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NEW YORK, SATURDAY, FEBRUARY 7, 1903.

The Editor is always glad to receive for examination illustrated articles on subjects of timely interest. If the photographs are *sharp*, the articles *short*, and the facts *authentic*, the contributions will receive special attention. Accepted articles will be paid for at regular space rates.

THE SIGNING OF THE PANAMA CANAL TREATY.

That great national work, the Panama Canal, has moved another important step forward by the signing of the treaty between the United States and Colombia, providing for the construction of the canal by this government. The event will cause the greater satisfaction because of the apparently unalterable position taken by the Colombian government through its representative, in demanding an exorbitant price for the concession of the six-mile strip along the route of the canal. There is some talk of opposition in the Senate to the ratification of the treaty; but in view of the clearly-expressed will of the people of the United States to have the Panama Canal built, we do not apprehend that any considerable portion of our Senators will be so fatuous as to oppose the signing of the treaty. It is pretty safe to say that long before the canal is completed, this country will have very great need for this short cut from the Atlantic to the Pacific seaports, particularly if complications over some future Venezuelan or similar incident should fail of such easy adjustment as the present trouble in South America.

EXPLOSION OF A 12-INCH GUN AT SANDY HOOK.

The premature detonation of a high-explosive shell at Sandy Hook has completely wrecked a 12-inch army gun, valued at about $50,000, and has served, incidentally, to shatter the expectations which had been based on a new form of high-explosive, and a new type of high-explosive shell. We say "new," although as a matter of fact both shell and explosive have been before the public for several years, and have received considerable notoriety because of a generous appropriation granted by Congress for the purpose of testing them. The high explosive was very much behind the times, because in comparison with the army explosive shell-filler it was over-sensitive to shock, while the shell was equally out of date, by virtue of the fact that it aimed to prevent detonation from shock, by dividing the shell internally into a number of cellular chambers, each containing its share of explosive. Even had the shell and its filler proved successful in these tests, there would still have been no call for them in army service, for the reason that in Maximite and Dunnite the army has secured a high explosive which, combined with absolute insensitiveness to shock, gives most terrific bursting effects, as was shown two years ago at the Proving Ground, when a 12-inch Krupp plate was perforated and the backing completely wrecked. Maximite and Dunnite require no special construction of the interior of the shell, since they possess in a high degree the insensitivenes which is indispensable in a satisfactory shell filler.

Both the shell and the explosive which caused the wreck of the army gun at Sandy Hook were condemned by ordnance experts before Congress made a lavish appropriation for the purpose of testing them; and herein we see another of those costly lessons (the damages in the present case amounting, as we have said, to some $50,000) as to the folly of Congress in rejecting the opinions of the very ordnance experts upon whose judgment it is supposed to rely. There are a multitude of technical questions in which the average layman, in the very nature of things, is at best but slightly instructed; and when appropriations are asked for the purpose of testing experimental devices of a complicated or highly technical kind, it would be well to let the word of the ordnance officers be final as to whether the device is worthy the expense (usually very great) of a proving ground trial.

SHIPBUILDING DURING 1902.

The returns of shipbuilding that are available for the year 1902 prove that although it has been a busy season among all the shipyards of the world, it does not reach in total output the figures of the year preceding. During 1902, 2,393 vessels of a total tonnage of 2,699,000 tons were launched, whereas in 1901, 2,192 vessels of 2,763,000 tons were launched, an increase in the number of vessels, but a decrease in the total tonnage of 64,000 tons. As usual, considerably more than half, in fact sixty per cent, of the world's output was built in British shipyards, from which, during the year, was launched a total of 1,368 vessels of 1,619,000 total tonnage. Next to Great Britain in amount of construction came the United States and Germany. There were launched in this country in 1902, 162 vessels of 315,000 tons, which is a decrease of 10,000 tons compared with the previous year. Germany launched 259 vessels of 272,000 tons, an increase during the year of 6,000 tons.

The prosperity of the shipping trade has been practically world-wide, the tonnage launched in France having risen from 32 vessels of 86,000 tons in 1901, to 102 vessels of 190,000 tons in 1902. Italy, Japan, and Holland all show a considerable increase. There is not much to be said regarding the character of the ships that were built, for there have been no radical changes either in form of hull or in motive power. Perhaps the most interesting feature of the statistics is the increase in the number of sailing ships, the proportion of sailing to steam tonnage built in British yards having risen from 2.2 per cent in 1900 to 3.9 per cent in 1901, and 5.6 per cent in 1902. Unquestionably the most interesting sailing ship of the year was the seven-masted schooner "Thomas W. Lawson." The steam turbine is not making the rapid advance in the mercantile marine that was expected, although it is being applied to a few passenger steamers and steam yachts. The most interesting steamship of the year was, of course, the new North German Lloyd liner "Kaiser Wilhelm II.," of 26,000 tons displacement and 24 knots speed.

