(a book which everybody interested in the monuments should possess), to give two photographic views from the east and west ends. It is a May-year avenue (Az. N. 63° 30′ E., from 25-inch Ordnance map) like the Beckhampton Avenue at Avebury.

FIG. 14.—Assacombe Avenue looking east.

It will be noticed that, like the avenues at Merrivale, the row of stones is furnished at the west end with monoliths larger than ordinary, and that the other end has a well-marked blocking or sighting stone ending the avenue.

I may here refer to yet another May-year avenue which I measured in South Wales. It is near "Arthur's Stone," a famous cromlech in Gower to which I refer elsewhere. The true azimuth is S. 61° E., height of horizon 1° 30′.

There is no doubt, I think, that the "Nine Maidens" near St. Colomb, Cornwall, of which a plan is given by Lukis (plate xxxii.), is the remains of a double or multiple avenue. With Lukis's value of the magnetic variation, I found from his plan an azimuth of N. 28° E. I visited them in April, 1907, and assuming a variation of 18° W. (with hill 2°), I got the same value, giving Dec. N. 33° 47′: that of Capella in 1480 B.C.

This is a locality worthy of minute study, especially with reference to the actual commencement of the avenue, for the true azimuths of the many stones on the E. side of course depend upon this.

This avenue and the fine one at Callernish can be treated together. For the latter the conditions are as follows:—

Azimuth of Avenue.—N. 9° E.; hill, 1° 26′; dec. 32° 26′ N.; Capella, 1720 B.C.

This avenue is associated with a circle 42 feet in diameter, within which is a remarkable chambered cairn referred to elsewhere. The avenue consists of two parallel lines going off to the northward 270 feet in length, and about 27 feet in width. The total number of stones is forty-eight, and the total length of the monument, from the extremity of the double line, through the centre of the circle to the extremity of the single line beyond, is 408 feet.

It will be seen, then, that the more recent measurements give us avenues directed, on the orientation theory, both to sun and stars. The sun is the May sun, and the solar avenues are at Avebury, Assacombe, and Gower.

Of new stellar avenues parallel to others previously shown by the investigations to be aligned on northern clock-stars, we have those at Callernish and St. Colomb.

But these are not all.

NORMAN LOCKYER.

THE CALIFORNIAN EARTHQUAKE OF 1906.

ALTHOUGH only twenty months have passed since Central California was devastated and San Francisco destroyed, partly by earthquake but largely by fire, some fifty papers have appeared from technical and other journals describing this great catastrophe. The last appears as a Bulletin (No. 324, Series R, Structural Materials, 1) of the U.S. Geological Survey. It is a volume of 158 pp., illustrated by fifty-seven excellent process plates, in addition to which there are two maps. The introduction is by Dr. G. K. Gilbert, and it treats of the earthquake as a natural phenomenon.

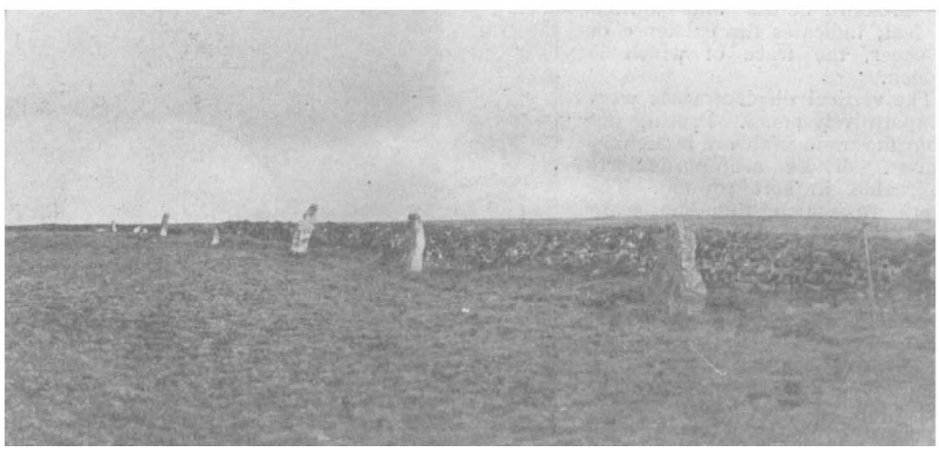

Photo. by Lady Lockyer.

