WIRE AND TUBE DRAWING.

[By John C. Anderson, C.E., in the Cantor Series of Lectures before the Society of Arts.]

Wire has been used in Europe for more than 400 years. At first it was made by drawing down, in blacksmith fashion, with the hammer upon the anvil. The draw-plate was invented in Germany about 300 years ago, but it was comparatively little used until recent times. Now, the rolling-mill and the draw-bench are combined into one system of manufacture, by means of which the rate and diminished cost of production have developed the trade so enormously as to have led to the use of iron and steel wire for ropes, bridges, fencing, telegraph, and so many other new purposes, that it has at length become a great branch of industry.

Hollow tubes are now manufactured of all sizes, and out of all the ductile metals. This apparently difficult process is accomplished in several ways. With one system it is done by first forming a hole through a short, dumpy piece of metal, either by casting or drilling; into this hole a mandril is inserted, and then the dumpy mass, by means of the drawing process or by rolls, is passed through a succession of holes until it covers the mandril from end to end. This mandril may be a fine wire, or large enough to form the tubes for a steam boiler. A similar process, but substituting rolls for the draw-plate, is mostly employed for the larger sizes. The same or similar principle is frequently employed to make tubes, close at one end, these tubes being of various sizes; in such case the holes are not passed entirely through the mass; the mandril is inserted and is then pushed through the successive holes in the draw-plate, until the metal is extended over the mandril. Sometimes the piece is formed from a disk into a thimble-form, and then put on a mandril to be elongated. There is also an extensive manufacture of iron wire and of iron tubes, both being covered with a thin brass tube, by which means not only beauty but greater strength is obtained at a reduced rate; and for such purposes as these articles are used, viz., picture-rods, hand-rails, shop windows, carpet rods, and such like, the arrangement fulfills the object equal to an entire brass structure. The iron wire or tube is made as before described; the outer brass tube is made in a similar manner, but sufficiently large to admit of its being slipped over the iron. The iron may now be considered as a mandril, and the two are drawn through the draw-plate together, thus fixing the thin brass tube upon the iron, while the whole surface exposed is brass.

The so-called copper wire which is now extensively used by upholsterers for the spring cushions of sofas, beds, and similar purposes, is merely iron wire, which is made in the ordinary manner until just before the last process, when it is immersed in a solution of sulphate of copper for a short time, sufficient to allow a thin film of copper to be deposited on the surface of the iron wire. The iron wire thus covered with copper is now drawn through a draw-plate, by which it is rendered hard and elastic and suitable for a spring, at the same time the dull surface of the deposited copper is made as bright as a new farthing, and serves to protect the wire from oxidation.

There is yet another application of the natural law, which a few years ago would have been reckoned an impossibility—it is the process for drawing conical tubes. Nothing yet said will explain how this can be done. A taper mandril will suggest itself, which, so far, is simple. But the die of varying diameter, how is that to be obtained? For a long time rolls for rolling taper gun-barrels have been in use, in which a succession of tapering grooves are formed, while, by dexterous management, the roller contrives to insert the thick end of the gun barrel at the precise point in the revolving rolls, and thus the gun-barrel is elongated towards the muzzle by means of the narrowing groove in the rolls; bayonet blades are likewise drawn out in the same manner. In the process to which I now refer, for the drawing out of the long tapering brass tubes, an expanding die is used for a draw-plate. This die consists of a ring of block-tin containing a small percentage of copper, to give it a little greater rigidity; this ring is applied at the smaller end of the mandril, and the brass is drawn through the die. By this means two effects are produced, first, the metal is drawn over the mandril to a small extent, and secondly, the die is destroyed, from the extension to which it has been subjected; it is therefore thrown into the melting-pot, to be cast into a new die, and thus by a succession of new dies, the metal is gradually drawn over the steel taper mandril, until it is covered with brass from end to end, when the steel mandril is withdrawn.

