Correspondence.

Solid Iron Floating on Molten Iron.

MESSRS. EDITORS:—In No. 15 of the current volume you give an explanation of the reason why solid iron floats on molten iron. You say that iron, like water, in changing from a liquid to a solid state, expands. If this be so, why is it that all patterns for castings are made one-eighth of an inch to the foot larger than the casting is required to be? Surely, when the molten iron is poured into the mold it is filled completely full, and by taking the caps off from any flask, you will see that the iron, in cooling, has shrunk away from the sand one-eighth of an inch to the foot in every direction. This being the case, a cubic foot of molten iron should be lighter than a cubic foot of solid iron. You say the reason why a pattern must be made larger than the desired casting is that the iron hardens while it is very hot, and then in cooling, shrinks. How do you reconcile this? Does not the iron occupy less space when hard and cold than the molten iron did? is iron when it is cooling not passing from a liquid to a solid state? and is it then both shrinking and expanding at the same time? Does iron continue to expand so long as its temperature of the mass is falling? if not, at what point is it the largest? Or, on the other hand, if it shrinks, at what point is it the smallest? By answering through the columns of your valuable paper, you will oblige your Canadian readers.

N. C. B.

Coaticook, April 8, 1866.

[It seems, in this case, that a few of our readers have failed to apprehend our meaning. Let us try again. Suppose that we have cast iron at a temperature of 2200°, and now pour it into a mold. It will begin to cool and will shrink in bulk, as may be seen by the surface of that in the gate settling. It will continue to contract until it reaches the temperature of solidification, about 1700°. It now changes from the liquid to the solid state, and in undergoing this change. it expands. Any founderyman may observe this expansion in the case of a casting which has a large sprue in proportion to its bulk, so that the metal will continue liquid in the gate—as the surface of the metal in the gate will rise at the instant of solidification. Now we have the mold filled with solid cast iron of just the same size as the pattern, but this iron is at a temperature of some 1700°, and we let it cool down to a temperature of 70°. In this cooling, it shrinks about one-eighth of an inch to the foot; hence the necessity of making the pattern larger than the casting. But this contraction is not equal to the expansion which takes place in the change from the liquid to the solid state. The pattern must be made larger because it is made for solid hot iron.—EDS.

A Coin and Feather in Vacuo.

MESSRS. EDITORS:—I have noticed in your valuable paper, under the head of "Notes and Queries," in answer to L. S. B., of S. C., a statement that is exactly the reverse of that which I had supposed was correct. You say, a piece of metal will weigh more than a feather in vacuo. Neil Arnott, M. D., in his "Elements of Physics," Vol. I., page 346, says: "A small weighing beam, having attached to its opposite ends pieces of cork and lead which equipoise in the air, if placed under the receiver of an air pump quickly exhibits the cork preponderating." As I have no means of trying the experiment I cannot demonstrate the fact. Can you give me the philosophy of it?

JAS. S. CONANT.

Joppa Village, April 13th, 1866.

[The correspondent to whom we replied, had an idea that the attraction of the earth is magnetism, and in proof of his theory he stated that a coin and a feather, if weighed in a vacuum, would have precisely the same weight, though in the air the coin, of course, would be heavier. In the case of a feather and piece of metal, which are of equal weight in the atmosphere, the one having the largest volume is of course buoyed up more in the air, and on removing the buoying fluid that one will preponderate.—EDS.

Hardening Dies.

MESSRS. EDITORS:—Please inform me the way to temper a steel die so it will not crack off at the edge in tempering. The dies are about two and a half inches in diameter, one inch thick, with the edges turned to one-eighth of an inch thick. I have had edges to fly half off sometimes, and some never crack at all. State whether I should have a composition to temper in.

JAMES AYARS.

