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MARCONI TELEGRAPHY.

Through the enterprise of The New York Herald, the public has been made acquainted in a very practical way with the great advantages which result from the use of what is now popularly known as the "Marconi system of wireless telegraphy." The world-wide interest which is being taken in the present international yacht races renders the instant transmission of the progress of the race a matter of actual importance, and the saving of a few hours' time, which is rendered possible by wireless telegraphy, led to the bringing of Mr. Marconi to this country in order that he might report the races from a steamer which accompanies the yachts over the course.

On the day of the first race the large ocean-going steamer "Ponce" was equipped with a slender mast which extended some 50 feet vertically above the foremast of the vessel. A similar mast was carried by the Mackay-Bennett cable steamer, which was anchored at the starting point, off Sandy Hook, and had temporary connection with the submarine cable at that point. The Marconi apparatus was installed in the chart room on each vessel, and the progress of the yachts was telegraphed at intervals of a quarter of an hour from one vessel to the other. From the steamer at Sandy Hook the messages were sent to New York, whence they were distributed throughout the world. The experiment proved to be perfectly successful, and the reports contained in The Evening Telegram appeared from two to three hours sooner than those transmitted by the ordinary methods.

Marconi comes to this country fresh from the triumphs which he has scored with his system in the recent maneuvers of the British navy, where messages were flashed from ship to ship over a distance of 80 miles. It was inevitable that the great success which is attending the Marconi system should have aroused the interest, and in some cases excited the jealousy, of other investigators in the field of wireless telegraphy. Marconi himself, we have no doubt, would be the first to acknowledge that there are others who have done conscientious work in this line of investigation, and he would be perfectly willing to give full credit where it is due. The existence of the Hertzian waves was known long before this young Anglo-Italian harnessed them so successfully to the uses of modern life, and others, both before and after him, have attempted unsuccessfully to do what he has done.

We regret to note that his arrival in America has unduly excited certain holders of patents on wireless telegraphy, who believe that Marconi is receiving more credit than is strictly his due, and claim that the credit is not his, but theirs. This has been the history of all great epoch-marking inventions, and the recent extraordinary attempts to prove that the Bessemer steel process was misnamed, and that a certain Kelly had actually done the work and should receive the credit, will be fresh in the minds of our readers. We note in this connection that a certain section of the press is responsible for the statement that Professor Dolbear, of Tufts College, is "the discoverer of wireless telegraphy," and that he is so far resentful of Marconi's invasion of his domain that "a conference of lawyers has been held," and instructions have been given to "serve notice that he (Marconi) would be restrained from using his system of wireless telegraphy in the United States."

Whatever may be the merits of this controversy, we are satisfied that it would be as easy to sweep back the tide with a broom as to prevent the system of telegraphy which has just done such good work off New York Harbor and with the English fleet from becoming forever identified with the name of the man who first brought wireless telegraphy to a practical and useful consummation.

"COLUMBIA" AND "SHAMROCK" IN DRY DOCK.

Next to the races themselves there is no event connected with a contest for the "America" cup which equals in public interest the docking of the yachts and the consequent disclosure of their underwater form; for it is in the model of the modern yacht and not in her sail plan that the genius of the designer of to-day is most apt to reveal itself.

The secrecy which surrounded the construction of the competing yachts had awakened more than usual curiosity as to the form and construction of the two boats. It was naturally believed that the extraordinary precautions which were taken to prevent the public from getting even a hint as to the beam, draught, or lines of the contestants was due to some marked departure from existing practice, if not from established theories. "Columbia" was launched at night; "Shamrock" in petticoats; and the Sphinx was not more silent on the questions which were in everyone's mind than the gentlemen who were responsible for the "America" cup champions of the year 1899.

It must be confessed that the docking of the yachts has furnished a great surprise; for where the public was looking for novelties it found in the case of both challenger and defender nothing more nor less than a typical, up-to-date yacht. The characteristics of the type, as represented in a "ninety-footer," are a beam of about twenty-four feet and a draught of twenty feet; some eighty to ninety tons of lead on the keel; a displacement of from one hundred and forty to one hundred and fifty tons; and a sail area of about thirteen thousand square feet. The materials of construction will include nickel steel for the framing, plating of some non-corrodible bronze, and hollow steel spars of great strength and lightness.

Now if we take the "Columbia" and the "Shamrock" as examples, we find that they conform with wonderful closeness to the above specification—at least as far as dimensions and materials are concerned. In the matter of model, both above and below the water line, there are, it must be admitted, very marked differences between the two boats; but in no sense can either be called a surprise. They possess all the characteristics which distinguish a Herreshoff from a Fife design, and certainly they present no startling novelties, hitherto unknown or untried by yacht designers. "Columbia" is an improved "Defender," "Shamrock" an enlarged and improved "Isolde."

