SUPPLEMENT

TO

CAPTAIN SIR JOHN ROSS'S NARRATIVE

OF

A SECOND VOYAGE IN THE VICTORY,

IN

SEARCH OF A NORTH-WEST PASSAGE

CONTAINING

The Suppressed Facts

NECESSARY TO

A PROPER UNDERSTANDING OF THE CAUSES OF THE FAILURE OF THE STEAM MACHINERY OF THE VICTORY,

AND

A JUST APPRECIATION OF CAPTAIN SIR JOHN ROSS'S CHARACTER AS AN OFFICER AND A MAN OF SCIENCE.

BY

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PREFATORY NOTICE.

Captain Sir John Ross, the commander of two expeditions in search of a North-West passage, the existence of which he has left as much in doubt as ever, has, in the Narrative of his last voyage, been pleased to lay the chief blame of its failure on the manufacturers of the steam-engines with which his vessel, the Victory, was equipped. He has done this, too, in language well calculated, by its boldness and bitterness, to impress his readers with a belief that he has been a prodigious sufferer from the conduct of these parties. Nor is this impression at all likely to be weakened by the reflection that must naturally suggest itself to every one, that Captain Ross's long residence amidst the Polar snows, must have given his fit of indignation (supposing it to be real) more time for cooling down to the sobriety of truth, than usually falls to the lot of offended mortals. Perhaps, too, it may occur to many, who calling to mind how commonly generosity is combined with quickness to resentment in the naval character—gentlemanly courtesy, with sturdy rectitude—that during the eighteen months which elapsed between the return of Captain Ross to England, and the publication of his Narrative, he must, as a matter of course, have made the individuals whose characters were to be seriously affected by his complaints fully acquainted with their nature, and even offered (it would have been

no more than fair) to publish along with his charges any answer or explanation which the accused parties might have to offer. No conclusion, in short, could be more natural under all the circumstances, than that Captain Ross's charges, against the manufacturers of his machinery, were perfectly unanswerable—admitting neither of refutation nor apology.

Yet how wide is all this of the *real* truth! If the reader will but favour the following statement of facts with an attentive perusal, he will see it established beyond all dispute that Messrs. Braithwaite and Ericsson, the parties* alluded to, had no more to do with the failure of Captain Ross's second expedition than with the failure of his first; that no just ground of complaint exists against the makers of the machinery, whatever cause Captain Ross may have to reproach himself for much ignorant and foolish direction in regard to it; that the high tone assumed by the gallant Captain has no better warranty than mere braggart assurance; and that so far from courting an investigation of his charges (as it is to be presumed every honourable man would under similar circumstances have done), he never from the time of his arrival in England to the day of his Narrative issuing from the press, made the slightest communication to Messrs. Braithwaite and Ericsson on the subject.

London, 1*st Oct.* 1835.

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* Captain Ross speaks throughout his work of "Messrs. Braithwaite and Ericsson" as partnership "manufacturers" of machinery; instead of being simply joint patentees of the boiler used on board the Victory.

SUPPLEMENT

BY MR. BRAITHWAITE,

TO

CAPTAIN SIR JOHN ROSS'S NARRATIVE.

The circumstances which led me to undertake the building of the engines for the Victory may be very briefly related.

In the years 1827 and 1828 Captain Ericsson and myself patented a new boiler, or steam-generator, of much smaller dimensions, and much lighter than the ordinary steam-boiler, while at the same time it consumed much less fuel.

In September, 1827, Captain Ross was introduced to me by Mr., now Sir Felix Booth, the liberal supporter of the Captain in his schemes of discovery; Captain Ross presented to my notice a work which he had lately published, entitled "Navigation by Steam, applicable to Commerce and Maritime Warfare;" and stated that he had heard, with a good deal of interest, of our new steam-boiler, which he longed very much to inspect. I readily agreed to show it to him, both from the highly respectable introduction to which I was indebted for the honour of the Captain's acquaintance, as well

as from the persuasion that a man who had volunteered to enlighten his brother officers in the management of steam-power for maritime purposes, was likely to be beyond all others qualified to appreciate the value of our invention. As yet it had not assumed anything beyond an experimental character; but, such as it was, the Captain had free permission to be present at all our experiments. With the results of these experiments he expressed the highest possible satisfaction. Our boiler, he declared, was "just the thing he wanted," and he gave us to understand that he would certainly make use of it in a set of experiments on a large scale, which he meant forthwith to institute to prove that steam-power was quite as applicable to ships of war as to merchant-vessels.

