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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.

STEEL AND WOODEN CARS IN THE SUBWAY FIRE.

Again the all-steel car has proved its superiority to the wooden car, this time under the double test of collision and fire. Not that the all-steel car needed any further proof as to its high qualities of resistance either to fire or shock, for its behavior both on steam railroads and in the eighteen months of operation of the Subway, had made it clear to every practical mind that it was the car of the future. What renders the recent accident particularly convincing is the fact that of the two cars which were at the ends of the colliding trains, one, a wooden car, was badly shattered and practically consumed, while the other, a steel car, received comparatively little structural injury and was only slightly injured by fire.

The accident was due to carelessness in switching a train of empties onto a third track, which, temporarily, was being used as a storage track. The force of the collision was sufficient to derail the front truck of one car and throw it against the third rail, with the result that there was a heavy short-circuit. The two last cars of the train which was run into were of wood. These instantly caught fire, the first of them being entirely destroyed, and the second car partly so. The damage to the steel car was confined to a portion of the wooden floor and the rattan of the seats, these being the only portions of the car that were inflammable, if we except the window sashes. It would, of course, be desirable to abolish even these inflammable materials, and the steel cars could be rendered more nearly fireproof by constructing the floor of steel plate overlaid with fireproofed hardwood strips, and by substituting steel or bronze sashes in the windows. As for the rattan, which is needed for comfort, it should be possible to treat that with some fireproofing solution.

The burning of these Subway cars has naturally excited some measure of public distrust of the wooden car; while that portion of the daily press which is only and ever seeking what it may condemn, and shutting its eyes to what it might approve, has been censuring the Subway operating company for running any wooden cars whatever on the system. Now, as a matter of fact, the wooden cars which were brought out some three years ago were built with a special view to the prevention of fire, the sides being copper-sheathed, and fire-resisting materials being worked in at all points which are in proximity to the electrical appliances. At the time they were built, they represented the most advanced ideas on fireproof construction. Five hundred of these were ordered by the Subway company two years; and to further insure the safety of the rolling stock and the public, the remaining three hundred cars that were required were voluntarily ordered of the present steel construction. These cars are more costly, are heavier and more destructive to the track, and therefore more expensive in operation than the wooden cars. The fact that they were voluntarily introduced is distinctly to the credit of the Subway company. It has been rumored, however, that with a view to reducing the cost of equipment, no more of the steel cars will be built. We have failed to verify this rumor, and the Rapid Transit Commission would in any case prevent the introduction of more wooden cars into service, the Chief Engineer in his report on the fire having recommended that no inflammable material be used in future cars.

A feature of the recent fire that excited much apprehension was the immense volume and pungent character of the smoke that resulted from the burning of so much insulated material, grease, and painted wood. Naturally this was strongly suggestive of the terrible fire in the Paris Subway, a few years ago, when so many died of suffocation. The public, however, need have no apprehension on this score, if the system of ventilation which the Rapid Transit engineers have designed be installed throughout the system; for it will render it possible to renew the whole atmosphere of the tunnel so quickly, that the smoke of a fire could never accumulate to the point of suffocation. This is a feature of the ventilation improvements which, of itself, would be sufficient to justify all the expense.

In an official report to the Rapid Transit Board, Chief Engineer Rice made the following recommendations:

1. That no parts of cars used in Subway service should be constructed of inflammable material.

2. That an adequate fire-line service should be installed throughout the whole subway, so that water can be had at interior points.

3. That means should be provided for quickly removing the smoke from the Subway in emergencies.

The question of the authority of the Board to compel the operating company to carry out these regulations is dependent upon the interpretation the courts may put upon the contract stipulation that the company shall provide such equipment as meets the approval of the Board.

OCEAN RACES FOR SMALL BOATS.

Although we are thoroughly in sympathy with the present effort which is being made to promote deep-water sailing, and encourage our amateur yachtsmen to gain that experience in navigation which can only be obtained when one is dependent upon the sextant, the compass, and the nautical almanac, we think that the recent offer of a cup for a race from New York to Bermuda was a case of pushing a good principle a little too far. The fact that two of the three boats that started made the trip in safety must not shut our eyes to the fact that the venture was attended with unusual risk of disaster. In the eyes of nine yachting men out of ten, it will appear that the restrictions as to size were placed entirely too low for a race of this character. While we have every admiration for the pluck and skill of the skippers and crews of the thirty-eight and twenty-eight-foot boats which completed the race, we cannot but think that the starting of such a diminutive craft as "Gauntlet," whose length on deck is only twenty-eight feet and her water-line length about twenty-two feet, was an altogether needless imperiling of the lives of the four amateurs that formed her crew.