There is yet another remarkable process in connection with this natural property, which is taken advantage of in the formation of ornamental twisted tubes of various patterns, such as we see in the gas fittings of churches and other places. To produce such tubes, the brass is first drawn into a plain tube upon a mandril, in the way described; this plain tube is then passed through a succession of revolving blunt screw-tools, having the required form upon their interior surface. In form the tool is arranged as a screw-nut, but not being adapted to cut the metal, and the plain tube being without a mandril, its surface is slightly depressed by the screw pressure, and by a succession of such screw-tools, or nuts, it is finally depressed to the finished ornamental pattern as required.

We sometimes see these ornamental tubes of a diamond screw pattern, where the spiral is crossed by another spiral, uniformly along the entire surface. This is done by means of two sets of screw tools, one set turns to the right hand, the other set to the left hand, and between the two the pattern is formed. This pattern may be of any section, plain, square, octagonal, ribbed, rounded, or otherwise, all depending on two principles; first, the flowing properties of the atoms of the metal, and secondly, the copying arrangement, by which the required pattern is transferred to the tube under operation, thus shifting the relative position of the molecules, yet without cutting the metal.

Referring again to the wire-drawing process, such is the effect produced by the operation that, contrary to what might have been expected, the strength of the wire or steel is greatly increased. In the case of iron of an ultimate strength of 25 tuns per inch, it is increased in strength fully 10 tuns, and some of the best iron, with a strength of 28 tuns, is raised to 40 tuns. The most remarkable change in this respect is in the case of steel music-wire. The mild steel out of which this is made has a strength, when in the natural state, of from 30 to 40 tuns, according to its steeliness, but when tempered mildly, by being made red-hot and then cooled in oil, and elongated into wire, its strength is increased fully three-fold. At the same time, if such steel or even iron wire is made red-hot, so as to allow the natural law to assert itself, all these high conditions vanish, with only one redeeming quality, that the wire then becomes more pliable, and similar in strength to the iron or steel out of which it was made.

The knowledge that this treatment of steel has the effect of increasing its strength and toughness so enormously, has produced fruits in several directions. One of these, bearing on the present subject, is the attempt to draw steel tubes of any length, or section or substance. Throughout the engineering world there are many purposes (indeed wherever motion is involved) for which a strong light material would be extensively applied, provided it could be obtained at a moderate cost. To accomplish this operation, a hole or slit, according to the section required, is first formed in a short thick mass of steel; two dies are employed, the one internally (which remains in use throughout the operation), the other externally (which has to be exchanged for a smaller one at every passage). Then enormous hydraulic pressure is brought to bear in pulling it through the vacant space between the internal and the external dies, thus leaving a portion of the steel behind, which forms a reservoir of steel for the increased length, by future elongating with that which could not pass through at the rate of motion of the apparatus, but to follow suit as it has opportunity, and then, by annealing the mass of steel, and using smaller and smaller external dies in succession, the thick lump becomes gradually elongated into any length of any section, and, if necessary, with the high qualities of the music wire.

With the object of carrying out such a manufacture, a company was recently formed in London, to produce steel tubular forms of any size or section. A variety of remarkable specimens was produced by them which made every engineer's mouth water, and although commercially it has not succeeded (simply because the arrangements of the world were not quite ripe for it), still that, judging by all past experience, does not affect the question any more than the receding wave affects the rising tide. The grand fact remains that it is a possibility, by sufficient pressure and patience, to cause solid steel to flow into any hollow form of section without breaking its continuity; it is a wonderful triumph of mind over matter which cannot be ignored, and which has yet to accomplish most important results in the future history the mechanism of the working world of applied mechanics, and the advantages are so apparent and so numerous that its ultimate success is only a question of time.

My chief object in making the foregoing remarks, is chiefly to show that the natural laws which govern materials and things, are a great lesson to be taught to our young students, before they enter the workshops of applied mechanics, and to show that the varied operations of the practical worker are thus intimately blended with the profoundest philosophy, and that the fashioning of matter into the various forms required by our civilization, is not the drudgery to a thinking mind which it is generally considered to be, but that we are fellow-workers in carrying out and taking advantage of the natural laws, as laid down for men by the Grand Designer of the Universe.