[The reason that a great many dies crack in hardening is, that they are hammered too much. A practice is gaining ground daily among our best machinists, of making dies directly from the bar or plate, where the size permits, without forging them at all. Dies so made are invariably safer in hardening than when hammered, and they last quite as well. Steel that is hammered, is, in most cases, of unequal density, so that the expansion and contraction in hardening is likely to destroy work. The twist drills of which so many are sold, are never hammered at all. and the manufacturers assure us that they never lose one by springing or breaking in tempering. Compositions, or baths, as they are sometimes called, may be of use in many cases, but cold water is as good as anything for general work. Cyanide of potassium, strewed over the die when hot, and the same plunged into water, will give a superior hardness to a die.—EDS.

Water Wheels for the South.

MESSRS. EDITORS:—We have been favored several times by your kindness in furnishing information on machinery, the address of manufacturers, etc., etc., and we feel much obliged by your attentions. Our Southern country is much in want of all descriptions of labor-saving apparatus, all useful inventions, etc.

Just at present we have pressing demands for a superior kind of patent cast-iron horizontal water wheel; one that possesses a concentration of power at the same time it economizes the supply of water; and is, withal, of cheap and simple structure.

We are not familiar with the merits of the several kinds heretofore used, known as the Jonval, turbine, Tuttle, Stephenson, and others, but believe there are some which are highly commended as certainly superior to all these, and are of comparative late introduction.

Will you be pleased to inform us in particular on the matter and give us the address of proprietors and manufacturers, if not inconvenient to you. The branch of business especially under my charge here is that of machinery, etc.

W. G. ATKINSON

Richmond, Va., April 10, 1866.

[There is a great difference of opinion among practical men in regard to the relative merits of the different kind of wheels. We will not undertake to decide the matter, but would advise the different manufacturers to send to our correspondent such facts and figures as will enable him to decide the question for himself.—EDS.

The Long and the Short of it.

MESSRS. EDITORS:—In your last issue in your "Answers to Correspondents," you say that a long screw-driver gives no more power than a short one if the handle is no larger. For the sake of apprentices who can start a screw with the former which they cannot with the latter, allow me to explain what I believe to be the true principle of the "power." It is simply this: the depth of the slot allows them to slightly lean the driver, thus obtaining a longer lever with the longer driver.

G. D. M.

Farmington, Me., April 13, 1866.

[Screws are not got out by prying on them with a lever. If our correspondent will take a screwdriver a foot long and another one six inches, with the same handle on each, he will do just as much work with one as with the other.—EDS.

Several Questions.

MESSRS. EDITORS:—Will you please answer the following questions through the medium of your valuable paper? Will it require more power to raise water to a pump which is twenty feet higher than the fountain, than it will to one that is only ten, except what is required to overcome the additional friction of the water in the pipe? A man who puts in a good many pumps, is a good mechanic, and reads the SCIENTIFIC AMERICAN, tries to make me believe that it takes no more power in one case than in the other. His idea is this: With a perpendicular pipe twenty feet long, with the lower end immersed in water, and connected with a pump at the upper end, it takes no more power to work the last stroke before water strikes the piston of the pump, than it does at the first one, when the water begins to rise. I would inquire how many degrees of heat an oven must be to bake bread? I would like to know if it has to be hotter than saturated steam at 30 pounds pressure? Is superheated steam hotter at 30 pounds pressure than saturated?

I have found by experience that a steam pipe covered so as to exclude the air, will rust through from the outside in from three to six months, according to the thickness of the pipe. A two and a half inch pipe, laid under ground in a wooden box, packed with fine charcoal was completely honey-combed in one winter—length of pipe 30 feet. Why is it?

H. P. W.

Lawrence, Mass., April 8, 1866.

[It takes just twice the power to raise a given quantity of water 20 feet that it does to raise it 10 feet. The temperature for baking bread, we believe, is about 220°. The temperature of saturated steam at 30 pounds pressure is 274°; that of superheated steam at the same pressure, is higher. Iron rusts in moist air more readily than in dry air.—EDS.

Taps.

