

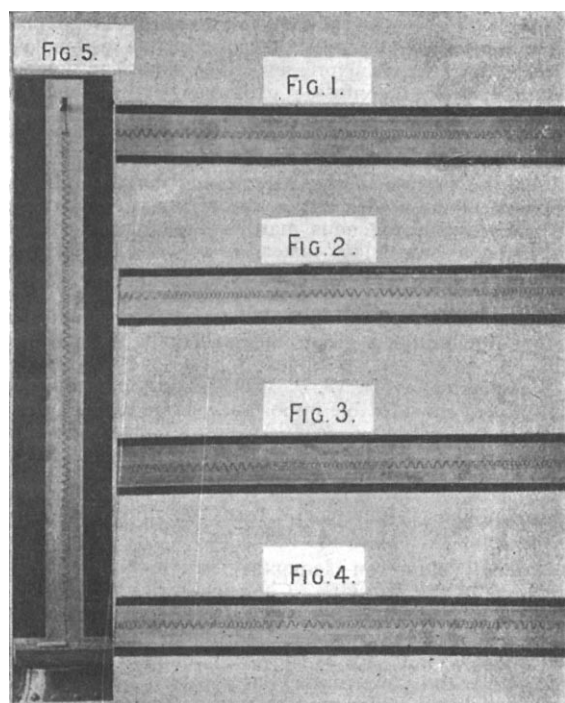
LETTERS TO THE EDITOR.

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A Simple Model for Demonstrating Beat.

THE phenomenon of beat produced by the interference of two series of waves having nearly the same wave-length can be objectively represented by a model of simple construction.

A spiral, whose diameter and pitch are respectively 2 cm. and 2.5 cm., is made of a steel wire about 1 mm. thick and hung vertically before a white screen. At a distance of a few metres we observe a very regular series of transverse waves. Another spring of exactly the same dimensions is suspended in front of the first spring so as to coincide with each other when they are seen at a distance. If one of the springs is then slightly stretched, there results a small difference in wave-length of the two sets of waves, thus causing them to strengthen in one place and destroy in the other. The distance between these



two places becomes less as the difference of wave-length increases. Figs. 1, 2, 3, 4 are the photographs of the springs suspended in the manner just mentioned, and show successive stages of interference produced by stretching the length of the second spring. The result of interference of two such waves evidently corresponds to the phenomenon of beat.

For practical purposes, two springs are suspended from a vertical board, one in front of the other, as shown in Fig. 5. Both ends of the first spring are fixed, while the upper end of the second is likewise fixed and the lower end pulled downwards by means of a string passing through a hook attached to the stand. Standing at a distance in front of the springs we can gradually stretch the second spring by pulling the string and easily observe the corresponding stages of interference in its different phases.

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Polar Exploration.

THE following sentence is extracted from an admirable notice of the Arctic explorer, the late Baron Nordenskiöld, by Prof.

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A. G. Nathorst, himself renowned as an investigator of the Polar regions:—

"It may perhaps be of interest at the present time to recall the fact that we in Sweden have always taken for granted that the leader of a scientific expedition must be a naturalist, to whom the commander of the vessel has to be subordinate."—*Geograph. Anzeiger*, ii. p. 129, September, 1901.

The marked success of the Swedish expeditions, not merely in pure science, but also in geographical discovery and the safe return of their members, gives this opinion weight as well as interest. Of course it is not what the president of the Geographical Section of the British Association calls "the good old British plan."

CIVILIAN.

ON THE CLUSTERING OF GRAVITATIONAL MATTER IN ANY PART OF THE UNIVERSE.

IN the Mathematical and Physical Science Section of the British Association, Lord Kelvin delivered a discourse on "The Absolute Amount of Gravitational Matter in any large Volume of Interstellar Space." Gravitational matter, according to our ideas of universal gravitation, would be all matter. Now was there any matter which was not subject to the law of gravitation? He thought he might say with absolute decision that there was. They were all convinced, with their President, that ether was matter, but they were forced to say that the properties of molar matter were not to be looked for in ether as generally known to them by action resulting from force between atoms and matter, ether and ether, and atoms of matter and ether. Here he was illogical when he said between matter and ether, as if ether were not matter. It was to avoid an illogical phraseology that he used the title "gravitational matter." Many years ago he had given strong reason to feel certain that ether was outside the law of gravitation. They need not absolutely exclude, as an idea, the possibility of there being a portion of space occupied by ether beyond which there was absolute vacuum—no ether and no matter. They admitted that that was something that one could think of; but he did not believe any living scientific man considered it in the slightest degree probable that there was space surrounding our universe beyond which there was no ether and no matter. Well, if ether went through all space, then it was certain that ether could not be subject to the law of mutual gravitation between its parts, because if it were subject to mutual attraction between its parts its equilibrium would be unstable, unless it were infinitely incompressible. But here again he was reminded of the critical character of the ground on which they stood in speaking of or giving very definite propositions beyond what they saw or felt by experiment. He was afraid he must here express a view different from that which Prof. Rücker announced in his address, when he said that continuity of matter implied absolute resistance to condensation. They had no right to bar condensation as a property of ether. While admitting ether not to have any atomic structure, it was postulated as a material which performed functions of which they knew something, and which might have properties allowing it to perform other functions of which they were not yet cognisant. If they considered ether to be matter, they postulated that it had rigidity enough for the vibration of light, but they had no right to say that it was absolutely incompressible. They must admit that sufficiently great pressure all round could condense the ether in a given space, allowing the ether in surrounding space to come in towards the ideal shrinking surface. When he said that ether might be outside the law of gravitation he assumed that it was not infinitely incompressible. He admitted that if it were infinitely incompressible, then it might be subject to the law of mutual gravitation between its parts; but to his mind it seemed infinitely improbable that ether was infinitely incompressible, and it appeared