VARNISH ROOMS.

From the Hub.

There are few good varnish rooms in this country—very few. Consequently, there are plenty of poor ones, and, for the sake of example, which may illustrate those features of a varnish room which are objectionable and should be avoided, we shall describe a certain poor one which we have in mind, and which we assure our readers is by no means the very worst of its class.

This shop is situated in the outskirts of a city. The varnish room is a small one, in the second story, and directly over the blacksmith's shop, while above it is an unfinished garret in which stock is stored. The room has two windows, which open only at the bottom. One window is shaded by a large elm tree, which is considered very attractive, but as the room is dark and this tree shuts out half the light which would otherwise enter, its shade is very objectionable. The light from the other window is partly obstructed by a series of shelves, upon which are arranged a variety of varnish and japan cans. The ceiling and walls are of rough boards black with age, and here and there pictures have been hung. In the middle of the ceiling newspapers have been tacked up, in order to prevent the passage of dust which rattles down from the cracks between the boards every time any one enters the third story.

It is not difficult to perceive that in such a shop the varnisher must be obliged to labor under many serious disadvantages. In the first place, his room is dark, whereas he needs the best light possible. Not only are the windows too few in number, and partly obstructed, but the walls and ceiling, being dark, cannot reflect and make the most of what light there is. Again, he has no proper ventilation, and this he must have in order to guarantee good work. The windows cannot be opened, for if this were done, an inward draft would be created and dust might be brought in. Even the cracks in the ceiling are rendered useless as ventilators, being covered with piles of lumber. Consequently, if you visit this shop on a warm summer day, you will find this room as hot as an oven, and the air so drenched with the moisture which comes from the rapid evaporation of the water upon the floor that it is difficult to see across the room. Every painter knows the effect produced upon varnish by a moist, muggy day; then who can expect that varnish will do its best in such an atmosphere as we have described. In the third place, the work in this shop is never safe from dust, for the walls and the ceiling being rough, they will hold a great amount of dust suspended, and this is liable to sprinkle down upon the fresh varnish whenever any jarring is caused by the workmen below, or by heavy teams, or even by the movement of the door, when the varnisher leaves the room at night. His work is therefore in constant danger of being spoiled in this way. If, under all these disadvantages, a varnisher is able to turn out perfect jobs even occasionally, he may be considered as eminently fortunate as well as skillful, and he cannot justly be blamed for frequent bad jobs.

As we have already mentioned, the shop which we have described is by no means the worst of its class, but is one that is looked upon by its owner as a "very comfortable sort of a place," and as we once heard him remark—"Anybody who can't dew good worruk in that 'ere shop, better jest go and try it with my gran'ther, who allus did all his varnishing in the back yard. That 'ere shop is where I done all my varnishing when I was a young 'un, and if there's anybody can do betterer varnishing than me in 1840, I'd just like to look at him."

In past times it seems to have been the policy to set apart, for varnishing, the odd room which couldn't be used for anything else; whereas, the varnisher ought to have first choice, and should have the best situated and the best fitted room in the building. The varnish room should be the "parlor" of the factory, for it is there that the most delicate part of the operation is performed. In some new shops we are glad to say that some improvement may be noticed in this respect, but still there are very few that approach perfection.

In conclusion, we shall briefly mention the several requirements of what we consider a model varnish room. These requirements refer to the railroad shop as well as the carriage shop, but more particularly to the latter, because the class of work is nicer, and also for the reason that in the carriage factory we find the faults are generally more serious. The paint room in a car shop must of necessity be roomy, and this will help ventilation, and the light is generally good.

1st. Every varnish room should have the best degree of light that is possible. A corner room with plenty of windows, is therefore to be preferred; and, if situated in the upper story, skylights will aid very considerably. The ceiling and walls should be white and smooth, as they will then reflect the rays and greatly increase the degree of light. Rays of sunlight must not be allowed to fall directly upon work, and each window should therefore be provided with a white curtain, which can be drawn when necessary.

