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No. 825.

For the Week Ending October 24, 1891.

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RELATIONS OF FOREIGN TRADE TO THE METRIC SYSTEM.

Several British consuls have recently warned their countrymen they were losing considerable trade in foreign countries owing to their persistent use of English weights and measures in their circulars and price lists, which were perfectly unintelligible to most of the foreign dealers, whereas their French, German, and other competitors used the metric system, which was familiar to everybody, and naturally attracted custom.

The consuls have declared that the British manufacturers are simply playing into the hands of their rivals by persisting in the use of figures which to many foreign merchants are so many hieroglyphics.

These warnings apply equally well to the exporters of the United States, and for their further guidance we here subjoin an alphabetically arranged list of the principal foreign countries in which the metric system is now used:

Algeria, Argentine Confederation, Austria-Hungary (Bohemia), Belgium, Brazil, Canary Islands, Chile, Colombia, Cuba, Denmark, Ecuador, Egypt, France and colonies, Germany and colonies, Greece, Guatemala, Honduras, Iceland, Italy, Malaga, Manila, Mexico, Mozambique, Netherlands, Norway, Paraguay, Peru, Portugal, Russia, Turkey, Spain and colonies, Sweden, Switzerland, Venezuela.

The use of the metric or decimal system was authorized by our laws many years ago, but the use has not yet been made compulsory, hence the majority of people cling to the old system and dislike to change, although the metric is more simple and easily understood. Our coins and monetary calculations are based on the decimal or metric system. Ten mills make one cent, ten cents make one dime, ten dimes make one dollar, ten dollars make one eagle. This is plain and simple, everybody is familiar with it, and probably nothing could induce our people to go back to the old style of pounds, shillings, and pence, which formerly prevailed in this country, and is still current in England. The extension of the decimal or metric system to our weights and measures is urgently needed and can be readily effected. Ten millimeters make one centimeter, ten centimeters make one decimeter, ten decimeters make one meter, and so on. This is far easier and simpler than to reckon measures as we now do, three barleycorns make one inch, twelve inches make one foot, three feet make one yard, five and a half yards make one rod, forty rods make one furlong, eight furlongs make one mile, and so on.

The metric system is so much more convenient, saves so much time, and has now become so generally adopted throughout the world, that the United States ought no longer refuse to fall into line. A very little pressure would suffice to bring about the change. It would do the business, probably, if Congress were simply to pass a law requiring that estimates, contracts and bills, specifying weights or measures, when not made out metrically, must bear a revenue stamp of one dime. Rather than pay a small tax, everybody would at once use the decimal system, and the change would be as smooth as the system itself.

LARGE CASTING AND LARGE FORGING.

The largest casting ever made in the United States was poured on the 13th of October, at the Bethlehem Iron Company's Works, Bethlehem, Penn.

The Hon. Secretary of the Navy, Benjamin F. Tracy, accompanied by Commodore Wm. M. Folger, U.S N., Chief of the Bureau of Ordnance, arrived in the city the evening of the 12th, and during the forenoon of the 13th, surrounded by the officials of the works, as well as the two naval lieutenants who look out for the government's interests at this place, they proceeded to the forge building. The scene was a busy one; the hum and shriek and roar of machinery re-echoing through the works. Locomotives darted back and forth, drawing trucks which carried huge ladles of white-hot, molten metal. The company assembled on the platform of the open-hearth furnaces to witness the pouring.

The mould had been prepared by digging a large pit and lining it with an iron bottom, to support the great weight of the casting. The patterns had been placed and well packed with moulding sand, and, when they had been withdrawn, the mould was braced in every conceivable direction by tie rods and braces. The top of the mould came just even with the floor of the building, and was thoroughly packed in with dirt, and all leveled off. Along this dirt floor were various troughs of iron, lined with composition.

At each end of the mould stood an immense ladle, containing over forty tons of molten metal. To one side was the railroad track, on which, by the aid of five locomotives, were drawn the twelve trucks, each truck carrying a ladle containing about nine tons of molten metal. When these twelve ladles were in place, in front of each could be seen a trough leading to the mould. On signal from Mr. John Fritz, the general manager, the two large forty-ton ladles were started, by side tapping, and two large streams of molten metal roared toward the mouth of the mould. A moment later, and each of the twelve truck ladles tilted forward and poured their tribute into their troughs, and thence into the mould.

