Discussion.

Mr. R. R. KING said that he had much pleasure in proposing a vote of thanks to Mr. Sinclair, and, in response to his request that he should describe some of the methods adopted at Mort's Dock when they were aligning the shafts for marine engines, he had brought the articles shown on the table and would now briefly explain the use of them. In double-ended steamers, part "A" shown in Fig. 1 was usually fixed to the keelson at about the centre of the vessel, the cross bar shown being free to move up or down. Then, on the outside of each stern frame was placed a small square plate of iron, as marked "B" in the figure above referred to, and each of these plates had a small hole drilled in the centre, whilst one of them was fitted with an eye-piece. By placing an electric or other bright lamp at the outside of the plate at the end opposite to that fitted with an eye-piece, a sight was taken through the latter. The crossbar on fixture "A" was then moved up or down until the light was just observable over the top of the bar. Then, having marked the height of the bar on the two uprights, the wire for lining the shafting was put through from end to end, stretched, and then pulled down in the centre an amount previously determined upon to allow for the alteration in the line of shafting due to the ends of the vessels dropping when the hull was launched. In wooden vessels of the Sydney Ferries type, which were about 150/175 ft. long, the amount to be allowed ranged from 2½ in. to 3½ in.

The three devices marked C., D., and E. respectively on Fig. 2 were used for sighting tunnel shafting when it was required to determine how much the shafting was down at the several bearings. The bearings could then,

