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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.

A COSTLY BLUNDER.

The most foolish and inexcusable blunder made in the provision of transit facilities in this city, was the failure of the operating company of the Rapid Transit Subway to install a type of car suited to rapid transit. There is no denying that in some matters the American people are marked by a rigid conservatism, which is in strange contrast to their general alertness and adaptability. Nowhere is this shown to more striking effect than in the blind persistency with which our railroad men insist on using the old end-door car for suburban and rapid-transit purposes. Ten years ago, in discussing the proposed subway, the writer of the present article, foreseeing the pit into which our rapid-transit authorities have deliberately walked, urged time and again the necessity for using a special type of car to handle the crowds which were certain to pour in upon the subway like a flood at the hours of busiest travel. The ordinary type of American car, with central aisle and end doors, is admirably designed for long-distance travel; but it is absolutely the worst type of car that could be designed for short haul, frequent-stop, city and suburban service. It was never intended for such service, and the only possible explanation of the existence of such cars in our subway to-day is the reluctance of car builders, superintendents, and operating men generally, to make any radical departure from existing forms and methods.

It is an axiomatic truth, well understood among railroad officials, that in a crowded city service the speed and carrying capacity of a road are determined, other things being equal, by the length of the stops. Never, surely, in all the history of railroading was represented such a fiasco as when, after building the subway in such excellent fashion and equipping it with eight-car trains with a speed of forty miles an hour, the operating company proceeded to throttle down the whole scheme and limit its carrying capacity by equipping it with the obsolete end-door passenger car.

In a recent and very excellent report presented by the City Club to the Public Utilities Commission, it is stated with much truth that the entire secret of the relief of the congestion on the subway at the rush hour lies in the adoption of a proper type of car door. Not even the notorious Brooklyn Bridge is more seriously hampered than the subway; for observation shows that 53 per cent of the passengers for Brooklyn obtain seats at the height of the rush hour, whereas only 41 per cent of those who travel by the subway can sit down. The limiting feature of the whole line is the long stops at the stations, and especially at the Grand Central; the delay being due to the length of time required to get passengers on and off the train through the two little end doors.

What is needed on the subway is not more trains, but more doors, coupled with the exercise of a little more common sense. The Interborough Company should begin at once to install the type of cars which is used by the Illinois Central Railroad for its Chicago suburban traffic, and has been in successful use in European suburban service for over half a century. Each Illinois Central car seats 100 persons, and there are twelve doors on a side. In response to inquiry, the officials of the Illinois Central Railroad state that the introduction of this type of car in their suburban service reduced the average time of stop from 30 seconds to 7 seconds. No platform men are required for the operation of the doors, which are opened and shut by the guards on the train. If these cars were adopted on the subway, instead of a maximum of 27 expresses an hour, the subway could accommodate 40 expresses; double the number of seats would be provided per car; and, in fact, 56,000 seats would be supplied every hour. This would leave a considerable margin for future increase of traffic.

THE PERILS OF THE LONG ISLAND GRADE CROSSING.

The gruesome collision of an automobile with an express train at a Long Island grade crossing, which occurred last Sunday, when two people were thrown into the ditch and burned to death by the oil from the broken gasoline tank, is the latest in a long series of fatalities of a similar kind, which have been occurring with increasing frequency during the past few years. The obvious duty of the railroad company is to abolish these grade crossings altogether, substituting at the intersection of their lines with the public highways either subways or bridges; indeed, they are under obligation to do so by law. We understand that the company is slowly doing this work, and has made the change at several places; but, considering the alarming increase in disasters, it is surely imperative upon the road to hasten the work, instead of permitting it to drag along in the present leisurely fashion. Absolutely inexcusable, however, is the present unguarded condition of many of these crossings. There are no gates, no gatemen, no flags, nothing, indeed, but an automatic gong which, it is stated, in the case of last Sunday's accident, was out of order. Pending the abolition of the grade crossings, the least the company can do is to render these places reasonably secure. Immediate steps should be taken to provide every one of them with gates and a gateman and some form of warning, either by flag or loud gong, which shall attract the attention of the automobilist sufficiently far from the crossing to enable him to make a safe stop. Automatically operated by the gates, there should be a signal which will warn the engineer by semaphore or red light, when the gate is open. These precautions are simple, easily taken, and sufficient to render the crossings safe until the change of grade can be made.

PERILS OF RECORD TARGET FIRING.

