TO CORRESPONDENTS.

*** *We beg to call the attention of our Advertisers to the notice below, and to state that the large circulation of* THE ENGINEER *compels us to go to press at an early hour of the morning of publication. Advertisements, to ensure insertion, must be delivered at the Engineer Office before seven o'clock on the Thursday evening of each week; any received after that time must necessarily stand over till the following publication.*

NOTICE.—A SPECIAL EDITION *of* THE ENGINEER *is published for* FOREIGN CIRCULATION. *This edition, printed upon paper manufactured for the purpose, will pass through the foreign post offices at the charge of a single postage.*

*** *We cannot undertake to return drawings or manuscripts, and must, therefore, request our correspondents to retain copies.*

*** *Covers for binding the Volumes can be had from the Publisher, price 2s. 6d. each.*

D. B. (Paris).—*A letter addressed* 18, *Adam-street, Adelphi, will find him.*

T. M. (New-cross).—*Received with thanks. Send a tracing or drawing of your rest; the lithograph is very confused.*

W. E. F.—*You can obtain cask washing machinery from Walker,* 18, *Cooper-street, City-road, and several other makers.*

T. H. (Altringham).—*You can probably obtain a copy of the official report—to which we presume you refer—through Messrs. Lockwood or Spon.*

S. P. S.—*We know nothing more of the balloon to which you refer than the accounts already published by the daily press, of which you are already in possession.*

W. S *We cannot tell what quantity of water would be consumed per hour by a turbine developing* 1 *horse-power unless we know the head, about which you say nothing.*

JERSEY.—*Capt. Cunningham secured a great number of patents for improvements in topsail reefing apparatus. The original and most important patent has recently expired.*

O. G. B. (Oban).—*One great objection to the plan you propose lies in the fact that it would be necessary to carry a very considerable quantity of water on board in addition to that contained in the boilers.*

M. G. (Havre).—*We regret that we cannot assist you further than by recommending you to apply to some of our large marine engine firms, such as Maudslay and Field, Lambeth; or John Penn, Greenwich.*

INQUIRER.—1. *The usual working pressure in the boilers of the Thetis was about* 90 *lb.; we believe that the load on the safety valve was some* 10 *lb. higher.* 2. *The expansion was about ten-fold.* 3. *A pound of good coal will evaporate about* 13 *lb. of water under very favourable circumstances. We cannot say what the evaporation was on board the Thetis; much less than this, we have no doubt. An evaporation of* 9 *lb. or* 10 *lb. is by no means unusual.* 4. *The loss in the cylinders, due to expansion, the influence of the condenser, &c., varies under different circumstances. You will find the subject fully treated upon in* THE ENGINEER *for March the* 10*th and* 17*th,* 1865.

L. M. J.—*We know of no better method of fitting the float than that ordinarily adopted. It is best made of close sandstone, or hard burned clay, circular in shape, flat on both sides, say* 1*ft. in diameter and* 5*in. thick. It should be counter-weighted to sink about half its depth. As the flue may possibly interfere with its action, the wire should be kept out of the central line of the boiler. The lever should be fitted with knife-edges, the balance-weight made to slide, and fitted with a locking screw by which to fix it at the proper point. The head of the screw should subsequently be cut off, in order to prevent the balance from being tampered with. An arc head should be fitted to the lever, carrying a small piece of chain, terminating in a brass or copper wire about one-tenth of an inch thick, passing through the stuffing-box of brass fitted with a flange by which to attach it to the shell. The box is of the ordinary construction, the gland being tapped. Very little packing will suffice to keep it tight; a little tallow must be applied from time to time. The lever is sometimes fitted within the boiler, but the arrangement is not very good. A swivel should intervene between the wire and the float, which is, of course, suspended so as to rest flatwise on the water. Care should be taken to fit the whole apparatus at a distance from the furnace.*

PAINT FOR STEAMBOAT FUNNELS.

(To the Editor of The Engineer.)

