THE STEAMER ST. PAUL.

We give an engraving from a photograph of this new and splendid steamer which lately has taken her place on the American line of steamers plying between New York and Southampton.

The St. Paul is a sister ship of the St. Louis, launched in November last, and both are, in the words of Mr. Charles H. Cramp, "American from truck to keelson. No foreign materials enter into their construction. They are of American model and design, American material and built by American skill and muscle."

They are the largest vessels ever constructed in America, their principal dimensions being: Length over all, 554 feet; length on load water line, 536 feet; extreme breadth, 63 feet; moulded depth, 42 feet; tonnage, gross register, 11,000 tons. The hull has a double bottom constructed on the cellular principle, subdivided by athwartship bulkheads and a longitudinal division arranged for heeling purposes, the whole available for water ballast. It is so subdivided by transverse bulkheads that even in the event of a collision and injury to a bulkhead, whereby two compartments might fill with water, the ship would still float in perfect safety. It has a straight stem and elliptical stern, topgallant forecastle and poop, with close bulwarks fore and aft, and promenade, saloon, upper, main and orlop decks, the three first named to be plated from end to end. The main deck will be plated for the length of the machinery spaces, and will have stringers and tie plates beyond. Wood planking will be laid on all decks. The promenade deck will remain unbroken the whole length of the vessel. The vessel will carry about 320 first-class and 200 second-class passengers and 900 emigrants.

The engines are quadruple expansion, designed to develop 10,000 I. H. P. each. The cylinders are 36, 50, 71, and 100 inches respectively in diameter, with a piston stroke of 60 inches, two sets of engines turning twin screws, which will be sectional, with three blades. Steam for the working of the main engines will be furnished at about 200 pounds pressure by six steel double-ended boilers, each 20 feet long and 15 feet 7½ inches diameter. When working under ordinary seagoing conditions, the vessel is easily capable of maintaining a speed of 20 knots per hour at sea.

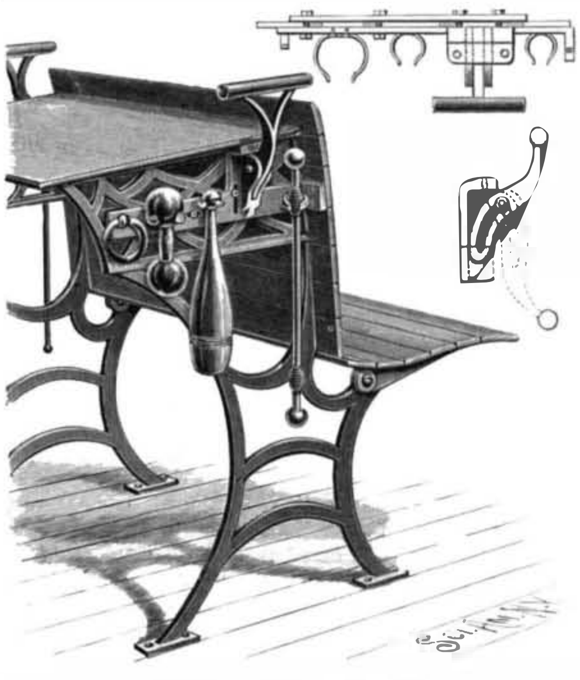
The St. Paul has been especially arranged to be readily and quickly convertible into an armed cruiser of the United States government, in which capacity she will carry a number of six-inch rapid fire guns.

House Numbering.

Berlin is preparing to fete the hundredth birthday of the house number. In the London and Paris of a century ago ciphered houses did not exist. The coat of arms, the house name or the sign board were the only indications to guide our ancestors' wandering feet by day or dark. "Watchman, what of the night, and where the deuce am I?" must often have been the cry of these bewildered minds. Berlin began to number houses in 1795. Starting from the Brandenburg gate, the Prussian ediles counted straight on to infinity, neither beginning afresh with fresh streets nor numbering the houses by odds and evens. Vienna adopted the latter reform in 1803 and Paris followed in 1805.

A SCHOOL ROOM GYMNASIUM.

