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NEW YORK, SATURDAY, MAY 16, 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.

WE NEED FEWER DOCTORS.

The other day at the convention of the American Medical Association, in New Orleans, where some 4,000 or 5,000 physicians and attendants were gathered, Dr. Billings drew attention to the decided oversupply of medical men in the United States. He attributed the surplus to the fact that the medical colleges are graduating annually from 10,000 to 12,500 physicians, when the actual needs of the country call for only about 2,500. If Dr. Billings is correct, and there is no reason to doubt his figures, from 7,000 to 10,000 young men are annually entering a profession in which they have but the slimmest hopes of making even the proverbial "comfortable living." Of course, it goes without saying that most of the professions are more or less overcrowded; but we doubt if any of them, except the Law, could afford a parallel to the condition of things brought to light at the New Orleans convention. What this disparity between the demand and supply means to this army of young men, can only be surmised; but certain it is that in the majority of cases it will involve the loss of much money, that can ill be spared, and much time, that can be spared still less. It does really seem a pity that some of these graduates have not entered other professions that are not so crowded, and can offer better prospects of remuneration. Sanitary engineering, naval architecture, and the comparatively new profession of forestry, for instance, are not overcrowded, and there will soon be a great demand for really competent automobile engineers, men who combine with mechanical ability a thorough knowledge of gas and other engines that are competing for the control of the field. Then there is the sphere of journalism, which, while abundantly supplied as to numbers, is pitiably supplied as to quality. There must be among those thousands of graduates not a few young men who have a natural gift for good writing—in these days an all-too-rare accomplishment that threatens to become a lost art.

THE PROPOSED BROOKLYN BRIDGE TERMINAL STATION.

What has become of the Mayor's or, to speak more correctly, of the Bridge Commissioner's proposed railway terminal at the Manhattan end of the Brooklyn Bridge? As suggested by Mr. Lindenthal, and laid before the Board of Estimate by the Mayor, the scheme contemplated the construction of a terminal which was to take in the subway, surface and elevated railroad systems, which now meet near the entrance to the Brooklyn Bridge; while above the terminal was to be erected a great municipal building, of such capacity that it would be possible to gather together under one roof the various city departments, many of which are located in different buildings throughout the city, and are therefore paying rents which aggregate yearly a very large sum of money. The proposal was to acquire several triangular plots of land in the immediate vicinity of the Bridge terminal, and above the ground thus acquired erect the proposed building, through which, by means of arcades, the traffic of Chambers Street and City Hall Place would find its way. Into the three-deck terminal below the city offices would run the cable and trolley cars that cross the Brooklyn Bridge, the surface cars of Fourth and Third Avenues, the tracks of the present rapid transit subway, and those of the proposed tunnel connecting the Williamsburg and Manhattan Bridges with the Brooklyn Bridge. Among the many improvements, most of them excellent in theory, proposed by the present administration, we know of none, outside of the contemplated extension of the subway system, that would confer more benefit on the traveling public.

"RELIANCE" AND "COLUMBIA."

Because the "Reliance" and "Columbia" happened to get in close company during their tuning-up work on Long Island Sound the other day, and the old boat seemed able to hold her own with her big sister, quite a little thrill of excitement, with some trepidation, was felt throughout the yachting circles on this side of the water.

As a matter of fact, the result was exactly what we predicted in these columns, the "Columbia" with her small wetted surface and generous sail plan proving equal to the "Reliance" with her large wetted surface and greater spread of canvas. Had there been a disturbed sea, the "Columbia" would probably have pulled away quite easily from the big boat. Let the two meet, however, on the Sound in a whole-sail breeze with started sheets, and there will be a very different story to tell. At the same time, there is no denying that the "Columbia" has a rare burst of speed in her in a strong wind; as witness her magnificent run on May 3, when in a piping breeze that held true throughout the run from Newport to City Island, she averaged for over one hundred knots of the course a speed of nearly fourteen knots an hour. It is probable that she was favored somewhat by the tides.

OUR ENORMOUS EXPORTS.

It is estimated by the Treasury Department that the exports of the United States for the current year will reach the great total of $1,500,000,000. It is interesting to note the growth in our exports during the past four decades. In 1870, for the first time, the total reached the $500,000,000 mark; and it took twenty years longer for the figures to swell to $750,000,000. In 1897 they reached the grand total of one billion dollars, and a 50 per cent increase was recorded in the half-dozen years that followed. The growth of imports has been always steady, and during the last five years remarkably rapid. In 1895 our imports amounted to $705,205,585. Five years later they had reached $838,761,870, while for 1903 they amount to $1,001,596,683. It is the ever-growing demand for manufacturers' materials that is responsible for this rapid increase. In the month of February last manufacturers' materials alone constituted more than one-half of the total imports.