MESSRS. EDITORS:—This is the second letter I have written on the same subject—namely, taps. The first letter I sent you was not published, and it is probable this one will share the same fate. That makes no difference with me, however; your paper is worth to me all I pay for it and more besides. There is one thing sure—the apprentice is in a fair way to gain the desired information on the tap question. Your correspondent, M. N., in the SCIENTIFIC AMERICAN of April 14th, throws no new light on the subject, if we except the taps being larger where it first enters the hole, which is a detriment in many cases. For instance, it will not start nearly so well; especially in cast iron. I would also ask M. N. how many taps in general are used in a machine, for there is a strong probability that the apprentice mentioned was not an apprentice to a bolt maker. M. N.'s theory of turning the tap larger where it first enters, and then filing it off tapering, which makes a wider cutting edge at the start, equalizing the cutting and strain, is right, but taps have been made thus for years where I work. But can you always get one made in that way out of a hole? For instance, in tapping a casting, instead of a nut, M. N. will find his tap not always come out the same road it went in, especially when bolt makers have ground it. Yours,

P. MCCORMICK.

Newark, N. J., April 13, 1866.

[We admire our correspondent's perseverance and spirit in writing again, and coincide with his views in general. The question of taps, and their adaptation to different works is a wide one, and not to be settled in one or two letters to an editor, or one or two answers to correspondents. Comparatively few taps are used in machines, and when it comes to running down a tap $1\frac{1}{2}$ inches in diameter in cast iron, and $1\frac{1}{4}$ in wrought iron (as is daily done on marine work) it is a matter of some consideration whether it cuts and clears. Many persons will say that a tap must never be turned back, as it breaks the teeth. So it does, if they are not made right, but how is one to get a full or a fair thread without doing so? As we stated first, tools that will cut like razors are easy to make, but those that are durable and conform to circumstances, are the most satisfactory.—EDS.

Popular Remedies for Disease.

MESSRS.—EDITORS:—As the cholera is anticipated here this summer, it is of the greatest importance that any preventive or cure should be made known to the public. An old gentleman who has attended a great many persons sick with the cholera, and who in his business uses the cyanide of potassium, the air in the room in which he works being at all times thick with the fumes or evaporations from it, states that if it had not been for the cyanide of potassium, he would have died long ago of the cholera, and that he is of the opinion that it can be used to great advantage as a preventive and cure. Will you please state through the columns of the SCIENTIFIC AMERICAN your views on the subject?

CHARLES A. GARDINER.

New York City, April 16, 1866.

[The science of therapeutics—the effect of medicines on diseases—is one of the most difficult problems that has ever been undertaken by the human mind. Constitutions differ; what will cure one man will kill another, and very frequently people recover in spite of medicines, instead of in consequence of them. It is only by the method pursued by Lewis, Velpeau, and other modern investigators, that any truths in regard to the effect of medicines can be established. They take large numbers of cases, divide them fairly in two equal portions, treat one-half with the proposed remedy, and leave the other half without treatment, and carefully record the result. We attach no weight whatever to the loose and careless method which usually prevails in observing the effect of medicine on disease. In this case it is our opinion that the man would not have had the cholera, had there been no fumes of the cyanide of potassium around him. There are several persons in this city who are not in the habit of breathing those particular fumes, and who have, notwithstanding, escaped the cholera.—EDS.

Hot and Cold Solutions.

MESSRS. EDITORS:—In the SCIENTIFIC AMERICAN of April 7th, your correspondent "F. T. E" asks the question: "Why does salt not dissolve in hot water in larger quantities than in cold?" He adds: "All *other* soluble substances dissolve more readily in warm than in cold water." "F. T. E." is mistaken in this last statement. About twice as much lime may be dissolved in water at the freezing point, than at the boiling point. May it not be because the lime expands more with a given amount of heat than the water? In this case the particles of lime would be forced further apart by heat than the particles of water, and cold water would dissolve more than hot.

In your article headed "Solid floating on molten iron," you say that Dr. Rowell has observed that several other substances besides iron expand in solidifying, and you mention lead as one of them. I have tried the experiment according to your directions, and think that it is a mistake. The lead floated, it is true, but it seemed to sink a little below the surface of the melted lead. I think it floated for the same reason that needles or iron filings will float on water when not wet on top; that is, on account of the repulsion between the melted lead and the dry surface. If you pour melted lead into a mold, it will be seen to fall in on the surface at the instant of solidifying, showing that it contracts.

CHARLES JANES.

