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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.

GAS-DRIVEN LOCOMOTIVES AND SHIPS?

The great advance that has been made during the past ten years in the development of the gas engine, and of its valuable counterpart, the gas producer, is making possible the application of the gas engine in fields of work to which, a few years ago, it was supposed to be quite inapplicable. So long as this type of motor was dependent upon the use of gas that was produced in a large stationary plant, nobody thought of applying it to any uses except those that could be served by a stationary engine. In the early days, when the Otto gas engine was making its plucky and successful fight to establish itself as a useful prime mover, and when only units of small horse-power were needed, if anyone had suggested the application of the gas engine to the locomotive or the steamship, he would have been called an enthusiast and a dreamer; yet to-day, thanks to the broad hint that has been offered by that brilliantly successful invention, the automobile engine, we are unquestionably within measurable reach of the time when we may see the gas engine applied both to the locomotive and the large ship. The automobile proved that the gas engine could be applied successfully to transportation, at least in units where the power was of limited size. But it was early evident to inventors that if trains were to be hauled and steamships driven by gas engines, means, compact and economical, must be found for producing the gas continuously as it was needed in a plant that was carried with, and formed practically a part of, the gas engine. It was realized, moreover, that if this prime mover was to be applied generally to railroad and marine transportation, its gas producer must be capable of handling the common grades of coal, that is to say, of taking the "run of the mine" just as readily as does the steam boiler.

Of course, much yet remains to be done in the perfecting of such gas producers. Some excellent designs have been brought out that show economy superior to that of the best steam engines, *provided they are supplied with fuel of good quality*. But there is much to be accomplished before the producer has been brought to the point at which it will take the cheaper grades of coal, such as are consumed with excellent economy under the steam boiler of to-day. As soon as it has been brought up to the desired point of efficiency when using low-grade fuels, we may look for no little activity in the development of a self-contained producer and engine plant for the operation of locomotives and large steamships. In the current issue of the SUPPLEMENT will be found an interesting study of this problem, as worked out on a United States warship and on the largest of the German transatlantic liners. In the latter case, the saving of space would be very striking. The four big smokestacks would literally "go by the board." One complete battery of boilers would be dispensed with, and the large amount of space between decks, now occupied by the uptakes, would become available for greatly-needed passenger accommodations. If the substitution of gas for steam should become widespread, we would have to make a rather sweeping revision of our glossary of terms. The steam locomotive might be renamed, without offense, "the gas locomotive;" but could the public ever bring itself to the point of calling the magnificent high-speed steamer of to-day a gas-ship?

CAN THE PORT ARTHUR FLEET BE RAISED?

The latest advices from the Far East would seem to indicate that the final surrender of Port Arthur was somewhat precipitate. It is at the conclusion of a war, or of some decisive battle therein, that various side lights, in the way of letters and interviews from the principal actors, are thrown upon important events which hitherto have been subject to the censor's blue pencil. This has occurred in the case of Port Arthur; and it begins to be pretty evident that if the judgment of many of the prominent officers connected with the siege had prevailed, the final capitulation would have been delayed for several weeks longer. If the surrender was precipitate, it may well be that many of the precautions, ordinarily taken before the surrender of a fortress, in the way of the destruction of the war material were, in the hurry of the moment, overlooked, or only partially carried out. In view of this contingency, it becomes quite possible that the Port Arthur fleet, which at the time of surrender was resting half submerged upon the bottom of the harbor, was not so completely wrecked by the Russians as to render its salvage by the Japanese impossible. In a recent interview, one of the paroled officers of the Russian navy has stated that, before the terms of capitulation were signed, the sunken ships were wrecked beyond all hope of recovery. On the other hand, the Japanese claim that some of the battleships can be raised and rendered serviceable, and we are inclined to think that the Japanese version is nearer the truth. According to the Russian account, heavy charges of high explosive were detonated in the boiler rooms, engine rooms and shaft tunnels. If this was done, it is difficult to believe that it was done effectually, since the charges, to properly do this work, must have been placed in carefully-chosen positions and in very large amounts. In view of the fact that the ships were submerged and under fire, this would be a particularly difficult task, and would require an elaborate equipment of divers and mining apparatus, which, in the disorganized condition into which the navy seems to have fallen, can scarcely have been available.

