can estimate the probable longitudinal value of his initial base within a few minutes of the truth. A final correction in longi­tude is constant, and can easily be applied. With reference to such absolute determinations of longitude, Major S. Grant’s “ Dia­gram for determining the parallaxes in declination and right ascen­sion of a heavenly body and its application to the prediction of occultations ” *(Roy. Geog. Soc. Journ.* for June 1896) will afford the observer valuable assistance.

But the recognized method of obtaining a longitude value in recent geographical fields is by means of the telegraph—a method so simple and so accurate that it may be applied with advantage even to the checking of long lines of tri­angulation. No effort should be spared to introduce a telegraphic longitude value into any scheme of geo­graphical survey. It involves a clear line and an instructed observer at each end, but, given these desiderata, the interchange of time signals sufficient for an accurate record only requires a night or two of clear weather. But inasmuch as rigorous accuracy in thc observations for time is necessary, it would be well for the surveyor in the field to be provided with a sidereal chronometer. Under all other circumstances demanding time observations (and they are an essential supplement to every class of astronomical determina­tion) an ordinary mean time watch is sufficient.

With reference to altitude determinations, there has lately been observable amongst surveyors a growing distrust of barometric results and a reaction in favour of direct levelling, or of differential results derived from direct observation with the theodolite (or clinometer) rather than from comparison of those determined by aneroid or hypsometer. It is indeed impossible to eliminate the uncertainties due to the variable atmospheric pressure introduced by “ weather ” changes from any barometric record. A mercurial barometer advantageously placed and carefully observed at fixed diurnal intervals throughout a comparatively long period may give fairly trustworthy results if a constant comparison can be maintained throughout that period with similar records at sea­level, or at any fixed altitude. Yet observations extending over several months have been found to yield results which compare most unfavourably with those attained during the process of triangulation by continued lines of vertical observations from point to point, even when the uncertainties of the correction for refraction are taken into account. Errors introduced into vertical observa­tions by refraction are readily ascertainable and comparatively unimportant in their effect. Those due to variable atmospheric conditions on barometric records are still indefinite, and are likely to remain so. The result has been that the latter have been rele­gated to purely local conditions of survey, and that whenever practicable the former are combined with the general process of triangulation.

The conditions under which geographical surveys can be carried out are of infinite variety, but those conditions are rare which absolutely preclude the possibility of any such surveys at all. Perfect freedom of action, and the recognition of such work as a public benefit, are not often attainable. Far more frequently the oppor­tunity offers itself to the surveyor with the progress of a political mission or the advance of an army in the field. It cannot be too strongly insisted on that geographical surveys are functions of both civil and military operations. Very much of such work is also possible where a country lies open to exploration, not actively hostile,but yet unsettled and adverse to strangers. The geographical surveyor has to fit himself to all such conditions, and it may happen that a continuous, compre­hensive scheme of triangulation as a map basis is impossible. Under such circumstances other expedients must be adopted to ensure that accuracy of position which cannot be attained by thc topographer unaided.

During a long-continued march extending through a line of country generally favourable for survey purposes—a condition which frequently occurs—when forward movement is a necessity, and an average of 10 to 15 m. of daily progress is maintained, one officer and an assistant can measure a daily base, obtain the necessary astronomical deter­minations, triangulate from both ends so as to fix the azimuth and distance from the base of points passed yesterday and those to be passed to-morrow; project those points on to the topographer’s plane-table to be ready for the next day’s work, and check each day’s record by latitude; whilst a second assistant runs the topo­graphy through the route, basing his work on points so fixed, on the scale of 2 or 4 m. to the inch, according to the amount of detail. Occasionally a hill can be reached in the course of the day’s march, or during a day's halt, which will materially assist to consolidate and strengthen the series.

