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ANOTHER SUCCESSFUL DEFENSE OF THE "AMERICA" CUP,

For the tenth time in the history of the "America" Cup have those who build and those who sail our yachts proved that they are well able to guard the historic yachting trophy that was captured nigh upon fifty years ago, in English waters. When we consider how keen is the competition and how narrow is the margin of difference between the competing yachts of the present day, we must admit that in beating the "Shamrock" by 10 minutes and 14 seconds in a light breeze, and by 6 minutes and 34 seconds in a heavy wind, the American boat has, verily, "done herself proud."

Among the axiomatic truths which nobody, with even an elementary knowledge of yacht-sailing, attempts to deny, is the fact that a boat which is weak in her windward work can never be a successful winner of races. No amount of speed to leeward or on reaching can compensate for the heavy loss which is entailed by inability to lie up close to the wind in beating to the weather mark. This truth has been demonstated times without number; it received a most emphatic indorsement in the very first completed "America" Cup contest of the present year, when the marked superiority of "Columbia" over "Shamrock" in windward work in a breeze of sufficient strength to test their real sailing qualities, placed the ultimate issue of the contest beyond all doubt.

The contest between these two fine yachts afforded unusual interest in the earlier stages of the struggle, because of the unexpected light-weather qualities developed by "Shamrock." In the drifting matches which had occurred at the time we last went to press the "Shamrock" had proved her ability to keep very close to "Columbia" in running and reaching, while it was the common opinion of those who watched the boats that in the very light airs which prevailed her work, when close-hauled, was superior to that of the home boat. It evidently needed the test of a fair to strong sailing breeze to bring out the superb qualities of the "Columbia." The first opportunity was given on Monday, October 16, when in a breeze that varied in force from 6 to 12 knots an hour the "Columbia" beat the challenger by 9 minutes and 50 seconds in a fifteen-mile leg to windward and by 24 seconds on the run home before the wind. The yachts had no sooner started on the first leg than it was evident to the veriest amateur that "Shamrock" was unable to lie as close to the wind as "Columbia," there being apparently from three-quarters of a point to a full point of difference between their courses. It was claimed that the difference was due to the English skipper's endeavoring to sail his boat with a "rap full," while "Columbia" was held closer with sheets more fully aboard. As a matter of fact, however, the second race over the windward and leeward course, sailed on Friday, October 20, proved that the fault lay in the boat and not in the skipper, for while "Shamrock" appeared to foot about as fast through the water as "Columbia," she was simply unable to approach her in ability to lie close to the wind.

The defect lies not in the model but in the rig of the English yacht. Her form appears to be about as easy to drive as that of the "Columbia;" for on two occasions in running fifteen miles to windward there has been but little difference between the two boats, and it is probable that had any reaching been included in the trials she would have shown about the same speed as "Columbia." The difference lies in the sail plan and the truth of the matter is that "Columbia" is rigged more in accordance with the latest theories and practice. Her mast is stepped further forward and a larger proportion of her sail area is in her mainsail. Fife, in his endeavor to secure the fine reaching qualities which invariably characterize his yachts, placed more sail in the fore triangle than is customary in the sail plan of other designers. The failure of "Shamrock" in her windward work seemed to indicate that he has carried his ideas too far in this direction.

It will always be a matter of regret that the breaking of the "Shamrock's" topmast shroud, with the consequent loss of her topmast, should have prevented the two boats from having a trial over a triangular course; as this would have given the "Shamrock" an opportunity to show what sne could do on her fastest point of sailing. We do not think that she would have won, for she certainly could not have shown sufficient superiority in twenty miles of reaching to overcome the lead of five to seven minutes which "Columbia" would have established in the ten-mile leg to windward. The decision of the committee that the race should count as one of the series was made in accordance with a stipulation suggested by Sir Thomas Lipton, to the effect that, as the contest this year was largely one between constructors, a breakdown on either vessel should be counted as a win for her opponent.

The third race, because of the splendid wholesale breeze that held true throughout the course, was by far the most exciting of the series. The "Columbia" started about one minute behind the "Shamrock" but overhauled her just before reaching the stake. After the boats had settled down on their first leg to windward, and "Columbia" had commenced to eat into the wind in the old familiar way, the issue was never in doubt for a moment. Her gain to windward was exactly 5 minutes.

We cannot close the subject of the present cup races without some reference to the great popularity achieved by the gentleman who was responsible for the challenger of 1899. Under the extraordinary delays and discouragements which have marked the weather conditions of the past three weeks, and the keen disappointment which must naturally be his on seeing so fine a boat as "Shamrock" defeated, he has borne himself with all those characteristics which mark the true sportsman. Whenever the next challenge comes from the other side, we can imagine no one who would be more welcome to the American people as its sender than Sir Thomas Lipton.

AN ENGINEERING TRIUMPH.

Unless the engineers' plans miscarry, the early days of December next will see the waters of Lake Michigan finding an outlet to the sea by two separate and widely divergent routes; the one being by the natural outlet through the Great Lakes and the St. Lawrence River to the North Atlantic, and the other through an artificial channel connecting the lake by way of the Illinois River with the Mississippi and the waters of the Gulf.