The fourteen streams of bright metal, the glowing tops of the ladles, and the showers on showers of sparks made a brilliant sight in the gloomy foundry. Not an accident occurred, not a moment's delay marred the proceeding, so well planned was the undertaking, so carefully had each item been looked after.

The finished casting will weigh about 330,000 lb., or about one hundred and fifty tons. Of course much more metal than this was poured to allow for sinking heads, troughs, and overflows. This is the largest casting ever made in the United States and probably the largest in the world. It is to be a part of a machine which will be used in the manufacture of war material for the United States. The casting will be left in its mould for a couple of weeks or until it is perfectly cooled.

The second event of great importance witnessed by the Hon. Secretary was the forging of a tube for a thirteen inch gun.

The compressed steel ingot had been bored to an internal diameter of about ten inches, its external diameter being about fifty inches. This ingot had been placed in the gas heating furnace and when taken out it was of a good welding heat. A mandrel had been placed through it and each end of the mandrel was supported by a chain hanging from a hydraulic traveling crane. These cranes, moving foward, soon brought the ingot under the large No. 1 Whitworth forging press. The ram of the press descended slowly, but with the force of many tons of hydraulic pressure, and the hot steel of the ingot gave way and was pressed down. The ram lifted and the ingot was turned or rotated slightly. The pressure was again applied, and so, stroke after stroke, the steel was kneaded, and the ingot was gradually worked down to a long tube. This tube in the rough, when it left the press, was about twenty-six inches in external diameter and eleven inches in internal diameter, thus leaving walls about seven and a half inches in thickness. It is about forty-two feet long.

The ingot from which this tube was made was cast in the Whitworth fluid compression mould, which aids in producing a homogeneous steel, free from blow holes, pits, cracks, and seams.

This tube will be rough-machined and then annealed and oil-tempered several times. Then test bars will be taken from it to see if it has the proper physical qualities, and chemical analyses made of specimens to determine the amount of carbon, silicon, sulphur, phosphorus, and manganese it contains. After passing the tests made by the government inspectors, it will be sent to the gun factory at Washington, D. C., where, with a suitable jacket, hoops, breech plug, and mechanism, it will be assembled, forming the largest modern high-powered breech-loading built-up gun that this country has produced. The assembling of guns at the Washington gun factory was fully described in the SCIENTIFIC AMERICAN for February 28, 1891.

The New Cunarders.

The new trans-Atlantic steamers which are to be built for the Cunard line are naturally attracting considerable interest in shipping circles. It is reported that the Fairfield Company's yard is already being cleared for the work on one of them, and that materials used in the early stages of construction are already prepared; though the construction of the vessels will be pushed with all possible speed, they will not be ready for service before the summer of 1893. It is reported that the ships are not absolutely guaranteed to be five-day boats, but 21 knots an hour in the open sea is guaranteed by the builders, and if pushed hard it is probable that they will make a much better record. It is stated that the Fairfield Company, who are to build these boats, offered to give the Cunard Company vessels capable of an average of 22½ knots per hour, but as considerable space for the accommodation of first-class passengers would have to be sacrificed in order to obtain this speed, the Cunard Company decided to be satisfied with a little less speed and a better-paying boat. Provisions have been made in the design for the accommodation of 600 first-class passengers, nearly a third more than the Teutonic or Majestic.

White Cement.

White cement of the same character as Portland cement is made by grinding together three parts of chalk and one of kaolin, burning at a red heat and grinding again. The cement made by this process hitherto has shown a tensile strength only about one-half as great as that of good Portland cement, but it has the hydraulic quality and other characteristics of Portland cement, and it is to be hoped that the manufacture may be so improved as to increase the tensile strength to the point required for making artificial stone. If a white cement can be found for a matrix it will be easy to obtain aggregates of light color by utilizing white sand, marble dust, white talc, and so on, suitable for making a concrete which could be used in place of marble.

How Toilet Soaps are Made in Germany.