"AMERICA" CUP CONTEST.

There are certain facts connected with the 1903 series of contests for the "America" cup that will render the coming season particularly interesting. Hitherto it has been so much a matter of settled conviction with the majority of the American people that the defending yacht cannot be beaten, that the existence, as in the present case, of any conditions favorable to the English boat, are welcomed as rendering the contest a closer one and, therefore, introducing that element of uncertainty as to the result which is the very soul of all true sport. Gradually the competing yachts have been drawing closer together in speed; and the increase has been, of late years, more rapid in the English than in the American yacht. This is shown by the fact that in 1901 Herreshoff failed to produce in "Constitution" a faster yacht than the two-year old "Columbia;" whereas "Shamrock II." pushed the American boat so closely at times that the more the observer knew about yachting, the more doubtful did he feel as to the final issue. On this side of the water Herreshoff is engaged in a second attempt to improve upon "Columbia," and whether he will do so or not, is just as much a matter of uncertainty as was the ultimate victory of "Constitution." There is a popular rumor abroad, which is shared, by the way, by many yachtsmen, that the latter boat has never shown her best speed. Why, we could never understand. She was in charge of one of our most skilled amateur yachtsmen, who had won golden opinions in the previous series of contests by the way in which he handled "Defender" against "Columbia." And as to the sailors on "Constitution," were they not all American seamen, selected in obedience to the popular wish that the American-built yacht should have an American-born crew from skipper to cook? Hence, if "Constitution" failed of selection to defend the cup, the fault must surely have been more in herself than in those who had charge of her. However, this is a moot question that will lend special zest to the trial races of the season, quite apart from the fact that the new cutter now in course of construction will come to the line prepared to show that what "Constitution" can do to "Columbia," she in turn can do to "Constitution." But what a sensation if the four-year-old boat, under her brand-new suit of canvas, should steal home, once more a winner, with the few necessary seconds to spare!

So much for this side of the water. In England, we only know that another costly cutter is being built, this time from designs by Fife, the designer of "Shamrock I." It is stated, probably with truth, that Watson, who designed "Shamrock II.," has collaborated with Fife to the extent of giving him the benefit of his experience. The third "Shamrock" is being built in the same yard as her predecessor; and although there have been rumors of radical changes in material and model, we shall be greatly surprised if the new challenger turns out to vary in any but a few minor details of form, construction, and sail plan, from the boat of 1901. There is one fact, however, that should put the challenging boat in a very much better position for a cup contest than any before her, and this is that she is so far advanced that probably she will be launched some time in March, and therefore ahead of the American yacht. This has never happened before, and it means that the English boat, if she is properly managed and handled, will receive a very thorough tuning up before the contests of August. The present programme is to try her on the Clyde in actual races sailed for prizes against "Shamrock I.," a vessel of pretty well-known speed and capabilities. She is then to be sent over here and tested outside Sandy Hook against "Shamrock II.," whose speed will give, by way of "Columbia," an excellent line on the respective merits of the challenging and defending yachts. Except for purposes of exhibition, it would seem to be a mistake, however, to try out the new boat in British waters. It would be better as soon as she is launched to ship her spars, sails, etc., to this side, bring the boat over, rig her, anchor her inside Sandy Hook and try her every day in every kind of weather over the New York Yacht Club's course. A single day's sailing under cup conditions outside the Hook is worth a whole week's drifting on the Clyde or in the Solent. The year 1903 gives promise of being the most notable yachting season since the memorable time when "Colonia," "Vigilant," "Jubilee," and "Pilgrim" were launched for the purpose of cup defense.

THE DISEASES OF DUST.

