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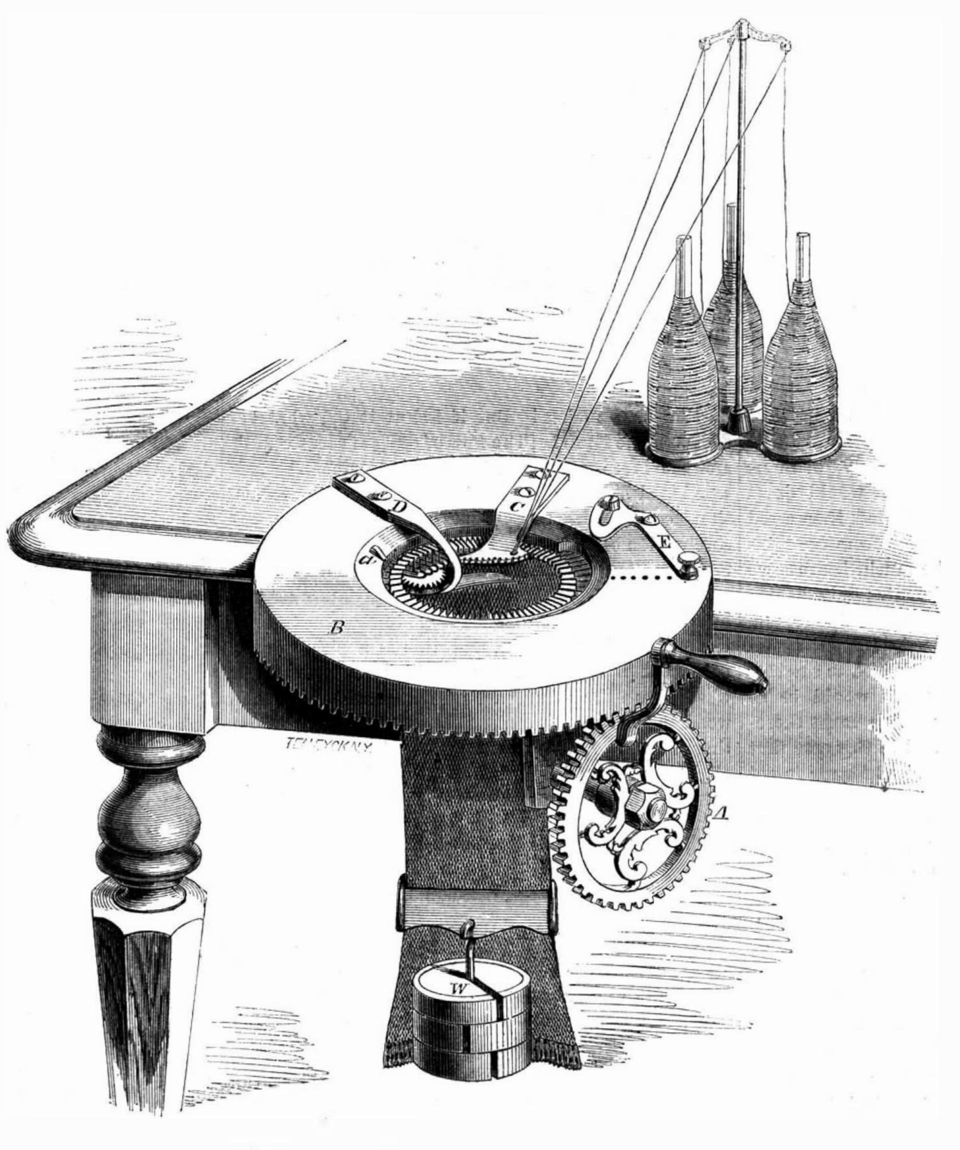
Improved Family Knitting Machine.

The sewing machine has become a general household appendage, and as an economist of family labor, its benefits are universally appreciated. The knitting machine should become equally common in families. and we predict that, in a very few years, it will be considered in most households as indispensable as most people in these times consider the sewing machine; and then the avocation of our grandmothers will have gone. It is much older than the sewing machine, but until recently, it has been too complicated and expensive in construction to render it suitable for domestic purposes. The old knitting machines were large and clumsy; it required considerable time and practice to acquire the art of working them, besides considerable power was necessary to operate them; the strength of a female being inadequate for the task.

The accompanying engraving represents a neat, portable knitting machine for families, especially those of our farmers. It is capable of being easily operated by a girl, and, with a few days' practice, stockings of every size and texture, undershirts, mufflers, shawls, undersleeves, rigoletts, &c., may be knit with it at the rate of 4,200 loops per minute.

This machine is so constructed that it may be fastened to a common table with a screw clamp exactly like a "sewing bird," and when not in use, can be taken off and placed out of the way. The spools which supply the yarn to it are set upon the table in a rack or frame, as here represented. Two or more yarns may be fed at once or separately, and each spool may be of a different color so as to produce mixed work. The standard by which it is secured to the table supports the stationary and carries the movable parts. A is a wheel which operates the machine by turning its handle, which is all the attendant does in knitting the articles, besides supplying the spools as the yarn is worked up. The teeth of the wheel, A, take into the cogs of the ring plate, B, and cause the latter to rotate. The threads or yarn are fed from the spools through the eye of the carrier plate, C, and laid upon the knitting needles. The latter are secured in radial grooves inside of the fixed ring plate, situated under the top one. A small tension wheel and plate are carried on the inner end of a bent arm, D; these rotate around under the needles and keep the loops tight and in place. There is a cam groove running around under plate, B, at the butt ends of the needles; and as this plate revolves, the needles are pushed out and drawn in, one after another, so as to take the yarn on the needles and deliver the loops when formed. The small weight, W, is clasped on the knit fabric, and acts as a simple let-off motion by descending. Each needle has a hinged latch on its inner center end, which opens and closes alternately as it is pushed out and drawn in, so as to form new loops and deliver those which have been formed. A whole series of loops around the entire ring are formed at each revolution and drop down at the center. The work produced is what is called plain knitting; all the loops are alike, perfectly plain, and in this respect they surpass hand-knit fabrics.



AIKEN'S FAMILY KNITTING MACHINE.

The knit fabric is tubular, but it may be converted into a great variety of articles. The small slide, E, is for regulating the throw of the needles to make long and short stitches, and the needles are put in and taken out at the small slide, *a*, when required.

This machine is simple and not liable to get out of order. It is capable of making stockings of all sizes and of different qualities, besides a great variety of other articles. It therefore invites the attention of many persons as a profitable investment for making such articles for sale on a small scale. Pleasant and independent employment, with a very limited outlay, is thus insured to the purchaser of this machine. They are manufactured by the patentee, Mr. J. B. Aiken, Franklin, N. H. By visiting the rooms of his agent, No. 429 Broadway, this city, persons can see the machines in operation. Further information may be obtained by addressing Mr. Aiken, at Franklin, N. H.

Zero of Fahrenheit's Thermometer.

In one of the first years of the eighteenth century, Fahrenheit, of Amsterdam, the inventor of the thermometer used generally in Great Britain, was in Iceland, and, experiencing a most severe winter, erroneously concluded it was the greatest degree of cold or absolute deprivation of heat, and being desirous of fixing a starting point for his thermometer, called that degree of cold 0, or zero. Having obtained the lowest point, he next fixed upon boiling mercury as the highest point in his scale, and divided this distance into six hundred points or degrees. Calling the lowest point zero, or 0, he dated upward, and found the heat at which water just freezes. or ice or snow thaws, to be 32 of these parts, and water to boil at 212 of these parts. Thermometers are often only marked with 212° at the top and 32° at the bottom; and for general observation this is sufficient. Sometimes fever heat, blood heat, and temperate are also written; and as there can be a higher degree of heat than boiling water, so is there also a lower degree of heat or cold than that of freezing water; and this cold, though very rarely occurring in England, can go down to the starting point in Fahrenheit's thermometer scale called 0, or zero, and even lower still, as was the case on Christmas day. All degrees of cold below 0, or zero, are marked with a minus sign before them, and must be added to 32° (or freezing point) to obtain the number of degrees below freezing point. The low temperature of zero can be artificially obtained by inserting a thermometer in a mixture of snow or beaten ice with sal ammoniac or sea salt. Quicksilver freezes at 39° below zero, or 71° below freezing point. To obtain the temperature of a lower degree of cold, a spirit thermometer is used; and some places in the north experience a cold of 58° of Fahrenheit below zero; and by artificial means, a degree of cold of nearly 150° below zero can be obtained.

The Boston Society for Medical Improvement has published a circular calling upon physicians to report their observations on the effect of ether upon patients. It has been stated that it is more safe to use than chloroform.

THE CHEMICAL HISTORY OF A CANDLE.

BY PROFESSOR FARADAY.

A Course of Six Lectures (adapted to a Juvenile Audience) Delivered before the Royal Institution of Great Britain.

LECTURE IV.—(CONTINUED.)

Products: Water from the Combustion—Nature of Water—A Compound—Hydrogen.

We shall now begin to understand more clearly our experiments and researches; because when we have examined the sethings once or twice we shall soon see why a candle burns in the air. When we have in this way analyzed the water—that is to say, separated or electrolyzed its parts out of it, we get two volumes of hydrogen and one of the body that burns it. And these two are represented to us on this diagram, with their

1 Hydrogen	8 Oxygen
	9

Oxygen	88.9
Hydrogen	11.1
Water	100.0

weights also stated, and we shall find that oxygen is a very heavy body by comparison with the hydrogen. It is the other element in water.

I had better, perhaps, tell you now how we get this oxygen abundantly, having shown you how we can separate it from the water. Oxygen, as you will immediately imagine, exists in the atmosphere; for how should the candle burn to produce water without it? Such a thing would be absolutely impossible, and chemically impossible without oxygen. Can we get it from the air? Well, there are some very complicated and difficult processes by which we can get it from the air; but we have better processes. There is a substance called the black oxyd of manganese; it is a very black looking mineral, but very useful, and when made red hot it gives out oxygen. Here is an iron bottle which has had some of this substance put into it, and there is a tube fixed to it, and a fire ready made, and Mr. Anderson will put that retort into the fire, for it is made of iron and can stand the heat. Here is a salt called chlorate of potassa, which is now made in large quantities for bleaching, and chemical and medical uses, and for gunpowder and other purposes. I will take some and mix it with some of the oxyd of manganese (oxyd of copper or oxyd of iron would do as well), and if I put them in a retort, far less than a red heat is sufficient to evolve this oxygen from the mixture. I am not preparing to make much, because we only want sufficient for our experiments; only, as you will see immediately, if I use too small a charge, the first portion of the gas will be mixed with the air already in the retort, and I should be obliged to sacrifice the first portion of the gas because it would be so much diluted with air; the first portion must therefore be thrown away. You will find in this case that a common spirit lamp is quite sufficient for me to get the oxygen, and so we shall have two processes going on for its preparation. See how freely the gas is coming over from that small portion of the mixture. We will examine it and see what are its properties. Now, in this way, we are producing, as you will observe, a gas just like the one we had in the experiment with the battery, transparent, undissolved by water, and presenting the ordinary visible properties of the atmosphere. (As this first jar contains the air together with the first portions of the oxygen set free during the preparation, we will carry it out of the way, and be prepared to make our experiments in a regular, dignified manner.) And inasmuch as that power of making wood, wax, or other things burn, was so marked in the oxygen we obtained by means of the voltaic battery from water, we may expect to find the same property here. We will try it. You see there is the combustion of a lighted taper in air, and here is its combustion in this gas [lowering tha taper into the jar]. See how brightly and how beautifully it burns—you can also see more than this—you will perceive it is a heavy gas, whilst the hydrogen would go up like a balloon, or even faster than a balloon, when not encumbered with the weight of the envelope. You may easily see that although we obtained from water twice as much in volume of the hydrogen as of oxygen, it does not follow that we have twice as much in weight; because one is heavy and the other a very light gas. We have means of weighing gases or air; but without stopping to explain that, let me just tell you what their respective weights are. The weight of a pint of hydrogen is three-quarters of a grain; the weight of the same quantity of oxygen is nearly twelve grains. This is a very great difference. The weight of a cubic foot of hydrogen is one-twelfth of an ounce; and the weight of a cubic foot of oxygen is one ounce and a third. And so on, we might come to masses of matter which may be weighed in the balance, and which we can take account of as to hundredweights and as to tuns, as you will see almost immediately.

Now, as regards this very property of oxygen supporting combustion, which we may compare to air, I will take a piece of candle to show it you in a rough way and the result will be rough. There is our candle burning in the air; how will it burn in oxygen? I have here a jar of this gas, and I am about to put it over the candle for you to compare the action of this gas with that of the air. Why, look at it; it looks something like the light you saw at the poles of the voltaic battery. Think how vigorous that action must be! And yet during all that action nothing more is produced than what is produced by the burning of the candle in air. We have the same production of water; and the same phenomena exactly, when we use this gas instead of air, as we have when the candle is burnt in air.

But now we have got a knowledge of this new substance, we can look at it a little more distinctly, in order to satisfy ourselves that we have got a good general understanding of this part of the product of a candle. It is wonderful, you see, how great the supporting powers of this substance are as regards combustion. For instance, here is a lamp which, simple though it be, is the original, I may say, of a great variety of lamps which are constructed for divers purposes—for lighthouses, microscopic illuminations, and other uses; and if it was proposed to make it burn very brightly, you would say, "If a candle burnt better in oxygen, will not a lamp do the same? Why, it will do so. Mr. Anderson will give me a tube coming from our oxygen reservoir, and I am about to apply it to this flame, which I will previously make burn badly on purpose. There comes the oxygen; what a combustion that makes! But if I shut it off, what becomes of the lamp? [The flow of oxygen was stopped, and the lamp relapsed to its former dimness.] It is wonderful how, by means of oxygen, we get combustion accelerated. But it does not affect merely the combustion of hydrogen, or carbon, or the candle; but it exalts all combustion of the common kind. We will take one which relates to iron, for instance, as you have already seen iron burn a little in the atmosphere. Here is a jar of oxygen, and this is a piece of iron wire; but if it were a bar as thick as my wrist, it would burn the same. I first attach a little piece of wood to the iron, I then set the wood on fire, and let them both down together in the jar. The wood is now alight, and there it burns as wood should burn in oxygen; but it will soon communicate its combustion to the iron. The iron is now burning brilliantly, and will continue so for a long time. As long as we supply oxygen, so long can we carry on the combustion of the iron, until the latter is consumed.

We will now put that on one side, and take some other substance; but we must limit our experiments, for we have not time to spare for all the illustrations you would have a right to, if we had more time. We will take a piece of sulphur: you know how sulphur burns in the air; well, we will put it into the oxygen, and you will see that whatever can burn in the air can burn with a far greater intensity in oxygen, leading you to think that perhaps the atmosphere itself owes all its power of combustion to this gas. The sulphur is now burning very quietly in the oxygen; but you cannot for a moment mistake the very high and increased action which takes place when it is so burned, instead of being burned merely in common air.

I am now about to show you the combustion of another substance—phosphorus. I can do it better for you here than you can do it at home. This is a very combustible substance, and if it be so combustible in air, what might you expect it would be in oxygen? I am about to show it to you not in its fullest intensity, for if I did so, we should almost blow the apparatus up; I may even now crack the jar, though I do not want to break things carelessly. You see how it burns in the air. But what a glorious light it gives out when I introduce it into oxygen! [Introducing the lighted phosphorus into the jar of oxygen.] There you see the solid particles going off which cause that combustion to be so brilliantly luminous.