With the memory of the "Georgia" disaster still fresh in our minds, there comes the story of another similar accident—this time to a gun mounted in one of our land defenses. The premature ignition of the powder took place in this case at Fort Terry, Plum Island, while the artillerymen were engaged in repelling an imaginary attack by the enemy. The piece was a 6-inch disappearing gun, and the casualties included the death of one artilleryman, the loss of eyesight by another, and the severe burning of several members of the gun detachment. In the course of an interview, an artillerist at Fort Trumbull attributed the too-frequent accidents of this kind to the same cause which we outlined in this journal in our last issue, namely, the too great anxiety of the men to make a record, leading to their playing fast and loose with the rules which are intended to safeguard their own lives. The officer in question stated that, if there should be a damp spot in the cloth inclosing the charge of powder, it is apt to remain in the breech and burn slowly; while carelessness in swabbing may leave a small ember which may ultimately cause a premature explosion.

The Board which inquired into the accident on the "Georgia" reports that the powder was ignited by a "flare-back." This is nothing more nor less than we expected. There is no possible excuse for a "flare-back" having occurred; for since the terrible accident from the same cause which occurred a few years ago on the "Missouri," the navy has installed on our large guns a pneumatic device for blowing the remaining gases out of the gun before a new charge is inserted. The strength of this blast is sufficient to blow a hat or other light article entirely through the bore and out at the muzzle; and therefore if the air blast be kept on for a sufficient length of time, it is evident that all of the gases must be entirely expelled. In the case of the 8-inch gun on the "Georgia," the fact that these unburnt gases were not driven out is strong presumptive evidence that, in their laudable desire to make a speed record at the target, the gun detachment must have reduced the time that should have been occupied in blowing out the gun.

But after all, is the value of speed of fire not being very much overrated? It is accuracy more than speed which will count in a naval engagement. No gun captain will attempt, when on the battle line, to fire at anything like the speed which obtains in target practice; for he knows too well that if such a speed could be maintained, the ship's magazines would be empty before the battle was half over. More time between rounds means a larger number of bull's eyes on the target; and the slowest rate of fire in target practice will always be faster than the fastest rate of fire in battle.

GOOD WORK BY OUR SUBMARINES.

In spite of the prejudice under which the submarine labored in the earlier years of its development, and the indifferent results which were secured, it begins to look as though this type of vessel would, after all, fulfill the sanguine promises of its inventors. Although the detailed official report of the recent competitive trials off Newport has not been made public, enough has leaked out to show that in our latest submarines we possess very capable vessels. The "Octopus" proved to be fast both above and below water, and she passed through unusually severe submergence tests at great depths in a most satisfactory manner. Recently the "Octopus" and "Cuttlefish," two of our largest vessels, during their official acceptance trials, have broken the records for submerged target practice. The "Cuttlefish," while running at full speed submerged, that is to say at about 10 knots an hour, made two bull's eyes with Whitehead torpedoes at a range of 500 yards, the third shot being a little to one side of the center of the target. Later in the trials, the "Octopus" made three bull's eyes out of four shots, at a range of 800 yards, while running submerged at full speed.

BRIGHT OUTLOOK FOR BETTER RAILS.

It is seldom that an agitation meets with such immediate success as that which has resulted from the recent exposure of the poor quality of rails which have lately been furnished to the railroads. As between the railroads and the railmakers, conditions have been completely reversed. Three months ago, the railroads were urging the manufacturers to give them a better product; to-day, it is the manufacturers who are urging the railroads to come to a speedy conclusion as to what kind of rail they require, in order that the present stagnation of the steel rail business may be relieved. It was a wise move on the part of the railroads, when they jointly determined to place no more orders with the mills until some better understanding had been arrived at, and a specification drawn that would meet the present conditions. There is evidence that the manufacturers are sincerely anxious to co-operate with the engineers of the railroads; and it is only fair to recognize the fact that the former had already shown a conciliatory spirit before the present falling off of orders began.

We note with much satisfaction that more than one of the more important rail-making establishments are preparing to overhaul their plants, and put in such improvements as are necessary to meet the demands for a better rail. A dispatch from Pittsburg announces that the Carnegie Steel Company are about to rehabilitate, at a cost of $2,000,000, their famous Edgar Thomson rail-making plant in Braddock. In addition to the installation of engines to be run by the fuel gas from blast furnaces, the improvements include extensive changes in the rolling mills, which, it is believed, will secure that more thorough working of the rail which is universally admitted to be necessary. It is also the intention of the company to build open-hearth furnaces, to enable them to furnish rails of open-hearth steel whenever they may be called for.