The recent experiments in this country and Europe with the disease germs collected on gelatine plates from the dust of city streets demonstrate almost to a certainty that our municipal health would be greatly improved if there were some simple method provided to keep the dust from entering our homes and lungs. The tests made with the germs thus collected indicate that people in large cities are practically living directly over a "Cave of Furies," and that all around exist the bacteria and microbes of a score or more of dangerous diseases. If this dust remained spread over the streets of the city, it would do little harm; but every wind blows it around, and every street cleaner sweeps up enough of it to destroy a whole houseful of people. There is something insidiously dangerous in the street sweeper's broom. Death actually lurks therein far more than in the filthy corners of the streets left untouched by broom or wind. Sunshine destroys more disease germs than any other agency of nature, and when the direct rays of the sun can penetrate to the heap of filth and dirt the destruction is great. The street sweeper's work of stirring up the disease germs of the avenues is consequently partly checked in its direful results by the action of the sun's rays, which have a better opportunity to reach the floating particles of dust than when they are covering the streets in thick layers. But the dust disturbed by the broom in dark streets and alleys is not thus purified. The experts appointed by the Paris Medical Society to investigate the subject of street dust in its relationship to diseases and their spread, reported recently that the only safe way to cleanse the public thoroughfares was to flush them with water. One good hydrant, with a fair pressure of water, would do more toward cleaning the streets than half a hundred sweepers. The latter would merely collect the coarse and more visible pieces of dirt and cart them away, while the fine, impalpable dust which contained the disease germs would be left floating around in the air or distributed in our open windows. Flushing the streets with a good force of water would carry the germs away through the sewers, and in the case of consumptive germs they would be effectually prevented from rising into the upper air for the people to breathe. A pile of filth may reek with poisonous disease germs, and yet if kept moist the danger to those living nearby may be comparatively small. When the dry, warm weather comes, however, the germs are separated from their environments and float in the air.

One of the most satisfactory solutions to the dust problem comes from Germany, where a number of chemists have been making extensive experiments with the germs collected from the dust of Berlin and Vienna. By sprinkling chemicals of a powerful nature in the streets once a week, or once every fortnight, all disease germs are destroyed. These chemical disinfectants of the streets, or as they might more properly be called, insecticides, are prepared for ordinary disease germs that are found in the dust of streets, but there are other mixtures suited to specially virulent disease germs that may occasionally find their way into particular streets or cities. In this way it is supposed that there would be little danger of the diseases spreading further by means of the dust. There is every reason to believe that in many of our disease epidemics the dust-laden wind has been an effective agent in carrying them from one street or town to another. Sometimes the clouds of dust have been blown several hundred feet away, and small particles in the

upper air have floated around for days before finally dropping to the earth again. In the upper currents of air they might travel a hundred miles before descending low enough to be breathed in by people. It has been estimated by German experts, who have made more of a study of these questions than any other nationality, that tropical diseases have in this way been carried by the wind from the mainland to islands ten miles and more in distance. Heretofore it has been said that tropical diseases were more or less local, and that the germs rarely reached an altitude of a few feet. But this must be modified in the case of germs which are carried upward by means of fine dust. While not volatile enough to float to any great distance in the air, they might easily be carried up there by the wind, and then distributed around over a wide area before falling. The germs which are destroyed by the warm rays of the sun would, of course, be killed by this exposure to the direct sunlight, but many of our worst disease germs are not injured in any way by the hot sun. They could easily be carried around indefinitely.

When warm, moist, and "muggy" weather comes in our cities, we speak of it as disease-breeding weather, and this probably more aptly describes the conditions than anything else. But such disease-breeding weather would have no injurious effect upon our health if the germs of disease were not already scattered around. Sometimes a few days of warm dry weather, followed by wind, will produce the right conditions to fill the air with the germs. Right after a snowstorm or heavy rain the air is clarified, and there are fewer germs breathed in than at any other time. Every one feels the tonic of such air, and enjoys the mere breathing of it.

SOME AFTERTHOUGHTS ON THE AUTOMOBILE SHOW.

In reviewing the late automobile show in this city, we shall endeavor to indicate the general trend of design as to general external appearance, and its particular trend in mechanical details.

The New York show of a year ago, outside of the purely American types of steam and electric vehicles, had a most pronounced French aspect, especially in the gasoline car division; and while the 1903 show also, somewhat more modifiedly, presented this aspect, it was largely due to the number of imported French cars on exhibit, and the presence of some few new American cars which were of this type. Nevertheless the "Frenchiness" of style, if the term is allowable, was not as dominating as in the previous show.

As was expected by those familiar with the state of the art, three-quarters of the vehicles shown were of the internal-combustion cylinder type, i.e., gasoline cars. This increase was largely due to so many of the new makers who have entered the field adopting this type, as have some of the makers of steam carriages also.

Out of seventy different makes and distinct patterns of gasoline cars, forty showed front-motor construction, while twenty-five of the back-motor cars had bonnet fronts, leaving only a small fraction which had not wholly adopted the typical up-to-date front-motor bonnet construction of the body. The tubular frame has practically given way to the angle or channel-iron frame, or wood frames reinforced with steel plates, which the French call "*bois d'armée*."