The facts which rendered the trip particularly hazardous are that no professional was allowed on any of the boats; that for hundreds of miles the little yachts were far from any port which they could make, in case of the carrying away of spars or dismasting; and that they were out of the regular line of steamer travel. A strong hint of danger was given shortly after the start of the race, when one of the yawls carried away one of her spars, and was detained two days in port before she could be put in shape for another start. As we have said, we are fully alive to the advantages of ocean races, such as that over the outside course off the Long Island shore, or the race held last year from New York to Hampton Roads. Here, in case of disablement, some port is always within reach, or the small craft, if disabled, will probably be spoken by passing ships.

The performance of the winning boat "Tamerlane," a yawl measuring thirty-eight feet on deck, which also won the last year's ocean race to Hampton Roads, was extremely creditable to the boat, her crew and her skipper, who by the way is the editor of our esteemed contemporary, The Rudder. She averaged over the whole course between five and six knots an hour, and the publication of the log of the little craft will be awaited with much interest in the yachting world.

A DECADE OF WIRELESS TELEGRAPHY.

Wireless telegraphy is now ten years old. On the 2d of June, 1896, there was filed in the British Patent Office a provisional specification "for improvements in transmitting electrical impulses and signals and in apparatus therefor," by one Guglielmo Marconi, residing at No. 71 Hereford Road, Bayswater, England.

At the time this patent was applied for the art of transmitting messages without wires was wholly unknown, in so far as its practice and utilization were concerned, and the drawings and description of the improvements cited gave neither the layman nor scientist an inkling that the arrangement was one of the most important since those first brought out in the allied classes of telegraphy and telephony, or that the young inventor was destined to take rank with Morse and Bell as a genius who had materially advanced civilization by devising a new means for the transmission of intelligence.

Exactly a decade has elapsed since the filing of that memorable patent, and the great and far-reaching progress made in the art in the brief period past is well known. There are, however, some salient features that have been brought out in the development of the new telegraphy that are not so well known, and to these attention may be appropriately called at this particular time.

After the first successful trials were made across the Bristol Channel between Lavernoch and Flat Holm, a distance of 3.3 miles, by Marconi, and during these notable tests, in which he became cognizant of the great value of using high aerial wires and earthed terminals, the feasibility of telegraphing through space without wires by the Hertzian wave method could no longer be doubted, and all other schemes for producing similar results were abandoned.

Notwithstanding the favorable issue of the experiments, there was yet much to be done before the system could be made commercially practicable, and the young inventor labored zealously to extend the limitations that hemmed it in on all sides. Nor was he alone now in the great work that confronted him, for numerous investigators on both sides of the Atlantic became imbued with the possibilities the new art offered. To increase the range of signaling was the first and most important step, and after that, the desirability of securing selectivity, so that a number of messages could be sent in the same field of force without suffering extinction.

Marconi was perhaps the most persistent experimenter in the bridging of greater distances, while very early in the development of the new telegraphy Lodge turned his attention to the production of a selective system by means of electrical resonance. The former succeeded so well in his task, that from three miles in 1897 he was enabled to send and receive signals three thousand miles in 1904; while the latter, although he failed to evolve a commercially selective apparatus, led the way for the timing of the sending and receiving circuits individually and syntonizing them collectively.

The work of Lodge and his successors has resulted in the beautiful compound open and closed oscillators and resonators, both close and loose coupled, that give, in the refined apparatus we have at the present time, the highest efficiency of operation with the least expenditure of initial energy.

Another important feature of recent date is the utilization of auto-detectors in connection with telephone receivers as receptors for the translation of incoming electric waves into the alphabetic code of dots and dashes. This adjunct may be attributed to American ingenuity, and was a difficult but well-taken step leading toward the goals of accuracy, rapidity, and simplicity, for it eliminates virtually all of the difficult adjustments found in the coherer and Morse register receptors, permitting a very great increase in the speed of reception, and greatly reduces the number of essential parts of the equipment. De Forest was probably the first in the commercial field to use the auto-detector and telephone receiver, while Fessenden has conferred a lasting benefit upon science and humanity by his ingenious detector, the liquid barretter, an instrument that in its sensibility, its ruggedness, and its simplicity is second only to the telephone receiver of Bell.