Owing to the different conditions of the oil market in Europe as compared to America, the raw materials for the soaps made there are somewhat differently regarded in Germany than here. Cocoanut oil and palmkernel oil largely predominate there, while wool fat, linseed oil, horse fat, and recovered greases are given special attention in connection with the many problems which confront the German manufacturer in regard to the proper procedure in the many soaps which he makes on a small scale. For it must be understood that there the number of even comparatively large factories is exceedingly small when compared to that of the very small factories that make their boiled soaps in batches of 3,000 to 4,000 lb. or less, in a kettle heated by an open fire, and with hardly as much as an indistinct recollection of having heard that in some parts of the world soap is crutched by machinery. Besides the difference in the raw materials used mostly, and the small scale on which the German manufacturer generally operates, there is also the difference in climate as well as of usage and popular taste, which calls for one kind of soap in one country and for other kinds elsewhere; so, for instance, boiled-down soaps are used to a much greater extent in Europe than they are here, and again, as owing to their moist climate soaps dry less rapidly than they do here, such kinds are greatly made as would prove almost insoluble in our climate after storing for some time. Then, too, soft soaps are made in Germany in incredible quantities.

But, to come to our subject of toilet soaps. It will be seen from the following description by Dr. Bering, a German soap manufacturer, that in the matter of toilet soaps the difference between the countries is less marked, only that they make a much larger proportion of their toilet soaps by the cold process. In a detailed description of the process, Dr. Bering writes the following, from which some of our readers can perhaps gain a useful wrinkle or two:

The soaps turned out by our perfumers are made either directly or indirectly by remelting or by milling. In the two last named processes soda soaps are used which must be free from odor and perfectly neutral, must be easily melted on heating, and—in spite of greater solubility—must yield a more abundant and solid lather than the boiled soaps. [We presume the author meant to say "the ordinary boiled soaps," since the remelted and the milled soaps are most generally boiled soaps.—Ed. *A. S. J.*]

In the first named process the fats are melted at the lowest possible temperature, not above 65° R., and one-half of the lye to be used, at sp. gr. 1·33, is run in while stirring steadily; after one-half to one hour, according as the mass shows a tendency to become solid, the remaining lye is added, and when the mass appears to be perfectly homogeneous throughout, the color and perfume are stirred in. Now the soap is run into rather strong wooden frames which are covered inside with linen cloths of a close texture, and sufficiently large that the entire block of soap can be covered with them. The square forms consist of side pieces about 1½ to 2 feet long and 1 inch thick, and a bottom of the same thickness. The side pieces are provided with pegs that fit exactly into corresponding holes in the bottom and walls, so that they can be easily put up or taken apart. Iron braces resting in notches on the side pieces give the frames the necessary strength to hold the batch of soap of say 1 cwt. After framing the soap, the whole is covered with thick cloths in order to keep in the heat which develops. As soon as the soap has become solid the cloths are removed, the soap is allowed to get cold, the side pieces are then taken off and the linen cloth is removed off. The soap is now ready for cutting and pressing, care being taken to warm the bars previously if they have become too hard, in order to avoid cracking. After pressing the cakes are trimmed in order to remove any unevenness on the edges.

The fats used are lard, tallow, cocoanut oil, palm oil, and less frequently almond oil. The lard and tallow must be previously purified, and especially the latter has to be freed of its disagreeable odor. In running the melted grease into the kettle it is passed through a cloth. The manner of adding the color depends on the nature of the latter, heavy, earthy, or metallic colors, such as umber or vermilion, being added only when the soap has acquired a thick consistency, while dissolved colors may beadded while the soap is still thin. Very few colors only can be added before all the lye has been run in and saponification has begun. Aniline colors almost disappear at first under the action of the alkali, but return after cooling.

Marbling of the soap is done by stirring up the required color in melted cocoanut oil, running it into a funnel closed at the lower end by a finger, and letting the contents run over the soap as it is run in layers into the frame. When the frame is full a stick is drawn in fancy figures through the soap to distribute the color.

Practice is the best teacher, not only in the use of different fats, whether cocoanut oil alone, or with tallow or lard, or with both, is to be employed, but also in deciding whether soda lye alone shall be used or potash lye added to it. Those who work intelligently will soon find which will bring them to the result they desire.