Educators seeking means by which to promote, with convenience and economy, the physical as well as the mental training of those in their charge, will be interested in the school room arrangement of gymnastic appliances shown in the accompanying illustration.



A SCHOOL ROOM GYMNASIUM.

The improvement forms the subject of a patent issued to Mr. Theodore Bessing, the manufacturers and owners being the School Gymnasium Company, of No. 226 South Spring Street, Los Angeles, Cal. The appliances comprise ring, wand, dumb bell, bar bell, and horizontal and parallel bars, the latter being very simply adjusted and dropped out of the way altogether, as indicated by dotted lines in one of the small figures. Another view is a section representing the attachment of the bar bracket and combination rack to a desk. The whole arrangement is compact and does not project into the aisle when not in use. The improvement has received the warm commendation of numerous teachers and school superintendents.

A Great Sailing Ship.

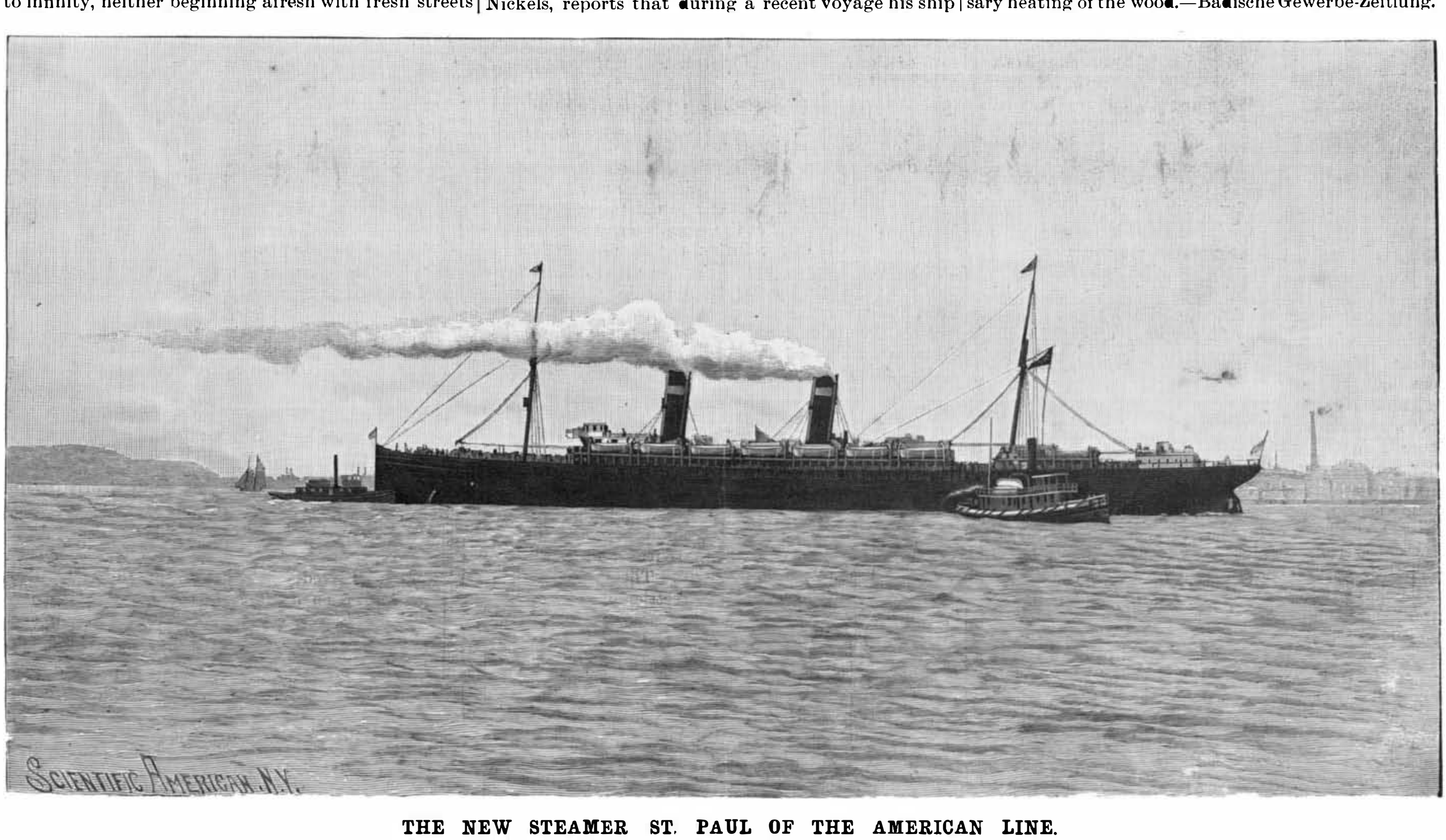
The Seaboard relates a curious incident with regard to the iron vessel May Flint, said to be the largest sailing ship that ever entered the port of San Francisco. She is 361 ft. long, 43 ft. beam, 25 ft. in depth, has a registered tonnage of 3,287 tons, and was carrying at the time of the occurrence referred to 4,320 tons of coal, which brought her down in the water 23 ft. Her commander, Captain E. D. P. Nickels, reports that during a recent voyage his ship encountered head winds and the usual rough weather near Cape Horn, losing her three topgallant masts, three topsail yards and a number of sails, which were blown away. The passage from the equator was quite uneventful until the ship arrived off the port of San Francisco. The wind failing, the vessel drifted north close to Bodega Heads. Captain Nickels tried to work her round the point into Bodega Bay, but was unable to manage the great becalmed ship. So he let go the starboard anchor about half a mile from the beach. The wind was so light that the anchor held the ship, though she had only about nine fathoms of water under her stern. At this point the steamer Alice Blanchard came along, and seeing the great ship in such a dangerous position, offered to tow her off for $12,000! Such a sum for throwing a hawser to the bow of a drifting ship on a calm day was a modest demand, to say the least of it. The demand then fell suddenly to $5,000. Captain Nickels offered $160 for the end of a tow rope, but the steamer, blowing her whistle as a salute, passed on, and her captain now passes as the meanest man on the coast.