Thus far we have tested this power of oxygen and the high combustion it produces, by means of other substances. We must now, for a little while longer, look at it as respects the hydrogen. You know that when we allowed the oxygen and the hydrogen derived from the water to mix and burn together, we had a little explosion. You remember also that when I burnt the oxygen and the hydrogen in a jet together, we got very little light but great heat; I am now about to set fire to oxygen and hydrogen mixed in the proportion in which they occur in water. Here is a vessel containing one volume of oxygen and two volumes of hydrogen. This mixture is exactly of the some nature as the gas we just now obtained from the voltaic battery; it would be far too much to burn at once; I have therefore arranged to blow soap bubbles with it and burn those bubbles, that we may see by a general experiment or two how this oxygen supports the combustion of hydrogen. First of all we will see whether we can blow a bubble. Well, there goes the gas [causing it to issue through a tobacco pipe stem into some soap suds]. Here I have a bubble. I am receiving them on my hand, and you will perhaps think I am acting oddly in this experiment, but it is to show you that we must not always trust to noise and sounds, but rather to real facts. [Exploding a buble on the palm of his hand.] I am afraid to fire a bubble from the end of the pipe, because the explosion would pass up into the jar and blow it to pieces. This oxygen will then unite with the hydrogen, as you see by the phenomena and hear by the sound, with the utmost readiness of action, and all its powers are then taken up in its neutralization of the qualities of the hydrogen.

So now I think you will perceive the whole history of water with reference to oxygen and the air, from what we have before said. Why does a piece of potassium decompose water? Because it finds oxygen in the water. What is set free when I put it in the water, as I am about to do again? It sets free hydrogen, and the hydrogen burns; but the potassium itself combines with oxygen; and this piece of potassium, in taking the water apart—the water, you may say, derived from the combustion of the candle—takes away the oxygen which the candle took from the air, and so sets the hydrogen free; and even if I take a piece of ice, and put a piece of potassium upon it, the beautiful affinities by which the oxygen and hydrogen are related are such that the ice will absolutely set fire to the potassium. I show this to you to-day, in order to enlarge your ideas of these things, and that you may see how greatly results are modified by circumstances. There is the potassium on the ice, producing a sort of volcanic action.

It will be my place when next we meet, having pointed out these anomalous actions, to show you that none of these extra and strange effects are met with by us—that none of these strange and injurious actions take place when we are burning, not merely a candle, but gas in our streets, or fuel in our fireplaces so long as we confine ourselves within the laws that Nature has made for our guidance.

Great Improvement in Making Sugar.

L'Opinion Nationale, of Paris, under the heading, "A Revolution in the Manufacture of Sugar," announces a discovery by M. Rousseau, which, it says, will *more than double the yield from a given quantity of cane.* The process is exceedingly simple, and the editor says that he has repeated it with complete success in the laboratory, and sees no reason why it should not succeed as well on a large scale.

It is known that saccharine juice as obtained from plants, alters rapidly in the air, because it contains albuminous matters which become brown or black by the action of oxygen. M. Rousseau removes the albuminous matters by heating the juice with about three one-thousandths of its weight of crude pulverized plaster. As soon as the liquid arrives at boiling heat, a thick scum forms on the surface, and by decantation, a perfectly clear liquid is obtained. This liquid left in the air would become as black as ink; but by mixing with it 6 to 8 per cent of its weight of hydrated peroxyd of iron, all the alterable organic matters are removed in a few seconds. It will then remain for an indefinite time without color, and it is only necessary to boil it down to obtain crystallized sugar.

Fence and Hedge-Row Timber.

The following, condensed from "Morton's (British) Cyclopædia of Agriculture," will be of use and interest to many of our farmers and others, at this season of the year :—

Trees are cultivated in hedge-rows for the sake of their timber, for shelter to the adjoining fields, and for embellishment ; and in many situations all these valuable objects are obtained in the same locality. It is true, that where timber generally rises to the greatest size and value, the situation which produces it is that which stands least in need of shelter ; but where trees fail to become specimens of excellent growth, on account of the climate and exposure, the value of the timber is often compensated for by the shelter which the trees impart to the fields in their vicinity. The quantity of timber grown in rows along roadsides, around the extremities of estates, and in the division of fields, throughout England, is supposed to be greater than that produced in close woods and forests. Many of her sheltered plains are overcrowded, and present the appearance of one continuous forest. In all windy situations, plants should be employed stout in proportion to their hight, and with lateral branches down to the surface of the ground. The figure of trees varies considerably, according to their kinds, their age, and according to the physicial circumstances in which they are placed ; such as soil, situation, climate, and, above all, to their proximity with other trees. Their natural form and outline, under different circumstances, can only be known when they stand alone. The sturdy oak alone, in poor soil, and cold elevated situations, becomes a bush ; in the rich and sheltered valley plantation, it rises to a lofty tree with a tall trunk.

In the growth of useful hedge-row timber the English elm is the tree most generally cultivated in England. When a plant, it naturally forms a bushy root ; and, if properly nursed, it admits of removal at a size beyond that of most trees. Its figure is erect, and the spread of its branches does not extend very far.

Next to the elm, various sorts of oak are to be recommended as valuable hedge-row trees, although generally they do not stand so erect as the English elm ; yet they are less destructive to the crops in their vicinity ; their roots generally strike deeper than most trees, and, consequently, are less dependent on the surface-soil for their support ; and, being late in expanding their leaves, they do not overshadow the crops in their vicinity early in the season. All the common varieties of oak are adapted for hedge-rows. The larch, although seldom introduced into the hedge-rows of highly cultivated districts, possessed of a superior climate, is, nevertheless, a very suitable tree ; it forms an agreeable variety, and breaks the monotonous appearance of some districts. It is profitable, being of rapid growth, and valuable as timber, and is less subject to disease in an isolated position than in masses. No tree is less injurious to grain crops ; its leaves enrich the soil, and, when shed, are commonly deposited on the surface around its roots. In rough situations, however, it is apt to be bent by prevailing winds, and to become unsightly.

For avenues, where a depth of embowering shade and seclusion are required, the lime tree, with its large umbrageous head yielding sweetly-scented blossoms, has no superior. The horse chestnut also is generally a favorite in such places. The Spanish chestnut, sycamore, Scotch elm, beech, and planes, are all of that large and spreading habit of growth which recommend them for such purposes.

For situations too rough and exposed for trees, in general, the sycamore, service tree, mountain ash, beech, Scotch elm, and hoary poplar, are most likely to succeed. The three kinds first named are remarkable for their unyielding character in cold or windy situations ; and, even at great elevations, they grow erect, and produce well-balanced heads.

Among the flowering plants for ornament, the varieties of thorn, laburnum, and scarlet horse chestnut are pre-eminent. A ready method of establishing lines of the numerous species of the first-named genus is, by selecting strong stems of the common hawthorn, in a vigorous-growing hedge. Such will readily train to a considerable hight, when they may be grafted with the varieties and species of the tree. Those most handsome and attractive in flower are the scarlet and double red.

In planting hedge-row trees, their roots should not be sunk under the surface beyond their natural depth; the upper fibres should be so situated as to be influenced by every shower. For the first few years after the tree has been inserted, its vigor of growth is much accelerated by the surface of the ground being loosened and kept clear of herbage, around a space comprehending the range of its roots.

The mode of pruning trees, under any circumstances, is of great importance ; but never more so than when they are placed in hedge-rows. In the forest, their proximity to one another, to a great extent, supersedes the necessity of much pruning ; but when situated individually, no part of their management is more important than that this operation should be performed skillfully. It should be attended to early, so that there shall be no necessity for the removal of large branches. The method of pruning trees, for useful purposes, appears to be ill understood. The common method is to clear the trunk of lateral branches to a considerable hight, and allow the higher ones to take their course. This has a tendency to produce a large head, widely spread and ramified; and, where this figure of growth is desired, we know of no other method which will so speedily accomplish the purpose, because it has the effect of establishing a host of branches equal in magnitude to the leader. This retards the hight, and adds to the breadth of the tree. Where bulk of useful timber is aimed at, the mode of treatment should be very different. It is then necessary to direct attention chiefly to the top or leading shoot, and to the branches in its vicinity, with the view of continuing the length of the trunk, and preventing it from dividing into forks or clefts. This is accomplished by preserving one leading shoot, and in shortening competing ones.

Ten Years' Imports of Cotton.

The cotton trade of Great Britain, vast as are the proportions it has already reached, is, like most other branches of trade, steadily on the increase. Whilst England's imports of cotton are enlarging, her consumption proceeds in an equal ratio, the amount taken by the trade in 1860 being 2,632,000 bales, or 338,000 bales over 1859. So industriously is her manufacturing power plied, that with increased imports, we find the supply on hand below the relative average amount, the stock on the 1st instant amounting to but 1,145,000 bales. In fact, the supply of the year 1860 is found inadequate to British requirements, and now that the prospect of a more extended market for English goods presents itself, it is not surprising that the manufacturing interest should have taken alarm at even the rumor of uncertainty as to the future adequacy of present sources of supply. There is nothing in our American advices to show that the next cotton crop, if the season be propitious, will not be larger than that of 1860. It is worth while to look to the extent to which the United States have answered the demand of English manufacturers the last ten years. In 1851, they exported to England 1,395,000 bales ; in 1852, 1,792,000 bales ; in 1853, 1,531,000 bales ; in 1854, 1,667,000 bales ; in 1855, 1,626,000 bales ; in 1856, 1,758,000 bales ; in 1857, 1,482,000 bales ; in 1858, 1,863,000 bales ; in 1859, 2,098,000 bales ; and in 1860 the amount reached 2,582,000 bales. The immense increase of late years in the United States supply will not fail to excite attention in this retrospect. There has been an occasional falling off in a year's supply as compared with that preceding, but the whole increase in this stated period amounts to no less than 1,187,000 bales, or from 1,395,000 in 1851 to 2,582,000 in 1860. The exports of Brazil to England have decreased in this time 7,000 bales—that is, from 109,000 bales in 1851 to 102,000 in 1860, though, it should be stated, that in 1859 her supplies were 118,000, and in 1857, 168,000 bales, the highest amount yet realized. The West Indies have doubled their produce in the last ten years, but only from 5,000 bales in 1851 to 10,000 in 1860 ; Egypt has increased its British supply in the last ten years from 68,000 bales to 110,000, and India from 326,000 to 563,000 bales. The total number of bales imported by Great Britain in 1860 amounted to 3,367,000 or 538,000 bales over the amount imported in 1859, and 1,464,000 bales over the receipts of 1851, an increase almost corresponding to the increased imports from the United States, those of 1860 exceeding those of 1851 by 1,187,000 ; looking for the balance, we find it in the increase of India supplies for the same time.

Progressive Increase in the Introduction of American Patents into England.

Of all the forms in which the power of a people is recognized by foreigners, there are none which furnish a ground for nobler pride than the reading of its literature and the adoption of its inventions ; for these are recognitions of its intellectual power. The hard crust of English prejudice has been pretty effectually broken up by the reaping machine, the revolver and the sewing machine, and there is a constantly increasing disposition to adopt inventions which are really good, even though they come from the United States. Since our last summary of American inventions patented in England, we have received a large number of Blue Books containing the printed specifications and drawings of American patents, secured through the Scientific American Patent Agency, from which we make the following notices :—

Improved Mode of Hanging Window Sashes.—Patented by Thomas Fry, of Brooklyn, N. Y.—Slides are arranged to move up and down in suitable grooves in the frame, and to these slides the sash is attached by pivots at the sides, so that they may be turned round, thus giving ready access to the outside of the sash for cleaning, and enabling the window to be fully opened, either for taking in and out such articles as cannot be conveniently carried through the house, or for securing more thorough ventilation. This invention was illustrated on page 8, Vol. III (new series), SCIENTIFIC AMERICAN.

Improvement in Railway Tracks and Carriage Wheels.—William Wharton, Jr., of Philadelphia, patentee.—The object of this invention is to allow one or more of a series of trains that run over a common railroad to pass the switches at the branch tracks designed for other trains without being turned out of their course, while the cars specially designed for the branch tracks will run upon them without any change of the switches, thus dispensing with the services of men to attend the switches. To accomplish this, the wheels of the cars have additional treads to run upon raised rails at the turnouts. (See engraving on page 208.)

Calendars for Clocks.—Patentees, Wait T. Huntington and Henry Platt, of Ithaca, N. Y.—This improvement relates to the mechanism through which the clock or time keeper effects the variable movements of the index for the day of the month, and the index for the name of the month of the calendar, which variable movements are rendered necessary by the variations in the length of the month in a quadrennial period. For the day of the month index a wheel is employed having 31 teeth, three of which are shorter than the other 28, a detent entering the wheel at different depths according to the number of days in the month. The days of the week are marked on one cylinder, and the names of the months on another cylinder, both of the cylinders rotating opposite openings in the face of the clock, so as to bring the several names in view at the proper times. The devices by which all these movements are effected are exceedingly ingenious.

Improvement in Pianofortes.—Patentee, Spencer B. Driggs, of New York.—The inventor of this improvement is the same gentleman whose profound article on the mechanics and mathematics of musical vibrations was published on page 146 of our last volume. The invention consists in a graduated sound-board and bridge, that is to say, in so arranging and applying the sound-board and strings, and so constructing and applying the bridge or bridges of a pianoforte, that the depth of bridge at the bearing point of the several strings, and the distances of the several strings from the board are in proportion, or nearly so, to the lengths of the vibrating portions of the strings.

Iron Pavements.—Patentee, Baron Otto des Granges, of New York.—This invention consists in the construction of cast iron blocks for pavements in which each block has a number of similar upright six-sided cells, and a base of quadrangular forms, beyond the sides of which the upper parts of the said cells project horizontally in such a manner, that when the quadrangular bases of a number of blocks are laid close together, the said projecting parts of the cells of each block fit between the cells of and lap over the bases of the adjacent blocks, and thus make all the blocks mutually supporting, so that none can sink without the neighboring ones on all sides of it going down with it.

Carpet Looms.—Patentee, Charles Crossley, of Bridgeport, Conn.—This invention consists in the application to a Brussels carpet-loom of a peculiar combination of devices intermediate between the stay and the harness or heddles, the object of which is to throw up the worsted or loop forming thread to the right and left alternately over and above the cotton warp threads. The devices require diagrams to be understood.

Preparing and Spinning Hemp.—Patentees, Joseph C. Todd and Philip Rafferty, of Paterson, N. J.—This invention relates to improvements in machinery for effecting three different operations required to be used in preparing and spinning hemp or other fibrous materials used for the manufacture of rope. These machines are an improved lapper or heckling machine, improved drawing rollers and endless belts or aprons of leather in place of the drawing rollers.

Apparatus for Warming Buildings by Steam.—Patentees, Lewis W. Leeds and Calvert Vaux, of New York.—Steam from a steam boiler is introduced into a vessel of water so as to warm the water; and through this vessel the air pipes pass by which means air is heated, when it is distributed in the usual manner over the building. Or the steam is used directly to warm the air chamber without the intervention of water. The patent also covers a regulator for regulating the heat automatically.

Printing Blocks.—Patentee, T. Crossley, of Bridgeport, Conn.—This invention consists in the production of an electrotype printing block, having a plain face, with margins of metal, and the body of felt or its equivalent, and highly raised above its base, and having perpendicular sides. The blocks are for printing calico, &c.

Nippers for Attaching Blocks and Tackles to Ropes.—Patentees, William H. Allen and Andrew J. Bentley, both of New York.—A pair of nippers, with jaws bent on one side and fashioned to grasp a rope, are made with eyes in the ends of the handles for the supporting cord or rope to pass through, so that the greater the weight on the block or tackle the more firmly will the rope be grasped by the nippers.