The Chicago drainage canal, as this channel is called, will easily take rank as one of the monumental engineering works of the century. Not only will it form one of the greatest artificial canals in existence, comparing in importance with the ship canals of the world, but as a work of municipal sanitation it is easily the greatest work of its kind ever undertaken. For whatever importance it may assume in the future as a new route to the sea for the waterborne commerce of the lakes, the canal was originally planned as a radical method of solving the problem of sewage disposal for the city of Chicago. It was realized fully a decade and a half ago that the time was approaching when it would no longer be possible to discharge the sewage of this great city into the same source from which it drew its water supply. Vast as is the volume of Lake Michigan it was only a question of time before the polluted waters of the Chicago River would find their way into the intake tunnels through which the water supply of the city was drawn in. However far the intake might be extended into the lake, the polluted stream under the influence of local currents invariably followed, until the problem of some other method of disposal had to be faced.

The plan adopted was at once daring and original It involved the cutting of a great canal twenty-two feet in depth, from 162 to 202 feet wide, and thirty-five miles in length, from Lake Michigan to the Illinois River, a tributary of the Mississippi, and turning the sewage of the city into the vast drainage ditch thus created. In this way the polluted waters would be kept constantly in motion until they were lost in the great volume of the Mississippi itself. By the time it is completed, the work will have involved the excavation of nearly forty million cubic yards of material, of which no less than twelve thousand yards will represent solid rock, the other twenty-eight thousand yards consisting chiefly of glacial drift. The excavation of the canal involved the diversion of the Des Plaines River and the provision of suitable works to control its waters and preserve the integrity of the canal in times of flood. As is invariably the case in works of this character, the actual cost has greatly exceeded the preliminary estimates, and by the time the work is fully completed it will have cost the city of Chicago fully thirty million dollars.

The approaching completion of the work, which will provide a waterway capable of accomodating large ships of 19 and 20 feet draught, has naturally suggested the possibility of a through water way to the Gulf of Mexico by way of the canal, and the Mississippi River. The canal is, of course, much deeper than the Illinois River or the upper reaches of the Mississippi, and to secure even the 14-foot channel proposed would entail a heavy expenditure on the part of the government.

It is natural that the people of Chicago, having in view the enormous development of commerce by way of the lakes and the Welland Canal, should find the prospect of another waterway to the seaboard very alluring, and he would be a bold prophet who at this early stage should deny that it would be a profitable undertaking. The decadence of steamboat traffic on the Mississippi since the development of the great railroad systems is a discouraging feature; but it must be remembered that the opening of a 14-foot waterway from Chicago to New Orleans, would place the question of river traffic on a very different basis from that under which it has made such a losing fight against the railroads.

REAR-ADMIRAL HICHBORN ON THE NEEDS OF THE NAVY.

The annual report of the chief constructor of the navy, Rear-Admiral Hichborn, is of special value as embodying in full the lessons which have been learned from the varied experience of the late Spanish war. Although many valuable data had been gathered at the time of the last report, it was written too soon after the events of the war to enable the voluminous reports furnished by naval officers to be received and fully digested. The present report says: "In response to special orders the bureau has been furnished with a large mass of criticism and comment as to matters under its cognizance. This criticism is the result of the experience under war conditions of seventy-five officers, and covers twenty-five vessels of various classes."

The chief constructor was an early advocate of sheathing as a means of enlarging the strategical and tactical qualities of warships, and the operations of the late contending fleets proved that the advantages of this device have not been over-estimated. The wisdom of Congress in agreeing to the provisions that our newest battleships and cruisers shall be sheathed and coppered is fully confirmed. Another obvious lesson of the war was the necessity for restricting severely the amount of combustible material on board ship, and as a result we learn that during the past year advantage has been taken of the visits of the older ships to the dockyards to improve them both in this respect, and also in the apparatus fitted for fire extinction. While the general attention which has been attracted to the question has resulted in an increase in the number of commercial non-combustible materials, nothing has so far been produced we are told which is more suitable for general purposes than fire-proofed wood.

We learn that the reports which have been turned in by our naval officers confirm the impressions previously arrived at as to the strength, stability, seaworthiness and maneuvering powers of our warships. As to matters of detail, the criticism in the reports naturally centered on such features as were most intimately connected with war service, and which were, under the conditions, severely and thoroughly tested. In this connection it is gratifying to learn with regard to that most important feature, the supply of ammunition to the batteries, that the ammunition hoists, etc., gave very general satisfaction.

The sanitary condition of our ships, as evidenced by the supreme test of the health reports, was found to be in the main satisfactory, although some defects in ventilation must be remedied, especially in the older vessels. The presence of steam pipes in the living quarters of officers and crew is universally condemned; and the favor with which the electrical installations already made have been received, encourages the board to replace steam with electricity as a motive power for the various auxiliaries, as fast as experience warrants. The work already done in this direction includes the installation of 320 electric motors in thirty-six vessels of various classes.

Now, just here we would suggest that although the desire to improve the sanitary condition of our warships is commendable, and the advantages of electricity over steam in cleanliness and in keeping down the temperature between decks are obvious, there is a danger lest in its admiration of the electric auxiliary the bureau should push the substitution too far. For we must remember, that as compared with steam power, electric power is obtained at the cost not merely of increased weight but of a certain amount of power that is lost in the double conversion; and while, considered as a matter of compromise, the weight and power are willingly sacrificed in the case of the manipulation of turrets and ammunition hoists, where perfect control is desirable, we think that for the operation of deck winches, anchor hoists and boat cranes, the steam winch is, perhaps, preferable. No complete substitution of electric for auxiliary steam power would be warranted unless the weights of larger duplicate central combined engines and electric generators, together with the several auxiliary motors, was about the same or slightly less than the aggregate weights of additional boilers and the separate steam engines now used.

Electric motors are especially economical where intermittent power is required at varying intervals, pro-