Multiple-cylinder, vertical motors, having two, three, and four cylinders, are of course in the lead. The horizontal type is a good second, owing to the number of two-cylinder opposed style motors shown, exemplified in the Winton car; and, if the single cylinder, horizontal motors are added to these, the horizontal type may be said to lead, or nearly so. Only two makers show a three-cylinder, vertical motor (the Duryea and Toledo), the trend evidently not being in this direction. Four-cylinder vertical motors were shown by eighteen makers, a large gain in this type. Only one two-cycle motor (the Elmore) was shown. A new form of horizontal motor (the Shelby) having both ends of the cylinder open, and two pistons forced in opposite directions by explosion in a common center chamber, attracted considerable attention. This motor was constructed somewhat on the same lines as that employed by the Gobron-Brillié firm in France. The idea of this particular form of construction is, that by causing the explosion to occur between the two pistons and drive them apart, vibration is almost entirely done away with.

The surprising thing was the total absence of alcohol and kerosene motors, the reason probably being the high price of alcohol, and the difficulty of vaporizing kerosene without carbonization, which chokes the tubes and motors. No traction motors for hauling wagon trains for agricultural purposes on common country roads were shown.

Nearly all the cars had small hand levers, conveniently arranged on the steering pillar, to vary the speed by advancing the spark, or to control the motor by using the throttle valve, so as to avoid the use of the speed change gears. Foot levers to disengage the clutches, leaving the motor running free, and foot levers that freed the clutch and put on the brake at the same time were plentiful. The only thing that now demands the inventor's attention is to devise some method of starting under load, and to do away with the power-consuming transmission gears of the gasoline car, so that the motor will be as elastic as the steam engine under the throttle and the electric motor under the controller. High-speed motors were not very common, low-speed motors being mostly used.

A great many of the cars shown still had the wasteful plain bearings; but a decided tendency was shown to use roller bearings more largely than heretofore, the ball bearings seeming to bother the automobile maker, although a number of them were used, not only in the wheels and steering heads, but in the transmission gears, and on the shafts, to take up the end thrust, as on the Peerless. The only carriage in the show having ball bearings all over, including the motor, a practice that might well be adopted by other light-car makers, was a light electric Baker runabout.

The reigning European practice of mechanically-operated inlet valves was shown on about a dozen cars, the peculiar thing about it being its use on many of the small cars with single cylinders, as on the Olds, the Rambler, and the Thomas, and its comparative absence on the big cars having multiple cylinders, which still use automatic suction intake valves. Few air-cooled motors were shown. One of these was the Franklin, with a four-cylinder vertical motor of ten horse power, with flanges on the cylinder and head; while a well-known form exhibited was the waterless Knox, having pins like a porcupine's quills all over it, and a fan to aid in cooling. It was expected that electric generators would be more numerous than the batteries for sparking purposes, but a careful census showed the batteries to be in the lead. In some cars both systems were used, the battery merely being used for starting, and afterward being automatically switched out, the generator then furnishing the current. Of course the dry battery was more largely used than the storage cell, which was sometimes used to store the excess of current the generator furnished, so that in case the generator went wrong at any time, the accumulator could be called in and used for running continuously as well as starting the motor. Some of the makers, like the Electric Vehicle Company, who make a big gasoline car, the Mathewson and the Spaulding, announced that they had succeeded in abolishing the starting crank; but investigations proved these claims to be misleading and ambiguous, to say the least, the method consisting of leaving one or more cylinders, in a motor having vertical multiple cylinders, under compression, and then firing the charge with an electric spark from the battery. This, however, can only be done about once in every four trials, and then not at all, if the charge is left standing over two hours. It necessitates a very close-fitting piston and piston rings, with high compression, each of which has been had before on French cars and is not new. As proof that it is not absolutely reliable, the usual crank is provided, with a battery for furnishing the initial spark, for starting, and the generator to furnish the current when running.

Mechanical lubrication has almost wholly displaced gravity oil feeds.

Sliding and planetary gear transmissions are about equally in favor, the use of independent friction clutches coming next. Two new forms of electric and pneumatic control over the transmission gears were shown, both operated by very small valve handles at the side of the operator, thus doing away with the long change-speed levers that are in common use. The pneumatic control on the Country Club car was arranged so as to divert a minute charge of compressed gas from both cylinders into a storage tank, from which it was conveyed by piping to three small cylinders having pistons, each of which operated a clutch giving the speed desired, when the pressure was admitted through a three-way valve rotated by its controlling handle.

Single-chain drives are more popular than ever, although at the previous show it looked as if the double outside chain drive to both rear wheels from a differential countershaft would supplant this form; but the bevel-geared drives have crowded the double-chain drives out of second place. Of course, this construction carried with it the live rear axle, a large majority of the cars shown being equipped with these, which has led to a close fight for supremacy between the spur and bevel differential gear, the spur, however, being still in the lead. Direct drives on the high speed, without the use of intermediate gears, was one of the latest forms of modern practice shown.

