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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.

THE TURBINE THE COMPLEMENT OF THE COMPOUND ENGINE.

In a discussion at the last meeting of the Institution of Naval Architects in England of the best method of combining the reciprocating engine and the steam turbine in the propulsion of steamships, the proposition was made that the best results would be obtained if the reciprocating engine were of the compound type. In a recent discussion of this subject in the Shipping World, a member of the Institution claims that the consumption of 100 pounds of steam per hour at an initial pressure of 10 pounds to the square inch would give 2.4 horse-power in a reciprocating engine, and 4.18 horse-power in a turbine. The wide difference between 2.4 and 4.18 horse-power can, of course, be secured only when the steam is of low pressure.

We have already pointed out in this journal that the impossibility of carrying the expansion in a reciprocating engine down to the low point that is possible in a turbine, is due to the fact that the low-pressure piston would have to be of such enormous size and weight, that the additional power secured by the increased expansion of the steam would be used up in overcoming the increased friction due to the heavy moving weights. In tramp steamers, and all steamships with a full model at the stern, it is advisable to use a large propeller running at a low rate of revolution. In a triple-screw vessel of this class, it is suggested that the best arrangement would be to use a compound reciprocating engine for the center propeller, and propellers running at a high speed of revolution driven by two turbines in the wings. We understand that in the new White Star liners "Olympic" and "Titanic," which, however, are vessels of fine form, the wing propellers will be driven by reciprocating engines, and the center propeller by a low-pressure steam turbine.

FUTILE CRITICISMS OF THE LOCK CANAL.

During the interval which has elapsed since the indorsement by an expert board of engineers of the plans upon which the lock canal at Panama is being built, we have made it a point to read much of the literature which has appeared in condemnation of the lock canal and in favor of one at sea level. This criticism has been distinguished more by the frequent, we had almost said the invariable, anonymity of the writers than by any originality in the arguments set forth. Why this modesty, and why should "An Engineer" or "An Eminent Engineer," or a "Specialist in Canal Construction" withhold from the public the immensely increased weight which would be given to his arguments by the publication of his distinguished name?

We have read these letters, mainly in the hope that some new facts might be presented which had hitherto been overlooked, and which would have a serious bearing upon the question of the relative value of the two types of canal; but we have to confess that we failed to find anything more than a wearisome reiteration of theories and propositions, and very little pertinent criticism of the actual facts as they were clearly set forth by the late Engineering Board.

The four great questions to be answered in a comparison of the two types of canal are, first, as to practicability of construction; second, as to time of construction; third, as to cost; and, fourth, as to speed and safety of navigation.

As to the practicability of the lock canal there is not a single element of the engineering problems involved which has not been subjected to a larger amount of preliminary experimental investigation than has been applied, probably, to any previous engineering work of magnitude in the history of the world. In every case, the outcome of these investigations has been to establish, in a most emphatic way, the feasibility of the proposed method of construction. With regard to the sea-level canal, on the other hand, there are several questions, most vital to the security of the canal, which have received practically no investigation, and against which there is at present a very serious element of doubt. Regarding the questions of time and cost, it is now known that it would take six years' more time and $200,000,000 more money to build a sea-level canal, and this canal, when it was finished, would provide a channel only half as wide as the narrowest width of the channel of the lock canal. And, lastly, regarding the question of speedy and safe navigation, it has been shown, and never disputed, that the lock canal will provide a navigable channel three hundred feet wide in its narrowest section, which, by the way, extends for only about one-seventh of its total length, and that for the other six-sevenths it will be from five hundred to one thousand feet wide. The sea-level canal, except for a few miles of 500-foot width at each entrance, would consist of a narrow and tortuous channel, never over 150 feet in width. Practically every navigator who has passed upon the merits of the two canals from the standpoint of the pilot house, has pronounced emphatically in favor of the lock canal.

Meanwhile, in spite of the efforts of a few contractors, disappointed promoters, and pseudo-engineers, to raise a tempest upon the deep waters of the correspondence columns of the daily press, the work of building the lock canal at Panama moves forward at an ever-accelerating rate. The last report of the chairman of the Isthmian Canal Commission, covering the month of March, shows that the grand total of all previous monthly excavations has again been exceeded, the total amount removed being over 4,000,000 cubic yards. This rate of excavation is not far from double the rate which was expected when the estimates for the present lock type of canal were made. Furthermore, a recent dispatch from Col. Goethals states that the total amount of excavation done since May 4th, 1904, when the United States began the work of construction, has been 73,124,849 cubic yards; and that of this total over one-half, or 38,059,180 cubic yards, was taken out in the last twelve months. There yet remain to be excavated 101,541,746 cubic yards. The building of the Gatun dam and concrete locks will be the controlling time-factor in the question of final completion, and the indications are very favorable for the opening of the canal on, if not before, January 1st, 1915, the date set by the Chief Engineer.

CONDITIONS OF THE BATTLESHIPS AFTER THE LONG CRUISE.

A correspondent, writing from one of the far Western States, incloses a clipping containing extracts from an article reprinted from a New York paper in which it is stated that the voyage around the world "practically wrecked the ships which took part in it"; and that the present extensive alteration to the upper works of the ships is being done to remedy certain serious defects that were discovered during the cruise. Our correspondent asks to be told whether the facts are as stated.

