For the Journal of the Franklin Institute.

On Marine Propulsion. By J. V. MERRICK.

It appears from the last "Reply" of Mr. Nystrom, published in the May number, that he is still unable to understand the true theory on the slip question. Possibly this might not have been the case, had he read attentively what he professes to criticize; in which case he would not have compelled me to notice one or two instances of misrepresentation, which are evidently the result of carelessness in reading.

The first passage to be noticed reads as follows:

"Now, after Mr. M.'s lengthy disquisition, "that slip is no loss of effect," he comes to the conclusion of my first formula: $p v = r s$, or, as Mr. M. expresses it, $p : r = s : v$, in which

p = coefficient of the vessel.

r = area of floats multiplied by the coefficient for resistance to plane surfaces.

v = velocity of the vessel.

s = velocity of the water backwards (slip).

This is a proof that slip is no loss of effect. The effect delivered from the steam engine $r s = p v$ the useful effect.

After Mr. M. has embodied the formula, he condemns it as wrong, and says it should be $p = r$.

If Mr. M. had substituted *resistance* of the vessel instead of *coefficient*, it would have been all right. But this "coefficient" makes the remainder of his article wrong."

If Mr. Nystrom will turn back to his own article in the March number, p. 200, he will find the following notation, which precedes the equation commented upon:

" p = mean thrust of dynamometer in pounds;

r = resistance to the propeller in pounds," &c., &c.

If he will then read again the definition given of the term "coefficient," (vide note, foot of p. 272,) and the examples given to illustrate it in the case of the *San Jacinto*, he will see that (the same notation being adopted) $p = C v^2$, when C = coefficient of the vessel, and v its velocity, and that p and r are simply convertible terms, since the resistance of the propeller in pounds is precisely the same as that of the vessel in pounds; in other words, the 12,815 pounds measured by the dynamometer of the *San Jacinto*, expresses either the pressure of the propeller backward against the water, or the resistance opposed by the vessel at the velocity at which it was moving forward—one of the very *elementary* principles in mechanics.

The assumption, therefore, that I have first condemned and then embodied Mr. Nystrom's formula, is entirely gratuitous.

To have substituted, as he suggests, the term, *resistance for coefficient*, would have been correcting (?) that which was right before.

Again: in the course of his remarks, Mr. N. indulges in some facetious observations respecting "square radius," and "square degrees," based upon a typographical omission in the text; for a correction of which he is referred to the "Errata" in the May number. Notwithstanding this omission, the result obtained was correct, as a little calculation would have shown him.

In this connexion it may be remarked, that although the projected area of the *San Jacinto's* propeller was inadvertently misquoted, an examina-

tion of the context will show what was *intended*. The error affected only that particular case, and not the principle involved; showing only that a higher coefficient for the resistance of plane surfaces obtained in that instance, than .845, which was therein deduced. The true coefficient was 2.347.

But to prolong this discussion will be of little avail: the arguments, *pro* and *con*, are before those who take any interest in the subject. I shall, therefore, conclude what I have to say, by showing to Mr. Nystrom the fallacy of the argument on which he relies for proof—an argument on which he appears to have expended a vast number of figures and equations.

To demonstrate this point, we have only to examine the diagrams by which the argument is illustrated.

We there find that a fulcrum, which has always been supposed to be a point of support for the action of the power, in propelling a vessel as well as in moving any other resistance, is an imaginary point in the area of a paddle wheel, situated somewhere between the shaft and the immersed float—the position of this point being determined merely by the ratio between the advance of the vessel and the slip. This is a very convenient (for the argument) and quite original method of viewing the lever. There is only one trifling circumstance overlooked, which is, that the “fulcrum” moves over space in the same direction and with the same velocity as the resistance.

To those who are content with the old method of considering the lever, it is easier to suppose that the fulcrum is in the water; that this fulcrum recedes a certain proportion of the whole movement due to the power; and that the resistance is moved over a space equal to the difference between these two spaces: in other words, that the arm of a paddle wheel is to be judged of precisely in the same manner as the arm of a locomotive driving wheel.

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On the Comparative Value of Anthracite and Bituminous Coals for the purpose of Generating Steam.

Congress has recently called on the Secretary of the Navy for the report of the Engineer in Chief, Charles B. Stuart, Esq., on the comparative value of the two different kinds of coal for the purpose of generating steam. Some years since a large number of experiments were made by Professor Walter R. Johnson, from samples of coal furnished by miners, all of which were published by authority of Congress; and in consequence of the result of those experiments, the naval steamers have been supplied with Cumberland coal, very much to their injury and expense.

The only true test of the comparative value of coal is to take the two kinds as they are delivered at your ship, stowed in the bunkers, and brought out at your boilers ready for use. The anthracite will undergo all this without change, while the Cumberland, from its friable nature, becomes reduced almost to a powder.