the transit of Venus over the sun's disc early in the morning of the 9th of this month. It is generally known to the reading public that upon correct observations of this phenomenon, made in different parts of the world, depends the best determination of the solar parallax, and consequently the only reliable basis we possess upon which to rest all our conclusions respecting the magnitude of the scale upon which the physical universe has been constructed.

With the revival of astronomy in modern times, numerous attempts were made to determine the distance of the sun from the earth, but the problem still continued to baffle the efforts of the most skilful astronomers. It was not until towards the close of the seventeenth century, when immense progress had been made in the construction of astronomical instruments, when the principles of their adjustment were thoroughly understood and practised, and when the telescope was used not as an instrument for revealing the physical features of the celestial bodies but for the purpose of fixing their apparent positions in the celestial sphere, that the places of the sun and planets, as determined by observation, attained such a degree of precision as to hold out any hope of furnishing reliable materials for arriving at a knowledge of their distances from the earth. The determination of the solar parallax by direct observations of the sun was very soon found to offer difficulties which were absolutely insurmountable, notwithstanding the immense progress which had been made both in theoretical and observational astronomy.

Obviously the chief difficulty of the problem for determining the distance of the celestial bodies consists in their excessive remoteness, compared with the smallness of the base from which the astronomer makes his observations. The earth, no doubt, is a body of considerable dimensions, its diameter being about 8000 miles, and consequently a base line of some six or seven thousand miles might be found, from the extremities of which the astronomer might make simultaneous observations of the celestial body with the view of determining its absolute distance. But, after all, such a base line is utterly insignificant compared with the millions of miles which separate us from the nearest of the planets. The most feasible method, therefore, of attacking this vexed question of parallax was to choose for investigation the distances of such of the planets as approached nearest to the earth. Now, there are two planets which approach occasionally much nearer the earth than any of the other planets of the solar system.

These are the planets Venus and Mars—the one revolving immediately within the earth's orbit, the other immediately beyond it. The advantage of a successful solution of the problem of parallax as proposed in this manner is obvious; for the distance of any one of the planets from the earth being thus known, and the relative distances of the planets from the sun being already known, we readily ascend to a knowledge of the distance of the earth from the sun, and the solar parallax being thus known, we arrive by a purely arithmetical process at a knowledge of the absolute distances of all the other planets from the sun. The first successful determination of the solar parallax was accordingly founded upon observations of the planet Mars, at a time when its position in its orbit offered special facilities for this purpose. In virtue of a remarkable relation in space which exists between the orbit of this planet and the earth's orbit, it occasionally, when in opposition, approaches very near to the earth compared with the distance which usually separates the two planets at the time of opposition.

the value of the solar parallax that astronomers were induced to attach any confidence in the result. In accordance with his results, the sun's distance from the earth amounted in round numbers to 95 millions of miles—a valuation which, as is known to most persons, has been inserted in all the popular textbooks of astronomy since that time. Recent researches in astronomy have, however, shown beyond all doubt that the value of the solar parallax, as then determined by Encke, was considerably in error. This was determined in the first instance by Hansen, from his researches in the lunar theory; afterwards by Le Verrier, from his researches in the planetary theory; about the same time, again, by several astronomers from researches founded on observations on the planet Mars; and finally by experiments of two French physicists—Foucault and Figeau—who determined the velocity of light, but found the result incompatible with the result previously arrived at by astronomical researches based upon the generally-adopted value of the sun's parallax.

It may be imagined, therefore, that much interest was excited by the approaching transits of the planet Venus in 1874 and 1882. As early as the year 1857, the Astronomer-Royal directed attention to the importance of these transits for arriving at a new solution of the important problem of the solar parallax, and he has on several subsequent occasions deemed it his duty to bring the question before the public. A few years ago, the Government having been made to understand the importance attached to the proper observation of this phenomenon, induced Parliament to grant a considerable sum of money for the purpose of defraying the necessary expenses. The whole of the arrangements connected with the observations of the transit, which is to occur on Wednesday, 5th, have been planned and executed by the Astronomer-Royal. The stations originally chosen for the purpose were—Alexandria, Honolulu, Rodriguez, New Zealand, and Kerguelen Island. It was subsequently considered desirable to supplement the station at Honolulu by two additional stations at some distance apart. These are Kiawai and Kauni. An additional station has also been attached to Kerguelen Island, and one at Cairo, in connection with the station at Alexandria. Furthermore, two stations have been established in India. In addition to these preparations, the transit will not fail to receive due attention at the observatories of Melbourne, Sydney, the Cape of Good Hope, and Madras. Some of the Colonial Governments of Australia have voted special grants of money for the observation of the phenomenon. Then there is the very complete expedition fitted out by Lord Lindsay, with the view of observing the transit at the Mauritius. Colonel Campbell, of Blythwood, has also undertaken to observe the phenomenon at Thebes. The various observing parties despatched from Greenwich have been furnished with an admirable equipment of instruments with the use of which the several observers have undergone a course of training at the Royal Observatory during the last two or three years, under the guidance of Captain Tupman, R.M.A. Photography will be used in connection with the observations at all the stations. Mr Warren De La Rue has liberally undertaken to superintend this part of the Greenwich arrangements.