FIG. 15.—The Nine Maidens.

The earthquake, Dr. Gilbert tells us, had its origin chiefly along the line of an old fault. This can be traced from San Juan, about ninety miles south-east of San Francisco, to Point Arena, about 120 miles north-west of that city, the total length being approximately 200 miles. There are, however, good reasons for believing that the fracture extends very much farther to the north. The total length of the line of yielding would therefore have been 300 or even 400 miles. Its general appearance is that of a huge furrow, the displacement of one side of which relatively to that of the other side has varied from 2 to 20 feet. In Fig. 1 the furrow-like appearance is not visible, but the fence, which is broken across and shifted 8½ feet, indicates the existence of a sheer, the trace of which is hidden.

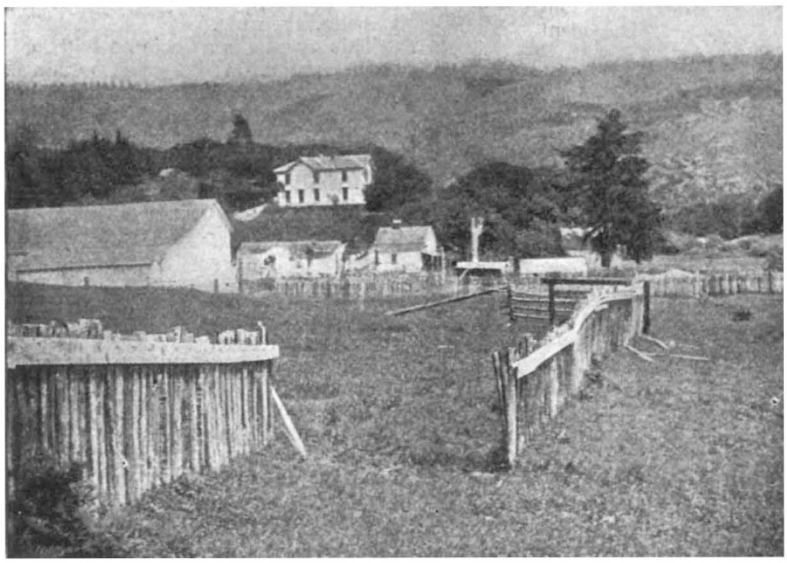

FIG. 1.—Fence parted by Earthquake Fault. The fault trace or racture accompanying the earthquake is inconspicuous although the horizontal displacement is considerable. (Photograph by G. K. Gilbert.)

The vertical displacements were comparatively small. Passing out from the main fault are branching cracks. These are particularly noticeable in soft ground. The depth to which this shattering has extended cannot be directly measured, but that it has descended to a considerable depth is indicated by alteration in the general circulation of underground waters. New springs have been created, whilst old springs have been closed or altered in their flow. The great length of the main fault suggests that it had a great depth. Further, as the initial impulse was sufficient to send earth waves round the world it is reasonable to suppose that this was occasioned by the sudden displacement of a very large earth block. We know something about its length. Its breadth may be estimated from its distance from more or less parallel faults which yielded or from the width of the area of the molar displacement. Its thickness may be that of the earth's crust. A suboceanic mass movement of this size might disturb the Pacific Ocean for twenty-four hours, or shake the world from pole to pole. Were it very much less it is difficult to imagine that such far-reaching commotions could be originated. This may be mere speculation, but to shake the world a heavy blow needs to be applied over a considerable area. A curious observation relating to the length of earthquake waves was made in Tomales Bay, where, before the earthquake, there was the usual smooth mud plain commonly seen on tidal flats. After the earthquake this plain was ridged, the crests of the ridges being ten to twenty metres apart. Whether these represent the solidification of gravity waves we are told is not quite clear, but whatever their history may have been, they illustrate the response of a mud flat to earthquake motion.

