Scientific American.

ESTABLISHED 1845

MUNN & CO., - - - EDITORS AND PROPRIETORS.

PUBLISHED WEEKLY AT

No. 361 BROADWAY, - - NEW YORK.

TERMS TO SUBSCRIBERS

One copy, one year, for the United States, Canada, or Mexico $3.00
One copy, one year, to any foreign country, postage prepaid, £0 16s. 5d. 4.00

THE SCIENTIFIC AMERICAN PUBLICATIONS.

Scientific American (Established 1845) ....$3.00 a year.
Scientific American Supplement (Established 1876) .... 5.00 "
Scientific American Building Edition (Established 1885). ...... 2.50 "
Scientific American Export Edition (Established 1878) ...... 3.00 "

The combined subscription rates and rates to foreign countries will be furnished upon application.

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MUNN & CO., 361 Broadway, corner Franklin Street, New York.

NEW YORK, SATURDAY, FEBRUARY 9, 1901.

The Editor is always glad to receive for examination illustrated articles on subjects of timely interest. If the photographs are *sharp*, the articles *short*, and the facts *authentic*, the contributions will receive special attention. Accepted articles will be paid for at regular space rates.

RAIL JOINTS AND STREET NOISES

A correspondent from the town of Bridgewater, Nova Scotia, referring to an article in this journal on rail joints and street noises, in which the use of the welded joint was suggested as the best means of getting rid of the loud pounding which seems to be inseparable from the present forms of spliced joints, asks us whether it would not be a better plan to provide a double rail consisting of two lines of rails, laid side by side, so that the joints of one rail would always lie at the middle of the adjoining rail. The idea is not new, and has been tried, we believe, on some European roads, where it was found that although the pounding was reduced, and the low-joint difficulty removed, there were so many attendant disadvantages as more than to neutralize any benefits secured. The separate elements of a double rail must necessarily be bolted together, and the difficulty and labor of keeping the bolts tight is enormous. Our recent suggestion that the elevated railways in this city would do well, in the reconstruction of their road, to introduce the welded joint, has been criticised on the ground that, except where such welded rails are embedded in concrete or Belgian blocks, it is impossible to preserve their alinement, because of the stresses which are set up by expansion and contraction under changes of temperature. We are perfectly aware of the necessity for holding the rails in line during hot weather, but are of the opinion that if screw-bolt connections instead of the inadequate railway spike were used on every tie, and if each tie were bolted to the stringers of the elevated structure, it would be quite possible to hold the rails in alinement even in the hottest summer weather. Such a construction would be costly in maintenance, and might not indeed commend itself to the shareholders; but it would bring relief to the citizens of New York from an inferno of din for which there is no parallel in any city of the world.

POUND-PER-HORSEPOWER ECONOMY.

It seems likely that to the marine engineer will belong the credit of having built and introduced an installation of boilers and engines that is capable of doing day by day work on a fuel consumption of less than a pound of coal, per horse power, per hour. We all remember the world-wide interest which was aroused by the quadruple expansion, five-crank engines of the steamship "Inchmona," which were the first to bring down fuel consumption to the one pound limit. The success of this vessel encouraged the owners of the "Inch" line of steamers, and the Central Machine Engine Works, of West Hartlepool, England, to follow up their experiments, and in the "Inchkeith" and "Inchdune" the consumption has been brought down respectively to 0.99 and 0.97 pound per horse power per hour. We must content ourselves here with giving the salient features of the installation of the vessels, and refer our readers to the next issue of the SUPPLEMENT for the drawings and full particulars. Of these vessels it may be said that every refinement that would bring the performance of their motive power nearer to the theoretically perfect steam engine and boiler has been installed. All the cylinders, with the exception of the high-pressure, are lined and jacketed, the last-named being unjacketed. The cylinders are completely surrounded by steam, all external surfaces being well lagged with asbestos. The expansion is quadruple, in five cylinders, two of which are low-pressure. The boilers are of the Scotch type, and carry a pressure of 267 pounds to the square inch. Above the boiler tubes at the front end is a superheater, and above this are nests of vertical pipes for heating the air on its way to the furnace. Special attention is paid to the feed-water, which is pumped first through a contact heater, then through a surface heater and is filtered before passing to the boilers. The feed-water, which at the hot well has a temperature of 96½ degrees, leaves the contact heater at 209 degrees, and the surface heater at 370 degrees. The steam enters the superheater at 412 degrees and leaves it at 469½ degrees. In the tests the temperature of the air on the deck of the vessel was 53 degrees, and after leaving the heater it entered the furnace at 290 degrees. The temperature of the gases on leaving the boiler tubes was 587 degrees; this was lowered 44 degrees in the superheater, and 41 degrees in the air-heating tubes. The hot gases are drawn through the air-heating tubes and delivered to the smokestack by means of a fan, and such is the saving of heat that their temperature at the fan discharge was lowered to 319 degrees F., that is to say, over 90 degrees below the temperature of the steam in the boilers.