SIR,—I noticed in a letter in THE ENGINEER of the 18th inst., signed "J. M.," that your correspondent wishes to know what is the best preservative from rust that can be applied to funnels of steamboats, the colour to be black. I beg to inform him and your readers that I am the inventor of a paint which is very extensively used, and which I will guarantee to answer the purpose for which he seeks. The colour, however, is a dark red, but as your correspondent prefers black he may put a coat of black over it, which will not affect my invention. I have also a paint for ships' bottoms, to preserve and keep them from fouling, and after many years' experience I have never known it to fail. F. POAD.

36, King William-street, London, E.C., Aug. 24, 1865.

MATCH-MAKING MACHINERY.

(To the Editor of The Engineer.)

SIR,—Could you, or any of your correspondents, inform me who are makers of lucifer-match machinery? This would greatly oblige

33, Cornhill, London, August 30th, 1865. X. Y. Z.

THE ENGINEER.

FRIDAY, SEPTEMBER 1, 1865.

WHY THE ATLANTIC CABLE WAS NOT LAID.

"FOR want of a nail the shoe was lost—for want of a shoe the horse was lost," &c., and a good many other old saws of the same kind, apply with absurd exactitude to the series of mishaps which culminated in the loss of the Atlantic cable. Sufficient time has elapsed since the publication of Dr. Russell's report to permit men to consider the whole sequence of events connected with the last voyage of the Great Eastern in its proper light. Something, but not much, is still left to be surmised; but it is more than probable that all that will ever be known beyond a certain circle is now before us, and that this all is so complete that further information could be of little service in enabling us to arrive at the causes which have conduced to a gigantic catastrophe. From first to last we find that arrangements apparently perfect have been ruined by trifles. The idea of employing the Great Eastern to lay the cable was in every respect so superlatively good that it could not possibly have been improved upon unless a conductor of a totally different character had been adopted. With regard to the system of stowage employed there is little fault to be found. It is true that the nature of the process of coiling and uncoiling was such that a twist must be imparted to the rope, but it was quite possible so to arrange matters that any distortion of this kind should take place during the coiling, so that the subsequent torsion due to the uncoiling would merely restore the cable to its normal condition. Whether such a precaution was or was not taken we are unable to say. The question is not important, because it does not bear upon the failure in any way. Had the rope been successfully deposited in its ocean bed the point would never have been raised. As a matter of fact plain circular coils are apt to engender kinks, and the perfection of coiling is represented by what sailors know as a "French fake," in which the line is laid figure of eight fashion. The lines used with Captain Manby's rocket apparatus are always thus disposed, as it is found impossible to avoid breaking them when a different arrangement—as, for instance, the circular coil—is adopted. The paddle engines of the Great Eastern, occupying the centre of the ship, effectually precluded the "fake" system, and, all things considered, it is not easy to see how the circular tanks actually employed could be improved upon. The paying out was in nearly every respect managed satisfactorily, and, save in a few minor matters of detail, there is nothing to complain of in the working of the apparatus devoted to this object. From first to last we find that in all great things requiring the expenditure of much thought and large sums of money, those in command of the expedition acted with circumspection and forethought, and the failure has been brought about altogether by a concatenation of events each in itself trifling to a degree, and which, had its occurrence been anticipated, could have been avoided with the utmost ease.