The facts are not as stated; nor is there a word of truth in the whole story. We would not take the trouble to refer to this false criticism were it not that the report seems to have originally emanated from Washington, and to have sprung from the same source and the same city from which has come so much of the destructive criticism of our navy during the past two years.

How maliciously untrue is this story is shown by the fact that the sixteen battleships that made the cruise returned in absolutely first-class condition, and that the repairs which are strictly chargeable to the cruise are a mere bagatelle as compared with the annual cost of maintaining the ships for the same period of time. At the New York yard there are at the present time for overhauling, the battleships "Rhode Island," "Nebraska," "Connecticut," and "Ohio." The repairs on these ships that are traceable to the cruise, and come outside of the regular repairs incidental to the periodical overhauling, will not average over $20,000 for each battleship. This low figure, be it remembered, covers continuous service for a period of over a year, and on a course that reached for 45,000 miles through the seven seas. The cost of maintaining a battleship in commission during ordinary service, for one year, is about $300,000; and that such extraordinarily severe service should have involved so small an extra cost for repairs must be considered a most creditable record, and a high tribute to the excellence of the ships. The most conspicuous evidence of wear and tear was in the linoleum with which the steel decks are covered; and this was due to the coaling and ceaseless tramping to and fro incidental to the multitudinous duties of life at sea.

The structural changes, which are almost entirely confined to the upper works, are not in any sense due to lessons learned during the voyage, and certainly they are not to be regarded as a "remedying of glaring defects and suddenly revealed weaknesses." As a matter of fact, the work was recognized as advisable long before the fleet started on the cruise. The principal changes are the removal of bridges, the taking out of the old military masts and the substitution for them of the new circular latticework masts for carrying the fire-control platforms. The after bridge and its associated armored signal tower have been removed, and the forward bridge has been greatly cut down. The extensions of this bridge on each side of the conning tower are now so arranged that they can be quickly removed in time of battle, the captain of the ship being henceforth compelled to take his station within the conning tower, where he properly belongs. By the removal of top hamper it will be possible for the captain to command the horizon, except through that arc of it which is shut out by the smokestacks.

This change will remove one more of the picturesque and popular episodes of the earlier days of sea fighting. The captain will no longer fight his ship from the flying bridge and in the open. The conning tower was built for him, and a due regard for the issues of the battle demands that he remain within it. It was the death of Admiral Vithoft of the "Czarevitch" that threw the Russian line into disorder in the great sortie from Port Arthur, at the very time when the chances of shaking off the Japanese seemed favorable. The captain of one of the battleships in that fight told us that the Admiral was struck by a shell, as he was leaning with folded arms upon the railing of the bridge watching the Japanese line. That shot also wrecked the conning tower, it is true; but the latter was of a design which would not be considered in our own navy.

In addition to the removal of top hamper, the whole of the accumulated layers of old paint throughout the ships is being removed; and in future, with a view to further reducing weights, no ship will be allowed to carry an accumulation of stores beyond the regular six months' supply. As showing the absurdity of the statement that the structural changes mentioned above are being made in order to bring the "deeply-laden ships" up to a lighter draft, it may be mentioned that when the alterations are completed, the draft will be only from ¾ inch to 1½ inches less than before.

The cruise was a splendid thing for the ships themselves. Of this the public may rest well assured. There is no surer way in which to insure rapid deterioration of a ship than to keep her moored in harbor. Conversely, there is no better way to maintain a warship in first-class physical condition than to keep her constantly on the move.

ORNAMENTATION IN LAKE-DWELLERS' HABITATIONS.

Traces of ornamentation have been found upon the remains of lake-dwellers' huts, which seem to show that these were ornamented on the outside by designs in relief. Such designs were executed upon the outer clay covering which was placed on the timbers of the structure, and they were cut or imprinted in the clay while it was still soft. However, such ornamentation is not to be found on all the lake-dwellers' habitations with which we are acquainted, and the only traces of it come from the Bourget lake in France, not far from Switzerland. Fragments of clay containing the ornamentation are now at the Chambery museum, and they have been examined by M. L. Schaudel. According to him, they consist of lines traced by a pointed tool, forming rectangular or circular bordering which contains stamped ornaments. These latter are made up of three concentric circles and seem to have been stamped in the soft clay by a terra-cotta mold. One of such molds was found at the Gresine lake-dwelling site. It is supposed that the dwellings were covered with clay on the outside, as all these dwellings had been destroyed by fire, and the specimens were intact on the ornamented side and blackened by smoke and partly baked on the other side. Had the clay lining been placed on the inside, no doubt the whole of it would have suffered. Besides, as the only light came from the door, the inside of the dwelling must have been very dark and there would be no reason for the ornamentation. M. Schaudel brings out some other points about such dwellings, which were determined from the remains discovered in a peat bog near Schussenried, Switzerland, by M. Frank. The dwelling was of rectangular shape about 30 feet long and 22 feet wide, and was divided into two rooms. The walls were made of oak trunks which were split in half, the flat side being placed next the interior, the cracks being stopped by means of a thin coating of clay. The floor was formed of several layers of split wood and clay. A fireplace was found in the smaller room, which no doubt served as a kitchen, while the larger room was probably used as a sleeping room. The latter had no outside door, and the single door was placed in the smaller room. A number of main timbers or piles were sunk in the lake bottom and also upheld the roof.