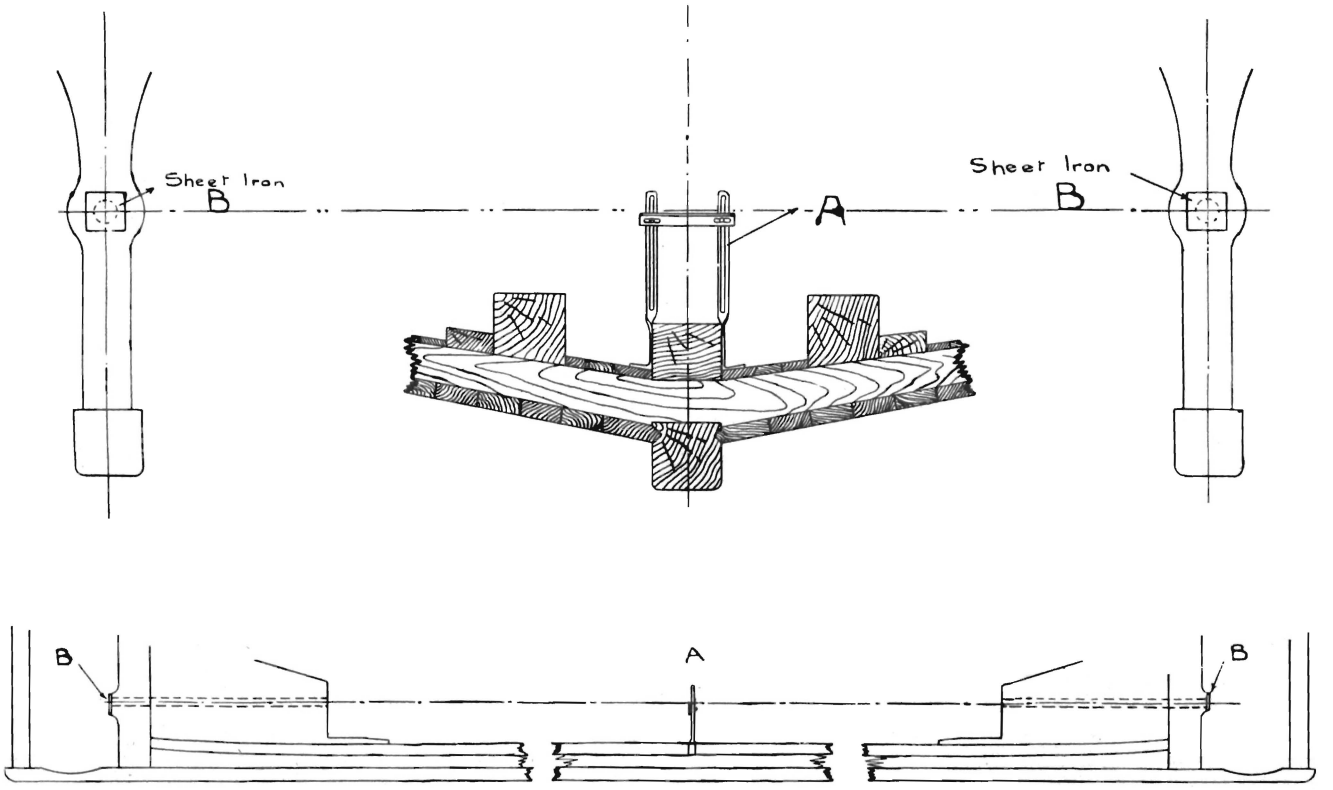

Fig. 1.

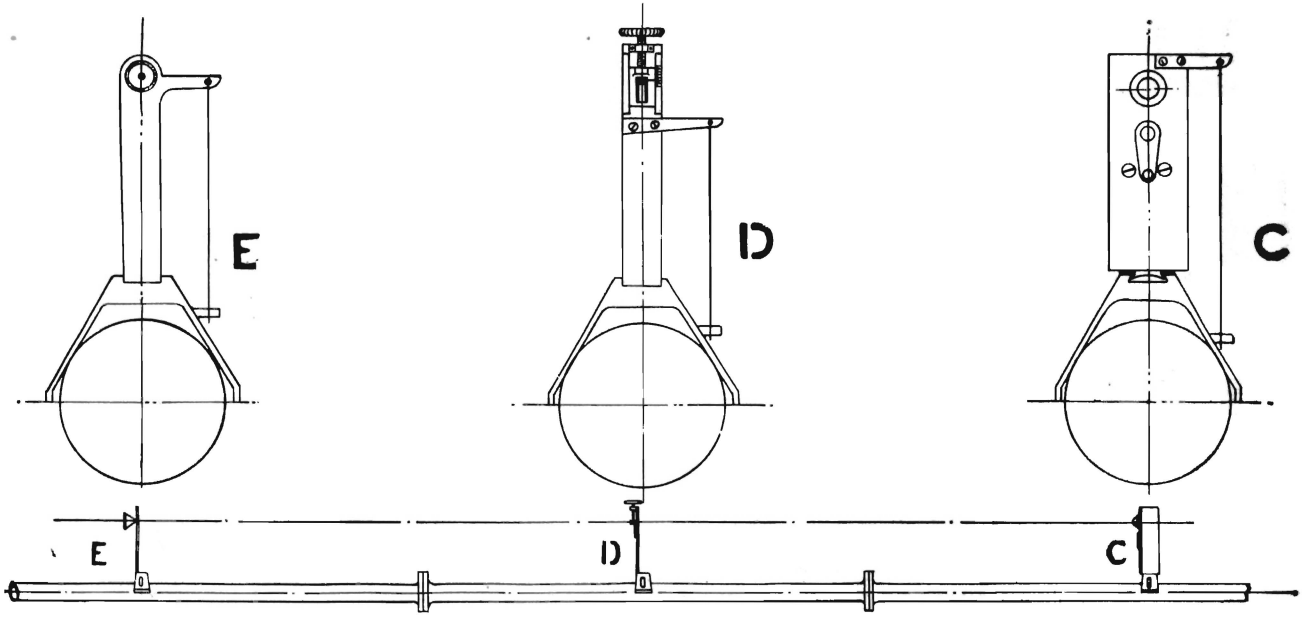

Fig. 2.

of course, be either packed up or remetalled in order to restore the shafting to its proper alignment. The process of lining the shafting with the devices shown was as follows:—

One of them was placed on the tail shaft, another on or near the crank shaft, and the third one on the shaft at each tunnel bearing in turn, then by sighting from the tail shaft end, the amount that each bearing was out of alignment was noted and the bearings lined up accordingly.