Liquefaction of Gases.

Olszewski recently succeeded in producing a momentary liquefaction of hydrogen by allowing it to expand suddenly from 140 atmospheres' pressure, when cooled to about −210° C. with liquid air or oxygen boiling under a pressure of less than 20 mm. Its boiling point under atmospheric pressure was found to be −243·5° C., only 30° above absolute zero. In a letter to Ramsay (Nature, October 3) he now announces that under the same conditions helium shows no sign of liquefaction. Its boiling point is therefore still lower than that of hydrogen, and it is the most volatile substance known. In view of the great difficulty in reaching still lower temperatures, it would seem that the present methods will have to be considerably improved before helium can be liquefied.

Staining Wood Black.

A process that is much employed for the above purpose consists in painting the wood consecutively with copper sulphate solution (1 per cent) and alcoholic aniline acetate (equal parts of alcohol and acetate). A very durable black—and the nearest approach to real ebony—is readily obtained by moistening the surface of the wood with dilute sulphuric acid (1:20), and subsequently applying heat. A temperature of 60°—90° C. suffices in a very few minutes to produce the desired result. An excellent black was obtained in this way on beech, bass, and boxwood; while a second treatment with acid was necessary in the case of cherry, walnut, and birch. With oak and ash the results were not so good; and apple, and different varieties of pine, were still less amenable to the process, pine especially being unevenly stained. In order to afterward remove the acid from the wood, it might be well to thoroughly wash the latter with dilute soda solution, followed by clean water. It is unlikely that this method can be applied to any but small articles, because of the risk of possible fractures during the necessary heating of the wood.—Badische Gewerbe-Zeitiung.



THE NEW STEAMER ST. PAUL OF THE AMERICAN LINE.

Who Has the Largest Bible?

The Evening Telegram puts the above query, and then proceeds to state that that of the Buddhists is in 325 volumes and weighs 1,625 pounds.