Should it turn out that the ships have suffered no other harm than that produced by the shells that sank them, the task of salvage, though difficult, should not be beyond the powers of the Japanese wrecking crews. The ships were sunk chiefly by the 11-inch projectiles from the mortar batteries. They fell, most of them, almost perpendicularly, and it is likely that, with their usual forethought, the Japanese used armor-piercing projectiles, that were not intended to burst on contact, but passed directly through the various decks and out through the bottom of the ship. Hence it is likely that the water entered through several more or less widely-scattered shell holes, and that the damage at each point of rupture does not extend over an area of more than a few square feet. If this be the case, it would be possible, by temporary patching of the inner bottom, to pump out the vessels and float them, one at a time, into the Port Arthur drydock, or possibly tow them directly to the Japanese yards. The extraordinary vitality betrayed by these very ships, after being struck more than once by torpedoes or floating mines, gives a reasonable expectation that the essential structure of the vessels are still intact, and that a few months in drydock and within reach of a machine shop, may see them added to the Japanese navy and available for the first line of defense. Of the five battleships, one, the "Sevastopol," was sunk outside the harbor in 150 feet of water, and she must be considered as permanently destroyed. The others, including the "Retvizan," "Pobieda," "Peresviet," and "Poltava," were sunk inside the harbor, and are only partially submerged. Wrecking operations, therefore, can be carried on from the decks of the ships themselves, and in no case, probably, under a greater head of water than 40 to 45 feet. The most valuable of these ships is the "Retvizan," which was built in 1900 at the Cramps' shipyard in this country, and may still be reckoned as a thoroughly modern ship. The "Pobieda," built in 1900, and the "Peresviet," built in 1898, are also modern battleships that made, on trial, speeds of 19.1 and 18.5 knots respectively, and carry a numerous battery of long-caliber high-velocity guns. The "Poltava" is an older vessel of doubtful value, launched in 1895; her main armament of four 12-inch guns is somewhat obsolete, and her speed is low. If the three former vessels can be salved, they will form a most powerful addition to the Japanese fighting line, and will give them a decided preponderance over any fleet, or combination of fleets, that Russia can place in the Far East, for at least two or three years to come.

WORLD'S AUTOMOBILE RECORDS IN FLORIDA.

It is gratifying to know that the world's record for the mile, against time, which was brought to this country last January, when W. K. Vanderbilt covered the mile, in a 90-horse-power Mercedes, in 39 seconds, will remain here for the present at least, and probably throughout the whole year. In the meet which was held last week on the famous beach at Ormond, Florida, last year's record for the mile was beaten by no less than three different machines. The fastest run was made by H. L. Bowden on a 120-horse-power Mercedes, weighing 2,650 pounds; his time for the mile being 34 1-5 seconds, and his rate of speed 105.26 miles per hour. The next fastest time was made by an English car, a six-cylinder Napier of 90-horse-power, of less than the regulation weight of 2,204 pounds, driven by A. C. McDonald. This machine ran the mile in 34 2-5 seconds, at the rate of 104.65 miles per hour. The third car to surpass last year's record was a steam car of 20-horse-power driven by L. S. Ross, which covered the mile in 38 seconds. The 120-horse-power machine and the steamer were both constructed specially for racing, the former consisting of a frame lengthened to accommodate two standard 60-horse-power Mercedes engines, placed in tandem on a common shaft, and the Stanley steamer being also a special design, modeled on what has come to be known as the "torpedo" lines, which present as little resistance as possible to the atmosphere. The Napier performance will stand as the official record, on the ground that the machine is a stock machine, coming within the prescribed limit of weight; but it must be admitted that the performance of the steam-driven car is one of the most sensational and altogether surprising events of the meet. It shows how largely the greater power of the gas-driven machines is compensated by the more even torque of the steam engine. Of course, much of the high speed of the steamer is due to its light weight, and to the small sectional area presented to the atmosphere. There can be no question, indeed, that on an ideal track, such as this at Florida, and at the high speed at which the trials were made, the air resistance is by far the most important obstacle to speed.

The record for the kilometer remains in Europe, at least for another year. The Napier machine, with a record of 23 seconds for the distance, being the nearest that any of the racers came to Rigolly's remarkable time of 21 2-5 seconds, made in 1904. In the Florida time trials, the double-engined Mercedes made the distance in 23 3-5 seconds, and the steam-driven car in 24 1-5 seconds.

Unquestionably the most meritorious feat in the time trials was the run of five miles by the Napier car in 3 minutes and 17 seconds, which is 14 1-5 seconds faster than the record made by Vanderbilt in a 90-horse-power Mercedes last year. It works out at an average of 39 2-5 seconds for the mile, or 91.37 miles per hour. For the complete details of the various time trials and races, reference is made to the illustrated article given elsewhere in this issue.

OUR EXPORTS.

