inventors was declared immediate and urgent. Although some branches of business seem to have been favored in Switzerland by the privilege heretofore enjoyed of making free use of the inventions of all other nations, it was pointed out that in some of the leading departments of Swiss industry the national progress had been slow because inventors had no encouragement to develop inventions at home; this also led many of their inventors to settle in other countries, where they could have the advantages of patent protection. A striking instance of this was furnished in the presence at the exhibition of the venerable Charles Edouard Tacot, president of the Association d'Horlogerie, who, in early life, came to America principally to patent a valuable invention, which was followed by five subsequent inventions, and the realization of competency, before he returned to his native home at Neuchatel. Now, it is said, this veteran inventor has since made several inventions which he declines to make public in his native land, because the moment he should do so they would be everybody's property.

BORACIC ACID; ITS SOURCES.

Except in chemical experiments, and very slightly in medical practice, we scarcely make use of boracic acid in its own form. But combined with soda, so as to form a biborate, it gives us the well-known borax ($2BO_3+NaO+10H_2O$); and inasmuch as we have in America such developments of boracic acid and its compounds as leave all other parts of the world utterly out of the line of competition, it is well to look briefly and see what we can learn as to the probable nature of the origin of the acid itself, and of the manner in which its combinations are made.

Until within a very few years all the borax found in the market was a factitious article, made by the direct combination artificially of boracic acid with carbonate of soda. And all the boracic acid came from one source, and this source being controlled by a single firm, the borax trade was practically a monopoly. This source was a series of marshy grounds commonly called the boracic acid lagoons of Tuscany, though the term is absurd, for there is no extent of water deserving any such name. They are only swampy spaces which are everywhere bubbling with hot water and steam. The hot water comes up from the earth charged with boracic acid in solution, but the proportion is so small that a great amount of evaporation is necessary before the acid can be separated by crystallization. This had been long known, but the expense of fuel for the evaporation was so great that the work was of small practical results, until in the second decade of this century the idea occurred to M. Larderel of making fire fight fire, that is, of using a certain amount of the hot water to evaporate a certain other portion. The plan was successful, and after having made a complete revolution in the borax history of the world, it continues in operation to this day, though its importance is now greatly diminished, as we may have occasion at some future time to see. The acid comes from below in solution, but before inquiring as to its probable origin at that point, let us look for whatever light the American history of boracic acid can give.

Near the lower end of Clear Lake, in California, about eighty miles north and a little west of San Francisco, is an enormous deposit of sulphur, covering many acres. This mass lies in such a form as to make a bluff projection along the side of a narrow valley, from ten to twenty feet in height. The entire bulk, as originally lying, was in large part pure sulphur, much of it most beautifully crystallized, but it also held disseminated everywhere through it veins and layers of cinnabar. And though hundreds of tons of sulphur were made and sold at a good profit, it was found that the yield of quicksilver from the cinnabar was of much more value, and it has for a number of years been worked for that alone.

The manifestations of heat and fierce energy of some sort in all parts of the sulphur bank were violent, and doubtless are so still. At one place a cavern was opened in the sulphur working, perhaps fifteen feet in diameter, filled at the bottom with a perfectly black boiling mass of fluid, while the roar from somewhere below was deafening. Any crevice in the bank was so hot that the hand could scarcely be held in it, and the suffocating gases, chiefly carbonic acid, were so copious in their emission that even the fleet-footed jackass rabbits were often suffocated in passing through narrow cuts. We have not unfrequently seen birds lying dead in the same places; they had probably settled down to enjoy the warmth, and remained too long. The slow-moving rattlesnakes might be expected to succumb, as they did. This was the sulphur bank.

By the side of the bank in the valley was, and doubtless is now, a spring from which ran a small stream down into Clear Lake. This spring was a nearly saturated solution of boracic acid in water. We have made many pounds of the acid from it by simple solar evaporation. We have no record at this moment of its strength, but crystallization always commenced with the commencement of evaporation, and the resulting bulk was nearly equal to the original depth of the water in the pan. This bulk was made up entirely of the lenticular scales of boracic acid (its characteristic form), discolored, it is true, at first, but needing only a recrystallization to give their full weight of the acid, equal in look and in purity to that in any laboratory.