It may, however, frequently be impossible to maintain a con­sistent series of triangulation for the “ control ” (to use an American expression) of the topography, even when the configuration of thc land surface is favourable. In such circumstances the method of observing azimuths to points situated approximately near to the probable route in advance, and of deter­mining the exact position of those points in latitude as one by one they are passed by the moving force, has been found to yield results which are quite sufficiently accurate to ensure the final adjustment of the entire route geography to any subsequent system of triangulation which may be extended through the country traversed, without serious discrepancies in compilation. It is, however, obvious that as accuracy depends greatly on the exact determination of absolute latitude values, this method is best adapted to a route running approximately parallel to a meridian, and is at complete disadvantage in one running east and west. Where the conditions are favourable to its application, it has been adopted with most satisfactory results; as, for instance, on the route between Seistan and Herat, where the initial data for the Russo-Afghan boundary delimitation was secured by this means, and more recently on the boundary surveys of western Abyssinia.

When an active enemy is in the field, and topographical opera­tions are consequently restricted, it is usually possible to obtain the necessary “ control ” *(i.e.* a few well-fixed points determined by triangulation) for topography in advance of a position securely held. With a very little assist­ance from the triangulator an experienced topographer will be able to sketch a field of action with far more certainty and rapidity than can be attained by the ordinary so-called “ military surveyor,” and he may, in favourable circumstances, combine his work with that of the military balloonist in such a way as to represent every feature of importance, even in a widely extended position held by the enemy. The application of the camera and of telephotography to the evolution of a map of the enemy’s position is well understood in France *(vide* Colonel Laussedat’s treatise on “ The History of Topography ”), as it is in Russia, and we must in future expect that all advantages of an expert and professional map of the whole theatre of a campaign will lie in the hands of the general who is best supplied with professional experts to compass them. Geo­graphical surveying and military surveying are convertible terms, and it. is important to note that both equally require the services of a highly trained staff of professional topographers. During the war between Russia and· Turkey (1877-78) upwards of a hundred professional geographical surveyors were pressed into military service, besides the regular survey staff which is attached to every army corps. Triangulation was carried across the Balkans by eight different series; every pass and every notable feature of the Balkans and Rhodope Mountains was accurately surveyed, as well as the plains intervening between the Balkans and Constantinople. Surveys on a scale which averaged about 1 m. = 1 in. were carried up to the very gates of the city.

The use of the camera as an accessory to the plane table *(i.e.* thc art of photo-topography) has been applied almost exclusively to geographical or exploratory surveys. The camera is specially prepared, resting on a graduated horizontal plate which is read with verniers, and with a small telescope and vertical arc attached. Cross wires are fixed in the focal plane of the camera, which is also fitted with a magnetic needle and a scale so placed that the magnetic declination, the scale, and the intersection of the cross wires are all photographed on the plate containing the view. A panoramic group of views (slightly overlapping each other) is taken at each station, and the angular distance between each is measured on the horizontal circle. The process of constructing the horizontal projection from these perspective views involves plotting the skeleton tri­angulation, as obtained from the primary triangulation, with the theodolite (which precedes the photo-topographical survey), or from the horizontal plate of the camera. With several stations so plotted, the view from each of them of a certain portion of the country may be projected on the plane of the map, and salient points seen in perspective may be fixed by intersection.

The field work of a photo-topographic party consists primarily in execution of a triangulation by the usual methods which would be adapted to any ordinary topographical survey. To this is added a secondary triangulation, which is executed *pari passu* with the photography for the purpose of fixing the position of the camera stations. From such stations alone the topographical details are finally secured with the aid of the photographs. Great care is necessary in the selection of stations that will be suitable both for the extension of triangulation and the purposes of closely overlooking. topographical details. In order to obtain means for correctly orienting the photographic views when plotting the map from them, it is usual, whilst making the exposures, to observe two or three points in each view with the alt-azimuth attached to the camera, in order to ascertain the horizontal and vertical angles between them. It is also advisable to keep an outline sketch of the landscape for the purpose of recording names of roads, buildings, &c.

The process of projecting the map from the photographs involves the use of two drawing-boards, on one of which the graphical determination of the points is made, and on the other the details