Mr. W. R. WRIGHT, in seconding the vote of thanks, said that he thought Mr. Sinclair's paper was a very clear description of the methods generally adopted in the alignment of ordinary plant, such as engines, pumps, etc. He hardly considered that the paper was open to much criticism, and although he could probably describe some methods that he had used in this department of engineering, he did not think that they were sufficiently original or so dissimilar from those described by Mr. Sinclair as to merit his bringing them forward. As Mr. Sinclair stated, it was quite necessary that an engineer should know how to correctly perform the work of aligning plant during its erection, but he felt that the field for ingenuity was not very wide.

Mr. DAVID CHALMERS said that he would like to ask Mr. Sinclair to recall the figure that he had mentioned for the deflection, or sag, in a stretched piano wire, for he considered that the figure mentioned by the Author was excessive; and he believed that it was more like 1/16 in. in a length of 40 ft. He remembered that when the alignment of the shafting of a certain steamer took place, the makers used linen thread instead of a wire line, and as he had always used wire himself, he asked the reason for the linen being used; and they said that it was on account of the latter being found to sag less, owing, of

course, to its being very much lighter. In this case the alignment was verified by a sighting method very similar to that described by Mr. King.

Mr. R. SYKES expressed the opinion that the subject of the Author's paper, although possibly the latter was not open to much criticism, was certainly one of importance, and as many of them, no doubt, had suffered on account of the loose methods often adopted, he looked upon it as a well-timed reminder. The matter of alignment was one that called for a great deal of care. He could understand the last speaker's reference to the use of a linen thread, as he had always used a line of this kind, the material being of specially selected unbleached linen. He had always found it more easily adjusted and supported, and it was just sufficiently elastic to easily maintain the requisite tension for a minimum amount of sag. As against the advantages mentioned, there was the drawback, when gauging with feelers, that a good deal more care was necessary owing to the linen being more easily deflected than a taut wire. For extensive jobs, or where a large amount of gauging was required and the line had to remain in one position for very long, doubtless the wire lines were the most desirable. The sighting method also referred to was one very generally used, and he had seen this method adopted in large textile factories (where there were exceedingly long line shafts), with a telescope fitted near one end and a number of adjustable sighting blocks supported at intervals along the shaft, and at a short distance from it, the sighting blocks being placed in position and adjusted, starting at the end remote from the telescope. When all the blocks were fixed, a line was stretched and dropped into notches in the sighting blocks.

Mr. P. F. ALLAN also considered the paper a timely one, as it was really most important that the subject dealt

with should be considered seriously by erecting engineers. So much depended upon this initial stage in the life of a machine being faithfully done, that the work could not be too carefully or thoroughly considered.

He did not think the Author had drawn sufficient attention to the necessity of ensuring that the tightly drawn wires were not only truly parallel in a vertical plane, but that they were also truly parallel to the base plane, which would presumably be horizontal. He thought that in some instances it was customary to thread the wires through steel upright guide bars, and to "sight" for the level at these intermediate guides, afterwards bringing the wire up to these levels and holding it there by means of clamping screws or other suitable attachments. By placing the supports sufficiently close together, the error introduced by the sag of the wire could be reduced to a negligible amount. In his opinion, a hard drawn copper or amalgam wire, such as a piano wire, was much more satisfactory to use than a steel wire—linen thread was too susceptible to climatic changes. In order to reduce the sag of hard drawn wire to even a moderate amount for 30 ft. spans and upwards, it was necessary to employ a very high tensile stress. Hard drawn copper wire of normal elasticity, for instance, when stressed from 4000 to 8000 lbs. to the square inch (corresponding approximately to 40/80 lbs. on a No. 11 I.W.G. wire), would have a sag of approximately 1½ in. to ¾ in. in a 30 ft. span.