DESIGNER FIFE ON THE "AMERICA" CUP CONTEST.

Apparently, the question of a challenge for a race for the "America" Cup next year depends entirely upon the decision of the New York Yacht Club as to which rule the contest must be sailed under. While on his way through New York to the "Canada" Cup races, Mr. Fife, the designer of "Shamrock I." and "Shamrock III.," stated that he regarded the prospects of an "America" Cup race next year as very bright. According to this authority, if a challenge is sent over this summer, it will bear the express stipulation that the race be held under the present rules of the club, and there is not the slightest likelihood of any challenge being sent over for a race to be sailed under the old conditions. Mr. Fife expresses his belief that there is absolutely no chance of England or any other foreign country being able to win the "America" Cup under the old rule. This opinion is probably shared by the majority of yachtsmen upon both sides of the Atlantic. The old rule, which was based merely upon a load-waterline and sail-area measurement, produced a fast light-weather boat, of such slight construction and exaggerated proportions that it was good for nothing more than a contest in a smooth sea and a moderate breeze. Not one of the later cup challengers and defenders has been put to any use whatever, subsequently to the sailing of a series of "America" Cup races. They are too broad, too flat, too long, too light, too heavily ballasted, and too heavily sparred to be of any possible use for cruising purposes. Moreover, they require for their handling as big a crew of men as is necessary for a large ocean square-rigger.

The new rule of the New York Yacht Club, to which Mr. Fife refers, was drawn up by a committee of the club expressly for the purpose of curtailing the exaggerations of form and construction above referred to, and producing a yacht which, while it was fast and seaworthy, would also be strong and staunch, and capable, after a series of races, of being readily transformed into a comfortable cruiser, should the owner so wish. In spite of the fact that some of our yacht designers have criticised the new rule, and predicted that naval architects would be able, by a skillful manipulation of its provisions, to produce yachts which would be practically as exaggerated as those built under the old rule, the experience thus far had shows the new rule to be a decided improvement, the new boats being handsome in form, almost as fast as their predecessors, and exempt from the many faults of the earlier type. The races for the "America" Cup have always been enormously popular, and of late years the contests have been marked, both on the part of the yachtsmen and the general public, by a spirit of fair play, which is in keeping with the best traditions of this, the noblest of all sports.

The majority of the yachtsmen and the whole of the American people will welcome a challenge; and a decision of the New York Yacht Club to arrange a series of races under their own new rule would meet with universal approval.

A FLEET OF FRENCH MILITARY AIRSHIPS.

The question of the use of airships is one which is very active in Europe at present, especially in France, Germany, and Italy. Upon the state of affairs in France, an important piece of news appeared not long since, and while it must be taken with some reserve, it is nevertheless worthy of mention. Although the military authorities decline to give any information on the subject, it has leaked out that the preparations for the new fleet of airships which is to be used by the army are being carried forward with all possible diligence, and there are no less than five airships to be constructed, of the same type as the "Patrie." These will be turned over to the government in March, 1908. It appears that three of the new airships will be constructed by Messrs. Lebaudy at their headquarters at Moisson, near Paris, while the other two are to be built at the government aerostatic establishment of Chalais-Meudon, near the city. It is the intention to provide a large fleet of airships in the future, as the War Department is now quite convinced of their great value in military maneuvers, for various purposes. Such airships will be constructed in series of five, and the above programme relates to the first five of the fleet, exclusive of the three Lebaudy airships which are already built, including the "Patrie." While the general type will remain the same, the object is to make improvements in detail in each of the series of five airships as they are constructed. As to the first five airships of the fleet, they will be distributed among the principal fortified posts in the center and the eastern frontier regions. Among these will be the forts of Belfort, Verdun, Toul, Besançon, and the camp at Chalons. The work of erecting the sheds which are to house them has already commenced. For some time past the War Department has been paying special attention to the subject of training the aerostatic corps, so that it will be able to handle the airships with certainty. For this purpose one of the airships is stationed permanently at the Chalais-Meudon establishment and the drills are constantly being carried out. It appears that the new Aerostatic Corps is to be composed of no less than 48 officers of the military engineer corps and 92 regular army officers who are chosen for their competence in aerial navigation work and their experience in mechanical engineering. Not long since the airship "Patrie" made a series of flights from Meudon to Paris and return, with the object of drilling the crews in actual flight, which is rightly estimated as one of the most important parts of the work. One of these, on the 8th of July, was the fourth flight which the "Patrie" made during the season. Starting at 7.50 o'clock A. M. it made some evolutions about the Chalais grounds, then started for Paris, mounted by Commandant Bouttiaux, Capt. Voyes and other officers of the Aeronautic Corps. After passing over the suburbs and entering Paris, it made several circuits above the city and then came back to its quarters at 9.10. The total distance, 34 miles, was covered in 1 h. 20 min. at the rate of 25 miles an hour, and this is a remarkable result, seeing that the airship had to struggle against a west wind blowing at a considerable speed. Another flight was made over the city on July 12 including a wide circuit through the region, lasting for nearly two hours. It was quite successful, and about the same speed was made. The landing can be carried out with ease, in spite of the fact that the station at Meudon is quite surrounded by woods, and the maneuver was made with great precision, entirely by the use of the movable steering planes. Capt. Voyer and five others formed the crew.