Compared with the champion of 1895 "Columbia" is in every way a more beautiful yacht. The three views which we present were taken when she was in the large No. 3 dry dock at the Brooklyn navy yard, and they show what exquisite beauty can be given to the underwater form even of a deep finkeel vessel of this extreme type. The variations from "Defender" are all in the direction of securing a finer form, one that can be driven through the water with less expenditure of power. While the beam is wider and the lead placed lower, the overhangs and the waterline length are considerably larger and the entrance and delivery are finer than in the older boat. The hull proper is deeper, and the whole model is a further departure even than was that of "Defender" from the old skimming-dish type of hull. The construction, moreover, is more wholesome than that of "Defender"; for the treacherous aluminum alloy in frames, deck beams, and topsides has given place to more reliable steel and bronze, with the result that our '99 champion will be prepared to cross the ocean and try her paces in the regattas of the Mediterranean and the Clyde.

In "Shamrock" the English have sent over their first out-and-out racing machine. She is the lightest yacht of her size ever constructed, not even excepting "Defender"; for in her aluminum deck alone she has saved about 5,000 pounds of weight as compared with that yacht. Perhaps the most striking features of the boat are her unusually lofty topsides (her freeboard is over 5 feet as against 3½ feet in "Columbia") and her deep draught of 21½ feet. Her midship section shows a considerable flare above the waterline, and this, combined with her wide beam, high freeboard, and deep lead, gives her great sail-carrying power, especially in a strong wind. The boat has rather a hard bilge and a flat floor, which rounds into the fin proper with a short hard curve. When afloat she looks to be much bigger than she is, most of the boat being above the waterline, and as a glance at the midship sections of the two vessels will show, she approaches more nearly to the true finkeel type than does "Columbia." The sheer-plan shows that the "Shamrock's" keel is much the longer (at least 8 or 9 feet); hence the center of gravity of the lead is lower, and this coupled with the fact that her draught is deeper by 1½ feet makes it certain that the center of gravity of the lead is at least 3 feet deeper below the waterline in the English boat. Other things being equal, this means less lead for the same stability. At the same time the longer keel involves the addition of about 220 square feet of wetted surface, and a slower boat in light winds. In heavy winds, and indeed in any wind, the longer keel should make "Shamrock" a better boat in climbing to windward when close-hauled.

At the present writing there have been two unsuccessful attempts to sail the first race of the series. The winds were too light and fickle to afford any reliable test of the yachts; for although "Columbia" was the leading boat during the greater part of the contests, on both occasions "Shamrock" was slightly in the lead when the race was called off. In spite of the fact, however, that the challenger showed unexpected light-weather qualities, it seemed to us that the performance of the two yachts indicated the "Columbia" to be the better all-round boat under the prevailing conditions.

PROPOSED CYCLE PATH ACROSS THE BROOKLYN BRIDGE.

The earnest efforts which are being made by the great body of wheelmen in New York city and Brooklyn to secure a separate cycle path across the bridge for their exclusive use are perfectly reasonable and deserving of the strongest support. The day has gone by when the efforts of wheelmen to secure proper facilities on our thoroughfares can be regarded as an endeavor to secure favors for a small minority at the expense of the general public. The enormous increase in the number of riders in the last few years has been accompanied by a demand for special provisions for their safety and convenience, and in nearly every case they have gained what they sought. Wheels are now carried as baggage free of charge on our railroads, and special protection is afforded in some of our cities by specially-trained squads of policemen.

However, it is not with the legal or ethical side of the question that we are concerned so much as its practical and mechanical aspects. As far as the structure of the Brooklyn Bridge is concerned, there is not the slightest reason why a cycle path should not be built across it. If the path were provided, the additional weight would be so insignificant compared with the total dead and live loads of the structure as to be a practically negligible quantity. Obviously the best location would be above one of the pairs of interior stiffening trusses through which tracks of the bridge trains are laid. Light steel floor beams could be laid across the top chords of the trusses, and these, together with the plank flooring and the light hand rail, would weigh but little per foot and would add practically nothing to the existing strains in the bridge.

It seems that the problem at present, as stated by the bridge engineers, is to provide a suitable terminal at the New York end of the structure, but it is certain that in view of the light nature of the necessary construction and its comparative narrowness, some way out of the difficulty could be found which would neither encroach seriously on the present space, nor present an objectionable appearance judged from the æsthetic point of view.