These remarkable results were obtained on a lengthy trial carried out between Hartlepool in the North of England and Dover. If, for the sake of comparison, the consumption be taken as one pound of coal, it is estimated by our contemporary, Engineering, that it is equivalent to a consumption of 15½ tons per day, in a vessel carrying 6,170 tons at 9½ knots an hour, or to 13¼ tons a day at a speed of 9 knots an hour. To put it another way, one ton is carried one knot for a third of an ounce of coal, and with coal at $4 a ton this would be equivalent to carrying one ton of cargo a distance of 275 miles at a cost for fuel of one cent.

PROGRESS OF TURBINE PROPULSION.

An important step in the development of the turbine-propelled vessel has just been taken in the signing of a contract for the construction of a large turbine-propelled passenger steamer for use on the Firth of Clyde. The vessel is to be 250 feet in length, 30 feet in beam, and 11 feet in molded depth, and she is to attain a speed of 20 knots with turbine engines of 3,500 to 4,000 horse power. Power will be developed on three shafts, by a compound turbine; one high pressure on the center shaft, and two low pressure turbines on the side shafts. The determination to construct a vessel of this size will be welcomed by the builders of deep sea steamers, for it forms the next logical step in a development which commenced with the little "Turbinia," and was carried on in the 380-ton "Viper" and "Cobra." We understand that probably a contract for a large cross-channel steamer of about 2,000 tons displacement, propelled by turbines, will shortly be let.

AIR RESISTANCE OF RAILWAY TRAINS

Additional light has recently been thrown upon the question of air resistance of railway trains by experiments which were carried out by Prof. Francis E. Nipher, of Washington University, who, upon being called in as an expert in a legal case, in which it was claimed that a boy had been drawn under a fast train by what is popularly known as "air suction," determined to test the action of a moving train upon the air, by actual train experiments. The method adopted was to use a hollow cylinder of brass to collect the air when the train was in motion, the open end being directed toward the front of the train, and the wind pressure being shown by means of a tube connecting the after end of the air collector with a water gage in the car. The air collector was so arranged that it could be placed at a distance from the side of the car varying from nothing to 30 inches. A great number of experiments were made. During one lengthy trial, which was carried out on an express train from St. Louis to Burlington and back, a distance of 316 miles, in which 957 measurements were taken, pressures were recorded of 0.95 pound to 2.62 pounds per square foot, the pressure of 0.95 pound being equivalent to that which would be experienced by a person standing 30 inches from the passing train, and the pressure of 2.62 pounds to the square foot being that which would be experienced by a person standing immediately against a car with just sufficient clearance for it to pass. It was estimated that the pressure, when the collector was thrust far out into the undisturbed air, was 3.42 pounds per square foot. These results, it must be remembered, are true simply for a speed of 40 miles an hour, and at higher speeds of 50, 60 and 70 miles an hour the pressure would increase proportionately.

RELATIVE FIGHTING EFFICIENCY OF WARSHIPS.