The reader can readily imagine that after such opinions and professions as these, Captain Ross continued to be a welcome visitor at my manufactory. I reasonably anticipated that through him we had as good an opportunity as could be desired of practically testing the worth of that improvement of which he thought so highly.

Captain Ross at length informed me that he had purchased an old steam-vessel for his intended *experiments*, and that he wished me to fit it with engines upon a novel construction, the details of which he would furnish—the boilers of course to be on our new principle, and to be adapted to high pressure. For reasons of his own, which he never condescended to explain, he said he should like to have three boilers, two of ten horses', and one of twenty horses' power! After much remonstrance I was permitted to construct only two of twenty horses' each. Then as to the engines; the vessel being intended (mark this) for "*war purposes*," the cylinders and engines were

required to be placed horizontally, and as near to the bottom of the vessel as practicable, "so as to be out of the reach of shot." The steam, moreover, was not to be allowed to escape into the atmosphere, as is usual in high pressure engines, but to be condensed; and the condensation was not to be effected in the ordinary way now practised in low pressure engines, but by being admitted into small copper tubes, surrounded with cold water constantly changed around them by means of appropriate force-pumps. The water produced by this condensing process was, by another pump, to be forced back into the boiler, and as some loss of water could not be avoided, some means were to be contrived of forcing into the boiler an extra quantity of water to make up the deficiency. The reader will, I have little doubt, think this a very complicated contrivance; I confess so did I, but in *experimenting*, complication is seldom regarded, since the intention is merely to ascertain facts and results for guidance in practice. Whilst speaking of the complicated nature of the experimental Victory's machinery, I must not omit to mention, that as the new boiler required a much more powerful draught than that produced by a chimney, we had recourse to artificial means to produce it, and the best mode that suggested itself at this early period of the invention was the use of bellows. Of course bellows constantly worked will soon wear and require repair; I mention this particularly, as those who have read Captain Ross's Narrative may remember that he has expressed himself very angrily at having had to mend his bellows!

When the working drawings of this complicated machinery were all completed, and the work far advanced, I began to feel some anxiety about the paddles, and accordingly spoke to Captain Ross respect-

ing them; but of what description they were to be, was, it seemed, *a secret* which could not then be divulged. A new sort of paddle-wheel was to be used, but that was the full extent of the information that could as yet be intrusted to me. But although the nature of the paddle-wheel itself could not be disclosed, it became imperative that we should know the precise point at which the paddle-shaft was to pass through the side of the vessel. This point was accordingly marked out by Captain Ross, when it became evident that the intention was not to attach the paddle-wheels to the main shaft of the engines—the latter being placed much nearer to the bottom of the vessel than the point so marked out; and that gear-work, that is cog-wheels, would therefore be required to communicate the power of the engines to the paddle-wheel shaft. What was complicated before, was thus rendered still more so. Of the new paddle-wheels themselves, which at length became revealed, more presently.

As the completion of the engines proceeded, the Victory underwent a material alteration; she was lined all over, raised about five feet and paddle-boxes of huge dimensions erected. Captain Ross, when questioned as to the necessity for timber of such unusual dimensions, gravely informed us, that it was his intention to make that part "shot proof." The deception had been so ably maintained, that there was but little occasion for this fresh falsehood to mislead us. Not content with all this, however, Captain Ross absolutely went so far as to tell us that he was "going to fire *red-hot shot!* and that he should require furnaces for the purpose." When I add that we actually proceeded to plan such furnaces, the reader will be convinced that Captain Ross must have performed

his part of mystification to perfection. And what was the object of all this miserable deception? Merely to prevent two persons in whom he was bound to place some confidence (and in whom he might have confided entirely) from knowing a few weeks sooner, that he was again in search of a North-West Passage!

Had Captain Ross only from the commencement confided in Captain Ericsson and myself and spoken the truth—had he but informed us of his real intentions—we should have proposed to construct machinery for him in which *simplicity and certainty of performance* would have taken precedence of every other consideration. But as it was, there was but little left to our judgment or discretion; we had but to execute the orders of our employer, such as they were.