2d. The varnish room should have a perfectly arranged system of ventilation. The windows should all be made to open at the top, and one or more of them ought constantly to be opened for an inch or two. If the room is in the upper story, as is usually the best situation for the varnish room, skylights will be found to give the best ventilation.

3d. Every precaution should be used to prevent the presence of dust. In the first place, the walls and ceiling should be finished smooth, so that dust cannot find place to lodge. Plaster, with hard finish, gives the smoothest surface, and we would advise its use in all new shops. When finished with wood, the boards should be planed and matched, and a coat of varnish or permanent wood filling added. In old shops, finished roughly, it is well to tack sheets of brown paper over the ceiling. In the second place, no shelves, cans, clothes, or pictures, should be allowed in the varnish room, as they are all liable to hold dust. The varnish room should be a perfect void—bounded by six blank smooth surfaces Then let the room be carefully dusted, swept, and sprinkled, and two or three hours afterwards the carriage may be wheeled in lightly, and the work of varnishing can be commenced with some confidence. Some varnishers have a silk suit to slip on before entering the varnishing room. This is a good plan, as they thus avoid carrying in much dust which would be likely to cling to their ordinary clothes. Thirdly, no one except the varnisher should be allowed to enter the varnish room. It should be the "*sanctum sanctorum*" of the factory.

4th. An even degree of temperature should be maintained. For this reason, it will be seen that the best situation for the varnish room is in the northern end of the building or in the northeast corner, for there the sun will not lie in during the day and raise the temperature. Steam is the best method of heating the varnish room. When this cannot be employed, care should be taken to select a good stove, that does not require constant attention, and this should be placed near an aperture in the wall, in such manner that it may be fired from the adjoining room, and furthermore, it should be inclosed in a tin or sheet-iron casing, made conical at the top, and this will prevent any dust from arising when the fire is replenished, or the ashes shaken down. The degrees of heat which are best adapted for varnishing range from sixty degrees Fahrenheit to about seventy-five degrees, and are about the same that make the room seem comfortable to the varnisher. A good thermometer should be hung up, and great care should be taken that an even temperature is maintained during working hours, and until the varnish "sets." If possible, the heat should be preserved throughout the night.

THE BERLIN HEATING GASWORKS.

From Engineering.

During the past five years gas heated furnaces of various kinds have come into extensive use in a large number of important works both in this country and abroad, and everywhere the great cleanliness and convenience attendant upon the employment of gaseous fuel have won for it a good name even under circumstances where its economy alone would not have been sufficient to do so. Gas heated furnaces, in fact, bear much the same relative position to ordinary furnaces using solid fuel that a gas light does to a lamp or candles; and it is probable that ultimately the gaseous will supplant the solid fuel as universally for heating as it now does for lighting purposes. Under present circumstances, however, there are certain practical difficulties in the way of of applying gaseous fuel universally to heating purposes. Ordinary coal gas, as supplied from the gas works, is too dear to be extensively used as fuel, while gas producers, such as are used by Mr. Siemens in connexion with his well known regenerative furnaces, do not work well on a small scale, and, in fact, do not give the best results unless they are worked in groups of, say, four or more; and it thus follows that where merely a small supply of heating gas is required they could not be satisfactorily adopted.

This being the state of affairs, it appears to us that what is wanted is a supply of cheap gas specially intended for heating purposes; and we are glad to see that the subject has attracted attention on the Continent, and that plans have been already brought forward for furnishing such a supply to the city of Berlin. The "Berlin Heating Gasworks" Company as it is named, proposes to establish works at Fuerstenwalde, a town distant about thirty miles from Berlin, where there are extensive mines of lignite, this latter being the material from which it is intended to manufacture the gas. At Fuerstenwalde it is proposed to erect twelve retort houses, each 105 ft. long by 62 ft. wide, these houses containing seventy retort furnaces with ten retorts in each. The retort furnaces are to be heated on Mr. Siemens' regenerative system, three gas producers being provided for each furnace; and the arrangements are to be such that the lignite may be tipped direct into the retorts from the wagons in which it comes from the mines. From the retorts the gas is to be conducted to the condensers, where any unconverted tar, water, or other condensable matters will be separated, and it is then to pass to the blowing engines by which it will be forced through a 4 ft. main to Berlin.