These sacred books are perfectly appalling in their bulk. They are called the Tripitaka, the Three Baskets, and were originally written in Pali, a vernacular form of Sanskrit. They have been translated into many languages, such as Chinese, Thibetan and Mandshu. They have also been written and published in various alphabets, not only in Devauagarie, but in Singhalese, Burmese and Siamese letters.

The copy in nineteen volumes lately presented to the University of Oxford by the King of Siam contains the Pali text written in Siamese letters, but the language is always the same; it is the Pali or vulgar tongue, as it was supposed to have been spoken by Buddha himself about 500 B. C. After having been preserved for centuries by oral tradition, it was reduced for the first time to writing under King Vattagamani, in 88-76 B. C., the time when the truly literary period of India may be said to begin. But besides this Pali Canon there is another in Sanskrit, and there are books in the Sanskrit Canon which are not to be found in the Pali Canon, and vice versa.

According to a tradition current among the Southern as well as the Northern Buddhists, the original Canon consisted of 84,000 books, 82,000 being ascribed to Buddha himself and 2,000 to his disciples, writes Max Muller in the Nineteenth Century. Book, however, seems to have meant here no more than treatise or topic.

But, as a matter of fact, the Pali Canon consists, according to the Rev. R. Spence Hardy, of 275,250 stanzas, and its commentary of 361,550 stanzas, each stanza reckoned at thirty-two syllables. This would give us 8,802,000 syllables for the text and 11,569,600 syllables for the commentary. This is, of course, an enormous amount: the question is only whether the Rev. Spence Hardy and his assistants, who are responsible for these statements, counted rightly. Professor Rhys Davis, by taking the average of words in ten leaves, arrives at much smaller sums, namely, at 1,752,800 words for the Pali Canon, which in an English translation, as he says, would amount to about twice that number, or 3,505,600 words. Even this would be ample for a Bible; it would make the Buddhist Bible nearly five times as large as our own; but it seems to me that Spence Hardy's account is more likely to be correct. Professor Rhys Davis, by adopting the same plan of reckoning, brings the number of words in the Bible to about 900,000. We found it given as 773,692. But who shall decide?

What the bulk of such a work would be we may gather from what we know of the bulk of the translations. There is a complete copy of the Chinese translation at the India Office, in London, also in the Bodleian, and a catalogue of it, made by a Japanese pupil of mine, the Rev. Bunyiu Nanjio, brings the number of separate works in it to 1,632. The Thibetan translation, which dates from the eighth century, consists of two collections, commonly called the Kanjur and Tanjur.

The Kanjur consists of 100 volumes in folio, the Tanjur of 225 volumes, each volume weighing four or five pounds. This collection, published by command of the Emperor of China, sells for £630. A copy of it is found at the India Office. The Buriates, a Mongolian tribe converted to Buddhism, bartered 7,000 oxen for one copy of the Kanjur, and the same tribe paid 12,000 silver rubles for a complete copy of both Kanjur and Tanjur. What must it be to believe in 325 volumes, each weighing five pounds—nay, even to read through such a Bible!

The Formation of Coal.

Carbon is the principal element in the composition of coal. A good specimen of hard dry anthracite would show from 91 to 98 per cent of carbon. The average anthracite of commerce, known technically as semi anthracite, would show from 85 to 90 per cent, and the bituminous and semi-bituminous varieties would range all the way from 50 to 85 per cent. The amount of volatile matter contained increases from three per cent in the anthracites to 38 per cent in the bituminous species. The conduct of these different kinds of coal in combustion gives practical emphasis to the difference in composition. The anthracites burn with a small blue flame of carbonic oxide until thoroughly ignited, give off no smoke, and leave a comparatively small percentage of ashes. The bituminous classes, on the other hand, burn with a continuous yellowish flame, give off considerable smoke, and leave a large percentage of ashes.