With these improvements, chiefly made within the past five years, wireless telegraphy is all that the most exacting critic could hope for, if we except selectivity, and in this especial branch of the work there is yet unlimited opportunity for the wireless inventor to exercise his ingenuity.

So much for the physical advances made during the past decade, in transmitting messages without wires. Its usefulness as a commercial factor has been universally recognized, and not only has the mercantile marine service been very largely equipped, but the different governments are fully alive to its possibilities in time of peace and war. Not only have the ships of the world's navies and strategic shore stations been equipped with some make of apparatus, but the armies of various countries have used it overland with considerable success.

Overland wireless telegraphy has been tried out commercially within the past few years; and while it is practical from the viewpoint of operation, the interference between stations leaves it a poor competitor of the wire system. It has competed more successfully with the shorter cables, and elaborate experiments are now being conducted by Prof. Fessenden and Dr. De Forest, working independently in the effort to establish permanently transatlantic cableless telegraphy. Should the results prove practicable, it is extremely doubtful if they will in any way affect the cable companies, as is popularly supposed.

The wireless patent situation has been aired in the United States courts to some extent, and it would seem from the decisions handed down that the claims of Marconi in his original patent of ten years ago, i. e., "a receiver having a sensitive tube or other sensitive form of imperfect contact capable of being restored with certainty and regularity to its normal condition," will be upheld during the life of the patent. As a matter of fact, the electrolytic detector or barretter of Fessenden comes under this claim, although this question has not been answered by process of law.

The present indications are that there will be no litigation between the Marconi and Fessenden interests; and in so far as the United States is concerned, there is reason to believe that of the several companies now making and selling apparatus, many will be driven entirely out of the business, one or two will be allied with the Marconi company, and the fittest only will survive, forming a parallel with the inter-

esting case of the Bell telephone of thirty years ago. If this should prove true, it will show not only the value of fundamental patents, but that which is of equal importance, namely, to have the claims so drawn as to properly cover both methods and apparatus.

THE NEED OF A PURE-FOOD LAW.

BY CHARLES RICHARDS DODGE.

The disclosures of the unsanitary methods in use at Western packing houses, recently brought to the attention of the President and now sought to be controlled and remedied by special governmental inspection, as provided in the Beveridge amendment to the Agricultural Appropriation bill, lately passed by the Senate, will, if concurred in by the House of Representatives, bring about a wholesome check on the preparation of improper products for human consumption.

The fact that the proposed law covers the preparation of only a small part of our foods seems to have been wholly lost sight of. What is true of such meat foods as are derived from cattle, sheep, goats, and swine (chiefly canned and prepared meats or lard) is equally true of a great range of other foods, such as fowls, game, fish, and eggs, and a vast number of non-flesh or fish foods, none of which are in the least protected by the Beveridge amendment, and which may in an equal degree become sources of danger to food consumers. It is not generally known that a proper pure-food law has been before Congress for some time, but it has not progressed as rapidly as its friends had hoped.

The pending bill on meat inspection fails to provide for the official examination of storage foods, such as fish and game, sometimes kept for a period of four or five years in cold storage.

As everybody knows, the prevailing custom in dressing poultry for market is to retain the viscera and contents. In market parlance such fowls have not been "drawn." It is possible—it is a fact—that the changes in the viscera and unremoved contents will in time impregnate the entire flesh of the fowl, and to overcome the very perceptible effects of the changes which have been produced after long storage, a certain "purification" with chemicals must be resorted to before the poultry can be put upon the market. Such treated fowls are common.

The many cases of ptomaine poisoning that are reported, and which are often directly traceable to the use of canned fish or shellfish, are caused by unwholesome conditions for which the packers are responsible. If the product has not been properly sterilized when first put up, in time the fact is made evident by a bulging outward of the ends of the cans. These "blown" cans are repunctured to let off the gases of decomposition, and the contents treated with some preservative solution, such as benzoate of soda, after which they are resealed and put upon the market, to be sold to the consumer as wholesome food, and at the prices of wholesome food. At the Paris Exposition, where the writer had charge of the American food products, we frequently found these blown cans.

There is a stringent law which prohibits the importation of liquid eggs; that is to say, eggs removed from the shell and shipped to us in bulk from other countries. Formerly large quantities of such eggs, preserved with salt, were shipped in barrels from China, to be used in the tanneries. As new methods in the preparation of leather came into vogue, the demand for liquid eggs for the purpose declined. They were then shipped to us as food for human consumption, but preserved with boracic acid instead of salt, the bakeries being the purchasers. While liquid eggs are now excluded from importation, there is no law to prevent the sale of liquid eggs produced in our own country, and large quantities of "broken" eggs, and even malodorous eggs, treated to remove the odor, are sold to the bakers. Can any one say that a stringent federal law is not needed to correct such an abuse?