Providence, R. I., April 7, 1866.

Photo-lithograpy with Half-tone.

(From the London Photographic News.)

The production of printing surfaces on stone, zinc, etc., by the agency of photography, has occupied the attention of experimentalists for many years, and in many respects a high pegree of success has been obtained. The process of Mr. Osborne, for the working of which a company has recently been formed in America, gives results in line and stipple which leave little to be desired. Mr. Ramage, of Edinburgh; Mr. Lewis, of Dublin; Col. James, and many others have also attained great excellence in the same direction. Messrs Simonau and Toovey, of Brussels, have attained some success in the production of half-tone, and the attempts of Col. James in the same direction have not been without promise. Still the fact remains, that no process for the actual production of photographs from nature by means of photo-lithography is in practical working, or has hitherto established a position, and that such a process remains an important desideratum, any means of meeting which would be hailed with a glad welcome by all concerned in the graphic arts.

Unless we are mistaken in our estimate of a series of specimens before us, by Messrs. Bullock Brothers, of Leamington, a process which they have recently patented bids fair to meet the long-felt want most successfully, and to render with a fair amount of delicacy, the true photographic gradation of negatives from nature. The subjects before us, consisting of landscapes with variety of foliage and architecture, are exceedingly excellent, and present all the good points of a good photograph, perfect gradation and half-tone, and great brilliancy, differing little in general effect from good silver prints from the same negatives.

Messrs. Bullock have followed in paths already partially trodden, but have made such practical deviations and modifications as have led them to success where others have only failed. Their aim is to secure in the transfer a suitable grain, so as to obtain the kind of gradation possible in lithography, without producing a coarse or woolly effect. Among the various methods by which they propose to effect this end, the plan used in producing these examples seems to be at once the most practical and efficient. A transfer paper is prepared with a plain solution of gelatin, and when this is dry a grain is printed on it from an aquatint plate. Paper so prepared can be kept in stock, and rendered sensitive when required by immersion in a solution of bi-chromate of potash. It is then ready for printing and transferring in the usual manner, and produces on the stone a photographic image, the continuous gradation of which is broken up into the stippled gradation of an aquatint plate. This is the broad principle; but it admits of much ingenious modification in practice, which is so far effective that it produces the most successful and promising examples of photo-lithography with half-tone.which we have yet seen.

New Process for Indigo Dyeing.

Before it can be used for dyeing, indigo must be rendered soluble in alkaline and caustic solutions by being treated by a reducing body; by this reaction indigo loses its color, but after being fixed on stuff and exposed to the air, it absorbs fresh oxygen and returns to its original color. This process, theoretically so simple, is practically complicated by serious difficulties, and requires, on the part of the dyer, much practice and great dexterity. Thus, for instance, with indigo reduced by fermentation with vegetable matters, in a caustic solution, the various acids produced during the fermentation combine with the alkali, the liquid soon ceases to be caustic, and loses the property of dissolving the reduced indigo. To remedy this a fresh quantity of alkali (soda, potash, or lime) must be added from time to time; but should an insufficient quantity be added, a portion of the reduced indigo remains undissolved, and soon decomposes under the fermenting matter. If, on the contrary, an excess of alkali be added, a certain quantity of white indigo is lost by its combining with potash, and forming an insoluble product.

According to M. Leuchs, of Nuremberg, all these objections are obviated by effecting the change from blue to white indigo by pectine. Pectine exists in considerable quantities in the turnips of different species, in pumpkins, melons, etc., it may be extracted from these fruits, or they may even be directly used to reduce indigo. The most simple process consists in heating 45 or 50 kilogrammes of the caustic lye to 75° C., adding half a kilogramme of well pulverized indigo, then suspending in the vat a kind of basket of iron wire, containing from 8 to 10 kilogrammes of fresh turnips, cut into small pieces. Then heat gradually to boiling point; the indigo soon loses its color, and the solution decanted into special vats and diluted with water freed from air, will be ready for dyeing purposes. Contact with air must of course be as far as possible avoided.