The opposition of the engineers of the bridge to the addition of any further weights, however small, to the structure is natural, and on general principles commendable. It is their duty to see that the limits of safety are not exceeded nor even too closely approached. At the same time we cannot but remember that the running of the trolley cars across the structure was at first strenuously opposed and pronounced to be neither practicable nor safe. The car tracks, however, have now for a long period been in operation, and have proved to be of inestimable service to the public. The bridge has suffered no harm from the addition, and we believe that as long as the proper headway has been observed, the safety of the structure has been in no degree jeopardized.

AMATEUR INVESTIGATIONS WITH A TESTING TANK.

In the current issue of the SUPPLEMENT is published the first part of an article which will be of the greatest interest to those of our readers who are interested in the matter of boats and boat sailing. The author of the papers is an amateur yachtsman with more than a quarter of a century of experience, who set out to determine for himself, by practical experiment, many questions which are supposed to be theoretically pretty well established. To determine the best model of hull and the influence of the various elements of beam, draught and general form on speed, the author of the paper constructed a small towing tank equipped with a dynamometer and a set of experimental models, the whole of which, including the tank, could be placed in a fair-sized sitting room. It is true no attempt was made to secure anything like the scientific accuracy of a full-sized shipbuilder's model basin; but the simplicity and cheapness of the apparatus, and the agreement of the results in a general way with those obtained in a full-sized tank, render the experiments of extreme interest and certainly of value.

Any amateur who wishes to test for himself the many vexed questions connected with the designing of a boat can do so at a small expense by following the methods described in the article referred to. The question of the best form of sails will be taken up in the second part of the article, which will be published in the SCIENTIFIC AMERICAN SUPPLEMENT of next week. The writer claims to have been the originator of the theory that a perforated sail would, under certain conditions of wind, do better work than a sail of the ordinary pattern. The principle of perforation was tried in a lengthy series of experiments with sails built on the principle of the Venetian blind or per-

haps, to speak more accurately, of the modern aeroplane. While the very idea of splitting the sail to let any portion of air pass through is radically opposed to accepted theories on the subject, Mr. Burnham, the author of the experiments, states that on certain points of sailing the slotted sail showed superior driving power to one of the standard type.

STATISTICAL DUPLICATION.

Statistician Powers, of the Census Bureau, is making special efforts to plan a successful campaign whereby full agricultural statistics shall be gleaned for the coming twelfth census. The law specifies only the crops of 1899 as those to be reported; but, as the census agents will not take the field till after June 1, 1900, and the bulk of the great crops of 1899, especially in the South, will be harvested and marketed long before that time, growers will be expected to furnish statistics to the enumerators, some of which will be quite a year old. It is desired by the Bureau that growers be prepared to do this, and to that effect it is using every channel to notify them of the necessity of being thoroughly posted as to what they grew and marketed, and the prices obtained therefor.

The strange part of all this is that our Department of Agriculture has a most efficient, long trained force for this very purpose; and not only their annual but their monthly statistics are the most complete of anything of the kind attempted in any country. Yet this working force will be entirely ignored, its records passed as of no avail, and exactly the same work and results as theirs will be attempted with comparatively raw, untrained recruits. That such statistics will differ from, and must be of considerably less scientific value than, those of the Department of Agriculture goes without the saying.

We call attention to this just at this time in the hope that it is not yet too late for the press of the country to take the matter up and induce a change of some magnitude to be made in the plans of the Census Bureau. General Merriam is sure to find the funds at his disposal far from what he will require for special features of great value to all students of commerce and political economy, if thousands of dollars are thus used to duplicate the work of the Department of Agriculture.

The same thing might also be well illustrated by reference to the duplications of work now being well done by the Treasury, Interior, Post Office and War Departments.

EXCHANGING FISH FRY WITH EUROPE.

Many tourists who will attend the Paris Exposition next summer need not be surprised if they find on the bills of fare of the leading European hotels such items as "American black bass," "American salmon," or "American muskalonge." It should not be hastily concluded that these items are put there for deceptive purposes, or that they refer to canned or dried American fish. They are in reality true statements of facts, and indicate the growth of our fishing interests under the wise and progressive supervision of the United States Fish Commission. During the past summer American fish, fresh from the water, appeared on the tables of European hotels devoted specially to catering to American tourists.

In order to appreciate the full meaning of this, it is necessary to glance at a feature of the work planned years ago by the Fish Commission. Almost thorough and painstaking effort was made then to collect all possible facts concerning our food fishes as a preliminary to adopting adequate methods for protecting and propagating young fry. This scientific study and experiment included an elaborate investigation of the food plants of fish in inland waters, the cause of famines and years of plenty, and the relative chances of certain varieties of fish in strange waters in reaching maturity.