The blowing engines are to be four in number, and each is to have a 5 ft. 9 in. steam cylinder, and 7 ft. 7½ in. blowing cylinder, the stroke in each case being 6 ft. These engines are rated at 360-horse power each, but they are to be capable of being worked up to 500-horse power each in case the extension of the works should render it requisite. The blowing engines are to force the gas into the main under a pressure equal to 16 ft. head of water, or about 7 lb. per square inch, it being considered that this comparatively high pressure will by enabling a smaller main to be used, in the long run give more advantageous results than larger pipes and less powerful engines.

The main leading to Berlin is, as we have stated, to be 4 ft. in diameter, and it is to be constructed of ¼ in. wrought-iron plates, and is to be carried above ground, being supported on piers of masonry placed at convenient intervals. This arrangement will give perfect facilities for examination and repair, and it is considered that, under the circumstances, it will be found preferable to burying the main below ground. Provision will, of course be made for the expansion and contraction due to changes of temperature. It is calculated that this 4 ft. main will, under a pressure equal to 16 ft. of water, pass 407 cubic feet of gas per second; while, if the pressure is increased to one atmosphere, the conveying power of the tube will be increased to 584 cubic feet per second, the actual weight of gas passed through per second under these latter circumstances being, of course, nearly three times as great as that flowing through in the former instance. At Berlin the gas is to be received in twelve gas-holders, each 154 ft. in diameter, 40 ft. high, and having a capacity of about 720,000 cubic feet each; and from these holders it is to be distributed by pipes to the various parts of the city in the same manner as gas for lighting purposes.

From experiments which have been made at the laboratory of Dr. O. Ziurck, the consulting chemist to the Berlin Board of Health, it is stated that it has been determined that there can be produced from lignite, by a simple process, a gas mixture well suited for heating purposes. The specific gravity of this gas mixture is 0·5451 (that of air being taken as the unit), and its chemical composition is given as follows:

Hydrogen	42·36
Carbonic oxide	40·00
Marsh gas	11·37
Nitrogen	3·17
Carbonic acid	2·01
Condensable hydrocarbons	1·09
	100·00

The proportions of carbonic acid and nitrogen are, it will be seen, extremely small, and if this chemical composition can be maintained in regular practice, the gas mixture will certainly possess very high heating power, although for lighting purposes it would possess but very little value. Experiments have, in fact, shown that 3,000 cubic feet of this gas mixture are equal in heating power to one Prussian tonne (2 200 lbs.) of lignite, or one-third of a tonne of pit coal. It is proposed to supply the gas at Berlin at the price of 6d. per 1000 cubic feet, and supposing the results of the above-mentioned experiments to be practically correct, the heating power of a tonne of pit-coal will thus be supplied for 4s. 6d., a cost which is certainly low.

With the arrangements for consuming the gas, the Berlin Gas Heating Works Company propose to have nothing whatever to do, it being their intention to merely supply the gas by meter at the price we have named, leaving the purchasers to do what they like with it. The annual supply which the works are laid out for manufacturing, in the first instance, is about 9,500,000,000 cubic feet, or about 2,627,000 per day, and it is estimated that this quantity would provide sufficient fuel for domestic purposes for about half Berlin, or about 8,000 houses.

Whether or not the Berlin Heating Gasworks will prove a commercial success—and we really see no reason why they should not—they will certainly be regarded with great interest as the first really practical attempt to make gaseous fuel available for domestic purposes. That gaseous fuel will, when once its proper management is understood, be as generally appreciated as coal gas for lighting purposes now is, we have little doubt; and although at first there will be many prejudices to overcome, yet we fully expect that one of these days we shall regard cheap gas for heating purposes as a domestic necessity.

The British Ironclad, "Glatton."

