

## Comparison of the Faults in the Three Earthquakes of Mino-Owari, Formosa, and San Francisco.

By

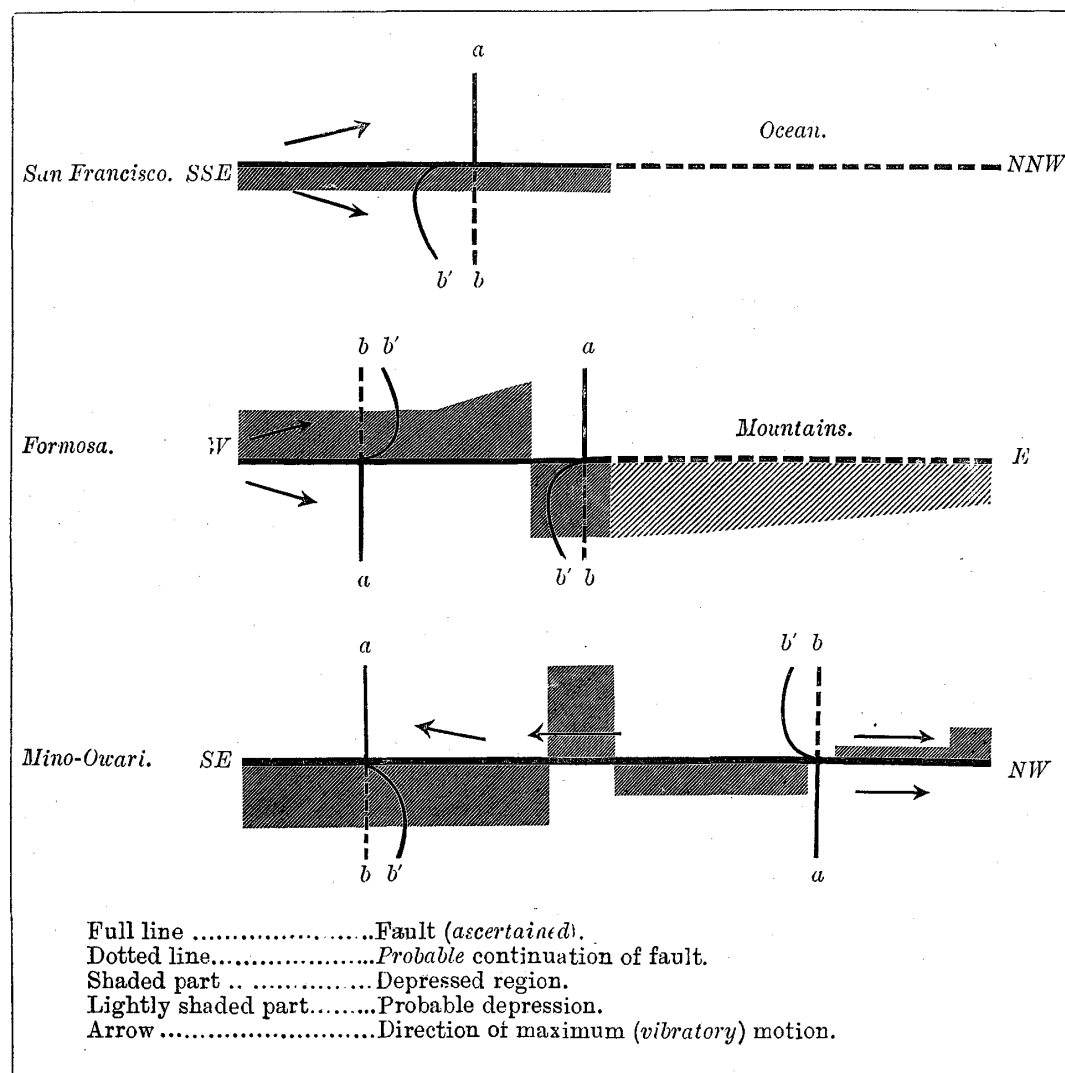
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The three great earthquakes of Mino-Owari (Central Japan) on Oct. 28, 1891, of Kagi (Formosa) on March 17, 1906, and of San Francisco on April 18, 1906, were each accompanied by the formation of remarkable *faults*, whose total lengths were about 100, 50, and 430<sup>km</sup> respectively. The dislocation in the San Francisco earthquake was formed partly along, and partly off, the west coast of California, belonging to the category of longitudinal faults. The dislocations in the Mino-Owari and Kagi earthquakes were, on the other hand, formed nearly at right angles to the course of the Main Island (Nippon) and the axis of Formosa Island respectively, both belonging to the category of transverse faults. Notwithstanding these differences, there are certain similarity among the three cases. Thus, in each earthquake, the direction of motion at different places in the immediate neighbourhood of the fault was not perpendicular, but more nearly parallel, to the latter. This seems to indicate that the formation of the faults was mainly due, in each case, not to such actions as the simple falling down or sudden creation of a cavity underground, but to the existence of shearing stresses in the plane of fracture, possibly of two opposing forces acting either from the centre toward both ends of the fault line, or toward the centre from both ends.

The accompanying figure is a diagrammatic illustration of the 3 faults, the line  $ab$  indicating, in each case, a straight line (say, road) which suffered a shearing movement in such a way that the part  $b$  on the depressed side was displaced to the new position  $b'$ , being generally transformed into a curve.

From the figure it will be seen that there existed in each fault what may be called the central point, where the disturbance of the ground is greatest and about which the shear and depression along the line of dislocation is more or less symmetrical.



In the case of the Mino-Owari earthquake the central point was in the vicinity of the village of Midori in the Neo-Valley, where a very remarkable depression of the ground took place. The corresponding point on the Formosa fault was between the villages of Bisho and Kaigenkō. In the San Francisco earthquake the northern half of the fault was under the ocean, but the central point was probably in the vicinity of the Tomales Bay, the greatest amount of disturbance having occurred there.

The greatest vertical dislocation of 18 feet occurred in the Mino-Owari earthquake, while the greatest horizontal shear occurred in the San Francisco earthquake. The latter has shown a vertical displacement of only 1 or 2 feet, while the former was accompanied by a large horizontal shear of about 18 feet. In the Formosa earthquake, whose magnitude was much smaller than the other two, the vertical and the horizontal displacements of the ground were each of a moderate scale, the maximum amounts being 6 and 8 feet respectively.

The maximum vibratory motion in the Mino-Owari earthquake showed a tendency of being directed from the central point towards both ends; while, in each of the two other earthquakes, the same motion was, as far as can be ascertained, directed from one end towards the centre. Again, the direction of the maximum (vibratory) motion was, in the Formosa earthquake, the same as that of the shear of the depressed ground. In the two other earthquakes, however, the reverse was the case. These differences are probably due to the diversity in the manner of the action of the force along the fault plane which finally produced the dislocations.

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