In propagating the young fry for restocking the streams, bays, and rivers, experiments were made to see how well they thrived in waters far removed from their natural habitat. This experiment proved of great commercial value to the country. Inland waters that were almost destitute of fish are now teeming with millions of artificially propagated fry. In some of the new waters they have been transplanted to, the food fishes have been found to thrive better than in the streams where they were found. The extension of this work to foreign waters was anticipated by the Fish Commission years ago purely as a scientific test. Consequently when they received intimations from leading ichthyologists abroad that an exchange of native fry would be agreeable, preparations were immediately made to send our fish to European countries

The first experiment was made in Scotland with our landlocked salmon. The inland waters of Scotland presented conditions somewhat similar to those in which our salmon loved to disport, and besides there was a species of Scotch salmon native to the streams and lakes of that land. Young fry of our landlocked salmon were shipped to Scotland some ten years ago, and in that time they have multiplied rapidly, much to the detriment of the Scotch salmon. The American salmon proved larger and stronger than their native cousins, and the Scotch salmon is almost threatened with extinction by the growing rapacity and multiplication of the American landlocked salmon. On the whole, however, this is not to be regretted, for the American species furnish more and better food than the Scotch salmon.

A shipment of American black bass fry was made to France for stocking the rivers and streams, and, like the American salmon in Scotch waters, they have flourished so marvelously that to-day they are quite common articles of diet at the French hotels and restaurants. The French streams, since the introduction of the American bass, have doubled in their productive value, and there is every reason for the French anglers to be grateful to our American Fish Commission for stocking their waters with a new species of food fish. The French streams were practically deserted when the fry were introduced, and they had little difficulty in taking quick and complete possession of the waters.

Other varieties of fish have been shipped to France and other countries as scientific experiments. The American rock bass has been introduced in several English streams, and the American brook trout is today in flourishing condition in the clear, cold streams of Russia and other northern countries of Europe. The waters of Switzerland abound with many of our common river and brook fish, which make the angling there superior to anything in the past. It is even reported that the fine American muskalonge has found a satisfactory home in the Rhine and Danube Rivers.

In return for these American food fishes we have received few foreign fry that have proved of any particular value. The attempt has been made to introduce the best of the European fish in our waters, but as a rule American fish are superior to any that Europe can produce, and we have not been greatly benefited by the exchange. The Scotch salmon has been tried here, but holds out little promise of success in waters where the American salmon lives There is reason to believe that we will be more benefited in introducing the young fry of South American fish in our northern waters than any that can be brought from Europe. The condition of ichthyology in the countries south of us, however, is such that it is difficult to secure the fry without sending an expedition after them. At present it seems as if we had sufficient varieties of fine, toothsome fish in our waters to satisfy the most fastidious epicure; but it is possible that in its scientific investigations with the fish from all parts of the world, the commission may some day add to our fish diet some new species that will prove of enduring value. Meanwhile, the scientific search after facts concerning the food and habits of our American fish at home and abroad will enable the commission to handle the problem placed before them with more assurance of success. In the comparatively few years it has been laboring in the field it has accomplished results that are well known, and of value alike to the consumer and the sportsman or professional fisherman. There are few scientific studies and experiments that show practical results sooner than that of fish culture. G. E. W.

THE MINING INTERESTS OF AFRICA.

The mining interests of Africa, especially the wonderful gold and diamond fields, are particularly interesting at the present time owing to the unsettled conditions in the Transvaal. Much of the recent rapid development of Africa, especially in the southern part, is due to the discovery and development of extremely valuable mineral deposits, particularly of gold and diamonds, and incidentally it may be mentioned that the iron, coal, and other mineral deposits of South Africa give great promise when the wealth-seekers find time to turn their attention to industries which are less speculative.

The gold and diamond mines are wonderfully profitable. The Kimberley mines, which are located in British territory just outside the boundaries of the Orange Free State and about 600 miles from Cape Town, now supply about 98 per cent of the diamonds of commerce. The existence of these mines as unknown prior to 1867, and in the brief period since their discovery $350,000,000 worth of rough diamonds have been taken from the Kimberley mines, and the stones were easily worth double this sum after cutting. This enormous production would have been greatly increased but for the fact that the owners of the mines in the vicinity formed an agreement by which the annual output was so limited as to meet, but not materially exceed, the annual consumption of the world's diamond markets. The supply is so plentiful and so comparatively inexpensive is the work of diamond digging that the industry has almost ceased in other parts of the world since the South African mines entered the field.