Mode of Attaching Tools to Handles.—James E. Emerson, patentee, of Trenton, N. J.—A stirrup is secured to the pick or other tool, the stirrup having a socket to receive the handle. This forms a very neat and substantial tool, and we are happy to know that it is meeting with extensive sale, as applied to picks and other tools.

Valves and Valve-Geer for Steam Engines.—Patentees, Addison Crosby, Simeon Savage, and Herman S. Stearns, all of Fredonia, N. Y.—This is an improvement in oscillating valves and their connections, which could be made plain only by engravings.

Rotary Planes.—Patentee, John Sperry, of New York. —Though a very simple engraving would convey a clear idea of this invention, it is a mere waste of words to attempt to render it intelligible by letter press description.

Nail Plate Feeder.—Patentees, John W. Hoard and Thomas A. Searle, of Providence, R. I.—This is an improved apparatus for feeding the plates from which nails are cut to the nail-making machine. It would require diagrams to make it intelligible, but it is a very ingenious arrangement.

Breech-Loading Cannon.—Patentee, Charles F. Brown, of Warren, R. I.—This invention was illustrated and described on page 240, Vol. III. (new series), SCIENTIFIC AMERICAN.

Apparatus for Lifting Vessels Out of Water.—Patentee, Horace I. Crandall, of New Bedford, Mass.—This lifting dock was illustrated and described on page 406, Vol. III (new series), SCIENTIFIC AMERICAN.

Great Storms in England—The Crystal Palace Damaged.

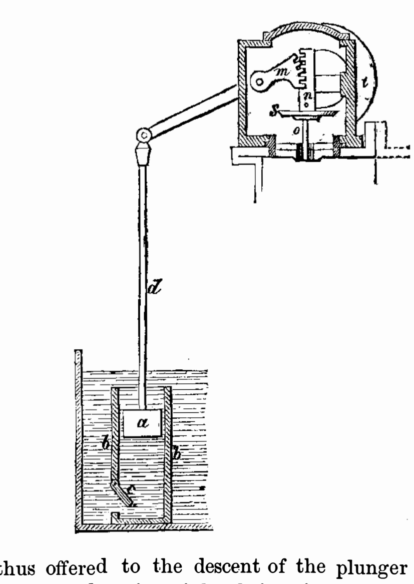
By the recent news from England, we learn that very severe storms have visited the British Isles, and done much damage to shipping and buildings. Several American ships have been wrecked, and about 140 British driven on shore in one night. One of the towers of the Crystal Palace, at Sydenham, has been destroyed. The wind coming in terrific gusts communicated a dangerous vibratory motion to the tower until at last it toppled over with a terrible crash. The iron columns were broken into little pieces as if they had been glass, and the ruins presented the appearance of being shattered by a tremendous explosion. The main part of the Palace was not the least affected. This tower will not be erected as it was of little use, nor will its absence injure the general effect of the structure.

ROMANCE OF THE STEAM ENGINE.

ARTICLE XVI.

WATT—THE DASH POT.

In our last article we illustrated the indicator invented by Watt, to measure the actual power developed in the cylinder of an engine. The accompanying figure represents the "dash pot" which Watt invented to graduate the descent of the puppet valve into its seat, to prevent it from slamming. There are two common methods of operating valves through the rods. One is by a *positive*, and the other by a *free* motion. The former is exemplified in engines having slide valves, the rods of which are positively united to the eccentrics; the latter is exhibited on the beam engines of our steamboats, the valve rods of which are lifted by toes or wipers, then fall into their seats by their own gravity. James Watt used puppet valves similar to those on common beam engines; these were operated by tappets on a "plug frame," and the valves dropped into their seats. A small vessel or cistern containing water was placed under the valve box, and in it was secured a small cylinder, *b*, with a plunger, *a*, in it, connected to the valve by a rod, *d*. A valve, *c*, opened into the cylinder, communicating with the cistern, and the plunger, *a*, has a water space around it. When the plunger, *a*, is drawn up, the valve, *c*, opens and the water flows into the cylinder; but when the plunger, *a*, descends, the valve, *c*, closes, and the water which is displaced rises between the plunger and the cylinder. The resistance



thus offered to the descent of the plunger prevents the valve dropping violently into its seat, as the water forms a graduating cushion to the descent of the plunger. At the same time, the plunger, by moving in water, enables the valve to be operated almost like a balanced valve in its lifting action.

In other arrangements, Watt hung balance weights on horizontal levers that vibrated on a joint, so as to permit his valves being operated easily—an arrangement which is substantially applied to many of our approved engines of recent construction.

The dash pot is now employed in our American beam engines, the valves of which are operated by vibrating lifters; but so far as we have been able to learn, it was first thus applied, about eighteen years ago, in connection with Sickle's cut-off, and at that time was supposed to be a new invention. And, indeed, we believe there are few who are fully aware of the age of this device, as, in a conversation which we had not long since with one of our old and experienced engineers, he expressed surprise when we told him that the dash pot on his engine was one of Watt's creations. The plunger in the dash pot of our engines has a space in it, into which the water enters during its descent, but otherwise the principle is the same as that here represented. The mode of connecting the valve stem, *o*, with the rod through tooth connections, *m n*, as represented in this figure, is not employed on the engines of the present day.

At the present time we can scarcely form an idea of the difficulties and perplexities which harassed Watt in his labors to construct the first steam engines and apply them to practical purposes. The tools which belong to the engineering establishments of the present day are so numerous and perfect in their action, that there is no difficulty experienced in executing all kinds of engineering work in the most accurate manner. It was very different, however, in the infancy of steam engineering. There was not a single machine in use capable of boring a cylinder correctly, consequently it was difficult to make the piston work steam tight; there were also no iron planers then in use, and it was almost impossible to obtain accurate joints in fitting the parts of the engines together. To all these different departments of mechanism Watt had to direct his attention, and it is fortunate for the world that he had originally been a most skillful machinist and maker of the most delicate philosophical instruments. He not only improved the steam engine in all its most essential features, but his active and inventive mind devised machines for the proper construction of its various parts; he organized the entire system of engine construction and steam engineering.

The Whaling Business.

An article in a recent issue of the Boston *Commercial Bulletin*, contains some very interesting information on this subject. For many years New Bedford, Mass., has been known, not only as the greatest whaling port in the United States, but the whole world; it is now, however, falling fast from its former oily greatness. In 1857, there were 329 vessels of 111,364 tuns belonging to New Bedford; but at the present time there are only 291 vessels of 98,760 tuns, a decrease of 38 vessels and 12,604 tuns. This reduction has not been caused by losses of ships at sea, but by their withdrawal from the trade, as the business has been very unprofitable for the past four years. The price of whale oil has been greatly affected by substitutes, especially coal oil, and the more general adoption of gas in cities and large villages. In 1860, the price of whale oil was only 50 cents per gallon, while in 1857 it was 73 cents, and this reduction of price was accompanied with another blow at whaling, namely, a very limited catch of whales. In 1857, the average catch was 800 barrels; last year it was only 500 barrels.

One-half of the whaling fleet is devoted to the sperm whale fishery, the other half to the right whale fishery. One-half of all the sperm oil obtained goes to England, and amounts to about 75,500 barrels annually, valued at $1,500,000. The right whale produces all the whalebone, most of which goes to Germany; the annual value of it is $1,000,000. The amount invested in the whaling trade in New Bedford is $10,000,000. Many of the merchants in that place are now looking around to see if they cannot enter upon a more profitable business. The total whaling fleet of the United States now comprises 514 vessels of 158,746 tuns. There has been a total decrease of 141 ships in four years. In 1858 two hundred ships went to the North Pacific for whale oil; it is expected that only one hundred will go this year.

HOW TO PROSPER IN BUSINESS.—In the first place, make up your mind to accomplish whatever you undertake; decide upon some particular employment, and persevere in it. All difficulties are overcome by diligence and assiduity. Be not afraid to work with your hands, and diligently too. "A cat in gloves catches no mice." He who remains in the mill grinds; not he who goes and comes. Attend to your own business; never trust to any one else: "a pot that belongs to too many is ill-stirred and worse boiled." Be frugal: "that which will not make a pot will make a pot-lid;" "save the pence, and the pounds will take care of themselves." Be abstemious: "who dainties love shall beggars prove." Rise early: "the sleepy fox catches no poultry;" "plow deep while sluggards sleep, and you will have corn to sell and keep." Treat every one with respect and civility: "everything is gained and nothing lost by courtesy;" "good manners insure success." Never anticipate wealth from any other source than labor—especially never place dependence upon becoming the possessor of an inheritance: "he who waits for dead men's shoes may have to go a long time barefoot;" "he who runs after a shadow hath a wearisome race." Above all things, never despair—God is where he was; "He helps those who truly trust in Him."

WEALTH OF INDIANA.—The Auditor of the State of Indiana reports the total assessment of property in the State at $455,011,378. As the population is 1,350,802, this gives an average of $336 to each inhabitant.

AMERICAN ENGINEERS' ASSOCIATION.

[Reported for the Scientific American.]

On Wednesday evening, March 6th, the regular weekly meeting of this association was held at its room, No. 24 Cooper Institute, this city—Thos. B. Stillman, Esq., President; John K. Simpson, Esq., Secretary, *pro tem.*

ELECTION OF MEMBERS.

Upon the balloting for the election of members, Messrs. H. H. Boyd, T. H. Lang, George Birkbeck, Wm. Watts, Thos. H. Davis and John Watts were declared unanimously elected.

ADMISSION OF MEMBERS.

The names of Messrs. E. W. Smith, James McFarland, Jesse S. Bunce, Henry Esler, Abraham Cameron, John Walker and D. Wells were, upon motion, referred to the Committee on Admission of Members.

NEW INVENTIONS.

Mortera's Steam Brake.—Dr. Van der Weyde submitted the drawings of this invention to the Association. The plan proposed by Mr. Mortera is that a piston and cylinder placed between the wheels of the locomotive, in connection with a simple mechanical arrangement as set forth and described by him, will satisfactorily work the brakes of a train of cars; the engineer of the train has it under his own immediate control. Two additional improvements were suggested in the drawings; first, that the steam could also be used to heat the cars; and second, that a mechanical arrangement, situated in front of the cow-catcher, to hook on a car to run it back or forth, thus obviating much of the trouble that is now generally experienced in moving cars, is claimed as a prominent feature.

Thomson's Gas Burner.—Mr. John K. Simpson presented to the association an improved gas burner, invented by a Mr. Thompson, of New York city. It is so constructed that it will emit sufficient light at the lowest pressure of gas, and maintain this volume whatever the pressure may be. Between the disks, a piece of leather saturated in oil is placed, and when the pressure is great, this as a valve, acting automatically, shuts it off, and doing so, secures a quantity of gas in a chamber provided for that purpose. Burning this gas relieves the pressure, when it again opens, and the same operation is observed. The adoption of this burner for the street lamps of cities is considered advisable, as under all circumstances, it is contended, a regular and sufficient light is given, while it saves large quantities of gas, which, in many of the burners now in use is wasted. During the description of this invention, Mr. Louis Koch remarked to the society that the day before, he had placed in his house, some eighteen gas burners in which the gas was raised by a pressure, and, as far as his observation extended, they had worked exceedingly well.

The above inventions were referred to the Committee on Science and New Inventions, who will duly report thereon.

REPORT.

The above committee, at this period, submitted the subjoined report on the undermentioned subjects:—

Thomas S. Davis' Piston Valve.—In regard to this valve, your committee would report that after a careful examination of the description and drawing, as also having witnessed its practical operation at the Jersey City Locomotive Works, we believe it to be a good and useful appliance, possessing qualities that will recommend it to engineers, affording a quick exhaust with short throw, is well balanced, will cause but little friction, and promising well for durability. The engine we examined has been in constant use since August last (as stated by Mr. Davis), and the valves or seats show no perceptible wear or injury; but we would here take occasion to say that valves of this description will require a fine adjustment, as also a careful operation at first starting, that is, when the valve seat (which is cylindrical) is at a low temperature.

Beach's Safety Switch.—In regard to this switch, your committee would say that they have examined it, and saw it in practical use at Jersey City. We have had an opportunity of seeing locomotives of 36 tuns weight pass safely over it and keep the track—the switch having been set purposely wrong, when an ordinary switch would have conducted the engine off the track and have occasioned much trouble and perhaps great loss. For station purposes, where the train will move at a moderate speed, they believe it to be a convenient and useful plan, worthy the attention of railroad companies. Whether it would be efficient or safe at points where the trains pass at high speed, your committee are not prepared to say.

Thos. B. Stillman, Chas. H Haswell, and Chas. McCarty, were appointed a Select Committee, to whom was referred the Act now before the Legislature of this State, to provide for the inspection of steam engines and boilers in the cities of New York and Brooklyn, for the purpose of making suitable amendments, suggestions, &c. The prominent points of the Act now before the Legislature, and which was referred to them, we append: it is as follows:—

SECTION. 1. No steam engine, boiler, or other steam apparatus shall be used in the city of New York or Brooklyn, without having been inspected.

SEC. 2 appoints William Broadman, George Birkbeck, Jr, and Thomas H. Faron, a Joint Board of Commissioners, to hold office for a term of five years, and who shall appoint three or more competent inspectors of steam engines, boilers, &c.

SEC. 3 makes it the duty of the inspectors to examine all steam engines and steam apparatus in New York and Brooklyn at least once a year, and furnish certificates to owners, of the condition of such engines, boilers, &c., which shall be sworn to before one of the Commissioners. The Commissioners are empowered to issue licenses to competent engineers, which shall hold good for one year, unless sooner revoked for cause. For each license issued, the Commissioners are required to hold meetings twice per week for the examination of candidates for engineers.

SEC. 4 forbids the use of any steam engine or boiler without a certificate of inspection, on pain of $20 per day, after due notice shall have been given.

SEC. 5 provides a penalty of $10 for each offense, to any person who shall act as engineer without a certificate of examination, and a penalty of $20 for each offense to parties who shall employ unlicensed engineers.

SEC. 6 authorizes the Commissioners to employ all necessary assistants to the inspectors, and such clerks as they (the Commissioners) may require, to be paid out of the fees of the Commissioners. The Commissioners are authorized to demand and receive for every boiler and engine, and for every boiler used for generating steam, to be used for other purposes than the driving of a steam engine, not exceeding ten-horse power, $6; for every one exceeding ten-horse power, $10

SEC. 7 provides that all fines and penalties provided for in this Act may be sued for and recovered, in the name of the people of the State, before any Court of competent jurisdiction.

SEC. 8. The Commissioners are to receive $1,500 each, per annum, for their services (to be paid out of fees received), and shall have power to fix the compensation of all persons employed by them under this Act.

SEC. 9. In no case shall any money be drawn from the State, County, or City Treasury, to pay any person or expenses incurred under this Act.

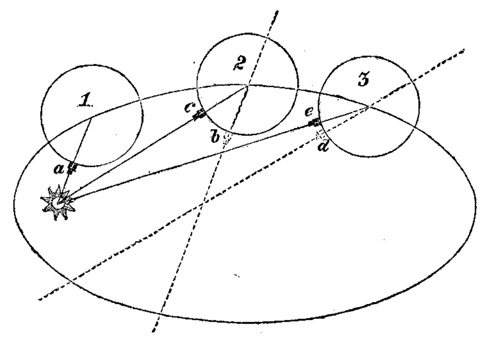
SEC. 10 requires the Commissioners to keep a record of their transactions and report annually to the Legislature; and, that after the payment of expenses, the funds, if any, remaining in their hands, shall be paid to the Alms-House Departments of New York and Brooklyn.

SEC. 11 authorizes the Governor to fill vacancies in the Commission.

Adjourned.