Exports of manufactures in the calendar year 1904 exceeded $500,000,000 in value. Details of eleven months' exports just completed by the Department of Commerce and Labor, through its Bureau of Statistics, show for the eleven months of the present year a total of $459,575,023 of manufactures exported, and for the month of November alone $46,608,896; so that, unless the December exports should prove much less than those of November, the total exports of manufactures for the calendar year must exceed 500 million dollars.

In the calendar year 1903 the exports of manufactures were but 421 millions; in 1900, in which year the highest export record in manufactures occurred, the total for the calendar year was 441 millions; in 1898, 308 millions; in 1896, 253 millions; and in 1894, 178 millions. Thus the exports of manufactures in 1904 seem likely to be nearly three times as great as those in 1894. The increase in the exportation of manufactures has been sufficient to nearly offset the phenomenal reduction in exports of agricultural products.

As is well known, the shortage in our own wheat supply, coupled with the unusual demand in the home market and the unusually large surplus in other countries from which our former customers were able to draw freely, have caused the exports of breadstuffs from the United States, and especially those of wheat and flour, to fall off greatly in the last year, so that agricultural products which, in the eleven months ending with November, 1903, amounted to 789 million dollars in value, were but 704 millions in the corresponding months of 1904, a fall of 85 millions; while manufactures show an increase of 77 millions, the figures for the eleven months of 1903 having been 382 millions, and in eleven months of 1904, 459 millions. In addition to this, products of the mines show an increase of about 3 millions, products of the forests 3 millions, and products of the fisheries 1 million dollars; while the miscellaneous group shows a decrease of about 1 million dollars and foreign merchandise exported a decrease of nearly 2 millions, bringing the total exports for the eleven months of 1904 up to $1,306,173,292, against $1,309,933,517 in the corresponding months of 1903.

On the import side the total importations for eleven months are $939,381,659, against $917,725,693 in the corresponding months of last year. The fact that the imports for the single month of November, 1904, were $95,208,172 seems to justify the statement that the total imports for the calendar year will be over one billion dollars. The greatest increase in imports occurs in articles of food, chiefly sugar and coffee, which divide honors about equally in the increase in imports of foodstuffs. The other group showing an increase is "articles in a crude condition for use in manufactur-

ing," which for the eleven months ending with November, 1904, showed a total of $309,338,579, against $293,439,440 in the corresponding period of last year. The other groups, "articles wholly or partially manufactured, for use in manufacturing," "articles manufactured ready for consumption," and "articles of voluntary use, luxuries, etc.," show in each case a slight decrease as compared with last year, the figures being: Articles wholly or partially manufactured, for use in manufacturing $122,122,187, against $140,845,440 in the eleven months' period of last year; manufactured articles ready for consumption, $145,110,133, against $159,872,017 in the same period of last year; and articles of voluntary use, luxuries, etc., $122,184,867, against $130,252,185 in the eleven months of 1903.

FOAMING OF THE WATER IN A STEAM BOILER AND ITS EFFECT.

BY CHARLES H. HASWELL, C.M. AND N. E.

There is not an element in the effective and economical operation of a steam boiler and attached engine, whether in land or marine service, and especially in the latter, that is pregnant with more results and casualties than the foaming, or "priming" of it (the latter a foreign term neither expressive nor derivative), inasmuch as it involves not only the wasted expenditure of heated water, by its flowing with the steam of operation into the cylinder of an engine; but, when its volume is in excess of that of the clearance space between the piston and the head or bottom of the cylinder, it involves the disruption of one of them. Upon the resulting arrest of the engine and consequent flow of steam to it, the foaming water, except when violently agitated by the motions of the vessel in which it is operated, subsides, and if its surface is below the upper surface of the furnace tubes or flues, as the case may be, it soon renders them incandescent, and as the result a collapse may ensue.

Before essaying to submit a remedy, or even an amelioration of this objectionable and destructive operation of foaming, it is proper to consider its origin. Ordinarily, it is the result both of an insufficient height and volume of steam space above the water line, and the *per saltum* flow of steam to the engine, consequent upon the periodic operation of the steam valves, which involves such undulations of the surface of the water that foaming ensues. It also occurs when the area of the surface of the water is less than that of the area over the crowns of the furnace.

With boilers where foaming exists, various expedients are resorted to, either to obtain additional volume of steam space by the addition of a cylindrical vessel, arranged as an integral of the boiler or attached to it, termed the drum, or by concentric cylinders set vertically at the termination of the flues or tubes, and rising to an elevation so far above the water level as to give space for the foaming water to subside before reaching the opening of the steam pipe. Upon this construction the smoke pipe is set, and the hot air from the furnace rising through the inner cylinder or chimney superheats the steam within the ring to an effective and economical degree. Another method is to extend the steam pipe into the boiler and attach it to the under side of the crown of the shell. The pipe is perforated with numerous small openings, and the steam, instead of flowing in a mass to the opening of the steam pipe, flows in minute currents from an extended surface, and foaming is materially arrested. This construction is termed a dry pipe.