WHAT TO ABOLISH FROM WARSHIPS.

In discussing the many conflicting theories as to what should be got rid of in warships in order to reduce their ever-growing weight and size, our esteemed contemporary, the Engineer, of London, says: "The Americans have abolished torpedoes altogether; and it may be added that the French and Germans have abolished nets. The Germans have abolished wood. If all accounts are true, the Spanish and Chinese have abolished guns, and the Turks, screw propellers also, though the Italians—who have a reputation for building light ships—still supply big four-poster beds for senior officers." The fact of the matter is (and we say it with all due deference to Admiral Dewey and the school that believes in smaller and lighter battleships), what is needed to-day is not the abolition, but the introduction of weight. Guns, torpedoes, armor, conning towers, a generous ammunition supply, powerful engines, reliable gun-mounts, good coal capacity—all of these are necessary, and all call for weight. If we are to have our fighting line made up of battleships and cruisers, this means, and always will mean, that we must have big ships. We do not need to take away, but to add; and evidently, if the experience in the "Maine" is any criterion, the addition must be in the direction of such weight as is necessary to give proper structural strength all round. It looks as though modern battleships, cruisers and torpedo boats were suffering from the same cutting down of weights that is causing such trouble in our big modern racing yachts.

THE METRIC SYSTEM.

Many of the opponents of the metric system base their unwillingness to adopt it on the fact that it is decimal; others only on the ground that it is metric—i. e., based on a unit that is nearly 40 inches long instead of one that is 36. As regards the decimal end of it, there is not one of the American objectors who goes to England, who does not complain of duodecimal currency with its various disadvantageous side issues. He finds his own dollar easily enough divisible and easily enough computed in all its divisions and multiples; but he complains of a 20-shilling pound and a 21-shilling guinea, and of the steps 4 x 12 x 20 on the road from farthing to pound. He never confuses the 20 hundredweights of 100 pounds each and the 20 nominal hundredweights of 112 pounds each, for although 2,240 pounds make the only legal ton in the United States, he uses almost exclusively 2,000. He forgets all our "troy" and "apothecaries'" weights, the tables for which used to wear out his soul when he was a boy, and which at forty years of age he cannot repeat. He probably uses for fine work, if he is a machinist, decimal divisions of the unit, or of one-third of the unit, as our United States standard is the yard, not the foot, in preference to the carpenter's eighths and sixteenths. He has no difficulty in laying out or laying off a third or a quarter of an inch on a decimal scale.

Those who base their objections to the system on the meter only, would do so were it divided into twelfths. They seem to think that if we were to measure in meters, we would have to change all our patterns. As a matter of fact, we would not. The designer who has any common sense and experience makes his drawings to some near unit which will give him enough stuff to bear the load or do the work. He gives himself a factor of safety according to the character of the load; and if the dimension were 39.4 instead of 40 inches, it would not cause him any worry nor make his work any the less reliable or suitable. A 3-inch shaft, so called, is really 2 15-16 inch about nine times out of ten; and no one complains of weakness because it is not just 3 inches. No one objects to putting in cold-rolled shafting because it is an even 3 inches on the so-called 3 inches size, instead of only 2 15-16. There is no confusion.

It will probably be a long time before British insular prejudice, some of which we have inherited, will consent to the adoption of either decimal subdivision or the metric unit, alone or in combination. Meanwhile there is one thing which we can do, so long as we are saddled with our present standards and subdivisions—that is, express dimensions in inches instead of in feet and inches. For instance, we can avoid writing 5′ 1″, and instead write 61 inches; because the 5′ 1″ is liable to be read 51 inches. There are times and places when such misreadings can be not merely annoying, but very expensive.

THE FIRST IRON SAILING VESSEL.

Some interesting facts have been published in England concerning the first iron sailing ship which set out from Liverpool, and its commander. The vessel with this unique distinction was the "Richard Cobden," commanded by Thomas Lidbitter. This craft was built of Coalbrookdale iron, and was launched in 1844. She was a bark of 461 tons, and had a speed of 10 knots per hour. She was constructed of iron throughout, including the rudder, rudder frame, and steering gear. Her lines were very fine, and she was five times her beam in length. She was without bulkheads, and in sailing trim she lay on an even keel. She had a great rise of floor, falling in somewhat from her bilge to the rails. In 1844-45 she set sail for China, but was laid up twice for repairs at Cork and Rio de Janeiro respectively during the passage. She aroused considerable attention at the various ports at which she called, as she was the first iron vessel ever seen, and was regarded somewhat suspiciously by the superstitious, to whom the idea of making iron float was considered as flying in the face of Providence. Her second voyage was to Bombay *via* the Cape of Good Hope and back. She covered the round trip in some seven months, which was considered a remarkable performance. She made another journey to Bombay, which she reached in 94 days. On none of these trips did the vessel make any water, so that the feasibility of utilizing iron for vessels was firmly established.