Mean Time.

The sun is sometimes 16 minutes too fast and sometimes 14 minutes too slow. The accompanying diagram illustrates the cause of this in a very clear



manner. The earth's orbit being in the form of an ellipse, with the sun in one of the foci, the earth moves more rapidly in that portion of its orbit which is nearest the sun than it does in the portion which is most remote from the sun. If we suppose the projection, *a*, to represent a fixed object on the earth—a tower for instance—and that the earth turns once on its axis while it is moving in its orbit from 1 to 2, this will bring the tower, *a*, to *b*, and the earth will have to turn from *b* to *c* in order to bring the sun overhead at the tower. But if, during the next revolution of the earth, it moves in its orbit only from 2 to 3, the tower will have to be carried only from *d* to *e* to bring it under the sun. Thus, while the earth always turns on its axis in the same length of time, it takes longer to bring the sun overhead at certain times of the year than it does at other times. As it would be very difficult to make clocks to correspond with these constant changes in the length of the days, the plan is adopted of making them measure the average or mean length of the days, and this is called mean time.

IF atmospheric air had been a good conductor, it is probable that mankind would always have remained in ignorance of the existence of electricity. How many other forces may there not be in nature, the existence of which is not even imagined?

DURING the late terrific gale in England, the anemometer at Lloyds', London, indicated a pressure of 36 pounds on the square foot.

Iron Becoming Crystalline by Vibration.

Our unknown but invaluable friend, the Paris correspondent of the *Photographic News*, writes as follows:

The spontaneous change forged and rolled iron undergoes when submitted to continuous vibration, is productive of so much critical danger, especially in the case of railway machinery, that an investigation into the best means of remedying the resulting evils, has been viewed as an engineering question of vital importance. Among others, Mr. Schimmelbuch, of Liege, has undertaken the subject, and the following is an epitome of his investigations. A bar of pure unalloyed iron was struck by a hammer three times in a minute for six consecutive weeks; at the expiration of this time it broke into three pieces. Before the experiment the bar was a good specimen of fibrous iron: after, on the contrary, its fracture exhibited a brilliant crystallized structure, resembling that of antimony.

A bar of iron alloyed with nickel, submitted to the same treatment, underwent no change.

A very simple means exists of recognizing this changed condition of iron, so dangerous in its consequences. Pure iron, when magnetized by contact, loses its magnetic properties immediately the needle is detached. On the other hand, iron combined with minute quantities of some foreign body, such as carbon, oxygen, sulphur or phosphorus, remains magnetized. The efficacy of this simple test has been established by repeated experiments.

Specimens of iron alloyed with carbon, manganese, zinc, cobalt, tin, chrome and nickel successively tested, show that nickel is the only one that can be adopted commercially to correct the tendency to crystallize in pure iron, which it is so desirable to overcome. The quantity of nickel required to produce the desired effect varies between 1 per cent and 2-1000th part.

Mr. Schimmelbuch's experiments were directed chiefly to studying the effects of the addition of the mineral wolfram to pure iron. This addition imparts the greatest hardness, tenacity and density to the iron; invaluable qualities in axles of machinery, locomotives, steamboats, and in steam cylinders, light cannon, &c. The most inferior kinds of iron acquire an extraordinary tenacity, and a hardness superior to that of cast steel, by an addition of 2 to 5 per cent of this mineral, according to the quality of iron employed.

Phosphoric or sulphuric iron becomes very tough and strong by the addition of a half to 1 per cent of wolfram, and 3 to 5 per cent renders it extremely hard. Iron thus treated does not lose these qualities, even after a second or third fusion, and the castings are free from bubbles.

The addition of wolfram to copper and its alloys exercises the same beneficial action. The addition of one-half per cent imparts great tenacity; whilst 2 to 4 per cent render the copper very hard, without in the least diminishing its tenacity.

The most important consequences to engineering science will doubtless result from these and other investigations, conducted with the same object.

Coal Oil Lamp burners.

A few weeks since we directed attention to several defects in the common lamps for burning coal and petroleum oils. Our remarks on this subject have attracted considerable attention, and, in one case, they have been the means of bringing to our notice a new burner, lately introduced, which obviates one of the evils we had pointed out. We stated that an improvement was wanted for regulating the length of the wick above the tube, as the common spur wheel used in burners for this purpose frequently cut into the wick, so that it could neither be moved up nor down. The new burner was obtained from Briggs & Co., No. 22 Merchants' Row, Boston. Instead of the wick being moved up and down in the usual way to regulate the length of flame, the wick is stationary in it, and the tube is moved up and down by a rack and pinion, so that there is perfect certainty about the operation. This burner also embraces some other improvements, such as a spring wire-clasp for retaining the chimney in place, &c., to accommodate the expansion of the metal to that of the glass.

WEALTH OF MASSACHUSETTS.—State valuation of property, $897,795,326; population, $1,231,494; av age to each inhabitant, $729.

OUR NAVY.

[Prepared expressly for the Scientific American.]

At this period, our navy attracts universal attention, and whatever intelligence, the character of which will tend to enlighten the public mind upon the actual condition of this important branch of our country's defence, should be perused with interest. With this view in mind, we have tabulated, at considerable labor, the particulars to be found annexed, which, for comprehensiveness and correctness, are infinitely superior to the many accounts recently published. We ask for it that attention and consideration which its prominence among the exciting topics of debate in these stirring times justly entitles it to.

VESSELS OF WAR OF THE UNITED STATES NAVY.

Name.	Guns.	Tunnage.	Where Built.	When Built.	Situation.	Where.
SHIPS OF THE LINE.						
Pennsylvania	120	3241	Philadelphia.	1837	In commiss'n	R'g s'p, Nf'k.
Columbus	80	2480	Washington.	1819	In ordinary.	Norfolk.
Ohio	84	2757	Brooklyn.	1820	In commiss'n	R'g s'p, B'stn
N. Carolina	84	2633	Philadelphia.	1820	"	" N. York
Delaware	84	2633	Gosport.	1820	In ordinary.	Norfolk.
Vermont	84	2633	Charlestown.	1848	"	Boston.
N. Orleans	84	2805	Sackett's H'r	1815	On the stock.	Sackett's H'r
Alabama	84	2633	Kittery.	1818	"	Kittery.
Virginia	84	2633	Charlestown.	1818	"	Boston.
New York	84	2633	Gosport.	1818	"	Norfolk.
FRIGATES.						
Constitution	50	1607	Charlestown.	1797	In commiss'n	Annapolis.
United States	50	1607	Philadelphia.	1797	In ordinary.	Norfolk.
Potomac	50	1726	Washington.	1821	"	New York.
Brandywine	50	1726	"	1825	"	"
Columbia	50	1726	"	1836	"	Norfolk.
Congress	50	1867	Kittery.	1841	In commiss'n	C'st of Brazil
Raritan	50	1726	Philadelphia.	1843	In ordinary.	Norfolk.
St. Lawrence	50	1726	Gosport.	1847	"	Philadelphia.
Santee	50	1726	Kittery.	1855	"	Kittery.
Sabine	50	1726	Brooklyn.	1855	In commiss'n	H. Squadron.
SLOOPS OF WAR.						
Cumberland	24	1726	Charlestown.	1842	In commiss'n	H. Squadron.
Savannah	24	1726	Brooklyn.	1842	In ordinary.	New York.
Constellation	22	1452	Rebuilt, Gs'pt	1854	In commiss'n	C'st of Africa
Macedonian	22	1341	Gosport.	1836	"	H. Squadron.
Portsmouth	22	1022	Kittery.	1843	"	C'st of Africa
Plymouth	22	989	Charlestown.	1843	In ordinary.	Norfolk.
St. Mary's	22	958	Washington.	1844	In commiss'n	Pacific Sq'n.
Jamestown	22	985	Gosport.	1844	In ordinary.	Philadelphia.
Germantown	22	939	Philadelphia.	1846	"	Norfolk.
Saratoga	20	882	Kittery.	1842	In commiss'n	C'st of Africa
John Adams	20	700	Rebuilt, Gs'pt	1831	"	East Indies.
Vincennes	20	700	Brooklyn.	1826	In ordinary.	Boston.
Vandalia	20	783	Philadelphia.	1828	In commiss'n	East Indies.
St. Louis	20	700	Washington.	1828	"	H. Squadron.
Cyane	20	792	Charlestown.	1837	"	Pacific Sq'n.
Levant	20	792	Brooklyn.	1837	"	"
Decatur	16	566	"	1839	In ordinary.	S. Francisco.
Marion	16	566	Charlestown.	1839	"	Por'mth, N.H
Dale	16	566	Philadelphia.	1839	"	"
Preble	16	566	Kittery.	1839	"	Boston.
BRIGS.						
Bainbridge	6	259	Charlestown.	1842	In ordinary.	Boston.
Perry	6	280	Gosport.	1843	"	New York.
Dolphin	4	224	Brooklyn.	1836	"	Norfolk.
STORE VESSELS.						
Relief	2	468	Philadelphia.	1836	In commiss'n	C'st of Africa
Supply	4	547	Purchased.	1846	"	H. Squadron.
Release	1	327	"	1855	"	Mediterra'n.
PERMANENT STORE AND RECEIVING SHIPS.						
Independence	—	2257	Charlestown.	1814	In commiss'n	Mare I'd, Cal.
Alleghany	—	989	Pittsburg, Pa.	1847	"	Baltimore.
Princeton	—	900	Re'lt, Boston	1851	"	Philadelphia.
Warren	—	691	Charlestown.	1826	"	Panama, N G
Fredonia	—	800	Purchased.	1846	"	Valparaiso.
Falmouth	—	703	Charlestown.	1827	"	Aspinwall.
SCREW FRIGATES.						
Niagara	12	4580	Brooklyn.	1855	In commiss'n	Japan.
Boanoke	40	3400	Gosport.	1855	In ordinary.	New York.
Colorado	40	3400	"	1855	"	Boston.
Merrimac	40	3200	Charlestown.	1855	"	Norfolk.
Minnesota	40	3200	Washington.	1855	"	Boston.
Wabash	40	3200	Philadelphia.	1855	"	New York.
Franklin	50	3680	Kittery.	1854	On the stocks	Kittery.
FIRST CLASS STEAM SLOOPS.						
Screw—						
San Jacinto	13	1446	Brooklyn.	1850	In commiss'n	C'st of Africa
Lancaster	22	2360	Philadelphia.	1858	"	Pacific Sq'rn.
Pensacola	19	2158	Pensacola.	1858	Pre'g for sea.	Norfolk.
Brooklyn	25	2070	New York.	1858	In commiss'n	Home Sq'ron
Hartford	16	1990	Boston.	1858	"	East Indies.
Richmond	14	1929	Norfolk.	1858	"	Mediterra'n.
Side-wheel—						
Mississippi	11	1692	Philadelphia.	1841	Repairing.	Boston.
Susquehanna	15	2450	"	1850	In commiss'n	Mediterra'n.
Powhatan	11	2415	Gosport.	1850	"	Home Sq'ron
Saranac	9	1446	Kittery.	1848	"	Pacific Sq'rn.
SECOND CLASS STEAM SLOOPS.						
Screw—						
Mohican	6	994	Kittery.	1858	In commiss'n	C'st of Africa
Narragansett	5	804	Boston.	1858	"	Pacific.
Iroquois	6	1016	New York.	1858	"	Mediterra'n.
Pawnee	4	1289	Philadelphia.	1858	"	Philadelphia.
Wyoming	6	997	"	1858	"	Pacific Sq'rn.
Dacotah	6	998	Gosport.	1858	"	East Indies.
Pocahontas	5	694	Purchased.	1855	"	Home Sq'ron
Seminole	3	801	Pensacola.	1858	"	C'st of Brazil
Side-wheel—						
Fulton	4	698	Brooklyn.	1837	In ordinary.	Pensacola.
THIRD CLASS STEAMERS.						
Screw—						
Wyandotte	5	464	Purchased.	1858	In commiss'n	Home Sq'ron
Mohawk	5	464	"	1858	"	"
Crusader	8	549	"	1858	"	"
Sumter	5	464	"	1858	"	C'st of Africa
Mystic	5	464	"	1858	"	"
Side-wheel—						
Water Witch	3	378	Washington.	1845	"	Philadelphia.
Michigan	1	582	Erie, Pa.	1044	"	Erie, Pa.
Pulaski	1	395	Purchased.	1858	"	Brazil Sq'ron
Saginaw	3	453	S. Francisco.	1858	"	East Indies.
STEAM TENDERS.						
Screw—						
Jno. Hancock	3	382	Charlestown.	1850	In ordinary.	S. Francisco.
Anacostia	1	217	Purchased.	1858	In service.	Washington.
STEAM FLOATING BATTERY.						
Stevens' War Steamer	6	4683	Commenced	1842	At Hoboken.	New Jersey.

RECAPITULATION.

SAILING VESSELS.

	Number.	Guns.	Tunnage.
Ships of the line	10	872	27,081
Frigates	10	500	17,163
Sloops of war	20	406	18,751
Brigs	3	16	763
Store vessels	3	7	1,342
Permanent store ships	6	—	6,340
Total	52	1,801	71,440

STEAM VESSELS.

	Number.	Guns.	Tunnage.
Screw frigates	7	262	24,660
First class steam sloops (screw)	6	109	11,953
" " (side-wheel)	4	46	8,003
Second class " (screw)	8	41	7,593
" " (side-wheel)	1	4	698
Third class " (screw)	5	28	2,405
" " (side-wheel)	4	8	1,808
Steam tenders	2	4	599
Stevens' war vessel	1	6	4,683
Total	38	508	62,402
Do. sailing vessels	52	1,801	71,440
Grand total	90	2,309	133,842

The vessels composing the different squadrons, and the particular points at which they were stationed at the latest advices, is as follows:—

HOME SQUADRON.

Flag Officer G. J. Pendergrast, commanding; cruise over the North Atlantic Ocean, the Gulf of Mexico, and the Caribbean Sea.

Name.	Captain.	Station.
Sloop Cumberland, flag ship	John Marston	Vera Cruz.
Sloop Macedonian	James Glynn	Vera Cruz.
Steam sloop Powhatan	Sam'l Mercer	Brooklyn Navy Yard
Frigate Sabine	Henry A. Adams	Pensacola.
Steam sloop Brooklyn	W. S. Walker	Off Fort Pickens.
Sloop St. Louis	Charles H. Poor	Off Fort Pickens.
Steam sloop Pocahontas	Sam'l F. Hazard	Norfolk.
Store ship Supply	Alex. Gibson	Brooklyn Navy Yard
Steam sloop Pawnee	S. C. Rowan	Washington.
Steamer Wyandotte	Lieut. Berryman	Pensacola.
Steamer Mohawk	Lieut. Strong	Brooklyn Navy Yard
Steamer Crusader	Lieut. Craven	Brooklyn Navy Yard

MEDITERRANEAN SQUADRON.

Flag Officer Charles H. Bell, commanding; cruise over the Mediterranean Sea, and takes charge of the ports on its shore.

Name.	Captain.	Station.
Steam sloop Richmond, fl'g s'p.	John Pope	Gaeta.
Steam sloop Susquehanna	George N. Hollins	Syria.
Steam sloop Iroquois	James J. Palmer	Genoa.
Store ship Release	Lieut. Frailey	New York.

BRAZIL SQUADRON.

Flag Officer Joshua R. Sands, commanding; cruise on the east coast of South America, Southwest Atlantic Ocean, and the Falkland Islands.

Name.	Captain.	Station.
Frigate Congress, flag ship	L. M. Goldsborugh.	Rio Janeiro.
Steam sloop Seminole	E. R. Thomson	Rio Janeiro.
Steamer Pulaski	Lieut. Macomb	Montevideo.