Foaming renders it difficult, furthermore, to readily ascertain the actual height of the water in a boiler; and as the removal or correction of this difficulty is imperative, various devices in addition to the ordinary gage cocks of manual operation are used, such as a glass gage attached to the front of a boiler and connected to it, both above and below the upper surface of the flues or tubes by small connections, which arrest and reduce the foaming to a degree that shows the actual height of the water. Sometimes a metallic cylindrical vessel with a glass face is used, connected in like manner.

The loss in the cylinders from the super-hydrated steam due to foaming water is a material element in the question of the economy of a steam engine. The conditions, results, and constructions here detailed are well known, and they are introduced, not only as a record of the construction of the period, but to give value to the following illustration of a very common and effective cause of foaming in all boilers, and how it can be materially prevented.

In the operation of the furnace of a boiler, the heated water contiguous to the outer sides of it rises in vertical currents to the water line, and in a boiler where the water line is less in width than the extreme width of the furnaces, the ascending of currents of water in the condition of ebullition will be concentrated at the water line between the sides of the boiler and furnace; and hence a concentrated ebullition of the surface of the water or foaming much in excess of that which arises from the ordinary want of steam space will ensue, which in small marine vessels, where the height under the deck is insufficient to admit of a drum, chimney, or like construction, is irremediable.

PASSAGE OF THE TRADE-MARK LAW BY THE HOUSE OF REPRESENTATIVES.

In our issue of January 14 we published an article by Mr. Arthur P. Greeley, late Assistant Commissioner of Patents, reviewing the bill presented by Mr. Bonynge (H. R. 16,560) for the relief of present trade-mark conditions. The House of Representatives has passed this measure. It must now be considered by the United States Senate and receive the President's signature before it becomes a law.

The main object sought to be accomplished by the bill, as pointed out by Mr. Greeley, is the registration of trade marks used in interstate commerce as well as those used in foreign commerce and in commerce with the Indian tribes; the formulation of a procedure which will give uniformity to the laws governing the registration of trade marks; the provision of additional penalties for the infringement of a registered trade mark; the reduction of the fees required on the filing of an application for the registration of a trade mark; the regulation of the procedure for the registration of a trade mark governing cases of interference or conflicting claims to the use of trade marks; the fulfillment of our treaty obligations with foreign governments.

Among the sections of the bill containing provisions differing from those of the present law, may be mentioned the first, which provides for the registration of a trade mark in use in interstate commerce, a provision that is sadly needed. Section 3 provides that if an applicant for registration is not domiciled in the United States, he must appoint some person who is a resident of the United States upon whom process may be served. Another important section is the fourth, which states that if a trade mark has been registered in this country, it shall have the same force and effect here as if filed here on the date of filing abroad, no certificate being issued in this country until the certificate has issued abroad.

In section 5, which has passed almost in the exact words proposed by Mr. Greeley, when he was a member of the Trade-mark Committee, the most important division is that giving full protection to common-law trade marks by providing that nothing shall prevent the registration of any mark in actual use as such for ten years. The sixth section provides for the giving of notice in the Official Gazette of contemplated registration, so that rival claimants to the same mark may file notice of their own titles.

The period of registration, according to the Bonynge bill, is twenty years, except that in case of foreign registration the registration in this country will cease with foreign registration. A trade-mark registration may be renewed upon payment of a fee and petition filed within six months prior to the expiration of the period for which a certificate was issued.

It is hardly to be expected that the bill will pass the Senate in its present form. Section 5 will need revision to meet the purposes for which it was drawn. It was intended in the last paragraph of that section to provide for the registration of marks which might not be technical trade marks, but which have acquired a certain vogue or recognition by use of ten years or more, and which have been in actual use as distinguished from "lawful" use.

Section 13 provides that any person who is injured by the registration of a trade mark may apply to have that mark canceled. The use of the word "injured" is not very clear, and may indicate more than may have been intended. It was probably intended to mean that any person may apply for cancelation of registration if he can show that a registered trade mark simulates one used by him and to which he has a prior right.

It is to be hoped that with the proper clerical corrections, the bill will pass the Senate.

ECLIPSE EXPEDITION FROM KIRKWOOD OBSERVATORY, BLOOMINGTON, IND.