Equally wonderful and promising are the great "Witwatersrand" gold fields of South Africa, located in the South African Republic, better known as the "Johannesburg mines." The strip of territory a few hundred miles long and a few miles in width to which this name is applied was, a few years ago, considered nearly worthless, useful only for the pasturage of cattle and sheep. According to our Treasury Bureau of Statistics, gold was discovered there in 1883, and in the next year the gold production was about $50,000. The output increased with startling rapidity. The amount of gold mined in 1888 was $5,000,000; in 1889, $10,000,000; in 1892, over $20,000,000; in 1895, over $40,000,000; and in 1897 and 1898, $55,000,000 each year. This wonderful development naturally attracted great attention to South Africa and drew thither thousands of people in the hope of making fortunes rapidly. The mines, however, cannot be successfully worked except by the use of costly machinery, and while they have been extremely productive where machinery has been used, they were not of such a character as to make hand or placer mining profitable, as was the case in California and Australia and other places. The gold production of the "Rand," since 1884, has been over $300,000,000, and careful surveys of the field show beyond question that $3.500,000.000 in gold can probably be extracted, while the large number of mines which have been located in adjacent territory, particularly in parts of Rhodesia, give promise of additional supplies, so that it seems probable that South Africa will for many years continue to be as it now is, the largest gold producing section of the world. Recent discoveries tend to the belief that these wonderfully rich mines are the long lost "Gold of Ophir" mines from which Solomon obtained his vast supplies.

RAILROADS IN 1898.

A welcome visitor to the editor's table is "Poor's Manual of Railroads for 1899." The general statistics regarding the roads for the year are most important and authoritative. The general exhibit for the fiscal year shows that the length of our railroads on December 31, 1898, was 186,809 miles, showing an increase of 1,915 miles in the year. There is in addition to the mileage already given 60.344 miles of second tracks, sidings, etc., making a grand total of 245,238 miles of track. Of this mileage, 220,803 miles of track are equipped with steel rails and only 24,435 miles have iron rails. There are 36,746 engines, 25,844 passenger cars, and 1,284,807 freight cars. The total liabilities of the companies are $11,968,751,204; the excess of assets over liabilities is $316,616,498. The total assets are $12,285.367,702. The actual number of miles of railroad operated was 184.532. The total train mileage was 905,010,232. In 1898, 514,982,288 passengers were carried and the passenger mileage was 13,672,497,664 miles; 912,973,853 tons of freight were moved. The passenger traffic earnings amounted to $272,589,591. The earnings from freight were $868,924,526. The total earnings from all sources were $1.249,558,724. The net earnings amounted to $389,666,474. The total available revenue was $494,203,378.

These figures show what an enormous business our railroads are doing, and our progress is all the more remarkable when we remember that it was not until 1842 that the railroad was opened from Boston to the Hudson, and from the Hudson at Albany to Lake Erie at Buffalo. In 1848 the progress made in railroad construction was so slow and unpromising that the total mileage of lines completed at the end of that year was only 5,996. In 1848, immediately after the annexation to the United States of California, the deposits of gold of marvelous richness caused great excitement, and the first movement in the construction of railways dates from the discovery of gold in California. From 1849 to 1857, 17,138 miles of railway were constructed. Then came a great commercial revulsion, which commencing in the United States swept around the world. But the nation had grown too strong, however, to suffer anything more than a temporary check. The lines of railroad which had been constructed penetrated every important portion of the country and gave high commercial value to its products. Labor everywhere was then enabled to reap, even in the midst of the great depression that prevailed, a remunerative return.

SODA WATER TO RELIEVE HUNGER.

Water charged with carbonic acid gas—in other words, soda water—is now prescribed as a palliative for hunger, especially for an abnormal sense of hunger due to disease. Says Modern Medicine, which gives us this information: "Carbonic acid gas has the singular property of lessening the sense of hunger, and may profitably be remembered in dealing with cases of diabetes in which bulimia (abnormal hunger) is a prominent symptom. The seat of hunger is found in the solar plexus. By the use of water charged with carbonic acid gas, the branches of the solar plexus distributed through the mucous membrane of the stomach are influenced in such a way that the abnormal irritation of the plexus, which is the foundation for the ravenous hunger often present in diabetes and certain forms of indigestion, may be greatly mitigated, if not wholly appeased. Water charged with carbonic acid gas may likewise be employed with advantage in many cases of hyperpepsia in which there is a sensation present in the stomach described by the patient as a gnawing sensation, 'goneness,' emptiness, etc."