PACIFIC SQUADRON.

Flag Officer John B. Montgomery, commanding; cruise on the west coast of North and South America, the Sandwich Islands, Marquesan and Guano Islands, and the adjacent seas.

Name.	Captain.	Station.
Steam sloop Lancaster, flag s'p.	John Rudd	Panama.
Steam sloop Saranac	Rob't Ritchie	Calao.
Sloop Levant	Wm. E. Hunt	Missing.
Sloop St. Mary's	Wm. D. Porter	Panama.
Steam sloop Wyoming	John K. Mitchell	Panama.
Steam sloop Narragansett	Timothy A. Hunt	Calloa.
Sloop Cyane	S. B. Bissell	Panama.

AFRICAN SQUADRON.

Flag Officer Wm. Inman, commanding; cruise on the west coast of Africa, from lat. 20° north to lat. 18° south, and the adjacent ocean.

Name.	Captain.	Station.
Sloop Constellation, flag ship	John S. Nicholas	Little Fish Bay.
Steam sloop San Jacinto	Thos. A. Dornin	Cruising.
Sloop Portsmouth	John Calhoun	Cruising.
Steam sloop Mohican	S. W. Godon	Cruising.
Sloop Saratoga	Alfred Taylor	On the Coast.
Steamer Sumter	Lieut. Armstrong	St. Helena.
Steamer Mystic	Lieut. Le Roy	St. Helena.
Store ship Relief	Lieut. De Camp	Coast.

EAST INDIA SQUADRON.

Flag Officer C. K. Stribbling, commanding; cruise on the coasts of China and Japan and in the China Sea.

Name.	Captain.	Station.
Steam sloop Hartford, flagship.	Charles Lowndes	Hong Kong.
Steamer Saginaw	James F. Schenck.	Hong Kong.
Steam sloop Dacotah	Wm. Radford	China Sea.
Sloop John Adams	John M. Berrien	Manilla.
Sloop Vandalia	S. P. Lee	En route to H'g K'g.

SPECIAL SERVICE.

Name.	Captain.	
Steam Frigate Niagara	Wm. W. McKean	Aden, Red Sea.
Frigate Constitution	George W. Rogers.	Naval Academy.
Steamer Michigan	John C. Carter	Lake Erie.

MISCELLANEOUS.

In ordinary	29
On the stocks	5

The condition of the vessels now lying in ordinary, together with the state of forwardness of those on the stocks, has received attention before; and it would be needless to repeat it here. Many of them could be rendered serviceable in a short time.

NUMBER OF OFFICERS—PAY.

The number and pay of the various officers occupying the different positions in the navy, depending upon the date of their commission and particular duty, are as follows:—

LINE OFFICERS.

		Per annum.
Senior Flag Officer	1	$4,500
Captains, active list	78	From $5,000 to $3,600
Captains, reserved list	15	$3,000
Commanders, active list	114	From $3,150 to $2,825
Commanders, reserved list	13	$2,250
Lieutenants, active list	321	From $2,250 to $1,450
Lieutenants, reserved list	30	$1,200
Surgeons, ranking with commanders	42	From $3,000 to $1,600
Surgeons, ranking with lieutenants	27	
P'd Ass't Surgeons, next after lieutenants	43	From $1,500 to $1,100
Ass't Surgeons, next after masters	36	From $1,250 to $800
Paymasters, ranking with commanders	34	From $3,100 to $1,400
Paymasters, ranking with lieutenants	30	
Chaplains	24	Paid as lieutenants.
Professors of Mathematics	12	From $1,800 to $960
Masters in the line of promotion, active list	36	$1,200
Masters in the line of promotion, reserved list	1	$825
Masters not in the line of promotion, reserved list	9	$825
Passed Midshipmen, reserved list	3	From $1,000 to $650
Midshipmen, graduates of the Naval Ac'y.	55	From $550 to $450
Acting Midshipmen on probation at the Naval Academy, first class	35	$500
Second class	38	
Third class	70	
Fourth class	124	
Boatswains	43	From $1,450 to $800
Gunners	47	
Carpenters	45	
Sailmakers	40	
Total	1,366	

MARINE CORPS.

TOTAL PAY AND EMOLUMENTS.

		Per annum.
Colonel Commandant	1	$3,282
Lieut. Colonel	1	On leave, $2,047 50 Com'ding, $2,883
Majors	7	On leave, $2,106 Com'ding, $2,544
Captains	14	$1,428
First Lieutenants	20	$1,308
Second Lieutenants	20	$1,248
Total	63	

ENGINEER CORPS.

		Per annum.
Chief Engineers	28	From $2,600 to $1,200
First Assistants	43	On duty, $1,250 On leave, $900
Second Assistants	29	On duty, $1,000 On leave, $750
Third Assistants	92	On duty, $750 On leave, $600
Total	192	

As the Engineer Corps of the Navy is composed of a highly intelligent and well-informed body of men, all of whom are obliged to educate themselves entirely independent of assistance from the government, either in their general or professional knowledge, and as many vacancies now exist in the corps, we think that the subjects upon which applicants for appointment and promotion are examined will be of general interest. We append them:—

Before persons can be appointed Assistant Engineers in the navy, they must have passed a satisfactory examination before a board of at least three engineers, designated at such times as the wants of the service require. Application for permission to appear before such board must be made in writing to the Secretary of the Navy, accompanied by satisfactory testimonials as to good moral character, correct habits and sound constitution. The application will be registered, and when a board next meets permission will be sent to the applicant, stating the time and place of the board.

In the examination of a Third Assistant Engineer, the candidate must be able to describe all the different parts of ordinary condensing and non-condensing engines, and explain their uses and their mechanical operation; to explain the manner of putting engines in operation, how to regulate and modify their action, and the manner of guarding against danger from the boilers, by the means usually applied to them for that purpose. He will be expected to write a fair, legible hand, and to be well acquainted with arithmetic and the mensuration of surfaces and solids of the regular forms; to have worked not less than one year in a marine engine manufactory, and present testimonials of his mechanical ability from the director of the establishment in which he may have served. He must not be less than twenty, nor more than twenty-six years of age.

Candidates for promotion to the rank of Second Assistant Engineer must have served at least two years as Third Assistants in the management of steam engines in the navy in actual service; must produce testimonials of good conduct from the Commanders and Senior Engineers of the vessels in which they have served; and must pass a satisfactory examination upon the subjects and to the extent prescribed for Third Assistants; they must likewise be able to explain the peculiarities of the different kinds of valves, the construction of expansion valves, the manner of their operation, the remedies which are usually resorted to to check foaming in boilers; must possess a knowledge of the usual causes of derangement in the operation of air pumps, force pumps and feed pipes; the proper preventatives and remedies, and the mode of cleaning boilers when required. They must have a general knowledge of the mensuration of surfaces and solids.

Before promotion to the rank of First Assistent Engineer, candidates must have been employed at least three years as Second Assistant Engineers in the management of steam engines in actual service, and produce testimonials of character and good conduct from their former commanders and superior engineers; must pass a satisfactory examination upon the subjects prescribed for Third and Second Assistants, the mechanical powers, the general principles of the operation of steam engines, the causes of, and the best means of removing, the different kinds of deposits and incrustations to which boilers are exposed, and be able to furnish a working sketch or drawing of different parts of engines and boilers; to superintend their construction, and determine upon their accuracy and fitness for use.

Promotions to the grade of Chief Engineer are to be made after the candidates have served for two years as First Assistant Engineers in the management of steam engines in the navy in sea service, and have been examined upon any of the subjects specified for Assistants, which the board may deem expedient; and after they shall have satisfied the board of their previous good conduct and character, of their sufficient knowledge of mechanics and natural philosophy; of the forms, arrangements and principles of different kinds of steam engines, boilers, propellers, and their various dependencies, which have been successfully applied to steam vessels, and their alleged relative advantages for sea or river service, and shall have attained twenty-six years of age.

Candidates for promotion, who may fail to pass a satisfactory examination, may be examined again once; and if they fail to pass at the second examination, they shall be dropped from the list of Engineers.

Candidates for admission or promotion will be required to furnish the Board of Examiners with evidence of their abilities in the execution of mechanical drawings, and their proficiency in penmanship.

The Examining Boards will report the relative qualifications of the persons examined, and number them, giving to the best qualified the lowest number.

When, in the opinion of the Department, the wants of the service require the admission of Engineers of any grade above that of Third Assistant, the same qualifications and restrictions as to times of service will be exacted, as by the regulations are required for promotion to the grade in question: *Provided*, that all appointments to the grade of Second Assistant shall be made between the ages of twenty-one and twenty-eight; and to that of First Assistant, between twenty-five and thirty-two; and to that of Chief Engineer, between twenty-eight and thirty-five.

The Assistants must employ all favorable opportunities for acquiring a practical knowledge of the fabrication of the different parts of steam engines and their dependencies, that they may be able to repair and replace such parts as the space and means for making and repairing can be furnished in steam vessels. When other qualifications are equal, candidates whose skill and abilities in these particulars are superior will have precedence over others, for admission or promotion, who may be considered equal in other particulars.

NOTE.—As resignations are of almost daily occurrence in the Naval and Marine Corps, the number of officers, as given above, may vary somewhat from the number on the pay roll.—REP.

It will be seen by these particulars what the actual condition our navy is at this momentous period of our country's history.

Our Correspondence.

Aquarium.

MESSRS. EDITORS :—On page 151, present volume, SCIENTIFIC AMERICAN, the promise was made to state the habits and peculiarities of the fish, and of the other inhabitants of the aquarium. Infinite and wonderful are the views which may be obtained in one of these tanks. And in noticing the fish let us first begin with the stickleback, which is among fishes what the humming-bird is among the feathered tribe; the largest one of these I have ever had or seen was not two inches in length. It is quite narrow, and very quick and nimble, being shaped much like the salt water mackerel. He would die a thousand times rather than give up a battle with another fish, and so ferocious is he that it is the exception rather than the rule, if he does not attack a fish placed in the same tank with him. No matter how large or how small his neighbors may be, they are quite sure to find but little mercy, and still less timidity, in their Liliputian adversary. I had one of these fish that kept the entire end of the tank, and woe be to any fish that dared to intrude on what he considered as his personal property. At one time a bullhead, five or six inches long, tried to push him out of the way, but as the stickleback did not agree to it, he punished him thus :—Raising his spines he moved back a short distance, and, returning seemingly with the speed of a bullet, he ran under the fish, cutting him open with those cruel spines, just as well as it could have been done with a knife; and then sailed around the tank in the most consequential and self-approving style imaginable. They trouble the gold-fish less than any others; but sometimes they will even attack large gold-fish, many times their own size, and frequently they find themselves between the jaws of these fish, but scarce ever are they swallowed; for when just in that position, they erect their spines and refuse to go any further. If the gold-fish attempt to crush him, it must, of course, be somewhat injured by the sharp little spines. I have often released this little fish from what to us seems a not at all desirable situation, when off he would swim as if nothing had happened, and not long after would try it again. They are very fond of feeding on the tails of tadpoles, or on frog's feet, and these members are not at all safe when there is such a thing as a stickleback in the tank. I have heard it said that they build nests in the water, in which the female spawns; but have never seen anything of that kind; but there are seasons of the year in which their colors are much brighter than at others, and when he remains in the sunlight moving his delicate little fins, I know of nothing more beautiful. Their bodies seem almost transparent, and especially beautiful are the males, which may generally be distinguished by their pugnacious propensities. Tadpoles come next on the list; they will soon be seen to grow very fleshy, then two feet will make their appearance near the tail, followed in the course of a month by two more back of their head, and gradually the tadpole becomes changed into a perfect frog, the tail being absorbed in the formation of the legs; and who can tell with what feelings of novelty, mingled with surprise and delight the once poor tadpole, but now Hon. Frog, gives his first croak as he dives into the water?

A word in regard to feeding fish. They are apt to be fed too much, and great care should be taken not to place an unnecessary quantity of food in the tank, as it decays and renders the water impure. The best food is a small angle worm, or fresh raw meat cut up in small pieces, and given to them once or twice a week. There are a great many rules which might be given, but the management of an aquarium is best found out by experience; and when the balance between animal and vegetable life has been found, the water may be kept in the tank for an indefinite period of time. I had a small tank in which water and a suitable stock of fish were kept for thirteen months, and not a single fish or plant died during that time; but it at last was broken, and thus the water was changed sooner than intended. Now, in conclusion, if you wish a pure, healthful and innocent study and amusement, either make or buy an aquarium; it will be money well invested. T. D. A.

Rochester, March 2, 1861.

Valued Testimonial.

MESSRS. EDITORS :—Please allow me, through the columns of the SCIENTIFIC AMERICAN, to express my sentiments respecting the high estimation which I entertain of the value of your paper to mechanics, inventors, manufacturers and others. The information which it contains, I have found to be thoroughly useful, and of great importance to myself as a practical mechanic; and as an organ for introducing new inventions to the public, it stands unrivaled. Your kindness to correspondents has been of great assistance to me in furnishing information which has been the means of my obtaining a valuable patent through your agency, and of introducing me to the Collins Company, by which I have been enabled to bring my cast steel molded plows to perfection and public use.

F. F. SMITH.

Collinsville, Conn., March 6, 1861.

The Baltimore Mechanics' Fair for 1861.

By a circular received from E. Whitman, chairman of the Committee on Exhibition, we learn that the Thirteenth Annual Exhibition of the Maryland Institute for the Promotion of the Mechanic Arts, will open early in October next. Steam power, with all the shafting, fixtures, &c., free of expense, will be in readiness for propelling the machinery, also laborers to assist in arranging the same. All freights from New York, Boston and Philadelphia, by steamboat, on machinery exhibited at this Fair, will be settled by the Institute both ways, and if the owner is not present, or has no agent there, by forwarding the bills of lading to the chairman of the Exhibition Committee, they will receive his personal attention in fitting up and arranging the same for exhibition.

Mr. Whitman says :—" From the success of our former exhibitions, the facilities and conveniences offered at the exhibition in October next, together with the central locality of our city between North and South, we flatter ourselves that we shall be able to offer greater inducements to manufacturers, mechanics, artists, inventors and others to exhibit at this Fair than has ever been offered at any similar exhibition in this country."

OLD COPPER CENTS TO BE WITHDRAWN FROM CIRCULATION.—The director of the Mint, at Philadelphia, has arranged with Adams' Express Company for the transportation, free of cost to the shipper, of the old copper cents to the mint to be exchanged for those of the new issue. They must be arranged in packages of not less than $20 each. Our ferry companies will be inexcusable if they pay out any more of the old cumbrous coin.

CEMENT FOR SHIPS AND WOODEN PIERS.—A substance for coating ships' bottoms and wooden piers exposed to the attacks of the ship-worm has been patented by S. Zoubtchaninoff, of Paris. It consists of bitumen 4 parts by weight, common resin 4 parts, crude turpentine 6, colza oil 2, sulphuric acid 8. The whole of these ingredients are placed in a cauldron heated and stirred until they are completely incorporated together. Apply it hot with a brush.

Column of Varieties.

An inch pipe, one foot high, holds 9.42 cubic inches

The soluble indigo of commerce makes a good blue ink when slightly diluted with hot water. It is incorrosive for steel pens, and it flows freely.

Excavations were lately recommenced in Pompeii, and among the first discoveries made was a druggist's shop, containing pill-boxes in abundance.

A deep purple ink, called mauve, is now becoming somewhat fashionable. It is made from the common aniline purple liquid employed for dyeing silk.

The *Alta Californian* states that the gold and silver ores in Tulare county are yielding at the enormous rate of from $1,500 to $6,000 to the tun of quartz.