The next vessel commanded by Capt. Lidbitter was also an iron vessel launched in 1853. She was 192 feet in length, 32 feet beam and 22 feet depth. She was a three-masted craft, and was provided with an iron bulkhead abaft each mast. Like the "Richard Cobden," she was without steam power. Her first voyage was from London to Bombay, Calcutta, and Melbourne. She covered the distance between the two last named ports in 60 days. In June, 1854, she left Melbourne for home with a large and valuable cargo of wool and £300,000 in gold. The captain intended to round Cape Horn on this trip, but after passing Tasmania the ship sprang a leak during a gale, and as she listed with dangerous heaviness to port, the captain beat his way northward to Tahiti, and Papate was safely reached, but the vessel had only been kept afloat by three weeks' incessant pumping. At Papate the ship was pumped out and examined, and the leaks were found on both sides of the ship, abreast the mainmast. Three hundred rivets were knocked out and renewed before the vessel was again ready for sea. When the repairs had been satisfactorily completed, the captain again set sail, and this time safely reached London in March, 1855. The vessel was again overhauled, and the springing of the leaks was found to be due to the keelson, which instead of being made solid from end to end, was constructed in three unconnected lengths separated at the fore, main, and mizzen bulkheads respectively, and these bulkheads were found to be far too weak to withstand the enormous strains set up. The defects were remedied, and the vessel made numerous voyages, principally between Philadelphia and New Orleans, and was finally stranded in the northwest Providence Channel. More than thirty salvage ships undertook to refloat her, but as they demanded a payment of $30,000

before commencing operations—a sum considered prohibitively excessive—her captain abandoned her, and she rapidly became a total wreck.

CHIMNEY DRAFT.

BY EGBERT P. WATSON.

A column of rarefied air is lighter than a similar column of cold atmospheric air, volume for volume, and from this fact a theory has been deduced to account for the existence of draft so called in chimneys. The velocity of an ascending current in them is based upon the difference in weight of rarefied and unrarefied air, but, unfortunately for the stability of the theory, the same phenomenon, if it may be so called, exists in a cold tube which has no rarefied air in it. I have just taken a length of stove pipe, cut a small opening in the bottom, and set it on end; when a lighted match was applied to the opening, the flame was strongly drawn in, showing the existence of an upward current in a cold tube. If there was not such a current, it would be a tedious task to rarefy the air in a large chimney; but every housewife knows that so soon as a fire is started, it commences to burn. Chimneys that never had a fire in them work well when properly built.

In a certain sense this is peculiar, paradoxical even, for from the latter postulate there does not appear to be any reason why setting a tube on end should cause a circulation of air through it; and if it is desirable to have a theory to account for every occurrence in nature, it will be necessary to construct a new one for the draught of chimneys, for they do not follow the present alleged law in all cases; in some they act entirely contrary to it. Currents of air move in all directions in nature, horizontally and downward; sometimes it seems, in a chimney which does not work well, as if all these things occurred at one and the same time. Opening a door or a window causes a draft, the heated air in the room being displaced by the colder air outside, and external objects, both natural and artificial, cause barriers which deflect currents so that they literally fall down the chimney, or drive the heated air down, which is the same for practical purposes.

The conditions under which draft exists or does not exist are very puzzling sometimes, in practice, and give rise to much speculation as to the causes. Take the case of a flue which has been used for forty years, and during that period has had five or six different stoves attached to it; every one of these stoves gave trouble, and would not burn the coal properly until they were adjusted to the conditions prevailing, whatever they were. This flue was crooked; that is to say, for reasons connected with the building it was carried up straight ten feet from the bottom, and then run at an angle of forty degrees for ten feet more; the flue was then carried up straight for ten feet to the roof, through which it projected six feet. The mason who built it said it would not draw, but in spite of his prediction it drew admirably, and continued to do good service until some alterations were made in the building, when the chimney was run straight for the entire length. Then trouble began. A stove that had always worked satisfactorily, sulked and protested against the new chimney.

