building, and of applying the propeller. Such a fact, taken with the results of the trials of the *Iris*, serves to show that we have yet something to learn, and we allude to it now because it helps to prove that it is unwise to accept hypotheses which, if they can be accepted as true, would justify the Admiralty in refusing to make experiments to test new inventions which might be condemned as impracticable. For the last six years the Rev. C. M. Ramus, Rector of East Guildeford and Playden, has held his invention of the Polysphenic ship at the disposal of the Admiralty, and that body, acting on the report of Mr. Froude, has declined to make even an experiment, although there is much reason to think that Mr. Ramus is right and Mr. Froude wrong. We mentioned the invention of the rocket-float at the time when it was first introduced to public notice ; but since that Mr. Ramus has developed the idea and evolved the polysphenic ship, a vessel which it is calculated will skim the seas at the rate of 40 miles an hour or more. The word "skim" discloses the secret of the idea, for the invention is mainly based on the fact that if a vessel can be made by the mere force with which it moves to ride over the waves instead of driving through them, there is *primâ facie* reason to believe that a much higher speed than anything with which we are acquainted will be achieved. The principle of Mr. Ramus's invention consists in making the bottom of the vessel a series of inclined planes, and his experiments tend to show that Mr. Froude's hypothesis as to the viscosity of water has little or no basis in fact, so far as a ship is concerned. In 1872 Mr. Ramus made a model having its bottom composed of two parallel and consecutive inclined planes ; or the vessel may be described as made up of two wedges, the thick ends of which are placed abaft the thin ends. There is thus in the centre of the vessel a ridge where the thin end of the sternmost wedge abuts against the thick end of the foremost. It will be readily understood that any floating body thus shaped must, when driven forcibly through the water, tend to rise, and if the speed is high enough it will rise on the surface instead of driving through the water. These facts were demonstrated by some rough experiments made in the presence of credible witnesses ; but it will suffice for our purpose if we give the details of one or two of the trials. The smaller model, with a 6oz. rocket attached, weighed 3 lbs. 3 ozs., and ran a distance of 105 yards in three seconds, being stopped by a bank before the propelling power of the rocket was fully expended. The line of the propelling force was inclined downwards, in the direction of the model's course, about two degrees from the horizontal. There might thus be a slight tendency to force the stern end down and consequently to lift the stem ; but we are inclined to think that in practice the effect would be found to be very slight. In another experiment the small model was driven 480 feet in $4\frac{1}{2}$ seconds, the water being much rippled by a strong breeze ; but in spite of that the deck was found to be unwetted. The measurements of this model may be of interest. It was $29\frac{1}{2}$ inches long and $4\frac{3}{4}$ inches broad, of solid fir. The inclines had a slope of 1 in 16, and the draught was $\frac{2}{3}$in. of water. Weight, without rocket, $2\frac{1}{2}$ lbs. Such a model drawn slowly over the water offers a greater resistance than a model of the ordinary shape ; but when high rates of speed are imparted it travels safely where the ordinary forms would topple over—it slides on the surface instead of offering increased resistance. It will be seen that if the downward pressure of a vessel's weight is insufficient to remove a quantity of water equal to the vessel's displacement within the time allowed for passing over, the vessel must be borne upon the top of the water, just as cannon balls flying with high velocities and striking the water at low angles, ricochet and pursue their flight without burying themselves in a fluid which, under ordinary circumstances, offers no resistance to their entrance. In the rocket-float we have, then, a destructive weapon of war, which can possibly be made of more utility than torpedo-boats or those automatic torpedoes which are distrusted by those who may be called upon to employ them. But the principle underlying the rocket-float may be taken advantage of to construct polysphenic ships, for it has been demonstrated that the resistance to such vessels, which at first increases about as the square of their velocity, decreases as the speed is augmented, until after a certain period there is no further increase of resistance. Given the required machinery for propelling the polysphenic ship, there seems every probability that speeds of 40 miles an hour or more can be attained.