PRESENT AND PROSPECTIVE DOCKING FACILITIES OF THE PACIFIC COAST.

BY H. A. CRAFTS.

Now that it has become an established fact that the main strength of the United States navy will be transferred temporarily, at least, to the Pacific, it becomes interesting to know what the present and prospective docking facilities are on that coast. Outside of possible accidents, the cruisers and battleships will have to be docked at stated intervals in order to have their hulls cleaned and repainted. As a matter of strict economy, it is said that a steel bottom ought to be cleaned and repainted at least once a year. Now on the entire Pacific Coast the United States government has just two drydocks—one at Mare Island in San Francisco Bay, and another at Bremerton, Wash., on Puget Sound. Both of these are graving docks, and are distinguished from the floating drydock by being built into the land, and being therefore fixed and permanent. The government drydock at Mare Island is of granite, 513 feet long over all, with a width of 80 feet 7 inches at the entrance, and a depth of 27 feet 6 inches over sill. The government drydock at Bremerton has a wood body and masonry entrance. Its length over all is 650 feet, width of entrance 92 feet 8 inches, and depth over sill 30 feet.

The inevitable naval base under the new order will, of course, be at San Francisco; and the docking facilities of that port consequently become a subject of more than ordinary importance. As may be readily seen, the drydock at Mare Island will be far inadequate to the needs of the occasion, when the mobilization of Uncle Sam's fleet on the Pacific becomes an accomplished fact. To be sure, a second graving drydock at Mare Island has been under process of construction for the past six years; but from various causes much delay has been occasioned, and it is stated upon good authority that it would take two or three years to finish the work, even though it were to be hastened with all possible speed. This new dock when finished will be 720 feet long, 102 feet wide, and 30 feet deep. The chief difficulty thus far encountered is in securing a substantial foundation. The formation composing its site is hardly more than a deep bed of mud; and in order to secure a foundation that will hold up the structure when finished, it is found necessary to drive a dense mass of wooden piling. Upon this foundation it is proposed to build the dock of reinforced concrete.

Fortunately, however, the government need not depend upon itself for docking facilities in San Francisco Bay. At Hunter's Point on the west shore of the bay, five miles south of the city of San Francisco, the San Francisco Dry Dock Company operates a very extensive plant, and has already done considerable docking for the government, notably in the docking of the battleship "Oregon" in 1894 and the cruiser "New York" in 1903. Recently Howard C. Holmes, chief engineer of the company, has completed plans for the largest drydock in the world, to be soon constructed by the company at Hunter's Point. The company's present plant consists of two graving docks and two floating docks. The first graving dock was completed in 1868. It is 490 feet long over all, 97 feet wide at the gate top and 56 feet wide at the gate sill; midships it is 117 feet wide at the top and 58 feet wide at the bottom. This dock has wooden altars and wooden caisson. The second graving dock was completed in 1903, and in it the battleship "Ohio" was docked in February of that year. This dock is 750 feet long over all; width at gate top, 103½ feet; at gate bottom, 86 feet; midships at top, 122 feet wide and 74 feet at bottom. This dock has concrete altars and a steel caisson; it is filled through the caisson, while the old dock is filled through a seven-foot tunnel.