When the dye bath is exhausted it may serve for a fresh operation by adding indigo, a little caustic soda, and boiling it as above with a certain quantity of turnips.

On the iron wire trellis there will remain hardly 5 or 6 six per cent of the original quantity of turnips. This residue may used in paper making.

The simplicity of this new process may easily be proved by introducing into a closed tube a small quantity of indigo mixed with a few drops of soda or caustic potash, adding a small piece of turnip, and boiling; the indigo will rapidly lose its color, and redissolve and return to its original color by exposure to the air.

As turnips are not everywhere cultivated, and during certain seasons are not to be procured fresh, the author has found that the active principles may be extracted by boiling the turnips with water, under a pressure of two or three atmospheres. C. Leuchs & Co., of Nuremberg, now manufacture on a considerable scale an extract of turnips, 1 kilogramme of which will dissolve cold 4 kilogrammes of indigo. —*Annalen Chem. und Pharm.*

NEW INVENTIONS.

Let-off Motion for Looms.—This invention relates to a let-off motion which is governed by the force with which the batten meets the fabric in striking up, or in other words, by the density of the fabric itself. The invention consists in the arrangement of an angular roller shaft (or a shaft or roller supported by the arms of two cross levers), over which the warp runs, and on the end of which an arm is mounted from which extends a spring bar in combination with a lever carrying one or more pawls which gear into a ratchet wheel mounted on the end of the warp-beam in such a manner, that by the tension of the warp, produced by the latter in the act of beating up, the shaft or roller over which the warp passes, is depressed, and a longitudinally sliding motion is imparted to the spring bar, and thereby the lever, which carries the pawls, is caused to swing back more or less in proportion to the force exerted by the batten on the fabric in beating up; and the pawls are made to take one or more teeth of the ratchet wheel, and as the batten recedes, the angular rock shaft, or its equivalent, returns to its original position, and the lever which carries the pawls is moved back by the action of a spring or by the direct action of the spring bar, causing the pawls to act on the ratchet wheel and to turn the warp beam in proportion to the number of teeth previously taken by said pawls. Samuel Estes, Newburyport, Mass., is the inventor.

Lamps.—The object of this invention is to correct inequality or unevenness in the light of lamps wicks, and also to clear the wick of cinders and of any other matter which obscures the light or hinders the perfect burning of the fluid. It consists in placing around the top of the wick tube a supplementary tube which is pivoted or arranged in such a way as to be capable of being vibrated to and fro, for the purpose of clearing or cleaning the wick and the top of the wick tube from cinder and from any matter that adheres to the tube, and also of being placed in positions out of parallelism with the top of the wick tube so as to bring it into parallelism with the wick, when the latter has been trimmed to an angular line or has been forced up unequally by the wheel so that one side is higher than the other. The supplementary tube is operated by a lever which extends through the side of the burner. Edmund Brown, Burlington, Vt., is the inventor.

Grate Bar.—The object of this invention is to furnish a simple and cheap grate bar, protected by its construction, from vertical or lateral warping from the effects of pressure or heat, to take the place of the complicated and costly grate bars now in use for that purpose. This object is accomplished in a simple and effective manner, by corrugating the rib or lower part of the bar with one or more longitudinal corrugations. George O. Tupper, 23 Abingdon Square, New York, is the inventor.

Apparatus for Distilling Petroleum and other Liquids.—This invention relates to an apparatus composed of a hollow drum and steam coil, which are heated by superheated steam, and surrounded or covered by a suitable jacket, in combination with a helical trough, commencing on the top of the steam drum and extending down to its bottom, in such a manner that crude petroleum, or other liquids, let into the top end of the helical trough, are gradually heated and partially evaporated, and those parts of the liquids which reach the bottom end of the trough, in a liquid state, drip down upon the highly-heated steam coil, where they instantly flash into vapors, and the distillation of petroleum, or other liquids, can thus be conducted without interruption, and without danger of an explosion or conflagration. L. V. Fichet, 440 Broadway, New York.

ONE of the strange properties of aluminium bronze is that after being forged it is annealed by precisely the reverse treatment to which iron is subjected, as it is heated to dull redness and then plunged into cold water.