The observers connected with the various Greenwich expeditions are, chiefly naval officers, with the addition of some officers of the engineers and artillery, and a few private observers. The following plan of arrangements relative to the appointment of the different observers was drawn up and issued some months ago by the Astronomer-Royal:

- Appointments of Observers to the several Districts of Observation, and Subordination of Observers.
1. Captain G. L. Tupman, R.M.A., is head of the entire enterprise, and is responsible, through the Astronomer-Royal, to the Government for every part. Every observer is responsible to Captain Tupman.
2. When the different expeditions are separated, the observers in each district of observation are responsible to the local chief of the district, and the chief to the Astronomer-Royal. The districts of observation and the observers will be the following, the name being set out below that of the local chief being that of the deputy, who will, if necessary, take his place.
3. District A. Egypt—Chief, Capt. C. O. Browne, R.A., astronomer; observers, Capt. W. de W. Abney, R.E., astronomer and photographer; S. Hunter, astronomer.
4. District B. Sandwich Islands—General Chief, Capt. G. L. Tupman, R.M.A.; deputy, if necessary, Prof. G. Forbes.
5. District C. Rodriguez—Chief, Lieut. C. B. Nante, R.N., astronomer; observers, C. E. Burton, astronomer and photographer; Lieut. R. Hoggan, R.N., astronomer and photographer.
6. District D. Christchurch (New Zealand)—Chief, Major H. L. Fakhri, R.E.; observers, Lieut. A. H. Grayford, R.N., astronomer.
7. District E. Kerguelen Island—General Chief, Rev. S. J. Perry, R.N.; deputy, if necessary, Lieut. C. Corbett, R.N.
8. District F. Kerguelen Island—Chief, Rev. S. J. Perry, R.N.; astronomer and photographer; Lieut. S. Goodridge, R.N., astronomer; Lieut. Smith, astronomer and photographer. Port Corbet, R.N.; observer, Lieutenant G. E. Coke, R.N.
9. District G. Kerguelen Island—Chief, Lieut. C. B. Nante, R.N.; astronomer and photographer; Lieut. R. Hoggan, R.N., astronomer and photographer.
10. District H. Kerguelen Island—Chief, Lieut. C. B. Nante, R.N.; astronomer and photographer; Lieut. R. Hoggan, R.N., astronomer and photographer.
11. District I. Kerguelen Island—Chief, Lieut. C. B. Nante, R.N.; astronomer and photographer; Lieut. R. Hoggan, R.N., astronomer and photographer.

Expeditions for observing the transit have also been sent to various parts of the world by the Governments of France, Germany, Italy, Holland, Russia, and the United States of America. The observation of the transit of Venus consists in noting the precise instant when the planet, in its passage over the sun's disc, forms internal contact with the margin of the sun at its ingress upon the solar disc, at its egress from the disc, or at both ingress and egress. If we suppose an observer to be situated at the centre of the earth, he would see the internal contact at ingress on the morning of the 9th of December at 2 h. 15 m. Greenwich mean time, and he would see the internal contact at egress at 5 h. 57 m. The included interval of time is therefore 3 hours 42 minutes. But the interval of time which elapses between the instant when the planet first impinges on the solar disc, and the instant when it finally leaves the disc is necessarily somewhat greater. It amounts, in fact, to 4 hours 41 minutes. Reference has already been made to the principle upon which astronomers have selected the stations for observing the phenomenon in different parts of the world. Strictly speaking, a value of the parallax may be deduced by a comparison of observations made at two stations suitably chosen. Let us take, for example, Woahoo, in the Sandwich Isles, and Kerguelen Island. The internal contact will be seen eleven minutes earlier from Woahoo, and twelve minutes later from Kerguelen Island than if it were viewed from the earth's centre. Hence, the interval between the times of internal contact, as seen at Woahoo and Kerguelen Island, amounts to 23 minutes. Similarly, the astronomer combines the observations made at two stations, where the internal contact at egress is seen earlier in the one case, and later in the other, than if the phenomenon was seen at the centre of the earth. There are certain stations of observation where the ingress of the planet can be seen, but not the egress. There are certain other stations again where the egress of the planet may be seen, but not the ingress. Finally, there are a few stations from which both the ingress and the egress of the planet may be observed. Halley's method of durations is manifestly applicable to observations made at two suitably chosen stations of the last kind. In general, however, the observations of the approaching transit will consist in noting the precise time of internal contact of the planet with the sun either at ingress or egress. The problem of the solar parallax may then be solved by combining two observations, one representing accelerated egress, the other retarded ingress, or by combining two observations, one representing accelerated egress, the other retarded ingress.