It was to Captain Ross's (not our) unskilful introduction of spur-gear to transmit the action of the engine to the paddle-wheels, that all the stoppages of which Captain Ross complains so much in his Narrative were entirely owing. They arose from the giving way of the coupling-keys of the main shaft. Each engine (witness all the Clyde boats and many others with single engines) would have worked quite as well by itself as if coupled with the other. I do not mean to say that the spur-gear, even as it was, would have prevented each engine from working singly, but still its introduction had the effect of making our would-be sailor-engineer believe that it was necessary to stop both engines on every occasion of the coupling-keys giving way, in order to patch up or "make new keys" while he might have kept his engines steadily going in spite of the much-bewailed, though really insignificant, breakages. Sure I am, that there is not a stoker in any of his Majesty's steam-ships

to whom the idea of working the engines singly would not have suggested itself.

To return to the fitting up the machinery for the Victory. The period at length arrived which disclosed the principle of the new paddle-wheel. The paddle-boxes were also completed, which were destined to cover, or rather *to confine* them; and a more perfect specimen of ignorance of the laws which ought to be followed in the construction of bodies intended to move through water than these said paddle-boxes displayed, cannot well be conceived. Let the reader imagine to himself two square boxes, one on each side of the vessel, the wall or perpendicular sides extending downwards and terminating abruptly towards the water-line; the ends also reaching down to the water, but sloping off gradually towards the side of the vessel; the whole so very *judiciously* contrived as to make the free ingress and egress of water from the boxes impossible! It becomes almost necessary to repeat that these boxes were actually intended to contain the *paddle-wheels.*

The engines being at last fixed and the paddle-wheels attached, the entire machinery was started, but while the vessel, be it observed, yet remained in the dry dock. Everything on this first trial went off well; the paddles, in particular, as they had the air only to beat, worked beautifully, to the no small delight and exultation of Captain Ross. No sooner was this preliminary trial over, than numbers of distinguished persons were invited by Captain Ross to view the machinery, to the great inconvenience of the workmen employed in finishing it off. And here I may be allowed to remind Captain Ross of the praise which he uniformly bestowed upon the superiority of *the workmanship* of the engines, as also on

the individual to whom he modestly reserved all the credit of *contrivance.*

As the vessel had not as yet left the dry dock, we could not form any correct opinion of the operation of the paddle-wheels, but our worst fears were realized the moment the vessel was afloat. In the first place, she drew *three feet* more water than Captain Ross had calculated upon or rather anticipated; for Captain Ross seems to have regarded all *calculation* as extremely superfluous in the getting up of this remarkable steam-ship. When the most necessary stores and a moderate supply of fuel had been taken on board, the vessel was so far brought down in the water, as to leave but one foot between the paddle-shaft and the water-line! Still this circumstance appeared to give no concern to Captain Ross; nay, to our great surprise, he distinctly declared that he did not expect and did not believe this deep immersion of the paddle-wheels would in the least influence the working of the engines or affect the speed of the vessel! We tried to reason him out of this preposterous notion, but he stubbornly defended it on the ground of the "peculiarity of the construction of the new paddle-wheel."

I will now state what constituted this peculiarity of construction:—The floats or paddle-boards, instead of being as usual, placed parallel with the paddle-shaft, were, in the new wheel, placed at an angle of forty-five degrees to it; but, as before, each end of the float was at an equal distance from the centre line of the shaft, performing equal circles during the revolution of the wheel. The only difference then between the action of this paddle-wheel and that of the common one was this:—that in the wheel used

by Captain Ross, the one end of the float entered the water before the other, whereas in the common paddle-wheel the whole length of the float enters at once. I must, at the same time, not omit to state that the length of the angular float should be greater than the length of the ordinary float to produce an equal resistance; forty-five degrees being the deviation from the parallel line, it follows that supposing the angular floats used by Captain Ross to have been eight feet long, they would not have produced any more resistance than floats five feet eight inches long placed in the ordinary or approved manner. As far as regards immersion, however, I feel convinced there is no one who ever reflected on the subject, except, perhaps, the author of "Navigation by Steam, applicable to Commerce and Maritime Warfare," who will not admit that there is no difference whatever between the common paddle-wheeel and the one to which Captain Ross attributed properties at variance with the most simple physical laws—laws well understood even by those who have *no pretensions* to be thought scientific. Accordingly the immersion which is most effective for the former of these wheels is also most effective for the latter; and common sense and practice unite to assure us that to *plunge the wheel into the water nearly to its axis* (although in conformity with Captain Ross's hydraulic doctrines) is a degree of immersion altogether absurd.