The London *Artizan* says: "This turret ship which is in course of construction at Chatham Dockyard will be the most powerful ship, for offensive and defensive purposes yet built. The *Glatton* is being constructed from the designs of Mr. E. J. Reed, C. B., and the utmost exertions are being used to have her completed as early as possible in the ensuing year. From the circumstance of the *Glatton* being the first vessel built by the Admiralty on the pure turret principle, with an exceedingly low freeboard, more than the usual amount of interest is taken in her construction. She will be constructed with a single turret, in which will be placed a couple of 25-tun guns. The thickness of the armor plating on her sides will be no less than 12 inches above the water line, and the remainder 10 inches in thickness, worked to a teak backing of 20 inches. The inner skin plating to which the timber backing is attached consists of two thicknesses, each one inch thick, laid on the usual iron frames 10 inches deep, placed two feet apart. The total thickness of the iron and teak of the *Glatton's* sides will thus be 3 feet 8 inches. The armor plates on the turret will be 14 inches in thickness in the most exposed parts, and 12 inches thick in the remainder, worked on a backing of teak of 15 inches, with two thicknesses of skin ⅝ inch each. The entire base of the turret is inclosed by a breastwork carried to a hight of 6 feet 6 inches above the deck, the whole being covered with armor-plating 12 inches in thickness, laid on a backing of teak 18 inches thick. The turret guns will fire over the breastwork, the *Glatton* when in action having a freeboard of only two feet, measured to the deck, the turret guns being exactly 11 feet 6 inches above the water line. This arrangement of breastwork possesses the advantages of raising the turret to a convenient hight, whilst at the same time it affords great protection to the lower part of the funnel, hatchways, and other necessary openings from the deck. The arrangement for the turret are such that the 600-pounder guns will command a fire round the bows, to within about twenty degrees of the fore and aft line on each side; while a single gun can be trained and fired from this line round to a right aft fire on each side. On the top of the breastwork the plating is 1½ inch thick, and on the deck outside the breastwork 3 inches thick. When not in action her mean draft of water, forward and aft, will be 19 feet, but she can be submerged to any depth by means of water ballast, pumped into tanks specially fitted for this purpose. At her 19 feet draft her deck will be only 3 feet above the water, her armor extending 4 feet below and 2 feet 6 inches above the water, a 6-inch oak deck covering the upper edge of armor. Above the breastwork will be fitted a flying bridge, from which on all ordinary occasions the ship will be conned; in action, however, an armor-plated conning tower, specially fitted for this purpose, will be used. Stowage accommodation is provided for 250 tuns of coal in her ordinary bunkers, but this quantity can be increased to between 500 and 600 tuns by using the water ballast tanks for stowing the coals. She is to be fitted with engines of 500-horse power nominal, capable of working up to 3,000-horse power actual, and her estimated speed will be from 9½ knots to 10 knots per hour."

French Forgeries.

When photography became established as a practical art, it was found that bank notes printed with black ink lent themselves too readily to the machinations of the forger. Thereupon, the Bank of France determined to employ blue ink, which baffles the photographic imitator, and to have some engraved device or other on both surfaces. This plan has been completely successful. In regard to other modes of falsification, an experienced chemist is constantly employed in studying all new discoveries that may perchance be brought into requisition, in order to devise means of averting roguery. Forgery of the notes is now extremely rare. On one occasion, three persons attached to a deposed royal prince were found to have been concerned in a deep-laid scheme of note forgery; a packet containing twelve false notes of one thousand francs each was presented to be cashed, but the fraud was detected in time to avert loss. About 1853, a more determined attempt upon the bank was made. False one hundred franc notes came to the bank with great rapidity and regularity. They were so admirably executed that no banker, money-changer, or trader, could detect the fraud, and therefore no reason presented itself for refusing to take them in the ordinary way of trade. The experts at the bank alone detected them by means of a tiny black spot near the figure of Mercury. For eight years continuously did these notes make their appearance, defying all endeavors on the part of the authorities to discover the malefactors. The bank did not like to make the fraud known, lest it should shake the confidence of the public in the one hundred franc notes generally. At last the clever scoundrel was discovered; he was an engraver, and it was found that he had successfully put into circulation false notes to the value of nearly two hundred thousand francs. His end was strange and horrible. Transported to Cayenne in 1862, he tried to escape into the Dutch settlements; faint and exhausted, he became fast embedded in the thick slimy mud of a river, and was there *eaten alive by crabs!*

Interesting Discoveries in Canada.