The largest drydock in the world to-day is at Belfast, Ireland; San Francisco will shortly possess a dock of even greater dimensions. The new drydock above referred to will be 1,050 feet long from gate to the landward extremity; width at coping, 144 feet, and at bottom, 92 feet; depth over sill and below coping, 39 feet 10 inches, or 34 feet 6 inches at high water. The interior facing of the dock will be of reinforced concrete of an average thickness of 15 inches; and the altars will be of the same material. The stairways and timber slides will be formed in the main body of the dock, and will be flush with the surface of the same. Such portions of the sides of the dock as will be above the rock formation underlying the site will be reinforced concrete, and will be proportional in thickness to the height of the same, and anchored into the rock with structural steel posts. The gate seat proper will be of dimension granite, but the approach and buttresses will be of reinforced concrete. The keelsons are to be of Douglas fir and the flooring of Port Orford cedar, all anchored and embedded in a sub-floor of cement. The drainage of the dock will be by surface gutters connected with a sump. The caisson or gate will be of steel construction, and will be virtually a vessel 147 feet long at the deck, 128 feet long on the keel, with a beam of 26 feet and a depth from deck to bottom of 41 feet.

The pumping plant for the new dock will consist of four 54-inch centrifugal double suction pumps with a joint capacity of 200,000 gallons of water per minute. Each pump will be driven by a 500-horse-power three-phase electric motor, using 440 volts. These will be located at the bottom of the pump pit, and will be so arranged as to be started from the gallery at floor level, it being the intention to use the high-tension current of one of the public service power companies, say at 1,000 volts, and transform the same to the requisite voltage.

The dock will hold 24,000,000 gallons of water, but with the pumping plant described may be pumped out within the space of two hours. The earth conditions at Hunter's Point are very favorable for the construction of graving drydocks, the site of the present docks and of the proposed dock being underlaid with what is known as green serpentine rock, forming a very solid foundation, as well as substantial backing for the sides.

The new dock was neither conceived nor planned in anticipation of any possible massing of the United States navy, but in anticipation of the constantly increasing size of ocean craft and the growing importance of the Pacific Ocean as a maritime field of operation. Some idea of the increase of the size of ocean-going ships may be obtained from the following:

Date.	Length of longest ship.
1840	200 feet
1855	375 feet
1881	525 feet
1905	675 feet
1907	786 feet

The last length cited is that of the "Lusitania" and "Mauretania," now building, and already they are talking in nautical circles of ships that will be 1,000 feet long; and this is a class that will call for a dock of 1,000 feet length and over.

THE CURRENT SUPPLEMENT.

The current Supplement, No. 1648, for August 3, contains a large variety of interesting and instructive material. That fascinating mystery, the planet Mars, has again approached the earth this summer; once more the canals and spots will be discussed, and the chances of the habitability will be thoroughly reviewed. Prof. Andrew Ellicott Douglass, who has made a careful study of Mars at Flagstaff, Arizona, contributes a paper on "Illusions of Vision and the Canals of Mars," in which he seeks to explain many of the Martian phenomena on the basis of fundamental defects in the human eye. "Glacial Geology" is the title of an article in which modern theories of glacial climate are outlined by the well-known geologist William North Rice. The shape of the earth is discussed on the basis of a theory of gravitational instability. The Temple of Aizani is described in detail. A system of traction which is designed especially for use upon heavy grades, has been brought out in France within a recent period. The principal feature of this system is the use of a type of locomotive in which a third rail, lying between the main rails of the track, is grasped between the wheels or rails, which thus serve to give an increased adherence to the locomotive, so that a comparatively heavy train can be propelled up a steep grade. The locomotives are described with considerable detail and are illustrated. An abstract of Mr. Allerton Cushman's noteworthy paper on the corrosion of iron is published. Mr. Cushman advances the theory that electrolysis is the cause of iron rust. In an article on the "Form and Energy of Sea Waves," the subject of ocean mechanics is popularly treated. The Scientific American's English correspondent writes on "A System of Reinforcing Concrete Sea Defenses," which has been devised by M. de Muralt. By far the most important article from a mechanical standpoint which is published in the current Supplement is Mr. Harold L. Brown's thorough *résumé* of "Motor Starting Devices for Gasoline Automobiles." The article is very fully illustrated with photographs and diagrams of the various systems which have been used from time to time. In the article on the Preservation of Timber some valuable data on penetration are given. Day Allen Willey writes on Copper Refining Machinery.

The Swiss exports of clocks, watches, and parts to the United States last year was the largest in the past twenty years, their value being $2,469,516, against $2,261,519 in 1905. This trade, which amounted to $1,671,028 in 1887, declined in 1895 to $1,000,000, continuing the retrogression until 1898, when the shipments of time-pieces to America amounted to but $746,240. Since that time the trade has been rapidly recovered. Music boxes from Switzerland no longer find the wide sale as formerly, the sales in 1887 having amounted to $235,415 and in 1890 to $300,708. There has since been a continuous drop, the exports amounting to but $52,174 in 1905 and $43,151 in 1906.