This last was thoroughly dried out, and being of glazed pipe was absolutely clean and true throughout. The smokepipe entered the chimney near the bottom and had a straight shot clear to the upper end; there was every reason why it should have had a great pull on the fire, but there was a very feeble one. Not knowing what else to do, I had the pipe taken out of the bottom of the flue and run off at an angle, entering the flue by short-connected elbows ten feet higher up, giving a crooked flue again. This started everything going in great shape, and the stove had to be checked in every possible way in order to prevent it from getting white hot in no time, so to speak. This is contrary to all precedent and common sense, but the sequel to the history of this flue is still more surprising. The stove was changed in due time for another of different make, but with the same sized flues in it as the discarded one, and of the same general design; when it was attached or connected in the same way that the other one was, nothing could be done with it, the fire smoldered instead of burning, and was useless for cooking.

There was a fire-brick in the back end of the new stove, which had been loosely put in, so that one end was cocked in toward the furnace, or firebox, leaving an opening of about three-eighths of an inch by nothing on the other end. It did not seem possible that such a small leak could seriously affect the action of the stove, but it did materially, for after stopping it with fire-putty it worked well and is now all right. The reason for this improvement is that the cold air entering the ashpit was short-circuited; instead of going through the fire it went through the leaky fire brick, not only cooling the smoke-pipe, but also robbing the fuel of the oxygen it required for combustion.

Stoves are sometimes blamed for faulty construction when the trouble lies elsewhere—in the way in which they are connected. One large heater which had always performed well was taken down during housecleaning, but when it was erected again it would not draw at all. Investigation revealed that it was too far out from the chimney-breast; the stove-pipe barely entered the breast by an inch or so, when it should have gone clear through into the flue itself. Singular as it may seem, the up-draught from the flue constituted a cut-off for the smoke-pipe; when this was changed, there was no more trouble.

Again, a factory chimney which had always worked perfectly for many years suddenly refused duty; upon investigation it was found that the blank wall of a recently erected building in the vicinity, during the prevalence of winds from the northwest, deflected a current which came down the factory chimney, constituting a back draft. This blank wall was about three hundred feet from the factory, and it seemed scarcely possible that it could have the effect mentioned, but it did, for after the chimney was hooded there was no more trouble.

Draft, so called, even when apparently strong, is relatively of very little force, for natural draft can be of great vigor, seemingly, and show nothing on a draft gage; tinder from burned paper will so obstruct the grate bars that the fire will not burn until it is removed, and this tinder is such a flimsy material that it cannot be picked up with the fingers; it crumbles at the slightest touch. A roaring draft, so called, is not caused by the force of wind rushing through the grate bars, but results from the combustion of the air and gases; an infinite number of minute explosions merge into a continuous rumble accompanied by vibrations, which sometimes shake heavy boilers so violently that they alarm the attendants; there is no danger attending such manifestations, except that of the gases collecting in pockets or corners to such an extent that they explode in one volume, blowing the furnace doors open and scattering the fire over the fire-room. Back draft of this character is easily stopped, so soon as the humming begins, by scattering fresh coal over the black spots in the fire.

One of the most peculiar arrangements of a chimney and its connections that I have ever heard of exists in Belgium, where a factory stack is set up on a hill, and connected to an underground conduit communicating with the boilers in the valley below. The part underground is horizontal for about one hundred feet, and is necessarily cold for a long time after the fires are started; the chimney is also cold, nevertheless the stack exhausts the conduit, or underground flue, so soon as fires are started under the boilers. There must, then, be a strong upward current in the stack itself at all times in order to exhaust the horizontal flue, which is merely a drag, or baffle on the stack. Rarefied air has no part in the action of this stack until the fires are under way.

TRADE-MARKS IN THE PHILIPPINES.

A new trade-mark, trade-name and unfair-competition law has been enacted by the Philippine Commission which repeals the royal decree of 1888 for the registration of trade-marks, as continued in force by military orders, and provides for an independent registration in the Philippines. Owners of trade-marks and trade-names who are domiciled in the Philippines, or the United States, or in foreign countries which grant similar privileges to persons domiciled in the United States and Philippine Islands, may register their marks and names under the new law.

The law defines trade-marks and specifies the requirements for their registration. Provision is also made for the registration of trade-names, which the law defines as names, devices or marks by means of which is intended to be distinguished from that of others, the business, profession, trade or occupation in which one may be engaged. It is not essential that the trade-name should appear on the goods dealt in by the person using the same, as it is sufficient if it is used by way of advertisement, or on letter heads, signs, or in any other way to furnish to the public a method of distinguishing the business.

Unfair competition, and the infringement of trade marks and trade names with intent to defraud the public or the owner of the mark or name are made crimes and the guilty party may be severely punished in the criminal proceeding, in addition to the loss which he may suffer because of the damages which the wronged party may recover in a civil action.

