

account of his conception and development of this invention is given, that it would be a trespass upon patience to restate it in this report. After a careful examination of the invention and all collateral information seeming to bear upon the subject within reach of your committee, they are fully warranted in the conclusion that the entire credit of originating and perfecting the method or system herein described, of metal forging by rolling shapes, without impairing the quality of the work by upsetting, belongs to Mr. Simonds, and that the high degree of perfection to which he has brought this new art, both in facilitating production and in improving the product, fully entitles him to recognition by the highest award in the gift of the FRANKLIN INSTITUTE, viz: the ELLIOTT CRESSON MEDAL.

Respectfully submitted,

S. LLOYD WIEGAND,

J. SELLERS BANCROFT,

HUGO BILGRAM,

JOHN H. COOPER,

L. L. CHENEY.

*Adopted October 3, 1888.*

GEORGE A. KOENIG, *Chairman.*

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## THE RELATIVE VALUE OF ALUMINIUM AND ITS ALLOYS IN THE ARTS.

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(A CORRECTION BY MR. PEMBERTON.)

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In the article on "Aluminium and its Alloys," published in the October impression of this JOURNAL, the statement was made that the United States Government had countermanded the order for manganese bronze for the construction of propeller blades, and had adopted aluminium brass in its stead. This statement was taken from a letter, by Mr. Eugene H. Cowles, to *Engineering*, appearing in its issue of June 1, 1888. As a matter of precaution, however, the entire paper on the subject was submitted to Mr. Alfred H. Cowles, but, unfortunately, owing to his absence from Lockport, did not reach him early enough to allow him time to

reply before publication. He writes me that the Government has "accepted our No. 3 aluminium bronze for this purpose, but still leaves the contractors free to use manganese bronze if they so desire. It results in our having to furnish the aluminium bronze with very high strength specifications in competition with manganese bronze with no strength specification stipulated, and at the same price. We are now making the wheel for the gun-boat *Petrel*."

H. PEMBERTON, JR.

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## ON THE DISTRIBUTION OF INTERNAL FRICTION OF ENGINES.\*

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BY ROBERT H. THURSTON, Ithaca, N. Y.

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### INTRODUCTION.

In earlier papers, read at various times before the American Society of Mechanical Engineers, the writer has called attention to the fact that the variation of load in steam-engines is not productive either of the method or of the amount of engine friction that has been commonly assumed by earlier authorities on that subject.† It was shown that the formula of De Pambour, which makes the internal friction of the engine proportional to the load on its piston is not usually correct, and probably is never so, with any familiar form of engine, or under any conditions often met with in practice. It was further shown that, under the conditions of usual practice, and at all ordinary speeds and pressures of steam, the resistance of the engine itself, its internal friction, remains sensibly constant, and that the so-called friction-card of the machine represents practically the friction of the engine when fully loaded, the indicated power without load being sensibly the measure of the

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\* Read at the Scranton Meeting of the American Society of Mechanical Engineers, October 15-19, 1888.

† "Friction of Non-condensing Engines." *Trans.* Vol. viii, No. ccxxviii and Vol. ix, No. cclxv.