Previously to detailing the progress of the experiments or entering into any calculations to prove this all-important point, *the want of speed*, it is necessary to state that, before we commenced the construction of the engines, a written contract was entered into with Captain Ross, which contained the following stipula-

tions--viz. that the cylinders should be sixteen inches in diameter, with thirty inches stroke, and the speed of the engines from thirty-five to forty revolutions per minute (this of course meant that the boilers should be capable of supplying steam at that rate), and the pressure to be equal to forty-five pounds per square inch. Now, that Captain Ross, a writer upon steam navigation, should not possess knowledge enough to be able to proportion his paddle-wheels and floats to cylinders of the dimensions and worked under the pressure specified, never entered our minds. Indeed, it was no business of our's to inquire about the fitness of the relative proportions, since we were not permitted to know the form of the paddle-wheels, much less their dimensions or intended immersion in the water. We followed the proportions laid down by Captain Ross and specified in the contract, and the blame of whatever error there may have been in them, attaches entirely to *him*, not to us. That the cylinders actually were of sufficient dimensions had the paddle-wheels been properly applied, I will prove hereafter.

I have stated that the vessel, when afloat with some of her stores, was so deeply immersed as to leave a space of only one foot between the paddle-shaft and the water-line, the paddle-wheels being thus nearly half immersed in the water. I will now proceed to relate the result of our first trial with the Victory afloat, and fast to her moorings. On starting the engines it was soon evident that although the extreme diameter of the paddle-wheels was only eleven feet, six inches, the utmost speed which could be obtained was sixteen revolutions per minute, averaging even under fifteen. But what was far more discouraging, was the

trifling tension on the hawser which held the vessel to her moorings, and which could not have escaped an experienced eye. This was, in itself, a conclusive proof that the paddles were too deeply immersed in the water, besides being boxed up in such a manner as to prevent a free current to and from the wheels. A few figures will readily satisfy the reader what the tension on the hawser ought to have been, and that the power of the engines was positively *wasted*, instead of being employed to *urge the vessel forward.*

The diameter of the cylinders, as stated, was sixteen inches, pressure forty-five pounds to the square inch; but the steam being shut off before the termination of the stroke, the effective pressure was thirty pounds to the square inch. Now, sixteen inches diameter gives a surface of 201 square inches, which, multiplied by the pressure (thirty pounds), produces upwards of six thousand pounds, being the actual force of the piston; for each revolution of the engine the piston moved through a space of twice two feet six inches, that is five feet; but during the same period the centre of the paddle-board (being two feet deep) moved through a circle of precisely thirty feet, hence 5-30ths of six thousand pounds, that is one thousand pounds will be the force which urges the wheel round, and this force would, with the common paddle-wheel properly trimmed or immersed, be the force, or nearly so, with which the vessel is urged forward. There being *two* cylinders and *two* wheels, it follows that the tension on the hawser before-mentioned, ought to have been two thousand pounds, a force sufficient to have produced a speed of eight miles an hour. It may be proper to add for the information of those of my readers who are not familiar with

the subject of steam machinery, that two thousand pounds is exactly the force with which an ordinary marine engine of forty horses' power is calculated to urge round the wheels, that is supposing this force to be applied in the circle which passes through the centre of the floats.

If any further proofs were wanting to show the bungling inefficiency of the method in which Captain Ross had applied his paddle-wheels, it is this fact,—that when the Victory was cast off her moorings and got under weigh, *the wheels moved no faster than before* (Captain Ross states in his Narrative that he could not exceed fourteen revolutions); now, in every other steam-boat, when in full motion, the paddle-wheels always move with *double* the velocity to what they do when the vessel is moored or stationary.

Captain Ross, however reluctant he may feel, or might have felt to enter into any calculation or reasoning to trace the causes of this unusual result, cannot, it is presumed, deny that there must have been something radically defective in the application of his paddle-wheels. I tell him now, as I did at the time, (to say nothing of the highly improper and clumsy construction of his paddle-boxes,) that they were too deeply immersed, and that the power of his engines was wasted in consequence.

One need not be a profound philosopher to comprehend that in Captain Ross's wheel, immersed nearly to its axis, every float in entering the water, must, in its endeavour to depress it, have met with just as much resistance when placed in the vertical position as it encountered in urging the water along in a horizontal direction; hence, in every position, these floats would absorb an equal quantity of the moving force; but I would ask, could these floats in entering the water with a nearly perpendicular movement, dipping into it

"broadside foremost," urge the vessel forward? Assuredly not. they could only tend to lift the vessel in entering and to depress it in leaving the water, thereby absorbing force without propelling.