One of the sections of the law provides for the registration of trade marks in the Philippines in order to enable persons domiciled in those Islands to register their trade marks in foreign countries, the trade mark registration laws of which require the registration in the home country as a condition precedent to registration in such foreign countries. The persons domiciled in the Philippines may now register their trade marks in those Islands and in foreign countries, but they are still unable to register their trade marks in the United States because of the ruling of the United States Patent Office that provision for this registration is not made in our our trade-mark law, which only provides for the registration of trade marks which are owned by persons who are domiciled in the United States or who are located in a foreign country which grants reciprocal rights.

It is to be hoped that this decision may be overruled or that the defect in the United States trade mark law may be corrected in order to enable persons domiciled in the Philippines to secure complete protection for their trade marks by registration.

SCIENCE NOTES.

Messrs. Mueller and Kempf have discovered in the course of their photometric work at Potsdam a variable star of so short a period—about four hours—that it may fairly be called unique. Up to this time, the variables that went through a complete cycle of changes in the shortest time were two stars in the cluster *Omega Centauri*. These bodies complete their periods in 7 hours 11 minutes and in 7 hours 43 minutes respectively. *S. Antliæ* has a period of 7 hours 47 minutes. The Potsdam star has a period of about one-half as long. From minimum to maximum the light changes at a slower rate than from maximum to minimum. The magnitude varies from 8 6-10 to 7 9-10 and the length of the period is 4 hours 13 seconds. The hypothesis that best explains the observed phenomena is that two bright bodies are revolving at a small distance about a common center of gravity, the plane of revolution being nearly in the line of sight.

The Révue Scientifique gives a brief history of experiments on the segmentation of unfertilized eggs. In 1895 Hertwig exposed the eggs of the sea-urchin to a weak solution of sulphate of strychnine and obtained the phenomena of karyokinesis or segmentation. Then Morgan, in 1898, obtained the same result by simply increasing the osmotic pressure of seawater. Mead, in 1899, experimenting on another species, obtained a like result by adding chloride of potassium to the seawater. In 1899 Morgan suggested that the unfertilized egg was in a state of unstable equilibrium and that any one of several exciting causes was sufficient to break it up into a more stable state, i. e., to cause segmentation. That is, there is no specific excitement; the reaction alone is specific. Loeb, in 1899, obtained parthenogenesis experimentally by exposing the eggs of the sea-urchin for a very short time to a weak acid solution, or to an alkaline seawater. The presence of ether, chloroform or alcohol will determine the action also. The absence of certain chemical bodies may likewise determine segmentation. If seawater containing sea-urchin's eggs is deprived of its oxygen (the oxygen being replaced by hydrogen) then the eggs, when transferred to normal seawater, begin to divide. Temperature acts in a similar way. Eggs warmed to about 32 deg. C. begin to divide when replaced in seawater at an ordinary temperature. Abnormal lowering of temperature has been shown by Mr. Greeley to provoke the reaction. Mechanical agitation will do the same. Mr. Mathews points out that the foregoing results seem to show that the essence of the segmentation is the formation of localized zones of liquefaction in the protoplasm of the egg, thus suggesting an analogy with localized digestion.

In a very able *resumé* of the different methods by which the distance of the sun can be determined, and of the trustworthiness of the results, A. R. Hinks, M. A., before the British Association, warned against the proclamation of any "accepted" values, which were generally proved to be fallacious as soon as the agreement was proclaimed. There was no accepted value for the solar parallax until six years ago, when 8.80 was agreed upon. Greenwich meridian observations yield 8.802, most other methods lower values down to 8.762. The Venus transit observation, on which such strong hopes were built—while Leverrier, among others, was convinced that all the trouble was wasted—had failed; the minor planets had given excellent results; the aberration determinations at Pulkowa (near St. Petersburg) yield 8.793, Nyrén's own latest work there 8.782, other determinations elsewhere 8.806. The motion of the nodes of Venus, the secular variations of the four inner planets, and the dynamics of the mass of the earth had also afforded bases for calculations. But Eros, the peculiar planet whose orbit lies between those of earth and Mars, crossing the latter's orbit, was worth all the 480 planetoids. Eros was watched when nearest the earth in 1900 by fifty observers, and 8,000 protographic exposures were obtained. The analysis of the results will take years. Mr. Hinks himself is engaged in comparing the photographs taken at Cambridge with others, with the view of tracing errors. The distance of the sun is at present believed to be about 93,000,000 miles; we are uncertain about the hundred thousands. Prof. Turner mentioned that the twenty years' study of Jupiter's satellites at Harvard promised to give valuable results.