This spring is perhaps unique; we know nothing like it on record. Another near it is similar, but its water holds in solution a certain amount of magnesian alum, and the boracic acid which we made from it was never pure.

These Clear Lake springs have been thus mentioned because it has been the common understanding that boracic acid was a volcanic product, and came up to us from deep sources in the earth's crust. It is true we have no certain data from which to reckon, but all the evidence seems to indicate that the sulphur bank here noted, like the other solfataras of the Coast Mountains, including also the noted geysers between Calistoga and Cloverdale, as well as numberless other hot springs, entirely superficial in all its relations, and has no connection with the "internal heat" of the earth. This item may be found to have important bearings when we come to consider the strange and apparently inexplicable features which pertain to the combinations of boracic acid with the bases lime and soda in California and Nevada.

Of the borax, which is its own base, we have practically no knowledge. We only assume that it exists in great quantities, and is oxidized in some manner, perhaps by the decomposition of water. A remarkable fact in relation to its extended distribution is, that the water of the Pacific, all along the coast south from San Francisco, holds it constantly in solution, as though jets of it were being emitted from fissures or apertures in the sea bed.

We will see at another opportunity, that in times past there have been outpourings of it for very many hundreds of miles, and that the combinations which it formed are without parallel anywhere else on the earth's surface.

PROPORTIONS FOR VESSELS OF LIGHT DRAUGHT.

In our paper of Dec. 8 we set out briefly, and necessarily, therefore, in an imperfect manner, some of the advantages which in our judgment must follow the construction of sea-going vessels of such form that they shall draw but little water. Now, before taking up the objections which can be urged against this mode of ship building, it is well to state definitely what it is that we have in mind.

The form which we propose is so totally unlike anything which we are in the habit of seeing, that the first idea will be to reject and ridicule it. And yet it may perhaps be worth a sober second thought; and we will launch our craft anyway, and see how she will float.

We do not go quite so far as the circular iron-clads devised for the Russian navy, though theoretically they are excellent; but the plan which we have been incubating involves craft whose breadth of beam shall be three-fourths of their length over all, and this breadth continued fore and aft to an extreme degree. Assuming definite figures will give us more precise means of statement, and we will therefore make our calculations for a ship whose extreme length is 160 feet and her breadth 120. This extent of beam seems at first startling and impracticable, but we shall grow accustomed to it, we hope, by and by; and though it gives us an approximation toward half an acre of space of hold for stowage of cargo, yet we may as well learn to look quietly at it and see if there is not a possibility of turning it to good account.

The breadth of 120 feet is continued to within twenty feet of both bow and stern, whence a broad, even curve joins the two sides. The sides of the vessel are thus straight, but this is not on the water line. We propose that her bottom shall show not a straight line in any part, in any direction. Built as we have planned she will carry 2500 tons, and when loaded will draw a few inches over five feet of water. From the middle of her length the curve of her bottom will rise one foot only in sixty-five feet; in the next ten feet it will rise four feet, bringing it to her load water line, and will continue on the same curve for the remaining five feet; so that her broad, flat bow is shelving forward above the water.

The curve sternward is very nearly the same, except that the curve may rise a little more abruptly above the water line. The curve beamward rises one foot in the first fifty-four feet, in the next five, and continues on that curve to the full breadth. The curves at both bow and stern are adjusted to these measurements.

This represents the shape of the ship's bottom as clearly, perhaps, as it is possible to do it without actual use of a model. And there is no part of these details which we do not deem of importance. The first and great thing of all to be secured is exceedingly light draught, so that the ship shall *sit on* the water instead of going down into it. This is attained on her breadth, but it would be fully as much so, and a trifle more, were she entirely flat, rising not at all until her bow and stern, and her sides were reached. But she needs something more than mere power of floating; she must move over the water readily, and of course, therefore, be so formed as to displace and replace it with the least possible resistance. We believe that the form we have described does this, at all events comes nearer to it than the forms which have been so long in use.

Her bow does not enter the water with either a shoulder or a knife-blade. Notwithstanding that it is very broad, it shelves forward in such a way that it is constantly *lifting over* the surface that it meets, instead of plowing through it, and we believe cannot be made, no matter with what speed it is driven, to carry a "bone in its mouth."

The gradual, though slight, rising curve from her mid-length forward is an additional relief to the forward resistance, and the curve from the same point aft is sufficient to allow free recovery without forcing her to "drag water." And in both these respects the lateral curves are adapted to aid.