We have before us an article by the brilliant Chief Naval Constructor of the German Navy, Otto Kretschmer, in which he offers a method of estimating the relative fighting values of warships. This is not by any means the first time an effort has been made to strike a mean between the various elements of fighting power which go to make up the total fighting value of a ship, and so arrive at a total numerical figure of each vessel, which should enable ships of widely different design to be compared directly and placed in the order of their merit. Such comparisons are necessarily of an arbitrary nature, and the value numbers assigned to the different elements of efficiency will vary in different writers. While the present comparison is extremely ingenious and carefully worked out, the results arrived at are, in the case of the United States vessels, to say the least, very astonishing. No one can accuse the German Chief Naval Constructor of partiality, inasmuch as the battleship "Kaiser Friedrich III." of his own navy is placed eighth on the list of the eleven battleships which enter into the comparison. The highest figure of merit is awarded to the Japanese battleship "Mikasa," which carries 15.23 points. The second most efficient vessel is also a Japanese battleship, the "Shikishima," with 14.15 points; then follow the "Formidable," of Great Britain, 12.77 points; the "Suffren," of France, 11.70; "Duncan," Great Britain," 11.46; "Cesarevitch," Russian, 11.23; "Retvisan," the battleship built by the Cramps for Russia, 9.16; the "Kaiser Friedrich," 7.38; the "Charlemagne," of France, 6.15 points; the "St. Bon," Italy, 5.23; and the "Alabama," of the United States, 5.23. While we are quite willing to admit that the "Mikasa," with 2 knots higher speed, larger coal capacity, and bigger displacement, is a better ship than the "Alabama," it is, on the face of it, absurd to affirm that the ratio for fighting values is as 15 to 5. It seems that the data used by the author was taken from an Austrian naval annual, and it is likely that the gun power of the "Alabama" is based upon the supposed use of the old brown powder. Moreover, it is also possible that the normal has been confused with the maximum coal capacity. A few errors of this kind will readily account for the low position of this vessel on the list. On the whole, we think that the comparative table before us simply affords additional proof of the impossibility of determining, except by the actual test of battle, just what is the relative efficiency of warships of widely different design.

COMPARATIVE COST OF PRIME MOVERS.

The present century will not have run very far on its course before the manufacturers of industrial establishments will be confronted with the problem of making a choice between three or four different prime movers, with a view to selecting the one which has the strongest recommendation on the grounds of economy. This choice will not be an easy one, except in certain specified localities where the conditions are such as to make the adoption of a particular type of power clearly desirable. In the nineteenth century no choice of powers has presented itself, not at any rate in the second and third quarters of the century, in which the steam engine had established itself as the universal prime mover without any serious competitor in sight. In the last quarter of the century, it is true, the wonderful development of the water turbine, the electric generator, and the transmission line, has brought into the field a competitor whose superior economy is undisputed when the competition takes place in the immediate locality in which the water power is developed. This superiority, indeed, is only challenged when the increasing length of the line begins to multiply the cost of the transmission.

The most notable developments of hydraulic power which have taken place in the past decade are those at Haute-Saboie in France, at Rheinfelden in Germany, and at Niagara; and the undoubted success of these installations has led to the construction of a large number of less important plants, that differ from these merely in the magnitude of power developed, and the details of the turbines and generators. It is probable that at the present writing the total amount of hydraulic electric power which is now being generated the world over is somewhere between 400,000 and 500,000 horse power. There are signs, in the opening years of the century, that a third competitor in the generation of large quantities of power in central stations has appeared in the shape of the utilization of furnace and producer gas in gas engines of large dimensions. Gas engines of as high as 700 horse power have been built, and they are working smoothly and economically, while at several mills in Belgium the blast furnace gases have been used for driving gas engines which supply the blast.

The question of the relative economy of steam, water and gas was treated at considerable length in a paper presented by Mr. J. B. C. Kershaw at a recent meeting of the British Association, and the conclusions which were reached were based upon a large amount of data, which had been carefully gathered from various existing plants. In order to secure a common basis of comparison the author has calculated the results upon the basis of the cost per year of 8,760 hours, the results being tabulated in connection with the locality in which they were achieved, with the object that local conditions, such as cost of labor, fuel, transportation, etc., might carry their full weight.

In regard to hydraulic power there is considerable variation in the cost, due chiefly to the wide difference in the first cost of the plant. But little preliminary work was required in some cases, while in others there was a vast amount of costly work in the construc-