It is apparently certain that but for two or three miraculous bits of wire, the operation of paying-out would have been conducted continuously without let or hindrance, and therefore they may be set down as the original cause of the failure of the enterprise, while the imperfections of the hauling-in apparatus represent its proximate cause. The cable was carefully tested mile by mile as it was manufactured, and this testing was practically continuous up to the moment the ship sailed. The result is well-known; the insulation was pronounced to be nearly perfect—more nearly perfect than in the case of any other cable ever manufactured. While stowed in the ship precisely the same tale was told by the testing apparatus; yet all this testing and approximate perfection of insulation went for nothing. As soon as the paying-out commenced we heard the same wretched story from the first day of the voyage nearly to the last; there was a continual and most disheartening succession of losses of insulation. Time and again was the great ship stopped on her course, and the cable hauled up from the depths of the sea, and whole miles of its length cut out before the paying-out could recommence. The cable was bewitched; there was no knowing when a fresh fault would appear. The minutely careful labour of months had actually, to all appearance, been thrown away, and an insulated conductor on the construction of which more pains had been bestowed, we are told, than on any other ever made, was practically worse than the worst made. The thing was due in every instance to the intrusion of little bits of wire an inch or two long—the cuttings according to one theory left in making splices—which were fortuitously driven into the gutta-percha, destroying insulation. Grave doubts existed in the minds of those on board as to whether there was really anything accidental about the intrusion of these demoniacal fragments. We confess that, although it is possible to believe that accident might have been the cause, it is much more easy to believe that it was not. The chances that the wires should adhere to the cable at all were as 1 to 10,000; the chances that they should be subsequently bent at right-angles by the paying-out wheels as 1 to 10,000,000. The fact—if it be a fact—that after this adhesion and bending they were forced into the gutta-percha is in no way short of an hitherto unheard-of miracle. It is simply a new thing under the sun. The rope never met with a single sharp turn; the curves of all the wheels were such that a bend at right-angles was according to all reason impossible. In point of fact there is not a wheel in the entire paying-out apparatus which could bend a bit of wire 2in. long, disposed longitudinally with the cable, at right angles. Then we have the hempen outer covering; the effect of any pressure must have been merely to bury the wire in this to a depth equal to its diameter, and the very nature of its position then, resting, as it did, on a comparatively elastic and yielding cushion, was in itself apparently sufficient to secure it from subsequent bending of any kind. We believe we are correct in stating that these "accidents," as accidents, are absolutely without a parallel in the history of submarine telegraphy—a fact not worth much, perhaps, but still worth something. Even granting however that the wire was bent, it remains to be seen how it could find its way through the outer casing of the cable. It is not very easy with every facility at the disposal of the experimentalist, to force the blade of a penknife between the strands of the outer sheathing, to say nothing of a comparatively blunt wire as thick as a strand. These facts, and a few others, can be urged against the "accidental" hypothesis. Let us see what can be said on the side of that which sets the affair down to design. There must, in the first place, have been some considerable motive called into play, it being preposterous to suppose that the work of destruction could have resulted from sheer wanton mischief. On this subject we have no intention of touching: our readers must think for themselves. Let us suppose, however, that a piece of wire was surreptitiously forced into the cable; one end would be rigidly fixed, the other would most likely protrude, and in passing over the paying-out wheel, it would, standing up, as it must have done, at right angles to the cable, have been infallibly bent over on the outer covering, being brought into precisely the condition in which one at least of the pieces was found on subsequent examination. If the bending did not take place during the paying-out—and it is just possible that the fragment might have missed the wheels—then would it have been bent in the hauling in. All the appearances so far are thus in strict accordance with the "design" theory. One other hypothesis remains for consideration. Could one of the outer wire strands part, and in parting could it force its way through the gutta-percha of the next coil above or below? This theory, albeit plausible, is invested with many difficulties. Why should a strand snap? While the cable lay quietly in its coil such an event did not occur; and it is certain that the mischief could not take place during the progress of the rope to the deck—if for no other reason, than because there were no longer two thicknesses of rope side by side. The snapping must, in short, have taken place almost at the instant of lifting the given portion of coil from that next below it—a thing to the last degree improbable, because the act of lifting imposed no sensible strain upon the strands which would be likely to lead to their fracture. For the present it is impossible to pronounce a decisive opinion as to the truthfulness of any one of these theories. Possibly the best method of arriving at a correct conclusion would be to pass a few miles or so of the cable through the paying out apparatus, as nearly as possible under the same conditions as those existing during the voyage, small pieces of wire being variously disposed on the outer surface of the sheathing. The experiment would at once determine not only whether the mischief could be accomplished, but also the manner and precise place of accomplishment. Measures could then be taken to provide for loose wires in future.

