hend their action, except in the presence of the machines, with copious diagrams to illustrate them.

The Paper is illustrated by several diagrams; and one of Martin's machines was exhibited, as also part of an old machine, and bands of equal numbers of cards, under each system.

Mr. FARINDON LANE explained the action of the new machine, and its superiority over the old machine, in producing a less amount of friction. Very little force was required, and in this respect, the main difference between the two machines, was in the moving of the band: the motion was communicated by means of a deep treadle. In the new machine, there was every facility for taking out and replacing the hooks and levers.

Mr. W. NEWTON said, that the Jacquard machine was one of the most ingenious introductions, for many years past, from France. He described the action of the common machine, and remarked, that the one under discussion was a decided improvement: by dispensing with force, simplicity was gained, and wear and tear was avoided. He thought, however, that the term 'cylinder,' of the old machine ought not to have been retained, as it was altogether inapplicable to the brass plate which corresponded to it in the new machine. He further described the mode of cutting the patterns on the bands, and the advantage gained by the substitution of so cheap a material as paper, for the old costly cards.

Mr. LOCKE, M.P., V.P., said, that the Paper could scarcely form a subject for discussion: the Members of the Institution should carefully read it over, and then examine the machine, the original of which in his opinion was the most beautiful invention ever imported from France. The method of obviating the friction of the old machine by dispensing altogether with force, was an improvement which could not be too highly praised, and the change effected in the action of the needles, from a horizontal to a vertical motion, was very ingenious. With respect to the mode of establishing the pattern on the cards, he was desirous of knowing, whether it substantially differed, in principle, from the method exhibited in 1851 at Hyde Park, or whether it was a purely mechanical improvement upon the latter. That machine was very similar, in

appearance, to a piano-forte, with keys, and it produced the pattern by stamping dots and leaving blanks upon the cards.

Mr. FARINDON LANE said, that the process of cutting the cards by the old machine, was very clumsy, each card being cut separately; whereas in the new machine, the band was cut from a pattern. A band under the old system, would require from two to three weeks, whilst the new band would only require two, or three days in cutting. He then described the ordinary machine for cutting the cards, and that introduced by Mr. Mackenzie. The new Jacquard was, in that respect, merely an improved mode of working the machine exhibited in 1851.

Mr. HAWKSHAW said, although silk-twist and cotton-yarn were now spun very fine, the tendency was to manufacture them finer still; and he apprehended, that with a more delicate machine, finer and more delicate fabrics could be produced. If the diameter of the wires was reduced to one-half, and they were proportionately increased in number, more intricate patterns and finer work might be accomplished. It would also be advisable, perhaps, to employ a more delicate paper for the cards.

Mr. W. NEWTON said, that the quality of the work had very little to do with the action of the machine. The thickness of the thread was of no importance, for coarse work and fine work, plain and intricate, could be equally well produced. The great superiority of the improved machine consisted in the simplicity of its action,—the absence of springs,—and the facility and correctness with which the cards were cut and prepared. The employment of oiled paper for the cards was attended with this advantage, that they were no longer liable to expand, by exposure to damp, or to contract by heat.

Mr. C. MAY said, that the fineness of the fabric had no relation to the diameter of the wires. The most delicate spider-yarn could be used in the Jacquard machine, and the most elaborate patterns could be produced by it.

Mr. FARINDON LANE explained that by the improved system of punching machinery, the bands could be cut from a design, previously perforated, at the rate of 3,000 cards per hour, and any number of duplicates could be produced with equal celerity; he, also, stated, that by these means, when a pattern became

fashionable, any number of looms might be set to work on it, in about as many days, as it had previously required weeks, under the old system. The price of the old thick cards was 6*s*. 9*d*. to 8*s*. 6*d*., and upwards, per hundred, for new sets, and 5*s*. 6*d*. for recuts; whereas the new paper bands would cost 1*s*. per 100, and 6*d*. per 100 for recuts. The comparison of cost of 3,000 cards (an average band) would, therefore, stand thus:—

	Cost.			Weight.	Length.
	£.	s.	d.		
3,000 cards at 6*s*. 9*d*. per 100 . .	10	2	6	90 lbs.	600 ft.
3,000 new bands at 1*s*. per 100 .	1	10	0	8¾ lbs.	63 ft. 9 in.

In reference to durability, he stated, that a band had been in constant work two years, although used on a heavy waistcoat-piece.

No. 910.—"An Account of the Deep-Sea Fishing Steamer 'Enterprise,' with Ruthven's Propeller."[1] By DANIEL KINNEAR CLARK, Assoc. Inst. C. E.

IN consequence of some remarks during the course of the discussion, that it would be very desirable to have further experiments made upon this vessel, which were promised to be undertaken, and the results to be communicated to the Institution, it has been decided to publish only the abstracts of the Paper and of the discussion upon it.

[ABSTRACTS.]

The vessel was described as having been built for the "Deep-Sea Fishing Association for Scotland," under the direction of the Author, the Consulting Engineer to the Company, who had recommended the trial of Ruthven's propeller for fishing uses, in preference to the paddle, or the screw, chiefly on account of there being nothing likely to interfere with the fishing nets; and also because the success of the previous trial of this means of propulsion, on board of boats 30 feet and 40 feet in length, when a speed of 7 miles per hour was attained, appeared to warrant its being tried on a larger scale.

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[1] The discussion upon this Paper extended over portions of four evenings, at different periods, but an abstract of the whole is given consecutively.