Enough, I trust, has been said to convince the reader that Captain Ross's paddle-wheel, immersed as it was nearly to the axis, and confined in a box which totally prevented a free ingress and egress of the current, could not give any great speed to his vessel, but that it possessed to perfection the property of absorbing or wasting the power of the engines.

It would be tedious to pursue this subject any further, otherwise I could easily prove that not only did the very deep immersion of the floats of Captain Ross's paddle-wheel absorb the power of the engines, but that it positively retarded the progress of the vessel. The reasons will be obvious to every one who will take the trouble to compare the direction in which a float of a wheel immersed to its axis moves when entering and leaving the water, with the direction in which the vessel moves.

Captain Ross asserts that the cylinders of the engine were not large enough for the power I had contracted to furnish. Now to show the groundlessness of this charge, I must remind the reader that Captain Ross, in drawing up the contract, desired that the cylinders and engines should be proportioned for a speed of from thirty-five to forty revolutions per minute. I will, therefore, form my calculations on the lesser number, that being in the Captain's favour.

Two engines of twenty-horses' power each, it will be recollected, were to be provided; I have already explained that the effective pressure of the steam was thirty pounds to the square inch, and

the superficial measurement of the piston was 201 square inches; 201 times 30=6030 pounds moving force of piston; stroke, two feet six inches, that is five feet space moved through each revolution, which at thirty-five revolutions per minute is equal to 175 feet space through which the piston moved every minute; the moving force as stated, being 6030 pounds multiplied by 175, produces a force equal to 1,055,250 pounds raised one foot high; this sum being divided by 33,000 pounds (which is the number of pounds which the power of a horse is capable of raising one foot high in one minute) it will be seen that $31\frac{2}{175}$ horses' power is the absolute force of each engine, although only twenty horses' power was contracted for; this mode of calculating is that adopted by all the world, and, moreover, Captain Ross, in his work on "Steam Navigation" before alluded to, lays down the very same rule for estimating the power of an engine.

Having thus proved that Captain Ross's own short-sighted policy, to use no harsher term, his own crude notions and ill-digested plans, were the sole causes of the ill success of the experimental machinery in his steam-ship the Victory—which ill success he has so wantonly and erroneously ascribed to the manufacturers, I will now advert a little more particularly to each distinct charge which Captain Ross has thought fit to bring against us.

First—The machinery is designated as being "*execrable*." Execrable, indeed, was the idea of employing nothing but new and untried machinery, and complicated to boot; and still more execrable the expedient of telling the makers of the engines, that they were intended to propel a vessel constructed for "*war purposes*." That the *workmanship* of *the machinery* itself was defective is utterly

false. Every pains was taken to make the engines as perfect as possible. Neither trouble nor expense was spared; every one, too, thought well of them, as hundreds can attest, who inspected them while in progress and when fixed in the vessel; even Captain Ross himself was full of their praise.

Second—Captain Ericsson and myself are charged with "*gross negligence*," but in such general terms that we are left in the dark as to the points of our conduct which we have under this head to defend. Did our negligence consist in passing many whole nights on board his vessel after we knew its destination, and the season was far advanced, in order to forward the completion of the work, and redeem, as far as lay in our power, the baneful effects of the wanton deception he had practised at the commencement? Or in our keeping constantly, even during the night, a great number of men at work till the Victory was ready for sea?

Third—"*The giving way of the coupling-keys of the main shaft*," about which Captain Ross has made so much noise, and which it appears caused so many delays and so much loss of valuable time. Having before adverted, at some length, to this subject, I will only here remark that Captain Ross, instead of stopping his engines, should have continued to work them, caring nothing for the imaginary disaster, for each engine would have worked by itself, and this Captain Ross, with all his self-sufficiency, ought to have known. There might have been some clattering noise in the cog-wheels, but its worst result would have been to remind him of his folly in introducing these cog-wheels at all, for had there been no such wheels, the working each engine separately might have been attended with great benefit when amongst the ice. By

slacking or stopping the one, and keeping up, at the same time, full speed with the other, he would have been enabled to perform many most serviceable evolutions amidst the floes and icebergs with which he was beset.