The second process, remelting, which is largely practiced in England, consists in finely chipping the tallow soap procured from the soap maker, melting it over a very slow fire while steadily stirring, adding the perfume, mixing well, and framing. If a soap smells too strongly of tallow it may be purified by melting it over a very slow fire or in a water bath, together with one-third its weight of water, preferably rose water, and adding a small quantity of salt to separate the soap again; run it through a sieve, as close as possible, and let cool. Repeat if necessary.

In the matter of soap, of course, cheap goods are always wanted and the demand was supplied by incorporating more and more water in the soap. Cocoanut oil soap is especially adapted for this purpose, not only taking up considerable water itself, but communicating the same property to other fats. Such soaps, however, by the evaporation of the water, soon lose their shape and appearance.—*Amer. Soap Jour.*

Horticulture Industries.

Census Bulletin, No. 109, contains a preliminary report, prepared by Mr. J. H. Hale, special agent, under the direction of Mr. Mortimer Whitehead, special agent in charge of horticulture, upon the nursery industry of the United States, which has for the first time been made a subject of census investigation. The material from which these statistics are compiled was obtained direct from the nurserymen, upon schedules specially prepared for that purpose, and by personal visits of special agents to nursery establishments in all parts of the country. These figures are subject to revision before publication in the final report.

From the tabulations in this bulletin it appears that there are in the United States 4,510 nurseries, valued at $41,978,835.80 and occupying 172,806 acres of land, with an invested capital of $52,425,669.51 and giving employment to 45,657 men, 2,279 women, and 14,200 animals, using in the propagation and cultivation of trees and plants $990,606.04 worth of implements. Of the acreage in nurseries, 95,025·42 were found to be used in growing trees, plants, shrubs, and vines of all ages; and the figures based upon the best estimate of the nurserymen make the grand total of plants and trees 3,386.855,778, of which 518,016,612 are fruit trees, 685,603,396 grapevines and small fruits, and the balance nut, deciduous, and evergreen trees, hardy shrubs, and roses. The largest acreage is devoted to the production of apple trees, viz., 20,232·75 acres, numbering 240,570,666 young trees, giving an average of 11,890 per acre, while the plum, pear, and peach have, respectively, 7,826·5. 6,854·25 and 3,357 acres, producing 88,494,367, 77,223.402, and 49,887,894 young trees, or an average of 11,307, 11,266, and 14,861 trees to the acre.

Horticulture has been making wondrous strides in this country during the last quarter of a century.

While most of the first trees and plants were of necessity brought from the mother country by the early settlers, their production from seeds and by budding, grafting, and layering was begun here early in the seventeenth century, as shown by many of the early colonial records.

Food before Sleep.

Many persons, though not actually sick, keep below par in strength and general tone, and I am of the opinion that fasting during the long interval between supper and breakfast, and especially the complete emptiness of the stomach during sleep, adds greatly to the amount of emaciation, sleeplessness, and general weakness we so often meet.

Physiology teaches that in the body there is a perpetual disintegration of tissue, sleeping or waking; it is therefore logical to believe that the supply of nourishment should be somewhat continuous, especially in those who are below par, if we would counteract their emaciation and lowered degree of vitality; and as bodily exercise is suspended during sleep, with wear and tear correspondingly diminished, while digestion, assimilation, and nutritive activity continue as usual, the food furnished during this period adds more than is destroyed, and increased weight and improved general vigor is the result.

All beings except man are governed by natural instinct, and every being with a stomach, except man, eats before sleep, and even the human infant, guided by the same instinct, sucks frequently day and night, and if its stomach is empty for any prolonged period, it cries long and loud.

Digestion requires no interval of rest, and if the amount of food during the twenty-four hours is, in quantity and quality, not beyond the physiological limit, it makes no hurtful difference to the stomach how few or how short are the intervals between eating, but it does make a vast difference in the weak and emaciated one's welfare to have a modicum of food in the stomach during the time of sleep, that, instead of being consumed by bodily action, it may during the interval improve the lowered system; and I am fully satisfied that were the weakly, the emaciated, and the sleepless to nightly take a light lunch or meal of simple, nutritious food before going to bed for a prolonged period, nine in ten of them would be thereby lifted into a better standard of health.