The major and most important part of the publication is written by three engineers, Messrs. R. L. Humphrey, J. S. Sewell, and Prof. Soule. All have had experience of fires, whilst Prof. Soule has for many years watched the growth of San Francisco and was present at its fall. We are told that the whole secret of earthquake-resisting power depends upon "proper design, first-class materials, and honest workmanship." The first condition, inasmuch as it involves radical changes in methods of ordinary construction, might have been underlined. The greatest destruction came from fire, and the modern structures which best resisted both fire and earthquake seem to have been those made of reinforced concrete. Tunnels, flumes, wrought and cast-iron pipes, particularly where

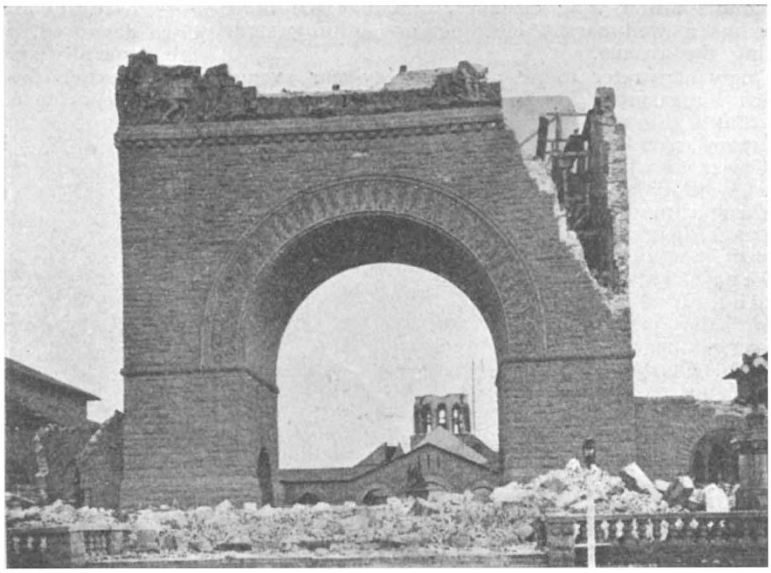

FIG. 2.—Memorial Arch, Leland Stanford Junior University. Earthquake Effect:—The beams designed to stiffen the walls were not tied to them, and helped to batter them down when the shock came. (Photograph by Richard L. Humphrey.)

they crossed the fault line, were interrupted, but the chief reason that fire gained the upper hand was the failure of the water systems in the city. Steel skeleton buildings withstood the earthquake, but although these and their supporting columns had been encased in fire-resisting material, under the effects of heat the protecting surfaces flaked off. Internal metal-work expanded, buckled, and then collapsed. Fire-proofing had been inefficient. Although there is much of scientific interest in the bulletin, its chief value will be to the practical engineer, who has to contend against, not simply the effects of earthquakes, but chiefly against the effects of fire.

PUBLIC CLOCKS AND TIME DISTRIBUTION.

THE interesting correspondence on "Lying Clocks" inaugurated by Sir John Cockburn in the *Times* has tended to degenerate into a display of advertisements by different firms interested in various systems of clock synchronisation. But in its original form, the point raised is one of great importance, and if it is not appreciated by the public as fully as it should be, the explanation is probably to be found in the general contempt for accuracy exhibited in this country, and the non-scientific habits which have been so long cultivated or permitted. It seems impossible to get the man in the street to understand the significance of secords. He is ready with his old adage, *De minimis non curat lex,* and thinks he has settled the question. But this is not so, and the interest taken in the *Times* discussion indicates the possible introduction of a healthier state of things. We may look forward to a time when every progressive town or city will be provided with clocks, publicly exhibited, which will declare the correct time. If such mechanism were provided, it would not only tend to economy in various directions, owing to the more complete appreciation of small intervals of time, but such clocks would furnish a wholesome lesson in accuracy, and by the introduction of scientific processes into everyday life inculcate the importance of paying greater attention to scientific methods.