That coal is a vegetable product may be specifically proved. Indeed, ocular demonstration may be had of that fact. For while to the naked eye the structure of a fragment of mineral coal is purely amorphous, yet if that fragment be made so thin that it will transmit light, and if it be then examined through a powerful microscope, its vegetable structure will be readily distinguished. Heat, pressure and confinement have produced the transformation. It is simply a process of smothered combustion. The operation may be watched in any peat bog. A peat bed is simply an accumulation of the remains of plants which have grown and decayed, and have been year by year buried more deeply under succeeding growths. Remove the upper layer, and you find peat with its 52 to 66 per cent of carbon. The deeper you go, that is, the older and longer buried the product, the better will be its quality for fuel. If this process of deposition should continue through many geologic ages, the result would doubtless be true coal.

It is known that during the carboniferous age the area now covered by the Middle, Southern and Western States was little more than a vast marsh burdened with the most luxuriant vegetation. The conditions were all favorable for the rapid and enormous growth of plants. The soil was rich and moist. The heat was greater than exists to-day at the torrid zone. The humidity of the atmosphere was great and constant. The air was laden with carbon. Plants luxuriated in it. They grew to enormous sizes. Plants which in our day are mere stems, a fraction of an inch in diameter, were in that time represented by trees from one to three feet in diameter and from 40 to 100 feet in height. This mass of vegetation, including more than 500 different species, was constantly growing, falling and decaying, each succeeding growth forming a still richer bed for the vegetation to follow.

If the theory propounded by Laplace is correct, our earth was at one time a ball of liquid fire. Cooling and condensation progressed from the surface toward the center. Contraction of the earth's crust necessarily followed, and vast areas of land sank and were covered by the waters. This process was still going on during the carboniferous age. The submergence of a bed of this incipient coal meant the cessation, for a time, of vegetable growth from its surface. That surface was covered instead by the sand, mud and gravel washed over it by the waves, by the drift from higher levels, and by the limestone deposits swept up to it from the sea. When contraction ceased for a time and the earth's crust again became stable, the waters began to recede, leaving behind them great wastes of mud and sand. And, following this slow recession to the sea, vegetation crept once more over the surface of the land, the soil grew rich with the products of decay, and plant life reigned and rioted anew. But cooling and contraction of the earth's body were going continuously on, and submergence followed again and again, each bed of vegetable matter, thick or shallow, being covered in turn by its layers of sand and silt.

In this submergence and burial of the deposits of the coal era we find all the conditions necessary for the transformation of vegetable matter into coal. Only from one-ninth to one-sixteenth of the mass of vegetable matter subjected to this heat and pressure was retained in the form of coal. This was largely carbon, the hydrogen and oxygen having been expelled. As we have already seen, the anthracite coal contains a much larger percentage of carbon than does the bituminous, and a much less quantity of volatile matter. Of the immense coal areas in the United States only an extremely small percentage are of the anthracite variety, and these all lie in the State of Pennsylvania, east of the Allegheny Mountains, with the exception of a small field in Rhode Island. It is not thought that the vegetable life which entered into one class differed in any material respect from that which entered into the other.

The presumption is natural, if not conclusive, that prior to the close of the carboniferous age all the coal deposits had been bituminous in character, but that the violent movement of the earth's crust at the time of the Appalachian revolution, the enormous pressure and intense heat, were sufficient to expel a large portion of the volatile matter from the bituminous coal beds, and otherwise change their character into what we now class as anthracite. In the slate strata immediately overlying each coal seam, it is common to find the impressions of twigs, nuts, seeds, leaves, the most delicate fern tracery, and the trunks of great trees mashed flat between the layers; while in the softer beds of cannel coal, whole trees have been found, roots, trunks, branches, leaves, seeds, and all transformed into like material with that by which they were surrounded. One of the results of the violent disturbances of the earth's crust already noted was to leave great rents in it across the lines of strata. These rents are known geologically as fissures. They have faces which are either parallel or inclose a wedge shaped cavity. Sometimes igneous rock from the molten mass below was forced up into these openings; sometimes the cavities were filled with drift and rock fragments from the surface. In either case the mass became hard and compact, but with a character materially different from the rock on either side, the formation of which was contemporaneous with that of the coal.