In my specialty (nose and throat), I encounter cases that, in addition to local and constitutional treatment, need an increase of nutritious food, and I find that by directing a bowl of bread and milk, or a mug of beer and a few biscuits, or a saucer of oatmeal and cream before going to bed, for a few months, a surprising increase in weight, strength, and general tone results; on the contrary, persons who are too stout or plethoric should follow an opposite course.—*Dr. Wm. T. Cathell, in the Maryland Med. Jour.*

Process of Sizing Paper.

The advantage of using aluminate of soda for saponifying the rosin used for size, instead of soda ash or caustic soda, is said to lie in the fact that in filling the paper its alumina serves the same purpose as the alumina of the alum generally used, rendering it practicable to dispense with alum entirely, and in the case of its use together with aluminate of soda giving an excess of alumina, which is a valuable addition to the pulp at this stage of its manufacture. The further advantage of using soluble salts of magnesia and calcium instead of alum to decompose the rosin soap is that these salts are neutral, while alum is acid, that they are cheaper than alum, and in case of the magnesia salts the precipitated magnesia is a valuable addition to the pulp.

A new method of precipitating alumina in the pulp in the beating engine is closely allied to this process and consists in adding aluminate of soda to the saponaceous solution of rosin mixed with pulp, together with the sulphate or chloride of magnesia, the chloride of calcium or the sulphate of alumina used to precipitate the rosin from the soap and form with it the sizing compound. Where these substances are used in solution they should be added separately.

The sulphuric or hydrochloric acid of the above-named salts will combine with the soda resinate or soap, freeing the resin acids (pinic, abietic and sylvic), and also with the soda of the aluminate of soda, precipitating the alumina; at the same time the magnesia, lime or alumina of the sulphate or chloride used is precipitated, and thus an excess of alumina or magnesium aluminate which serves as a filler, besides the size formed from the resin in the usual way, is secured.

The reactions incident to the process may be given as follows: $2NaR + 2NaAlO_2 + 2MgSO_4 = 2Na_2SO_4 + MgR_2 + MgAl_2O_4$; and when aluminum sulphate is used, $12NaR + 6NaAlO_2 + 3Al_2(SO_4)_3 + 12H_2O = 9Na_2SO_4 + 4AlR_3 + 4Al_2O_3 + (12H_2O)$.

Remedy for Phylloxera.

The introduction of American plants to replace those destroyed by parasites in French vineyards has not arrested the use of insecticides for the protection of French vines still attacked by *Phylloxera*, and for this purpose carbon bisulphide (either pure or dissolved in water), sulpho-carbonates, and submersion continue to be employed with more or less success. The carbon bisulphide is by far the more efficient, but is too volatile and does not diffuse with sufficient rapidity. When, however, it is mixed with vaseline, its volatility is reduced and its diffusibility is increased, the former proving advantageous in light and calcareous soils, the latter in heavy soils, in accordance with theoretical considerations. The vaselined sulphide is applied in the same way as the ordinary sulphide, depositing some at the foot of the vine stock and spreading the rest over the surface; this treatment is found to be effectual; with it *Phylloxera* is no longer seen in the roots, vegetation is luxuriant, and numerous new rootlets indicate a decisive increase in vitality; the manuring on a test tract of land had not been altered for six years, therefore the improvement was solely due to the insecticide.—*P. Cazeneuve.*

A New Local Anæsthetic.

Dr. C. Redard, Clinical Professor at the Geneva School of Dentistry, speaks highly of chloride of ethyl as a local anæsthetic. It is a colorless, mobile liquid, having a peculiar and pleasant odor and a sweetish burning taste. Its sp. gr. is 0·9214. It is slightly soluble in water, but dissolves readily in alcohol. It is sent out for medicinal use in hermetically sealed glass tubes containing a little more than two drachms each. When required for use the point of the tube is snipped off, and the warmth of the operator's hand is sufficient to cause a very fine jet of the chloride to be projected on the part to be anæsthetized. Up to the present its use has been confined to dentistry and as an external application in neuralgic affections, but there is little doubt that in a short time its value will be tested in general surgery. Its action is similar to that of methyl chloride.