In the matter of tomato catsup, while it can be prepared without preservatives by proper sterilization, the fact remains that preservatives as a rule are necessary. The tomatoes, coming to the factory in larger quantities than can be worked up immediately, begin to decay; they are accessible to swarms of flies, and after none too careful sorting the pulp is placed in barrels, where in time it loses color, and it not only becomes necessary to use preservatives, but coloring matters as well, or the public would not buy the bottled product.

Among the many baking powder adulterations may be mentioned ground stone. A powder of this description, recently placed on the market, was enlarged under the microscope 120 diameters. The adulteration amounted to over 25 per cent.

Much of the so-called gluten flour sold on the market is either adulterated with wheat flour or is not gluten flour at all.

While there are a few instances of injurious food adulteration, there is a large class of adulterated foods that may not be deleterious to health. They may have been prepared in a cleanly way, and appear quite as appetizing as pure foods; but if they lack nutritive value, by means of certain manipulation, or substitution of cheaper substances, or by the abstraction of any valuable or necessary ingredient, such foods are sold claiming to be what they are not.

When the public health is so menaced, it is time that a proper pure-food law should be put upon the statute books, with ample provisions to carry it out.

THE BRITISH NAVAL PROGRAMME FOR 1906.

The estimates for the British navy during the forthcoming twelve months ending March 31, 1907, show a further diminution, the reduction amounting to $7,500,000 over those of the previous year. The result is that within two years there has been effected a reduction of $25,000,000 in the naval expenditure of the country. For the present year the appropriation is $159,337,335, of which total $46,260,655 is to be devoted to the construction of new vessels, representing a saving of $1,865,350 under this heading.

Though the programme does not contain any sensational features, yet at the same time it illustrates the active work of reorganization which is at present being carried out in all the departments relative to the naval organization, and several economies have been effected. One of the most notable features of this revising policy is the withdrawal of all the subsidies to the mercantile shipping companies for armed merchant cruisers, with the exception of the Cunard Steamship Company, whose whole fleet is still to be retained at the disposal of the Admiralty, and the steamers of the Canadian Pacific Railroad Company, the contract in regard to which has not yet expired. By the abolition of these subventions a sum of $606,900 will be saved.

In regard to the new constructional programme for the ensuing twelve months, the following thirty-three vessels are to be laid down: Armored vessels, 4; ocean-going destroyers, 5; coastal destroyers, 12; submarines, 12.

In comparison with former years this is a somewhat modest programme, but as was pointed out in the SCIENTIFIC AMERICAN a few weeks ago, the Admiralty had decided upon a restricted naval construction policy for the present, to be increased if the exigencies so demanded; and although the administration has since changed, the new government evidently intends to proceed on somewhat similar lines.

In addition to the foregoing, however, there is at present a formidable programme in hand, since the following vessels are at present under construction: Battleships, 6; armored cruisers, 10; coastal destroyers, 12; ocean-going destroyers, 5; destroyer special class (very fast ocean-going), 1; submarines, 15; total, 49; and a new royal yacht and repair ship.

The construction of the recently-launched battleship "Dreadnought" is to be pushed forward with all speed, so as to be ready for commission early next year. In the estimates no particulars of this vessel are vouchsafed beyond the estimated cost, which is $8,987,485, and the fact that it will be ready for sea within fifteen months of the laying of the keel. With regard to the destroyers, the coastal type are to be of 26 knots speed, while the ocean-going craft of this class are to attain a speed of 33 knots. The construction of the special fast ocean-going destroyer has not yet been commenced, though the contracts have now been completed and the work will soon be in progress. This vessel is purely experimental, the contract speed on trial to be 36 knots per hour. The submarine vessels are well under way, so as to be ready for the six submarine bases established round the coast and which are now in course of erection.

During the past year the navy has been augmented by 49 vessels made up as follows: Battleships, 3; armored cruisers, 8; second-class cruisers, 1; scouts, 8; destroyers, 16; submarines, 13; total, 49.