or by combining two observations, one representing accelerated egress, the other retarded ingress. The solution of the problem by this method necessitates an exact knowledge of the longitudes of the two observing stations, to the attainment of which will, in several instances, be attended with considerable difficulty. I shall conclude with a statement of the steps by which the human mind is enabled to ascend in succession to the contemplation of these lofty truths. First, the astronomer measures a base line seven or eight miles in length upon the earth's surface. Combining this result with the solar parallax, he determines the distances of the planets from the sun, their magnitudes and masses, and computes the dimensions of their orbits. He and meteor streams, and assigns with precision the distances to which they proceed into space when they have reached the aphelia of the orbits. Finally, assuming as a new base line for his researches the diameter of the earth's orbit, a line measuring a little more than a hundred and eighty millions of miles in length, he determines the distances and masses of the stars. He computes the velocities with which they travel in space, and compares them in this respect with the movement of the solar system in space. Nay, the spectroscopist informs him respecting the materials of which those remote bodies consist, and thus teaches him another important fact in support of the grand doctrine that the sun is no other than a star, and that the innumerable bodies of the stellar vault are magnificent globes of light, rivaling the sun in magnitude and splendour. We have here presented to us a striking instance of the sublimity of the views respecting the immensity of the physical universe which the sciences of astronomy has disclosed to the resources of the human mind. L. CHASE. The Observatory, Dec. 8, 1874.

TRADE NEWS.

THE DISPUTE IN THE SHIPBUILDING TRADES.

The joiners and carpenters in the employment of Messrs John Elder & Co. at Fairfield, and Messrs Wingates at Whiteinch, still continue out. Though the old rates have been conceded to Messrs Stephen's men, they had not all returned to work yesterday, and they appear disposed, now that they are out, to take a holiday cut. Other matters remain unchanged. The employers had a meeting yesterday afternoon, but the proceedings were private. REMFREW.

The workmen who struck work in the shipbuilding yards of Messrs Henderson, Colburn & Co. and Messrs W. Simons & Co., are still out on overtures having yet been made on either side to settle the dispute. Messrs Henderson, Colburn & Co., during the past year, have built seven steamers and one sailing vessel, of 700 tons in all. At present the same firm have three steamers on hand, with an aggregate of 1000 tons. All these vessels being in a forward state. The builders, we are informed, are in the contract exempted from penalties by a "strike clause" in the agreement with the owners. They have also contracted for a steamer of 300 tons. It may be noted on the authority of the firm, that the engineers employed in this yard agreed with the employers to accept a reduction of about 1s per week, or equal to 3 per cent. to 4 per cent. on previous rates, as a compromise of the proposed reduction. They began work on Friday on these terms, but after working for some three hours they left in a body without condescending upon any reason for this change in their resolution.

MOTHERWELL.—Malleable Iron Trade.—The malleable iron trade at the Motherwell Works has been dull for some time. The workmen fear that there will be another break in the wages. An intimation was published at the works on Saturday to the effect that instead of the usual 14 days' notice to leave, they are about to be put on a day's notice.

DUNDEE.—Strike of Mill and Factory Workers.—The reduction of wages paid in Dundee mills and factories has had the effect of causing a sort of strike among the workers, and yesterday most of the works in the west end of the town were closed for the greater part of the day. In many cases, only a section of the workers stayed out—generally the weavers—but the employers put off the whole, the one portion being dependent on the other. It is not expected that the interruption will last beyond a day or two at most, and several millowners threaten, unless the workers resume immediately, to put off their works entirely till after the New Year. There is a rumour that one firm at least intends doing this at any rate, and rumour also has it that another firm has resolved to put off all Saturday, and stop at five o'clock instead of six on other days of the week. It is extremely probable that such a time, in some shape or other, will now be resorted to in a good many works, whatever course of action the larger firms in the trade may pursue, so greatly the depression presently prevailing in the trade.

