disappointment will be felt if they decline to co-operate in the manner proposed in the execution of this preliminary step, should it be found indispensable.

It seems, however, desirable that further consideration should be given to the question whether survey is necessary before actual operations are commenced.

At the Colonial Conference of 1887, and in the subsequent correspondence, it was assumed that this was the case. Some doubt was expressed at the Ottawa Conference as to whether the partial surveys already made in the Pacific Ocean were not sufficient to render possible a fairly approximate estimate of the difficulty and cost of the work. This was the view taken by Mr. Lee-Smith, who stated as an illustration that when the cable on the west coast of Africa was laid no survey was taken, but allowance made for risks.

It appears that since 1887 the scientific resources connected with the laying of submarine cables have been so improved that, given a general knowledge of the depth, a previous survey is not now always required. On this point I will quote from a printed memorandum by Mr. A. Siemens, which was communicated to me after the close of the Conference. Mr. A. Siemens is well known as a distinguished member of one of the most important electrical firms in the world, and has very recently been successful in laying the last cable between Great Britain and America:

"With regard to the technical difficulties raised in 1887, it may not be out of place to consider that the necessity for a close survey of a cable route arises principally from the requirements of the engineer laying the cable, who has to know at every moment the exact depth of water into which the cable passes. The break power with which the cable is held back, and by which the percentage of slack is regulated, has to be adjusted according to the depth of water, in order to ensure an even distribution of the slack along the whole route of the cable. Such a distribution prevents accidents, economises cable, facilitates repairs; hence the usual practice is to lay cables only on routes where very frequent soundings have been taken, and in 1887 the experts consulted by the Imperial Government were not satisfied that the Pacific Ocean was sufficiently well explored for this purpose.

"During the last seven years the work of survey has steadily progressed, and at present it may be asserted that the route proposed at the Wellington Conference passes nowhere through water more than 3,500 fathoms deep.

"If the adjustment of the break power depended entirely on the knowledge required by soundings taken previously on the selected route of the cable, grave doubts might still exist whether the laying of the Pacific cable could be proceeded with, without further information being obtained by carefully taking soundings over the exact route. Fortunately means have been devised to indicate to the breaksman continuously the percentage of slack with which the cable is paid out, and thus it is possible to lay a cable over a route of which only the general features are known.

"This contrivance has been used with perfect success in the laying of six Atlantic cables, so that there is no doubt as to its performance realizing its theoretical advantages. The depth of water met with in the Atlantic reaches 3,000 fathoms in several places, where the cables have been laid, so that there is no doubt about the possibility of laying the cable in 3,500 fathoms, or even more.