Referring to the steam carriages exhibited, to the introduction of which the present popularity of automobiling is due, it is evident they are much more carefully constructed than formerly, and the details are better worked out. It was not to be expected that anything new would be shown in steam carriages, modern engineering having so thoroughly exhausted anything new in this line, so that all the makers in steam carriages could do was to adopt the best stationary practice to their use. Fire-tube boilers are in most common use, but flash boilers and condensers are shown on the White, which also uses a compound engine. Economy in the use of water is the desideratum, and in England condensers are a necessary adjunct, the law there not permitting the use of steam carriages on the road without condensers.

Prices at the show ranged from $500 to $8,000, and it is evident that the day of the $100 automobile, excepting the motor cycle, is a long way off. Prices on runabouts with single-cylinder motors average about $750; a heavier single-seat car, with a more powerful motor costs about $1,200; a touring car with a tonneau body costs from $850 to $8,000, the high-powered ones costing from $1,800 to $2,500, and some makes from $3,000 to $5,000; the lowest-priced steam carriage shown (the Mobile) costs $550—certainly a popular price to commend it to public favor. Many of the high-priced tonneau bodies are of the bulging shape known as the "King of Belgium" type. They are made of aluminium and can be bought separately of the carriage-body makers, to fit the *chassis*, two of the makers of these (the Berg and the Locomobile) announcing that they prefer to build and make the *chassis* only, leaving the purchaser to select the body, painting, and the upholstery elsewhere. No freaks were shown, and the entire absence of racing monsters was a sign of the tendency to build for comfort, economy, and efficiency, with moderate speed for touring purposes; and if touring over the country is not popular this coming season, it never will be. Eight makes of motor cycles were shown, but the poor man's automobile was rather overshadowed by the four-wheelers, as was the only three-wheel carriage at the show. A number of inclosed cars of the coupé type, by the Berg Company, and also the Limousine top style of the Ward Leonard, and other makers, mounted on the regular *chassis* of the gasoline cars, was shown, thus making the modern automobile an all-the-year-round vehicle instead of a summer car for the pleasant weather only. In commercial vehicles, the ponderous but yet handsome electric trucks of the Vehicle Equipment Company made the best showing, the lighter electric delivery wagons, with and without tops, sharing their popularity with the White steam and long-distance gasoline wagons of the same style.

SCIENCE NOTES.

The New York Aquarium added to its collection on December 13 a snapping turtle which was one of the best ever seen in captivity. Unfortunately, the creature died three days after it was received. It was a Mississippi snapper, and measured from the point of its beak to the tip of its tail 4 feet, 7½ inches. Its upper shell was two feet long. The total weight of the animal was 106 pounds.

A very striking instance of the deterioration of leather, produced under conditions demanding quicker tanning by the use of various chemicals, thus decreasing the durability of the material, is afforded by the fact that the British Museum expends $20,000 a year in rebinding books in leather. Modern leather is widely different from the material produced by what is now regarded as an effete process, its life being limited to fifteen years. In the search for cheaper and quicker processes of making leather, large quantities of sulphuric acid are used, and this chemical, in combination with others, causes the material to decompose rapidly in the course of a few years.

Franz, the German astronomer, published two years ago an exhaustive treatise on "The Mountains and Craters of the Moon." In this work the latitude and longitude of each mountain and crater were worked out, and since that time his book has been used in all the observatories of the world as the standard. Prof. Pickering, of Harvard, has been at work recently on a new atlas of the moon and discovered that no account has been taken heretofore of the altitude of the craters. He has discovered that the latitude and longitude measurements of each are greatly affected by the height. All previous measurements used in the study of the moon by astronomers will have to be corrected by the new series of tables, upon which Prof. Pickering is still at work.

Ever since Prof. Tyndall first discovered the movement of glaciers, attempts have been made by scientists to ascertain the exact depths of these natural phenomena by boring. Their efforts, however, have not been attended with very conspicuous success, owing to mechanical difficulties that have been encountered. But Profs. Blumcke and Hess, from Bavaria, who are well known for their studies of glaciers, have succeeded in boring through the Hintereis glacier in the Otzthal Alps, and found the ice to be 153 meters deep. The machine used for boring was driven by hand, and somewhat resembled that usually employed for experimental boring in mines, but was fitted with special arrangements for washing out fragments of ice from the bore hole to prevent their freezing together again. The expenses of the investigation, which is of incalculable benefit to science, were defrayed by the German and Austrian Alpine Clubs.