The term synchronisation seems to be used very vaguely. For its successful operation, two distinct processes have to be considered—the distribution of correct time signals and the control of local clock dials. Some seem to think that the problem would be sufficiently solved if clocks were all made to show the same time. This result could be ensured by simple methods of control, and it is true that so long as we remained in one town the annoyance of a "lying timekeeper" would not have to be tolerated, but the uncertainty would reappear as soon as we entered another town, and the only way to secure uniformity is to arrange for the exhibition of correct standard time. This essential preliminary of the distribution of correct time signals is provided for by the Post Office authorities, working in cooperation with the Royal Observatory, Greenwich. The telegraphic service throughout the country is suspended for a few seconds, while the signal is sent through the trunk lines at 10 a.m. But, unfortunately, it is to be feared that the duty of forwarding this signal to the smaller towns is very carelessly and inefficiently performed, simply because the officials who are responsible for its wider distribution have not sufficiently apprehended the necessity for accuracy. From personal experience we are afraid that this signal is not sent on automatically. Here is the first necessity for reform. If it were thoroughly well known that there did exist in every town and village an office where correct time could be had, even at some personal inconvenience careful people would take the trouble to keep their clocks fairly accurate, and by so doing gradually educate the more indifferent to a higher standard.

The control of the clock dial is a much simpler matter, and has passed into the commercial stage. The convenience of having a number of clocks in one establishment indicating the same minute is so evident that a variety of patents has been secured with the view of effecting this purpose. But most of the patentees do not concern themselves with extreme accuracy, and are content if no greater difference than half a minute can be perceived between any dial and the master clock, from which the signal is sent generally at intervals of half a minute. There are several processes which can be easily utilised, some of which are admirably adapted for outside dials, and could be supplied at small cost. Probably it would not be wise to insist on extreme accuracy, but to endeavour to establish a system that could be improved. The trouble is that London, and other large towns generally, have no system of clocks under municipal control which could be synchronised. It is necessary to make a new departure, and the discussion in the *Times* is so far valuable that it tends to create a public opinion, which may induce the authorities to take the initiative.

LORD KELVIN AND THE ROYAL SOCIETY OF EDINBURGH.

ON January 6, at the first meeting of the Royal Society of Edinburgh since the death of the president, Lord Kelvin, Prof. Crum Brown, F.R.S., vice-president, read the following appreciation, a copy of which has been communicated to us by the society:—

We meet here to-night for the first time since the death of Lord Kelvin.

This is not the time to enter into an enumeration or a criticism of what he did. Our thoughts now are of the loss which we have sustained. But it is impossible in our mind to separate the man from his work. For the transparent truthfulness, the simplicity and straightforwardness, the absence of the least trace of affectation or trick, which contributed so much to the charm of his manner, felt by everyone who came, even in the slightest and most transient way, into relation with him, are to be seen in all that he did. It was his love of truth and his sympathy with nature that led him in all his investigations directly to the root of the matter, and made him so zealous and successful in his searches for the essential principles underlying the phenomena of nature. And when a truly essential new view was obtained, by himself or by another, of the way in which nature works, he rejoiced greatly, and called on his friends to rejoice with him. Nature was to him very real, and no demonstration seemed to him quite satisfactory until it had been "realised." This and his sympathy with men and with their work gave everything to him a practical aspect. And so in almost every direction in which he worked he devised working models and instruments of precision. Some of these are known only to specialists, and by them used and valued, but everybody has heard of his compass and of his sounding apparatus, and knows something of the enormous benefits he has conferred on navigation.

It was not only in pure and applied science that he was interested; everything that affects the life of the people, education, politics, religion, occupied his thoughts, and on all subjects which he had seriously considered he had definite opinions. While he would, on occasion, defend with zeal and energy what he believed to be the truth, he was always perfectly fair to his opponents, as he was always courteous to everybody.

We have already had emphatic evidence that the world knows that a great and good man has left us; we who knew him more intimately also mourn a dear, trustworthy, and trusted friend.