Objections have been urged against the polysphenic ship, but they do not appear to be of serious moment, and are easily met by Mr. Ramus. For instance, it has been urged that though it might act well enough on smooth water, it would fail to lift and pass safely over a chopping sea, or the long and large waves of the Atlantic. A consideration of the shape of the vessel will, however, tend to modify this opinion, and the inventor states hat the effect of rough water upon the polysphenic ship is nothing more than retardation ; but if the waves are not of unusual size they actually favour the passage of the vessel. Rough water, of course, does something to retard the passage of all ships, but if they are so formed as to ride on the surface rather than to cut through the water, and the latter is obviously accomplished only at an enormous expenditure of force, the polysphenic ship must attain the higher speed. Such experiments as have been made serve to show that the polysphenic ship would, in a sea only moderately agitated, have its speed increased, while in a very rough one it would experience only that retardation which is common to vessels of the usual shape. It has been also urged that the new form of vessel would be liable to capsize, for being borne, when at high speed, upon the surface of the water, it is deprived of the support which a partially submerged vessel receives. Mr. Ramus, however, points out that nothing can well be further from probability, because from the very form of the vessel the side which becomes most submerged is the side which is most forcibly lifted. The polysphenic ship is, in fact, self-righting. A model was weighted so that one side was depressed, and in this state it was drawn swiftly over the water, with the result that it attained and preserved a perfectly level deck. Whatever doubts may, however, be expressed as to the feasibility of making a polysphenic ship capable of traversing the Atlantic at high speeds, there can be little doubt that Mr. Ramus has made good his case as regards the rocket-floats, for there is no difficulty in providing the propelling power required by the latter. It appears, then, that while the Admiralty should experiment with the invention as a torpedo, the great steamship companies might well devote some of their attention to the possibility of constructing steamers which, while safe and comfortable, would traverse the seas at much higher speeds than any yet attained.—*English Mechanic.*

Scientific Items.

SUBMARINE TELEPHONY.—Mr. Raymond, an engineer in New York, recently read a paper before the Society of Engineers in New York, in which he described some improvements he had made in using telephones in diving operations. The arrangements first employed consisted of two Phelps telephones, which, being oval and flat, are convenient for this purpose. One of these was fastened in the diver's helmet, in such a position that by simply turning his head the diver could place his mouth or his ear to the instrument. The other was placed on the scow which carried the assistants and the air-pump ; and the two were connected by means of insulated wires inside the air-hose. This was found to work very well, so far as communication from the diver to his helper was concerned ; but there was difficulty in sending messages the other way, since the bubbling of the air as it escaped from the helmet into the water interfered with the divers' hearing of the telephone. This difficulty was overcome by the use of Edison's "carbon-transmitter," which rendered the sound so much more audible that conversation could be carried on with the utmost facility. It was found that the diver could talk in the helmet without putting his mouth to the instrument, and be heard plainly, so that work and conversation could go on at the same time. In the discussion upon Mr. Raymond's paper, it was asserted that the cost of the necessary outfit for telephonic communication of this sort would be about one hundred dollars, and that, on the other hand, the work of a diver with ordinary means of communication costs about three dollars per hour. The saving of time effected by this means of quick and full transmission of intelligence would evidently soon repay the original outlay.—*Electrician.*

THE WRITING TELEGRAPH.

On the evening of February 26, 1879, the writing telegraph of Mr. E. A. Cowper, of London, was exhibited in operation before the Society of Telegraph Engineers, in that city. It is a curious and remarkable invention. By its use the handwriting of the operator may be transmitted, but a double circuit, that is, two telegraph wires, are used. The operator moves with his hand an upright pointer or stylus, with which he writes the message on paper. The stylus has two arms connected with it, one of which arms, when the stylus makes an upward movement, causes a current to be sent over one wire, while the other arm causes a current to pass over the other wire when the stylus is moved laterally. These two motions are, at the receiving end of the