The Melbourne *Herald* states that in less than a quarter of a century, Australia has increased from a population of 170 to 530,000 persons; and in ten years has exported 23,000,000 ounces of gold.

According to Humboldt, the destruction of forests on the tops and sides of mountains results in the scarcity of wood for fuel and building, and the drying up of mountain springs and rivulets.

Within the past ten years an American aquatic plant has become so abundant in the rivers and canals of England as to offer serious obstacles to navigation. It is supposed to have been introduced with some logs of American timber.

The sugar crop of Louisiana for last year amounted to 228,753 hogsheads, at the ratio of 1,150 lbs. to each; the molasses crop amounted to 18,414,550 gallons. Steam engines are used on 1,009 Louisiana sugar plantations; 283 are operated by horse power.

Very minute quantities of lead, mixed with copper, render the latter so brittle that it cannot be drawn into wire. Sulphur affects copper in nearly the same manner. Annealed copper wire is a better conductor of electricity than hard drawn wire.

The cars of the Pennsylvania Railroad Company are lighted with gas, which is supplied at the works of the company at Altoona. The gas is forced under a very high pressure into a receiver in each car, which contains a supply for three burners to last 18 hours.

In Montreal the skating pond is roofed over, so as to prevent its being covered with snow. It is lighted at night, and the band of the Canadian Rifles generally attends. The ladies frequent it, wearing short dresses, looped up so as to be out of the way, and Turkish trowsers.

An American engineer, who has lately made an extensive tour through the manufacturing districts of Great Britain, counted 46 new steamships in the course of construction on the river Clyde. These vessels range in size from 6,000 tuns to 200, but most of them are over 2,000 tuns.

Upwards of one million papers of seeds have been put up at the Agricultural Department of the Patent Office within the past two months and sent to members of Congress for distribution. Each collection or batch comprises 54 varieties of vegetable and about the same number of flower seeds.

The American Association for the Advancement of Science was to meet at Nashville, Tenn., on the 17th of April, but we understand that the meeting is to be postponed for one year, owing to the disturbed state of the country—an unwise step; science should go forward unfettered by political considerations.

On the northern lakes wild moanings are frequently heard under the ice, especially just prior to thaws. This is caused by imprisoned air seeking an outlet. It is frequently heard at a great distance like the wailings of a bound giant, then it bursts out like explosions of artillery, frequently causing huge rents several miles long.

At a late meeting of the Manchester (England) Philosophical Society, Dr. C. Calvert stated that he had recently analyzed several samples of snuff, in all of which he found traces of red lead. This is a most dangerous adulteration, as the lead in such snuff will ultimately accumulate in the heads of snuff-takers and produce dreadful diseases.

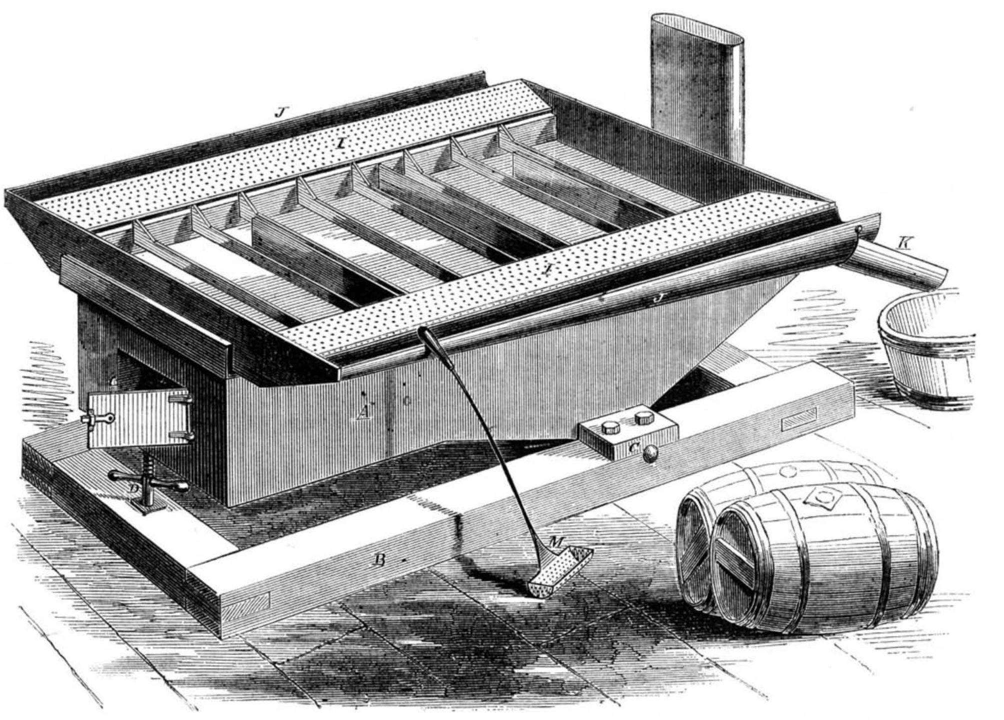
Dr. Landerer, of Athens, states that garlic stands pre-eminent, as a plant, which snakes dislike. In Greece, gardeners who suffer frequently from their bites while collecting cucumbers and melons (under the large leaves of which the reptiles conceal themselves) find it an excellent plan, before commencing operations, to strew crushed garlic among the plants to frighten off the reptiles.

Improvement in Apparatus for Evaporating Saccharine Juices.

In boiling the juices of the sorghum, maple, sugar cane, &c., for the purpose of evaporating the water which they contain, the scum which rises is generally thrown to the sides of the pan; and this fact is taken advantage of in the invention here illustrated, to arrange an apparatus by means of which the scum is removed with great facility, and the juice mixed with it is very thoroughly strained back into the plan.

The furnace, A (see cut), is hung upon the frame, B, by the pivots, C, and is adjusted in its position by the screw, D. The sides of the pan, E, are made sloping outward above the sirup, and the strainers, I, are placed over them, so that, when the scum is drawn up upon the strainers, the juice which is mixed with it will pass through them and be conducted back by the sloping sides into the pan. Just outside of the strainers are the inclined troughs, J J, into which the scum is drawn and which conduct it into the spout, K, by which it is led away to a proper receptacle.

The skimmer, M, may be made of perforated tin in semi-circular form, with end pieces as shown. The bars, F F, extend across the pan just under the sirup, serving as supports and guides to the skimmer when in use. These bars have inclined ends, as shown, to lead the skimmer up on to the strainers, I I. The bars, G G, are the usual ones extending nearly across the pan to obstruct and guide the flow of the sirup.



MANSFIELD'S APPARATUS FOR EVAPORATING SACCHARINE JUICES.

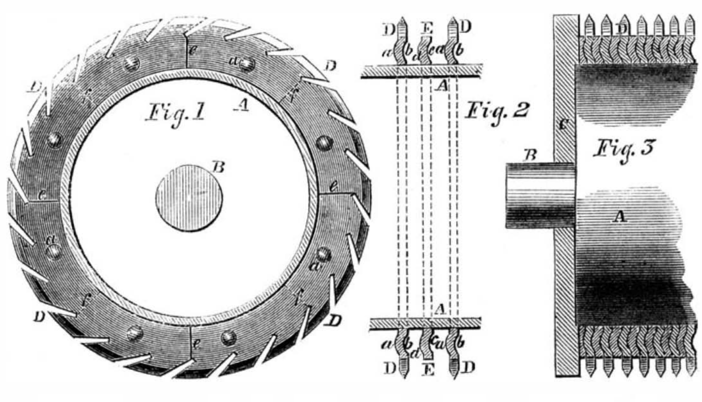
The patent for this convenient apparatus was granted Feb. 12, 1861, and further information in relation to it may be procured by addressing the inventor, M. H. Mansfield, at Ashland, Ohio.

The Oreide of Gold.

This substance, of which so many articles called jewelry are now made, is simply an alloy of copper and zinc—a brass of a peculiar color resembling "jeweler's gold" of about 16 carats fine—copper and gold mixture. It is the invention of MM. Mourier and Vallent—two Frenchmen. It was patented in France in December, 1854, and in the United States in March, 1857. Some of our daily papers have lately referred to this substance as if it were some new discovery; whereas, if they had consulted the pages of the Scientific American—where all the most recent information respecting new discoveries first appear—they would have found it described in full on page 308, Vol. XII., old series, (June, 1857). It is composed of 100 parts (by weight) of pure copper, 17 of zinc, 6 of common magnesia, 3.60 salammoniac, 1.80 quick lime and 9 of crude tartar. The copper is first melted in a crucible, then the magnesia added, then the salammoniac, lime and tartar separately, and in powder. These are kept from contact with the air, and all well stirred for about 20 minutes, until they are incorporated together. The zinc is now added in strips, which are thrust below the scurf formed on the top of the crucible. The mass is now stirred, the lid put on the crucible and its contents kept fused for about 25 minutes; after which the crucible is opened, the slag skimmed carefully from the surface, then the molten alloy is poured out into ingot molds if it is required to be rolled, or into iron molds if designed for castings. When designed for works of art, however, it is best to cast it into ingot form first, then melt it in a furnace and cast it. This alloy is very beautiful, and well deserves the name "oreide of gold," as it greatly resembles the precious metal. It is very ductile, and may be rolled into very thin leaf; but it is nearly as easily tarnished as common brass. We believe it may be used for making excellent tubing for marine boilers, and think it may be more usefully employed for this purpose than in furnishing two-penny trinkets for street-sweepers. It is manufactured upon an extensive scale by Messrs. Holmes, Elton, Turrell & Co., of Waterbury, Conn., assignees of the American patent.

Improvement in Bur Cylinders.

In the manufacture of woolen cloth, it is usual, before the wool goes to the cards to pass it through a machine to rid it of the burs which the sheep are apt to collect in the pastures by rubbing against the plants that bear them. The burring machine consists of a cylinder covered with sharply pointed steel teeth which comb the wool in between them, while a rapidly revolving beater, close over the top of the cylinder, knocks the burs off into a box placed in proper position to receive them. The wool is then combed out from beneath the teeth of the bur cylinder by a doffing card or brush.



BIDWEL'S IMPROVEMENT IN BURR CYLINDERS.

The teeth of the bur cylinder are formed on the periphery of flat rings of cast steel, and these rings are slipped upon a central shaft with narrower rings between them to separate them the desired distance apart; which varies from the 1-11th to the 1-20th of an inch. As the steel rings are punched from plates, there is of course a great waste of metal, amounting in practice to one-half. To diminish this waste as much as possible, it has been the practice to make the bur cylinders of several sizes, from 5 to 9 inches in diameter, punching the smaller rings out of the larger ones. This practice is objectionable, however, as manufacturers desire but two sized cylinders, one about 6 inches in diameter and the other about 9 inches, though they have been obliged to use the several sizes in order to effect this economy of metal in their construction. Another objection to the employment of the entire ring is the impossibility of hardening it without warping or cracking it, so that it has been necessary to use the steel in a very soft state.

All these difficulties are completely obviated by the simple little invention here illustrated. This consists merely in making the rings in sections, and in the mode of fastening them to the central shaft. In the cut, Fig. 1, is a flat view of one of the rings formed in eight sections. These sections are held in place by sinking, with a punch, depressions, *b b*, Fig. 2, in one side of the plate, raising corresponding elevations, *a a*, Figs. 1 and 2, on the opposite side, and these fit to similar depressions and elevations formed on the packing rings, as plainly shown in Figs. 2 and 3. The whole are held in place by a cap, C, which is secured by a key through the shaft, A.

It will be seen that these small sections may be punched from a steel plate with only chippings of waste, thus effecting great economy of metal. The plates, too, may be readily hardened and tempered; and the cylinders may all be of any size desired.

The patent for this invention was procured, through the Scientific American Patent Agency, Nov. 15, 1859, and further information in relation to it may be obtained by addressing the inventor, James Bidwell, at No. 159 East Twenty-ninth-street, New York.

Influence of Trees upon Climate.

Jochim Frederic Sahouw, Professor of Botany at Copenhagen, speaks as follows of the influence of forests upon the atmosphere:—"We find the most evident signs of it in the torrid zone. The forests increase the rain and moisture, and produce springs and running streams. Tracts destitute of woods become very strongly heated, the air above them ascends perpendicularly, and thus prevents the clouds from sinking, and the constant winds (trade winds or monsoons), where they can blow uninterruptedly over large surfaces, do not allow the transition of vapors into the form of drops. In the forests, on the contrary, the clothed soil does not become so heated, and, besides, the evaporation from the trees favors cooling; therefore, when the currents of air loaded with vapors reach the forests, they meet with that which condenses them and change into rain. Since, moreover, evaporation of the earth goes on more slowly beneath the trees, and since these also evaporate very copiously in a hot climate, the atmosphere in those forests has a high degree of humidity, this great humidity at the same time producing many springs and streams."

New Style of Letter Paper.—Our suggestion to make letter paper in single leaves has been very promptly acted on. We have received from Messrs. Kempton & Mullin, of Mount Holly Springs, Pa., a sample of paper which they call "Business Letter," which is made with only two pages to the sheet of just about the right size for most business letters. The sample sent us is of most excellent quality and finish.

Attempts are about to be made in the city of St. Louis to propel the street cars with steam in place of horses. There are no restrictions in that city, as in New York and other places, against steam cars being used in the streets.

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VOL. IV. NO. 13.....[NEW SERIES.]....*Seventeenth Year.*

NEW YORK, SATURDAY, MARCH 30, 1861.

SIX GOOD REASONS WHY EVERY MANUFACTURER, MECHANIC, INVENTOR AND ARTIZAN SHOULD BECOME A PATRON OF THE "SCIENTIFIC AMERICAN."

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COTTON AND ITS SUPPLY.

The manufacturing and commercial communities are deeply exercised at present, respecting the supply of cotton for manufacturing purposes. Very large meetings have been held recently in England, and active measures taken to encourage the cultivation and development of cotton in several of the British colonies ; and in private, as well as public, cotton has been the universal theme of discussion. What is the cause of this excitement respecting cotton ? The answer is to be found in the position of the cotton-growing States of America. Fears are entertained by manufacturers of cotton goods that contingencies may arise by which the cultivation of the plant in these States may be interfered with, and the regular annual supply be greatly diminished. Such a result would not only raise the price of cotton, but, owing to the diminished amount furnished to manufacturers, many thousands of operatives in Europe and America would be deprived of employment, and a vast amount of capital invested in buildings and mechanism would be rendered unproductive. The whole cotton crop of America last year, was 4,675,770 bales ; and of this, 3,697,727 bales were exported, and 978,043 used at home. England alone took 2,582,000 bales, which amounted to about four-fifths of her entire consumption. It is no wonder that this question causes considerable excitement at present, and especially in England, where four millions of persons are stated to be connected with, and dependent for support, on the cotton manufacture.