As to the hauling in of the cable, we shall not be far wrong if we state that no proper provision for such a proceeding was made. In fact so confident were the directors that a picking-up apparatus would be useless and unnecessary, that we deem it matter for some surprise that even a substitute for perfect machinery of the kind existed at all. As it is the cable has not been laid because it could not be unlaid, so to speak; and the directors will do well to profit by the lesson in all time to come. A wretched donkey engine has earned for itself a most unenviable notoriety, but we cannot discover, in its failure, anything very exceptional. The machine was of a very ordinary type, fitted with oscillating cylinders, and apparently incapable at the best of times, of working up to more than 15-horse power. It was absurd to expect that such an engine could ever prove competent to drive the hauling-in apparatus as it should be driven. No earthly reason exists why the cable should not have been hauled in at the rate of three miles an hour, instead of one mile in an hour and forty-six minutes, at which speed the ship would have very fair steerage way—a matter of the greatest importance. The dynamometer actually registered at times a strain of about $2\frac{1}{2}$ tons—sometimes rather more. Assuming the resistance to amount to 2 tons 15 cwt., or 6,160 lb., a simple calculation will show that not less than 50 effective horse-power will suffice for the operation of hauling in at the given speed—three miles per hour, or 264 feet per minute. The useful work to be done is, as nearly as may be, $16\frac{1}{2}$-horse power for each mile per hour; but it must be remembered that there is a good deal of gearing to drive, and that steam cranes may be frequently met with which absorb half the power expended in overcoming friction. It would only be prudent, therefore, in future to provide a simple substantial engine capable of working up to 100 indicated horse-power with ease and certainty, and if practicable such an arrangement of machinery that cog wheels, seldom to be trusted under trying circumstances, would be replaced by frictional gearing in some form. It might also be expedient to remove the shrouds of the masts so far inboard that a clear gangway would exist at each side of the ship along which the end of the cable could be freely passed, instead of getting it forward step by step by hawsers over the side, a troublesome and difficult operation at any time, and one absolutely impracticable in rough weather.

Little more remains to be said upon the subject. The directors of the company have taken such pains to keep their proceedings secret that they cannot be surprised if the world rests satisfied that a secret exists. Quite enough is known to account for the failure of the undertaking. We can only hope that nothing may lead to the unnecessary postponement for a single day of the next attempt to carry out a great work, certain sooner or later to be successfully accomplished, and to suggest that in future the most minute matters of detail should receive as much attention as, let us say, the insulation of the cable.

SCREW PROPELLERS.

A SOMEWHAT remarkable experiment carried out within the last few days in the Thames and Medway, goes far to re-open a number of questions connected with screw propulsion—questions, indeed, which have from the first constituted problems, never yet fairly solved although they have ceased to attract much attention from practical men. The vessel experimented upon was a screw steamer, the property of Messrs. Rennie, fitted with a Griffiths propeller of the approved type—in short, resembling in all points those used in the navy. Behind this propeller, attached to the stern-post, was fitted a second or "boss" screw, as it is termed by the inventor, a Mr. Rigg, very much resembling the common many-bladed screw in nearly every respect, save that the centre is occupied by a large boss, the blades being set at angles precisely the opposite of those of the real propeller. It must be understood that this appendage is incapable of rotation, and at first sight it apparently constituted a serious impediment to the progress of the ship. If we assume that a screw merely acts as though the water formed a nut within which it revolves, it is, in fact, impossible to escape such a conclusion. If the published reports of the trial are to be credited, however—and we see no reason to doubt their accuracy, the entire experiment having been conducted under the care of Mr. Griffiths and Mr. Rumble—far from constituting an impediment, the subsidiary blades acted such a part that the speed of the vessel was considerably increased, while the power was actually reduced. With the Griffith screw working in conjunction with Mr. Riggs' invention the mean speed attained, we are told, was 7·574 knots per hour, with 184 revolutions per minute. With the ordinary Admiralty screw the speed was but 5·871 knots, the revolutions rising to 227 per minute. As a result, we find that the speed was increased by 1·703 knots, while the power was apparently reduced by 18·94 per cent. We say apparently, because—although it is very improbable—the engines may really have developed an equal power in both cases—a higher pressure of steam compensating for a lower speed