THE LAMBERT FUND.—We have to acknowledge receipt of the following sums:—John Marshall, 10s; Mrs Marshall, 10s.

MASTER AND SERVANT CASE.—Yesterday, Elizabeth Anderson, farm servant, residing at Maryhill, was convicted before Sheriff Murray of having deserted the service of John Young, farmer, Househillwood, Hurler, and fined in £2 10s, including costs.

GLASGOW PHILOSOPHICAL SOCIETY.—A meeting of the members of the Chemical Section took place last night in the Lecture Hall, Corporation Galleries. There was a poor attendance. Mr G. Combe Stewart, F.C.S., Greenock, read a paper "On the Chemistry of Sugar Refining," and was awarded a hearty vote of thanks therefor.

THE LIQUOR HARVEST.—Yesterday, at the Central Police Court—Baillie Torres presiding—there were 73 charges against persons for having been found drunk and incapable. Of these, 57 were men and 16 women. 29 men were fined in the sum of 5s, and in 28 cases the pledges were forfeited. Five women were fined, eight were admonished, and in three cases the pledges were forfeited. PAWN BROKER'S CASE.—Yesterday, at the Justice of Peace Court—before Messrs John Cairns and Joseph M'Lean—James B. Landy, pawnbroker, East Clyde Street, was charged with having failed to deliver up a quantity of repp cloth, valued at 29s, which had been pledged with him. He was ordered by the Court to pay the value of the cloth, and £1 17s 6d of expenses. It appeared that the cloth had been pawned with defendant about two years ago by a woman named Miller. At the expiration of a year she paid the interest on it. When the second year expired she again paid a year's interest, and expressed a desire to see the dress, and on its being shown her she expressed her belief that the dress produced was not hers, as it was of inferior quality. She also perceived that the wrapper in which the article was wrapped was not the one in which she had pledged it. The defendant, however, contended it was her property, and hence the present proceedings. The defendant and assistant both gave evidence to the effect that the dress produced was the one pledged by Miller. The ticket upon the parcel having been handed to the Bench, it was detected that it had been previously affixed to another parcel—there being fragments of a newspaper adhering to the ticket. The Court therefore decided in favour of complainant.

FIRE AT KELVINSIDE TERRACE NORTH, MARYHILL.—Yesterday morning, fire broke out in the laundry of the house situated at No. 5 Kelvin-side Terrace North, Maryhill, the residence of Mr James C. Kemp, of the firm of Messrs David Kemp & Son, shawl manufacturers, 37 Buchanan Street, Glasgow. The fire is believed to have been caused by one of the servants having inadvertently placed a quantity of hot firewood in the laundry near to a large quantity of cut firewood. The box which contained the ashes having taken fire communicated it to the cut firewood, which got up in a blaze. When the alarm was given, a number of the neighbours, along with several workmen in the neighbourhood, rendered all assistance they could. Information of the outbreak of the fire reached Maryhill Police Office at the time the Provost Bruce was sitting, and Captain Anderson, the procurator-fiscal, immediately left, discharging his duty as procurator-fiscal to Inspector Day, and proceeded to the scene of the fire, providing with him a number of police officers. Provost Bruce, Hillhead, and Provost Shaw, Maryhill, had preceded him, and a "chain" had been formed by which a continuous stream of water from buckets was directed against the flames. Provost Bruce sent for the Hillhead fire hose. By the time it was connected, however, had Bryson, of the Glasgow Fire Brigade, had arrived on the ground with an engine—having been telegraphed for by Mr Kemp—and with the use of the Hillhead hose and the Glasgow fireman the fire was soon extinguished. The damage done to the laundry was considerable, the dressings, roof, and door being partially burned, and the house otherwise very much destroyed by the smoke and water. After the Police Court at Maryhill had finished its business, Baillie Murray and Mr J. M. Taylor, the assessor, drove to the scene of the fire, and, along with Provost Shaw, Provost Bruce, and Captain Anderson, had a consultation as to the desirability of having a properly equipped joint fire brigade provided for the burghs of Partick, Hillhead, and Maryhill.