The great desire of cotton manufacturers is to increase the supply of cotton in many different parts of the world, so that they may not be so dependent upon one particular section of the globe. Several erroneous views have lately been propagated on this subject. The growers of any material are just as dependent upon consumers as the latter are upon the former. The laws of trade regulate these things, and there is no earthly mode of controlling the influence of the cotton-growing region of the Gulf of Florida but by raising as good qualities of cotton at lower prices, in other sections of the world. Now, the question arises:—"Can this be accomplished ?" So far as we have knowledge of the various climates, we think it cannot, without new agencies being brought into requisition. Cotton requires a warm, moist climate ; it is as sensitive to drouths as to frosts, and so far as we know, the warm breezes of the Gulf of Florida supply that moisture to the plant in America, which cannot be obtained in any other warm climate without artificial irrigation. Cotton is raised in Egypt, the land of no rain ; but the plants are watered by artificial agencies, from the Nile, at a great cost for such labor. In India, Africa, and China, wet and dry seasons prevail ; there are no gentle showers of frequent recurrence, as in the Southern States ; therefore the drouths in those countries are unfavorable to the cultivation of cotton, as compared with America. The development of the American cotton trade affords evidence of great natural advantages. The cotton fields of America embrace an area of 500,000 square miles, and the capital invested in the cultivation of the plant amounts to $900,000,000. Seventy years ago, the exports of our cotton were only 420 bales—not one-tenth of the amount furnished by several countries to England. Now, America furnishes five-sevenths of the surplus cotton product of the entire world ; it has increased while other cotton countries have decreased. There must be a reason for this, as the best American *herbaceous* cotton is not indigenous to the soil ; the seed was first imported. We can only attribute these results to great care in its culture, and the natural advantages of climate which we have described. We do not say that it is impossible to cultivate cotton as cheaply and to raise as good qualities as American cotton in other countries, but we do assert that without great and new improvements in machinery for cultivating, irrigating and cleaning it, so as to lessen the cost for labor, such results cannot be achieved.

HISTORY OF THE ART OF KNITTING.

In a small treatise lately published by Mr. Aiken, the inventor and manufacturer of the family knitting machine illustrated on another page, we find some very interesting information relating to the history of the art of knitting by machinery in America.

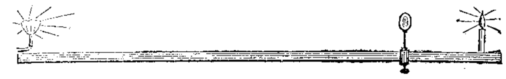
The art of knitting itself is stated to have been invented in Scotland, but the first machine for making knitted fabrics was the invention of Wm. Lee, of England, about two and a half centuries ago. This machine remained in nearly the same condition in which Lee left it for almost two centuries, and the first introduced into America was the old heavy hand frame, which required the strength of a pretty strong man to operate it with advantage. Immense sums of money had been expended in England to adapt the knitting frame for operation by steam or water power, like the carpet loom, but this achievement was left for the perseverance and skill of American inventors. This was first accomplished, as we learn by the treatise referred to, in 1831, by Timothy Bailey, of Albany, N. Y. It is stated that Egbert Egberts, of that city, Dr Williams, and Alfred Cook, in a conversation regarding the application of power to the knitting frame, suggested that Bailey, who was well known to be a man of great inventive powers, should be consulted ; this being done, the latter asserted that he could "do the job." A partnership was soon formed, and Bailey set to work in earnest, but so many delays and discouragements were for some time experienced that the partnership was ultimately broken up. Bailey, however, although poor in this world's goods, was richly endowed with the qualities which characterize most inventors—genius and perseverance. His interest in the invention was stimulated, his faith in ultimate success was unshaken, and with a resolute will he stuck to his old machine, continuing his experiments by taking out a piece here and adding another device there, until he was able to make it execute thirty-two revolutions per minute, without missing a stitch—which was done by simply turning a crank. His old partner, Egberts, hearing of this, went and saw the machine, advanced Bailey five hundred dollars to render it still more perfect, and it was soon afterward placed and at work in the attic of a large building at Cohoes, on the lower Mohawk Falls, in the State of New York. This machine established knitting by power in America ; it was the parent, so to speak, of all the knitting manufactories in our country.

Timothy Bailey, the inventor, now resides at Ballston Spa, N. Y.; Egbert Egberts and Joshua Bailey—who also became an early partner in the business—reside at Cohoes, where they have extensive works, and it is said that they have accumulated large fortunes in the hosiery business.

Bailey's machine was modeled upon Lee's hand frame ; it was square, and made a flat web. The circular knitting loom which forms the legs of stockings without a seam, is an invention of quite recent date, but whether invented in France or Germany is at present a matter of dispute. We do not know the entire value of knit fabrics manufactured on such machines, but it must be large, as Mr. Aiken states that upon the machines manufactured by himself, no less than $2,000,000 worth of hosiery and other knit fabrics are made annually.

MEASURING LIGHT.

In our gas works a standard quality of gas is fixed upon by the directors, and then it is the duty of the engineer to so mix his coals as to produce gas of this quality. In order that the quality of the gas may be readily determined, a most ingenious little apparatus has been devised by which the quantity of light emitted from the gas-burner may be measured in comparison with the light of a candle burning a certain amount of spermaceti per hour. This apparatus is illustrated in the annexed cut. It consists of a graduated bar



with the gas jet at one end and the candle at the other, and a peculiar disk fitted to slide along the bar between the two lights. The central portion of the disk is oiled so as to be translucent, while the outer portion is opaque. Thus a portion of the light coming from the candle is transmitted through the oiled portion of the disk while the light which strikes the opaque portion is reflected. The same is the case with the light from the burner. By slipping the disk along the bar, a point is found where the light transmitted from each side is just equal to that reflected from the other, and the difference in the appearance of the two portions of the disk disappears, showing that at this point the light received from the burner is just equal to that received from the candle. As the graduated bar gives the distances of the disk from the candle and from the burner, and as light radiating from a burning body diminishes in proportion to the square of the distance, it is easy to calculate the quantity of light coming from the burner in proportion to that produced by the candle.

Nothing can exceed in delicacy and care these measurements of light as conducted in the beautiful laboratories of our large city gas works. The apparatus is placed in a perfectly dark room with black walls, the candle is nicely balanced in sensitive scales with fine sand, and after it has burned the measured length of time, it is extinguished, when the quantity of spermaceti consumed is accurately ascertained. The standard candle burns 120 grains of spermaceti per hour, and the standard gas-burner is a five feet Argand burner, with 15 holes $\frac{1}{23}$ of an inch in diameter, and a 7-inch chimney.

THE WAY BANKS EVADE THE USURY LAWS.

The banks have a plan so simple and effectual for evading the usury laws that it is not probable that they would give one cent to have these laws repealed. When the market rate of interest is 14 per cent a year, the plan is for a merchant to get notes discounted at 7 per cent for double the amount of money that he wants, the whole to be carried to his credit, on condition that he is to draw out but half of it; thus if he gets $5,000 from the bank he pays interest on $10,000.

The way the bank manages to have its customers leave a portion of the money carried to their credit, is this. Several merchants offer notes at the bank for discount, and when they call to know whether the directors have decided to take the notes and pay the money for them (after taking out the interest), one merchant finds that his paper has been discounted while the offerings of another have been declined. The unsuccessful applicant calls on the cashier and asks him :—

"Mr. Chandler, why was not my paper done to-day; were not the names satisfactory?"

The cashier replies, "The directors found no fault with the names, Mr. Smith, but we had applications for all of our funds from firms whose accounts were better than yours, and we felt bound to give them the preference."

By the "accounts being better" is meant that these firms have larger sums to the credit of their accounts, on which they are paying interest, but which they have left with the bank to be loaned to somebody else, thus enabling the bank to get double interest on its funds.

Most merchants living in cities expect, when they hire money, to pay the market rate of interest, but the obstruction of the usury laws works a serious inconvenience to borrowers, especially when dealing with banks, as they can use only a portion of their receivables, having to leave a portion with the banks merely for the purpose of evading the usury laws.

We never knew a usury law in any community which was not systematically and generally evaded; and the inconvenience and expense of the evasions always fall upon the borrower.

The Fifteen-Inch Gun.

We have received from the publisher, D. Van Nostrand, 192 Broadway, a very neatly printed little volume, entitled "Notes on Sea-Coast Defense," by Major J. G. Barnard, U. S. Corps of Engineers, the object of which seems to be to defend the United States system of harbor fortification from attacks in various quarters, and especially from some remarks made by Sir Howard Douglas in his famous work on naval gunnery.

Major Barnard claims a superiority in the embrasures or openings, through which the cannon are discharged, of the American sea-coast forts over those generally found in European fortifications. The latter flare from the inner face of the wall outward, while the embrasure designed by General Totten in 1815, and built in our forts previous to 1852, has the narrowest portion within two feet of the outer face of the wall, thus diminishing very considerably the area of the external opening. In 1852, General Totten made a still further improvement, which consists in lining the embrasure with wrought-iron plates, 8 inches in thickness, and in some improvements in form rendered possible by the employment of the new material. They have an external opening of $3\frac{9}{10}$ sq. feet, while that of embrasures found in most European fortifications ranges from 40 to 50 square feet. Sir Howard Douglas, as he says, "after a careful perusal" of General Totten's report, condemns the plan in toto, pronouncing it the very worst possible combination of materials for such a purpose, and states that the United States War Department have declined to carry it into effect. Major Barnard, in reply, says that General Totten's report contains a statement that his plan had been approved by the Secretary of War; and he further says that more than 500 embrasures, in accordance with this plan, have been built within the last five years into our fortifications now in process of construction.

Major Barnard says also that the United States engineers have been constantly endeavoring to construct cannon of extraordinary caliber, as a part of our system of sea-coast defence; it being well known that a missile of large weight moving at a moderate velocity has a far greater smashing effect than one of small weight moving at high velocity. A bullet fired from a pistol will make a clean hole through a plate of glass, while the same bullet thrown from the hand will break the glass in pieces.

The practical limit to casting very large guns in a solid mass resulted from the property of iron by which it shrinks in cooling. As the outside cools first, it forms a rigid band which will not yield inward, and as the metal inside cools and shrinks, it forms a porous mass of little strength which rapidly wears away in service. But Captain D. J. Rodman, of the ordnance corps, contrived a plan for casting cannon hollow, and cooling them from the inside, by having a stream of water circulating through the core. As the inner portions around the bore cool first, when the outer portions cool they find nothing to prevent them from skrinking, and thus the whole mass comes together in an unusually solid condition.

After casting several guns of smaller caliber by this method and finding that it succeeded according to his anticipations, Capt. Rodman undertook the casting of a gun of 15-inch bore, and this was successfully effected at the Fort Pitt foundry of Messrs. Knapp, Rudd & Co., Pittsburg, as has already been mentioned in our columns. This cannon is 15 feet and 10 inches in length, with an external diameter of 2 feet and 1 inch at the muzzle and 4 feet at the breech, and it weighs 49,100 lbs. Major Barnard says that, up to the present date, it has been subjected to 350 rounds with full charges, and that at the three-hundredth round, the delicate tests applied to the bore failed to indicate the slightest enlargement or deterioration of any kind. The average charge has been 35 lbs. of large grained powder with shells of 305 to 335 lbs. weight. The solid shot would weigh 425 lbs. The range, accuracy, &c., were entirely satisfactory. Major Barnard thinks that no iron-plated ships would be able to bear the crushing effect of these ponderous missiles.

Patent Extensions Before Congress.

Mr. Bigler, from the Committee on Patents and the Patent Office, to whom was referred the petition of Samuel F. B. Morse, for an extension of his patent for the electro-magnetic telegraph, submitted a report, accompanied by a bill, to extend a patent heretofore granted to Samuel F. B. Morse, which was read and passed to a second reading.

He also, from the same committee, to whom was referred the petition of John G. Mini, praying for an extension for his patent, asked to be discharged from its further consideration, which was agreed to.

He also, from the same committee, to whom was referred the petition of Solomon Whipple, praying for an extension of his patent for a machine for cutting files, asked to be discharged from its further consideration, which was agreed to.

He also, from the same committee, to whom was referred the petition of Samuel Colt, praying for an extension of his patent for an improvement in firearms, asked to be discharged from its further consideration, which was agreed to.

He also, from the same committee, to whom was referred the memorial of a committee appointed by certain employés of the Patent Office, praying compensation for their services from April 1, 1860, at the rate fixed by law, asked to be discharged from its further consideration, which was agreed to.

Patents in the Southern Confederacy.

The following resolution passed the Southern Congress on the 4th of March :

Resolved, by the Congress of the Confederate States of America, That all persons, being citizens of the Confederate States, who may wish to procure patents or file caveats for inventions and useful discoveries and improvements, may file in the office of the Attorney General a specification of such invention, discovery or improvement, together with such descriptive drawings as may be necessary; and such specification, when so filed, shall operate as a caveat to protect the rights of such persons until regular application can be made according to law; and this resolution shall apply to all patents heretofore granted by the United States to citizens of this Confederacy, and to caveats heretofore filed by such citizens in the Patent Office of the United States on such patents, and copies of such caveats being deposited, as aforesaid, in the office of the Attorney General; *Provided*, That such applicants shall pay such fees as may hereafter be required by law establishing a Patent Office, on application for patents and filing of caveats.

The above resolution is merely declaratory, and does not fully indicate what the settled policy of the Confederate States will be respecting patents.

It will be observed, however, that all persons, being citizens of those States, may take out patents and file caveats, but applicants for such privileges are not required to make oath that they are the inventors of the object for which protection is sought. This indicates a free-and-easy system, and one which forebodes no security to the honest inventor against a wholesale appropriation of his rights. The resolution also squints at ignoring the rights of all patentees protected by the Federal Government, except citizens of the Confederate States.

Coal Fields of Massachusetts.

A memorial has been addressed to the Legislature of Massachusetts by Professor Thomas S. Ridgway relative to the coal fields of that State, setting forth the causes which have hindered their development. These carbonaceous deposits extend from East Bridgewater to Seekonk river, and from Foxborough and Mansfield to Mount Hope Bay, embracing the townships of Seekonk, Attleborough, Pawtucket, Mansfield, Norton, Raynham, Taunton, Dighton, Rehoboth, Swansey, Somerset, Berkley, and parts of Easton, West Bridgewater, Middleborough and Wrentham.

The greatest difficulty that presents itself to a practical miner, says Professor Ridgway, in searching for a workable bed of coal in this coal field, is owing to the fact that nearly the whole of the coal deposit is covered up to the depth of from twenty to seventy feet with sand, gravel, pebbles and boulders, well known amongst geologists by the name of "drift formation," concealing effectually not only the outcroppings of beds of coal that may exist, but all traces of their locality. The exact position of the deposits is therefore wholly a matter of conjecture, and a dozen test holes of moderate depth may be sunk without striking a lead of coal. The only mode of ascertaining with certainty whether there is a workable bed of coal, is to sink test holes in the center of the coal fields, by boring through the drift of sand, pebbles, &c., to the coal strata, and then to drill down to the lowest part of the coal measures. All attempts at mining for coal in this State have been along the edge of the formation, where the drift covering is moderate in depth. Pits that yielded quite largely of good coal have been opened, but the coal seams being thin and twisted, and a lack of capital preventing the pits from being sunk down through the whole of the coal strata to the thickest beds of coal below, the enterprises were abandoned.

Professor Ridgway believes that there are workable beds of good coal, of a merchantable character, to be found at a considerable depth, in the Massachusetts coal field, and proposes that the State shall defray the expenses of boring to discover the same. The cost of boring one hole, 370 feet deep, he estimates at $3,590; but, having once started, eight holes may be bored for $4,990. In some of the Pennsylvania coal fields the pits have to be sunk from 400 to 900 feet deep. Coal which has been mined at Mansfield is nearly equal to the Pennsylvania anthracite.

Decease of a Scientific Physician.—Sir William Burnett, the discoverer of the method of heating timber, called Burnettizing, died in England on the 18th ult., at the advanced age of 82 years. He was a physician by profession, and served principally in the British navy. His scientific attainments were considerable; he was knighted as a mark of distinction for his services, and he was a fellow of the Royal Society. His process of heating timber to preserve it, consisted in forcing a solution of the chloride of zinc into its pores, by pressure, in close cylinders. This process was carried on a few years since, upon a somewhat extensive scale at Lowell, Mass.