During the summer just closed good work appears to have been done by the Geological Survey in the Lake Superior region. Professor Bell's party have all returned to their winter quarters, after having experienced many of the hardships and privations incident to the life of the first explorers in the distant wilderness. We understand that the results of the expedition include a complete topographical and geological survey of Lake Nipigon, and an exploration of much of the surrounding country. This lake, it appears, will rank, in point of size, with the other great lakes of the St. Lawrence, forming the sixth and last in the chain. Professor Bell has not yet been able to map the whole of his extensive survey, but thinks the area of Lake Nipigon will be found to exceed that of Lake Ontario, or even Lake Erie—some 590 miles or more of coast line having been traversed. This great lake is drained by the Nipigon river, or upward continuation of the St. Lawrence, beyond Lake Superior, which is described as a very large clear-water stream, about thirty miles in length. Upward of a dozen rivers, of considerable size, are reported to empty into Lake Nipigon from all sides. We understand that one of the most singular features in the geography of this beautiful lake, is the immense quantity of islands which are scattered throughout its whole extent, and presenting a great variety in size, form, and elevation. It appears that geological discoveries of a highly interesting and important nature have been made, and that, contrary to common belief, a large extent of level land, with deep and fertile soil, exists in the Nipigon country. Professor Bell had received instructions, in addition to his geological explorations, to obtain as much information as possible in regard to a route to our great Western territory, and his discoveries in this direction, are, perhaps, not the least important of the results of the expedition. If we are not mistaken, he has found that this country, so far from being a difficult one, offers great facilities for railway construction. Further, he has, we believe, ascertained that the elevation of Lake Nipigon above Lake Superior is very moderate, and, consequently, this lake may be found useful for the purpose of navigation in the desired direction.—*Toronto Globe.*

Hager's Rules on Treatment of Platinum Vessels.

Every beginner in chemical analysis, must learn that, though little effected by acids and other powerful agents, except its solvents, platinum may be injured or destroyed by many other articles which hardly ever effect glass or porcelain. Platinum vessels, such as crucibles, dishes, wire, and rods, are at no time to be brought into contact with, or used for fusing either of the following:

I. Alkaline or alkaline earth sulphides, or their sulphates when liable to be reduced to sulphides.

II. Nitro-muriatic acid, or anything which might evolve free chlorine, iodine, bromine, sulphur, selenium.

III. Those processes in which silica is separated at a high temperature.

IV. Fusion, and heating of the caustic alkalies and alkaline earths, as well as their nitrates, and all the salts of lithia.

V. Fusion, or reduction from their oxides, of the fusible metals, like lead, bismuth, cadmium, tin, as also of the oxides of nickel, copper, etc., which give off oxygen at high temperatures.

VI. Heating or fusion of phosphoric acid and acid phosphates with carbonaceous matter or other deoxidizers.

VII. Evaporation or calcination of readily decomposable chlorides, *e. g.*, sesquichloride of iron, etc.

VIII. Fusion of iodides and bromides.—*Chemist and Druggist.*

One of the most extraordinary passages ever undertaken and performed has recently been accomplished by the steamer Helen Brooks. On the 5th day of August, 1869, the steamer Helen Brooks left Baltimore, Md., for Bayou Teche, La. She left Baltimore by way of the Chesapeake Bay, and passed through the State of Delaware by canal; up Delaware river to Trenton, N. J.; through the State of New Jersey by canal; down Raritan river to New York city; up Hudson river to Troy; through the State of New York by the Erie canal to Buffalo; thence by way of Lake Erie to Chicago; down through the Illinois canal to the Illinois river, and thence down the Mississippi river, arriving at Napoleon, Ark., on Thursday morning, October 14, after a circuitous journey of over 3,000 miles.