It will be noticed that we have said nothing of keel. This was done designedly. We propose to build and strengthen the ship's bottom as usual. Of course an external keel may be displayed or not, as shall be preferred. The idea which has been prevalent in this design has had reference to vessels driven by power and not by sails, and our own choice would be decidedly for a movable keel (not a center board, but much greater in length), so that, in case of necessity, advantage could be taken of every inch of her extreme lightness of draught.

We have spoken thus far only of the ship's bottom, but her upper works will vary much from what we are in the habit of seeing. In this ship of 2500 tons we propose a depth from deck to keelson of only ten feet. It will give her abundant room for stowage, and is all she needs. But with this depth she will be but five feet out of water, and the first impression is that she will be swept by every sea, except in the smoothest of water. This is in part an error, for her great buoyancy will in large degree prevent any such effect of the waves. They will not come on board of that which *does not resist them.*

But that they will do it to a certain extent is doubtless true, and we expect it and provide for it. We have a space of 160 feet by 120; of this we propose to utilize as deck surface but 100 by 80. This portion is raised above the level given, the ten feet; a "house" is built, as is so constantly done, five feet more or less in height, as may be deemed best. This leaves a space of fifty feet clear from the bow, twenty feet on each side, and ten feet at the stern, over which seas may break without injury or inconvenience. They are occupied by nothing, and the sea runs off from them as from the sides of an ordinary ship. With such buoyancy as a craft like this possesses, she will ship fewer seas on her real deck than one built as vessels are built now.

A.

CARE OF PATTERNS.

One of the largest expenses of the producers of cast metal articles from toys to machinery is that of patterns. These must be made of the finest stock and by the most skilled workmen. All patterns are made originally of wood, which in the case of light articles are exchanged for duplicates in metal at once, just as the wood block for engraving is exchanged for the stereotype or the electrotype. But large patterns, as for beds for lathes, planers, and other heavy machines, and many other articles, must necessarily be of wood in permanence. How to keep these patterns in good condition when not in constant use has been a puzzle to many, but moisture proof as well as fire proof buildings have filled that demand. A greater annoyance and anxiety is caused by the difficulty of classification and arrangement, so that any particular pattern may be found at once. Where the patterns are limited to a certain stock of reproduced machines, it is easy enough to arrange the patterns in suits, each part of a completed machine to be kept in one compartment. But where the demands on a foundry are of a miscellaneous character, it is impossible to keep a referable list with ordinary classification.

A shrewd manufacturer has overcome this difficulty by adopting the alphabetical order of the dictionary, a name being given to each pattern and piece when made, and entered upon a kept dictionary in the office, another, a duplicate, being kept in the pattern house. Illustrations might be given to show how the thing works, but this is not necessary. It is sufficient to say that under a single letter, G, there are no less than 200 entries, but all so distinct and discriminated that no difficulty is found in locating them in their alphabetical departments, or in charging them to each handler, as pattern room, foundry, or designing (draughting) room. By the addition of numerals to the alphabetical plan it is easily seen that any number of convenient subdivisions may be made.

A Bill to Reduce the Lifetime of a Patent to Five Years.

The above is the official title of a bill introduced by the Hon. J. A. Anderson, of Kansas, being H. R. 3617. The full text is as follows:

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,

That section forty-eight hundred and eighty-four of the Revised Statutes is hereby amended by striking out the word "seventeen" and inserting in lieu thereof the word "five;" and that all acts or parts of acts inconsistent herewith are hereby so modified as to be made consistent.

In another column we publish the two bills lately passed by the House designed to establish free trade in patents. Of the 331 members only six voted against these bills, and not one spoke against them. It may therefore be presumed that Mr. Anderson's bill will soon be passed, perhaps by a unanimous vote. From the House of Representatives our manufacturers and inventors have nothing to expect but the most hostile legislation. Their only hope is in the Senate. It behooves those who have property or business interests at stake, and who believe in the maintenance of the patent system, to lose no time in presenting remonstrances to their senators.

Prize for an Original Essay on Sanitary Science.

The Worshipful Company of Grocers, of London, have issued an announcement, offering a prize of $5,000 for the best essay on the above subject. This prize is awarded every four years, and is open to universal competition, British and foreign.