The expedition is under the direction of Prof. John A. Miller, Professor of Mechanics and Astronomy, assisted by W. A. Cogshell, Assistant Professor of Astronomy; A. F. Kuersteiner, Professor of Romance Languages, who is now in Spain; and J. E. Valdez, a young Spaniard, who is a student at the university. These gentlemen are all members of Indiana University. The university has assumed financial responsibility for the expedition, but it has been aided by generous contributions from the Indianapolis News and the Reader Magazine, published at Indianapolis.

The equipment will consist of (1) A photographic telescope of 8 inches aperture and about 70 feet focal length. It will be mounted horizontally and fed by a cœlostat, the mirror of which is 14 inches in diameter. Five exposures will be made with this telescope. The negatives thus obtained, it is hoped, will give some information regarding the structure of the inner corona. (2) Four other cameras, varying in focal length from 80 to 60 inches, will be mounted on a polar axis. (3) There will be a battery of four cameras of 3½ inches aperture and 11 feet focal length, with which photographs will be made in search of the intra-mercurial planets. Pictures of the region where the sun will be at that time will be made at the Kirkwood Observatory, in order to compare them with the photographs made at the time of the eclipse. The expedition will go to Spain, but the exact location has not yet been definitely decided.

SCIENCE NOTES.

Frédéric Mistral, the Provençal poet recently awarded $10,000 as half share of the Nobel prize for literature, intends to devote this sum to the development and adequate installation of the ethnographical museum—Le Musée Arletan—founded by him some years ago at Arles. For this purpose the municipal authorities agree to make over an old palace, now used as a college, the restoration and adaptation of which will cost $50,000. An American resident at Avignon, Mr. Edward Leon, has offered $10,000 as a subscription, and will arrange for five lectures in the United States to help on the fund thus inaugurated.

The prizes for the year 1904 have been awarded, we learn from La Nature, by the Paris Society for the Encouragement of National Industry. The grand prix of the Marquis d'Argenteuil has been awarded to MM. Auguste and Louis Lumière for their discoveries in photography. The "chemical arts" gold medal has been awarded to M. Héroult for his works on electrometallurgy, and the "constructions and fine arts" medal to M. Arnodin. Gold medals have also been awarded to M. Boulanger for his micrographic work, to M. Grey for a rolling-mill, to M. Guillet for his work in metallurgy, and to M. Schwoerer for his system of superheated steam.

To those connoisseurs who evince great pride in their collections of Dresden china, it will come as a great shock to learn that to-day there is no such product under this name, although sold as such. In the course of a prosecution in London, where a firm was prosecuted for selling ware as Dresden and marking the goods as such, it was stated that no china is manufactured at Dresden. The name is applied to the products of the royal factory at Meissen. Furthermore, many pottery decorators at Dresden work upon china that is manufactured at different places, is transferred to that city, receives its imprint, and is then disposed of as Dresden china.

At a recent meeting in London of the British Ornithologists' Club were shown the legs of three lapwings, demonstrating the extraordinary injuries that are inflicted by the accidental entanglement of sheeps' wool around the feet of the birds. In one instance so tightly had the wool encircled the bird's foot, that one of the toes had mortified and had dropped off, while in another case the bird had lost all its toes from this cause. The birds become entangled with the wool while flying among bushes and shrubs upon the animal's grazing ground, and also when they settle upon the sheeps' backs, and their beaks are not sufficiently strong or long enough to remove the strands from their feet.

An interesting archeological discovery was made in the neighborhood of Bournemouth, England, recently. During the construction of a new road the excavators cut into a mound, which is indicated upon the maps as an ancient burial ground, and a large sun-baked clay urn was unearthed. It was in a remarkable state of preservation, and was intact, though in removing it the vessel was slightly damaged. The urn was only buried a few inches below the surface of the ground; in fact, the roots of the heather had forced their way into the interior of the receptacle into the ashes and dust it contained. Upon examination by experts, the urn was estimated to be two thousand years old. As this road will penetrate through other similar mounds, the work is to be conducted under the supervision of antiquarians, in the hope that other articles of archæological value may be excavated.

According to Nature, an optical convention will be held, under the presidency of Dr. R. T. Glazebrook, F. R. S., at a date toward the end of May next, at the Northampton Institute, Clerkenwell, London, E. C. The object of the convention is to bring into co-operation men interested in optical matters. A sub-committee has been appointed to consider the subjects of papers on optical questions, which should be brought before the convention, and suggestions as to subjects for discussion will be welcomed. It has been decided to organize an exhibition, of a scientific character, of instruments manufactured in this country, with a view to show the progress recently made and to stimulate further efforts. In order that interest in the convention may not be confined to London workers in optics, a sub-committee is being formed to secure the assistance of local representatives. The honorary secretary of the convention is Mr. F. J. Selby, Elm Lodge, Teddington.