Fourth—*The external leakage of the boiler.*—Every high-pressure boiler leaks more or less until worked for some time, when the leaks (to use a technical expression) "take up." Now, as Captain Ross worked with distilled water, and there was thus an absence of all sediment, a much greater time than usual would naturally elapse before the leaks, in this case, could "take up." The *malt-dust* confounded by Captain Ross, with "dung and potatoes," which he was told to put into the boilers, should have been repeated three or four times, which would have rendered the water, in some degree, mucilaginous, and caused the leaks to "take up" much sooner.

As to the workmanship of the boilers, it was of the first-rate description, and everything that could be done, was done to ensure their soundness. They were even tried under a pressure of one hundred pounds to the square inch, to prove they could be depended upon.

Fifth—The *internal leakage of the boilers.*—Captain Ross having candidly stated, to his readers, that the leak inside the boiler was occasioned by the flue-pipe having been pressed flat, I will dispose of this charge simply by stating, that this misfortune could not have taken place but for the tube being allowed to get red-hot through the neglect of those who ought to have attended to the height of the water in the boiler. The numerous holes spoken of

were the necessary consequence of the neglect which suffered the tube to get red hot.

Sixth—"*The wearing of the bellows.*" I have before explained this matter to the reader, and to save repetition I will only state that Captain Ross knew perfectly well before he ordered the engines, that bellows became indispensable to produce the requisite draught. Indeed, this formed, in the estimation of Captain Ross, one of the best features of the entire arrangement. That bellows constantly worked are not very lasting, Captain Ross ought to have known, and provided himself accordingly.

Seventh—"*The cylinders not of sufficient size.*" The falsity of this assertion I have so fully proved, that nothing further need be said except to remind the reader that instead of twenty horses' power contracted for by Captain Ross, the cylinders were sufficiently large to produce upwards of thirty horses' power each when worked at the speed determined by Captain Ross himself, as the basis upon which the cylinders were calculated and proportioned.

Eighth—*Want of speed in the ship.* For this Captain Ross has himself alone to blame; it was assuredly no fault of Messrs. Braithwaite and Ericsson that the Victory drew three feet more water than it should have done consistently with the position of the paddle-wheels. That the vessel was *impeded and the power of the engines absorbed by the too deep immersion of the paddle-wheels,* as well as the too-confined construction of the paddle-boxes, is a fact so indisputable that nobody with less effrontery than Captain Ross would attempt to deny it.

Having thus explained for what *purpose* the machinery of the Victory was from the *commencement* constructed, as well as the

origin of the peculiarities and errors in that construction, and having disproved the statement put forth by Captain Ross, which attributes to Captain Ericsson and myself the failure of his last enterprise, I will now take a summary review of the conduct of Captain Ross, by which the reader at one glance will see the true position of the gallant Captain.

Captain Ross deceived us as to the *real object* of the machinery which he instructed us to make.

He positively ordered us to place the engines *under the water-line* to be out of the reach of shot. He told us that he wanted to try the experiment of condensing the steam in tubes, and to use the same water over and over again; for which purpose we made him a condensing apparatus *(never before tried)* according to his own directions.

We received orders to supply him with our patent steam-boiler, which, though it promised well, was never before used for any *practical purpose.*

Captain Ross refused to acquaint us with the nature of the paddles he was going to use, and thus concealed from us a material circumstance to be taken into account in proportioning the size of the cylinders, for which the only instruction given was that the engines should make from thirty-five to forty strokes per minute.

Without being at all consulted whether the introduction of cog-wheels was advisable or not, we received orders to make such wheels for communicating the power of the engines to the paddle-wheels. Determined not to call in *our* assistance to aid him in his calculations touching the proper height of the pad-

dle-wheels, &c., that part forming a particular hobby of his own, Captain Ross committed errors to such an extent that the paddle-wheels became immersed nearly to their axis, whereby undue resistance was opposed to the engines and the propelling power of the paddles destroyed.

Besides his discreditable miscalculation of the floatation of his vessel he plunged his otherwise ill-constructed paddle-boxes so deeply in the water as to present an insurmountable obstacle to the attainment of any considerable speed.

Having related the instructions given to us by Captain Ross, and shown the part he took in the construction of the machinery intended to propel the Victory, I confidently appeal to the whole world whether Captain Ross has not calumniated the makers of his engines in ascribing to them the failure of his steam-ship; and whether it be not the fact that Captain Ross has slandered them, in order to divert attention from his own errors, his own blunders, and from the disgraceful ignorance and incompetency in which all these errors and blunders originated?