## RAILWAY SIGNALS AT THE VIENNA EXHIBITION.

We illustrate, from *Engineering*, on page 323, a system of switch exhibited at Vienna, in the Hungarian department, by Messrs. Paravicini and Clement. This arrangement consists chiefly of an iron bar *a*, *b*, between 6 ft. and 10 ft. long, of strong section, and fastened to the outside of the rail, which is next to the stock-rail of the switch. The one end of this bar is carried by a bolt passing through a bearing *c*, and the web of the rail, whilst the other end is provided with a nose placed under the head of the rail in order to prevent the untimely lifting of the bar. At a corresponding distance from the latter end of the bar a wedge *d*, is fastened, which rests upon a wedge *f*, of the same shape, and slides over it on pointing of the switch. This wedge *f*, is connected by the bell crank *g*, and the rod *h*, with the tongue of the switch; the bell crank is fastened with its fulcrum *k*, upon the bearing plate *i*, which serves also as sliding surface for the bell crank at the point where the wedge *f*, is fastened; the two wedges *d*, and *f*, have inclined sides of 45 deg. In the normal condition of the switch the bar *a*, *b*, is level with the rail, whilst during the changing of the points, the motion of the tongue is transferred by the screw bar and the bell crank to the lower wedge, which presses with its inclined surface upon the top wedge, so that the bar *a*, *b*, is lifted over the lever of the rail, but sliding back on the other side of the wedge occupies again its normal position If the tongue, however, is not firmly pressed against the stock-rail, the bar *a*, *b*, will project above the lever of the rail, but it will be pressed down by the wheels of the passing train when the tongue is forced into its proper position before the wheels have reached it. This safety arrangement is intended for preventing the danger of running off the rails if the tongue is not placed in the proper position. It is stated that practical use of this arrangement has given satisfactory results.

The tongues are simply moved by hand, and the turning of the signal disc is effected by the same lever; this latter is connected with the lever V, which is provided at the upper end with an oval hole, through which the pin *x*, is passed with one end, whilst the other end is connected with the up-right bar which carries the signal disc. Moving the lever V, will therefore produce a turning of the upright bar and the disc.

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## PREPARATIONS FOR THE DEPARTURE OF THE TRANSIT OF VENUS EXPEDITION.

The time is now drawing on for the departure of the English expedition for the observation of the transit of Venus. In a few weeks the parties proceeding to all the stations except Egypt ought to be on the sea. At the dinner of the Astronomical Society Club, on the 8th of this month, Sir George Airy stated that he had reviewed the English and Russian plans for carrying out the work, with the Society's illustrious guest, Otto Struvé, the Astronomer Royal of Russia, and had arranged them in complete harmony with one another. We may therefore consider that the time is ripe for the consideration of the English plans in a more definite shape than when we noticed them. We may add that the general scheme, as explained in our previous article, is unaltered.

To take up the question so as to make its features intelligible to readers who are not astronomers, we may again point out that the "parallax of the sun" may be said to be the angle that any point of it subtends on such a base line as the earth affords; and without again describing how this angle is measured by the observations taken, we may treat it as an angle taken in three ways.

The first is Halley's method, on which the angle is taken between two chords across the disc of the sun, each one being the apparent path of Venus as seen from some position where the entire transit is visible. Such positions are taken in pairs in suitable northern and southern localities—the length of the base line depending mainly on their difference in latitude. This work is carried out, as far as England is concerned, by Kerguelen's Island—covered by Rodriguez—and by New Zealand. These form the southern ends of bases coupled with certain Russian stations dotted across Siberia, connected together by a telegraph wire for obtaining longitude by telegraph.

The second and third measures and lines of bases are on Delisle's method. One base line depending on observations taken at ingress, and extending from the Sandwich Isles to Kerguelen's Island, Rodriguez falling near the latter. The other base line depends on the observations taken at egress, one end being at New Zealand, with Kerguelen's Island sufficiently far along it to be a substitute should it fail; the opposite end being Egypt and certain Russian stations not far from the Caspian Sea. Rodriguez falls too near the centre of this base line to be of much use.

Having thus recapitulated our stations in their positions in the base lines which we drew in on the figures in our former article, to which—in the aspect in which we endeavour to make the matter clear — we cannot do better than refer our readers, we will pass on to the equipping and arming of each point, and the peculiar character of its duties.

We may first notice that the work of every station must consist of two branches — first, the work of observing and recording the phenomena of the actual transit when it takes place; second, the systematic work—which may occupy many weeks or months—necessary to establish the latitude and longitude, so as to fix the precise position of the station and give meaning and value to its observation and the records of the phenomena seen at transit.

Under the head of observations and records of the actual transit must be classed the work performed by what we may call the gazing telescopes, from the larger equatorials down to the 4 in. ones with tripod stands and slow motion imparted by hand, as well as all the peculiar work of the photoheliographs.

Figs. 3 and 4, page 326, are fair specimens of the equatorials. The former we give on account of its historical interest, being the Lee telescope, with which the late Admiral Smyth drew up the well-known "Bedford Catalogue." Those who are familiar with this work may remember the characteristic enjoyment with which Admiral Smyth dwells on the 8½ ft focal length, the object-glass by Tulley ($5\frac{9}{10}$ in.), with all its beauties of correct form and "space penetrating power," and the sharpness with which it came to focus, carrying the reader so along with him that he almost feels as if it was an extraordinary instrument, perhaps almost making an audible click as it came to focus. It is unnecessary, therefore, to dwell on features which if the truth must be told, are not in these days extraordinarily good, even in the optical parts. It may be said briefly that the mounting, though old-fashioned, is simple and effectual, the clock powerful and good, and the instrument altogether capital for the work required. Astronomers who know what a favourite this telescope has been in its day, and the excellent work it has done, look at it with a feeling akin to respect and affection, and may feel glad it should have the prospect of again performing important work. In the figure it is shown, we need hardly say, pointed towards some polar star, near its upper culmination. Consequently, for the transit to be seen with the sun rising in the south-east, it is necessary that the side of the building in the corner directly beyond the centre portion of the telescope should be capable of removal, and it was so made three years ago by Sir George Airy, when designing the huts for the expedition. Fig. 3, is an equatorial, designed and made by Simms, with a 6 in. object-glass; the mounting is, of course, good, and of a general character, readily admitting of adjustment to almost any latitude. Beyond this there is little to remark in connection with it. With these and all the larger telescopes the sun is to be observed not directly, but by reflection off the surface of a glass prism; by which means not only is the glare enormously diminished, but also the heat rays which pass on through the glass being got rid of, there is no risk of the dark glass suddenly failing and the observers being blinded—a fate which has too often befallen examiners of the sun Double image micrometers are used, as described in our previous article, and contact observed in as nearly as possible the same phase by all the English and Russian observers.

Fig. 1, exhibits the photoheliograph employed at every main station. It is designed and made by Dallmeyer, and deserves a few words. Its optical part consists of a tube with an object glass resembling that of an equatorial telescope, but constructed so as to combine the optical focus with that of the chemical rays, so that to the eye it would not be truly corrected for colour, but is admirably adapted for facilitating adjustment to the work required. A little beyond the focus of the object