The mind must exert itself to the utmost in order fully to realize through what vast periods of time the processes were continued by which the coal of to-day was formed. Still more difficult of comprehension is the fact of the enormous amount of vegetable matter which entered into the composition of these beds of coal. In the Pottsville regions in Pennsylvania the average thickness of the combined anthracite coal seams is 120 feet. In order to make up this quantity of resultant coal, there must have been an average thickness of vegetable deposit amounting to at least 1,200 feet.—New Science Review.

Graduating Glass Measures.

Graduations on glass bottles, measures, etc., may be easily engraved with the aid of a few small files, a set of six of which, of various shapes, can be bought at most tool shops for about one shilling. A small bottle of turpentine in which some camphor has been dissolved is also very useful as a lubricant, although it is not absolutely necessary.

Suppose it is wished to graduate a bottle which will hold about ten ounces or half a pint of water. First fix a strip of gummed paper, about three-quarters of an inch wide, vertically on the outside of the glass, taking care that it is long enough to come slightly above the place where the ten ounce mark will be. When the gum is dry and the paper slip firmly secured to the glass, pour exactly ten ounces of water into the bottle, place the latter on a flat table, and when the surface of the water has become level and perfectly steady mark the height in pencil on the paper strip. Now take a dry graduated two-ounce measure, pour two ounces of water from the bottle and mark the level of the eight ounces remaining; in the same way register the position of the six, four and two ounce marks. Then empty the bottle and proceed to refill it at one ounce at a time, marking the level of the water at each addition; every second ounce ought to agree with the marks made at first, and in this way the correctness of the measurements will be checked.

When satisfied with the accuracy of the graduations, file with one edge of a fine triangular file through the paper where each mark occurs, until you feel that the tool is cutting into the glass. The marks can be made any length you please; the file cannot slip, as the paper will keep it in the proper place. When all the lines have been well cut in, the paper can be removed and the marks deepened or made wider by using a differently shaped file; the angle of a square or the edge of a very thin flat one dipped in the turpentine and camphor will make good broad lines that can easily be seen. If it is wished to number the graduations, Roman numerals are the easiest to make, but they should all be penciled on the paper and cut through, as before described. It will generally be found on trial that two or three of the small files will easily cut the surface of the glass when used at the point like pencils; and in this case any sort of numerals or letters can easily be engraved, provided that they are first started through the paper.

The turpentine should not be used until the paper has been removed, as it is important to keep the latter dry, but afterward the files will work much more easily and quickly with the aid of the lubricant. If thick, bold lettering is required, it should be drawn on the paper and the thick lines removed with a sharp pointed penknife. In most cases it is better to cut through all pencil lines with a sharp knife before filing, as this prevents the files from becoming clogged.

If very broad lines are required, it is as well to commence them by making two thinner lines the proper distance apart; the surface of glass between the lines can then be easily chipped away with the end of a file.

There is not the slightest difficulty with any part of the operation excepting when elaborate writing is attempted, and even this can be easily mastered by any one who is accustomed to use the pencil. The precautions to be observed are: First mark upon the paper every line that is required to appear upon the glass, and do not remove the paper until every line has been cut, or rather scratched, on the surface of the glass. Special care must be taken to insure this in the case of lettering, as it is very difficult to remedy omissions in the absence of the paper.

Numbers or lettering will always look neater if placed between two parallel lines, which need only be lightly scratched on the glass. These will, in a great measure, prevent the tool from overshooting the mark when deepening and picking out the body of the letters, and will also insure that the latter will all be of the same height.

If these instructions are carefully carried out, with very little practice measures and bottles can be easily graduated in such a manner as to give no evidence of the work of an amateur engraver.—Photo Notes.

Tobacco Boxes.

Formerly the plugs were pressed into the boxes by powerful leverage, which necessitated great strength in the box. Most of the manufacturers now have iron or steel moulds, into which the freshly made plugs are pressed into a body just large enough to exactly and evenly fill the wooden boxes in which they are marketed. This allows the use of lighter boxes without cleats or corner pieces.