No details are advanced concerning the type of vessel to be adopted in connection with the four armored vessels authorized in the programme for the present year. Two, however, are to be constructed in government dockyards, and from this fact, together with the fact that considerable alterations are to be carried out at Portsmouth dockyard in connection with the shipbuilding berths and facilities, it is believed that they will be modeled upon the lines of the "Dreadnought." This hypothesis is supported by the speed with which this vessel is being constructed, so that actual data regarding the advantages of such a fighting unit in practical operation may be gained, and thus form a tangible guide in the construction of future battleships; while the fact that heavier sums are to be expended upon armor plates and guns, amounting to $1,059,085 and $500,000 respectively, tends to support this view. The speed with which the construction of the "Dreadnought" is being carried out, however, fulfills another important factor. By this experiment the Admiralty will be able to obtain conclusive data concerning the shortest time in which such a vessel can be constructed, so that should any other power embark upon an abnormal shipbuilding programme, the Admiralty, owing to their unique position for rapid construction, would be able to supersede the other power's efforts, and thus have a superior fighting unit in commission at the same time. The British authorities have boldly stated that the policy in future is to be a waiting one, in the sense that they can either, in the government or private dockyards, construct and pass a vessel into the active fleet in half the time required by other nations.

With regard to the present estimates, there is one very prominent fact, and that is the small amount of information that is being conveyed therein to the public, though it is apparent that widespread alterations and improvements have been effected all round, conducing to the greater efficiency of this first line of defense. In regard to the guns, numerous improvements have been effected in the latest patterns of breech-loading weapons. Steel of a greater tensile strength and higher tenacity has been introduced, both for the construction of new guns and the repair of the older types. The sighting arrangements have also been completely overhauled, and the re-equipment of the fleet in this direction is being carried out as rapidly as possible.

With regard to liquid fuel, the Admiralty state that this is being extensively developed. The torpedo boat destroyer "Spiteful," which is fitted with oil-firing apparatus exclusively, is being employed as a training ship for the engine complements in the manipulation of the oil-burning apparatus. Four of the present battleships in commission are equipped with this steam-raising system, while those already in operation in two other battleships are being replaced with the latest type, and all the vessels now in course of construction and nearing completion are to be similarly equipped.

The forthcoming year will, however, rank as an important one in the annals of naval shipbuilding, since it marks the passing of the reciprocating engine and the introduction of the Parsons marine turbine. The Admiralty state that the success of the numerous and severe experiments with this propelling machinery in the cruiser "Amethyst," combined with the results attained therewith in the case of the mercantile marine, is such that all the vessels authorized in the programme for the coming year are to be fitted with turbine machinery.

Wireless telegraphy also is to be developed on a considerable scale as a means of communication between vessels. All the stations round the coast are now exclusively operated by the coastguards. During the coming year three further stations are to be established. In this connection it may be pointed out that the naval authorities are experimenting with a new system, which it is anticipated will become highly successful. During the recent maneuvers communication was established between the various vessels over a distance of 2,000 miles, with complete satisfaction under the most difficult conditions.

Extensive alterations are to be carried out at the Portsmouth dockyard, which constitutes the premier naval station, and which will involve an outlay of $12,500,000. These improvements have become imperative in view of the rapid increase in the dimensions and displacement of modern war vessels. The building slip upon which the "Dreadnought" was constructed is to be lengthened, so as to be able to accommodate vessels up to 700 feet, for some of the latest warclads will exceed the "Dreadnought" in length, while two new repairing docks are to be constructed. At present there is only one dock in which the "Dreadnought," owing to its great size, can be berthed. The two proposed new docks will be each 700 feet in length, so that there will be adequate provision for future developments in warship construction. The improvements in this connection which have been in progress for some years past at Devonport, the second dockyard, have now been completed. One battleship is to be constructed at least every year at Portsmouth, and the time limit imposed for such work is to be two years.

STEAM JACKETING INVESTIGATIONS.

The following conclusions are announced by A. L. Mellanby in an article on Steam Jacketing published in the Inst. Mech. Engin. Proc.: (1) With such an engine and a boiler pressure of 150 pounds per square inch, the best mean pressure referred to the low-pressure cylinder is about 40 pounds per square inch. (2) The jackets have their maximum efficiency when the whole of the high-pressure and the ends of the low-pressure cylinders are jacketed with high-pressure steam. (3) The total indicated horse-power is slightly reduced when jackets are applied to the high-pressure, but considerably increased when they are applied to the low-pressure cylinder. (4) Jackets have little effect on initial condensation in the high-pressure, but considerable effect when applied to the low-pressure cylinder. (5) The temperature cycle of cylinder walls next to the steam is considerably less than that of the steam. (6) The greater part of the missing quantity is due to leakage and not to initial condensation.