The effect of the use of tea has been much discussed. Professor Johnstone, a good authority, has asserted that it prevents the waste of the body, and nourishes it. Dr. Smith, in a lecture recently delivered before the Society of Arts, maintained that tea was good only in helping our digestion of fat or farinaceous food, and thus far was nourishing; but if the tissues are wasted by exertions or too profuse perspirations, tea is injurious. It does not suit a spare habit, or much exertion, or low temperatures, or a defective skin. These opinions are not generally held.

Among the many products obtained from coal are chloroform and very pure spirits.

THE POLYTECHNIC ASSOCIATION OF THE AMERICAN INSTITUTE.

[Reported for the Scientific American.]

The usual weekly meeting of the Polytechnic Association of the American Institute was held, at their room, in the Cooper Building, this city, on Thursday evening, March 14, 1861, Professor Mason in the chair.

PLOWING THE PRAIRIES.

Mr. Jesse Frye exhibited a model of a "steam horse of-all-work," and a series of gang-plows, especially intended for plowing the Western prairies. The principle of the plow is intended to avoid both bottom and land-side pressures. The track of the wheels is plowed up after they pass, leaving the whole surface of the land perfectly light. By plowing from twenty to thirty-four feet wide, the expense of plowing is to be very much reduced, but three men being required to plow 160 acres per day. The subject was referred to a committee, consisting of Messrs. Butler, Dibben and Johnson.

COTTON.

The President exhibited a specimen of the yellow cotton, brought originally from China in the form of nankeen. It was transferred to Georgia; but it was found that it intermixed with the white cotton, so that its cultivation was laid aside. Its fiber is light and short, rather more twisted than that of ordinary cotton. A specimen of cotton purporting to come from Peru, upon microscopic examination proved not to be a true cotton, the fiber not having the screw form. In the Astor Library he had found the English Parliamentary reports complete from the day they commenced printing their reports down to the last session. Commencing with the volume for 1836, in which are the first reports relative to the cotton culture in India, he had carefully examined all the reports to 1846, and would proceed to examine these subsequently made. In the first paper upon the subject, the success in the culture of American cotton is attributed to the high intelligence of the overseers, mentioning also the peculiar adaptation of the very slender fingers of the Creoles for taking the cotton cleanly from the pod. After various experiments, at enormous expense, in the East Indies, for ten years, it was advised that the cotton produced, on account of the inequality of the length of the staple, and its extreme tenderness, be sent to the Canton market, being unfit for the British market. The failure was attributed, first, to the utter incompetency of the natives to be trained to neat and orderly work, and they say that nothing but the most strict oversight and perfect authority of the men who command over those that do the labor, can produce anywhere a successful crop to compete with the American cotton. The second difficulty was their periodical rainy and dry seasons; whereas here the Blue Ridge, extending from New York to Texas, is a regular provider of rains through all the period from the planting of the cotton until it is fully ripe, and the cotton region rarely suffers from drouth. Another remarkable fact is that while the cottons here improve under culture, in India they decline with improved culture. The reports also confirm the statement that the perrennial cottons are unfit for the market, and the culture of the cotton trees has been abandoned.

Dr. Stevens said that the characteristics of cotton may be best understood by considering its object, which is to preserve and distribute the cotton seed. The cell of the fiber is originally hollow; but collapses, which gives it a twisted and flattened form, thus introducing more air into the mass. One function of the flax fiber is to transmit silica to the plant. The silica is transmitted in the form of silicate of potash; and when the silica is used the potash is deposited between the cells of the fiber, or even within the cavities of the cells. The cotton fiber has no occasion for the introduction of silica or potash into it; and this is a radical distinction between the two. The cotton fibers radiate from the seed like those of the dandelion; and the consequence is that those on the same seed are all of equal length, giving it a uniformity of staple. Indeed all the cotton in the pod that ripens at the same time will be of equal length. From the peculiarity of the soil and climate of the United States, the seeds ripen almost simultaneously over a large extent of country; and all the cotton ripening upon the same day will be of equal length. During its growth, cotton requires an alternation of showers with hot weather; but when the pod begins to break, it requires a period of dry weather. Owing to the Appalachian system of mountains, these wants are supplied. The African continent, in its geographical and geological features, is more similar to the North American continent than any other upon the globe. In the interior of Africa, the cotton can be planted as successfully as in some portions of the United States; and probably there will yet be a cultivation of cotton in Africa second only to that of the United States. The uneducated labor of Africa is capable of raising about one bale of cotton to the individual. In the Southern States, the half-intelligent African is able to raise about three bales to the individual. But the intelligent German, upon the same soil and under the same circumstances, is able to raise about six bales to the individual; showing that it is intelligence after all which produces most cotton upon a given soil.

The President remarked that he should suppose from the appearance under the microscope, that the cotton fiber grew in the flattened form.

Mr. Haskell stated that cotton is extensively cultivated in Brazil, where there are about 4,000,000 blacks who can be taught to cultivate it.

Mr. Nash said that the difficulty in the East Indies, is that the climate is divided by the monsoons. The plant is well started by the rain of the first monsoon. Then comes the sirocco, when it needs rain; and in the fall, when it needs dry weather, the monsoon comes, and the rain is so violent as to destroy everything. The Alleghany range of mountains stops the trade winds, as the coast stops the tides; and the currents of air are deflected northward like the Gulf Stream, producing a climate such as is found nowhere else. In Eastern Africa and in Brazil, there is an approach to it, and cotton can be cultivated there; but it will be an inferior article. The electrical influences of the earth which affect this question are very unevenly distributed. Gold brought from Australia or Africa has no crystals; while American gold is full of them. He did not believe that any white man could grow as much cotton as a black man with a white man over him.

Mr. Seely remarked that the specimen of Peruvian cotton was probably from milkweed, and came from Peru, Ill.

Mr. Bartlett said that he should wish, when the question should come up again, to make some statements and to correct some erroneous statments which had been made to-night.

ELECTRIC TELEGRAPH.

Mr. Dibben said that he had not yet reached any satisfactory solution of the question of the origin of the additional power in Mr. Holcomb's combination of the permanent and electro-magnets. With a battery force of two, and a positive force of four from the permanent magnet, upon combining the two the sum is not six, but about twelve, as shown by his latest experiments. So with other proportions. If the sum of the two forces, taken separately, is ten, taken together it will be about doubled, or twenty. He could only account for it upon the supposition—which, however, he was not prepared to accept—that the presence of the permanent magnet permits a quicker passage of a given battery force through the coil, and thus a greater force is generated in the battery by the consumption of a greater quantity of zinc.

Mr. Smith said that any two magnets would react upon each other when brought near together, and thus there would be a greater combined force than the sum of the forces of the two acting separately. The telegraphing apparatus of Mr. Hughes adopts the principle of using a permanent and an electro-magnet in connection with each other; and many other experimenters have used the same feature.

Mr. Churchill said that two permanent magnets, with a separate force of four each, would give a greater force than eight when combined. He suggested, as a reason, a molecular change produced in the steel. It has been found that soft iron, subjected to the influence of the Ruhmkorff coil, becomes so hard that it cannot be filed; whereas, upon removing it, it becomes soft again.

Mr. Eddy stated that Mr. Hughes merely neutralized the permanent magnet with the other, but did not make the two currents flow together, as Mr. Holcomb did.

Mr. Dibben said that he had alluded to Mr. Hughes in saying that something similar had been done, but not the same that Mr. Holcomb accomplishes.

Dr. Van der Weyde explained more fully the action of magnets upon each other. Take four steel magnets, carrying two pounds each, and put them together, and, instead of eight pounds, they would only carry about three pounds, because the similar poles being placed together, counteract each other. It is not possible to have a power out of a combination of horseshoe magnets equal to the sum of them all. In an electro-magnetic machine with seven magnets, each carrying alone sixteen pounds, the seven could scarcely carry fifty pounds. But if the magnets are placed end to end, the force will be more than doubled, for they react upon one another.

The President—Does this submit to Carnot's law?

Dr. Van der Weyde replied that he did not question that, but that there were some peculiar circumstances not to be overlooked in the influence of the magnets upon each other.

Mr. Dibben did not question the facts, but asked for the cause—whether it arose from an increase of battery action.

Mr. Smith and Dr. Van der Weyde stated that the battery action is increased.

The President—That brings it within Carnot's law.

Mr. Seely gave a historical account of various steps in telegraphing, commencing with the discharge of a current of electricity through 4 miles of wire, by Dr. Wilson, in 1747, and described the various methods attempted to be used; the signals being made by a pith ball, by the flashing of gunpowder, by the electric spark, by the decomposition of water, by the deflection of the magnetic needle, and some using 24 wires. Upon one plan, two clocks were to be used, going equally and marked with letters, the signal indicating the letter to which the index should point at the moment. As to Mr. Holcomb's invention, he should be disposed to add his name to the list. It may be that there is no increased consumption in the battery, or that the result may be explained by the concentration of the power where we can use it, being moved outward from the central portions of the magnet. There may be really no more force, but, being shoved along to the end, we may be able to use more of it. In our ordinary operations we do n t utilize all our power.

Mr. Holcomb believed that his combination of the electro and permanent magnets does not increase the consumption of the battery. The best proof of this is that a galvanometer placed in the circuit will not be affected by the action of the permanent magnet. The method of Ampère, deflecting a magnetic needle, was a combination of a permanent and an electro-magnet. Merely combining the two was not new. It was merely his peculiar combination which he supposed to be new. In former combinations, the power deduced is only the power of the electro-magnet without the permanent magnet.

Mr. Bartlett said that it was owing to the support given to Professor Morse by the American Institute that he was enabled to bring his invention before the public, and thus to introduce a practical American telegraph.

NEW SUBJECTS.

The subject selected for the next meeting is "The Effects of Alcohol upon the System in Large or Small Quantities."

The subject selected for the following meeting is "The Relation of Climate to Invention, and the Applications of Inventions," proposed by Prof. Mason.

On motion, the Association adjourned until half-past seven o'clock on Thursday evening the 21st inst.

Cricket Balls.—A new kind of cricket ball has been patented by H. Nicholson, Rochdale, England. He makes the body of cotton filaments, and covers it with gutta-percha, molded for the purpose, with the cotton for a core. Common cricket balls are made of worsted wound hard round a small core.

Electricity in Steam Engines.—Faraday's investigations of this matter showed that dry steam escaping from a small opening produces no electricity, and led to the conclusion that the electricity results from the friction of the small drops of water against the sides of the orifice.

Annual of Scientific Discovery.

We have received from the editor, David A. Wells, A.M., his "Year Book of Facts in Science and Art for 1861," and heartily commend it to our readers. It is a complete summary of the discoveries in all departments of science and the useful arts which have been made in the world during the past year. The subjects are divided under the following heads:—Mechanics and Useful Arts, Natural Philosophy, Chemical Science, Geology, Zoology, Astronomy and Meteorology. We give the following specimens of the varied contents of this little work:—

THIN CAST IRON.

At a recent meeting of the Manchester Philosophical Society, Mr. Fairbairn, the President, exhibited two large pans of cast iron, procured from China, where they are used for boiling rice. The metal, which is at the strongest part only one-tenth of an inch in thickness, possessed considerable malleability. The President remarked that the art of making such large castings of thin metal was unknown in England.

NEW MODE OF JOINING PIPES.

Mr. Siemens has exhibited at the London Institution of Civil Engineers a machine of his invention, manufactured by Messrs. Guest and Chrimes, for joining lead and other pipes by pressure only. The machine consisted of a strap of wrought iron, in the shape of the letter V, and of three dies, two of which were free to slide upon the inclined planes, while the third was pressed down upon them by means of a screw passing through a movable crosshead, embracing the sides of the open strap. The pipes to be joined were placed end to end, and a collar of lead was slipped over them. The collar was then placed between the three dies, and the pressure was applied by means of a screw key until the annular beads or rings projecting from the internal surface of the dies were imbedded into the lead collar. The machine was then removed, and a joint was formed capable of resisting a hydraulic pressure of eleven hundred feet. The security of the joint was increased by coating the surfaces previously to their being joined with white or red lead. The advantages claimed for this method of joining lead or other pipes, over the ordinary plumber's joint, were the comparative facility and cheapness of execution, as the cost of a joint of this description was said to be only about one-third or one-fourth that of the plumber's joint. A machine of a similar description was also used for joining telegraphic line wires, a specimen of which was likewise exhibited by Mr. Siemens.

CHROMEIDOSCOPE.

Under this name a new form of kaleidoscope has recently been brought out in England. The objects viewed, instead of being bits of colored glass, &c., are patches of floss silk of various colors, arranged on a spindle, capable of being drawn in and out and rotated, so as to make endless changes. The effect is very pretty, and, as any figure can be reproduced and kept stationary, the instrument is likely to be of use to designers for manufactured goods, as well as forming a pleasing optical toy.

THE DEBUSSCOPE.

This name has been given to a recent French invention, which consists of two silvered plates, highly polished and of great reflective power, placed together in a framework of cardboard or wood, at an angle of seventy degrees. On being placed before a small picture, a design of any kind, no matter how rough, or whether good or bad, the debusscope will reflect the portion immediately under the eye, on all sides, forming the most beautiful designs; and, by being slowly moved over the picture, will form new designs to any extent. The instrument gives the design in such a manner that it can be made stationary at pleasure, until copied. It is, therefore, an inexhaustible treasure to draughtsmen and others. Setting aside the utility of the debusscope altogether, it can be made the means of gratification in the drawing room, and, doubtless, will soon assume its proper place along with the microscope and stereoscope, as a source of amusement.

ON THE REGISTRATION OF SOUND VIBRATIONS.

The Abbé Laborde has recently devised the following plan for registering the vibrations of sound. To the ceiling of a room are fixed two rings, some six feet apart, and to these are suspended two wooden rules, about eight feet long. Their lower ends are fastened into a block of wood, which is connected with a pendulum, so that the vibrations may be registered on a piece of glass, the face of which is covered with smoke black. From this photographic impressions may be multiplied, if desirable, to any extent. This apparatus is much less costly than any other hitherto made for registering sounds, and is interesting, since it is an aid toward the invention of machines which shall gradually advance from registering sounds to registering syllables and words. As soon as the wit of man has invented a machine as delicate as the human ear, we can have reporting machines. The idea is certainly far less astonishing than that of the daguerreotype before its invention. If the vibrations of light, so much finer than those of sound, are made to register themselves with such wonderful accuracy, why may not the vibrations of sound be made to do the same.

ALUMINUM LEAF.

A Parisian gold-beater, Degousse, has succeeded in obtaining leaves of aluminum as thin as those from gold and silver. The aluminum must be reheated repeatedly over a chafing-dish during the process of beating. This leaf is less brilliant than that of silver, but it is not so easily tarnished as the latter. It is easily combustible, taking fire when held in the flame of a candle, and burning with an exceedingly intense white flame.

According to Fabian, the chemical lecturer will find aluminum leaf to be well adapted for exhibiting the characteristic properties of the metal. It dissolves, for example, with surprising rapidity in a solution of caustic alkali.

MEANS OF REMOVING THE RANCIDITY OF BUTTER.

Wild recommends that the butter should be kneaded with fresh milk and then with pure water. He states that by this treatment the butter is rendered as fresh and pure in flavor as when recently made. He ascribes this result to the fact that butyric acid, to which the rancid odor and taste are owing, is readily soluble in fresh milk, and is thus removed.—*Pharm. Jour.*

ANTIDOTE FOR PHOSPHORUS.

Poisoning by phosphorus is becoming common from the facility of procuring friction matches. It is, therefore, important that the antidote which has of late been found the most efficacious should be extensively known.

Messrs. Antonielli and Barsorelli have shown by numerous experiments on animals:—

1st, That fatty matters should not be employed in poisoning by phosphorus, as these matters, far from preventing its action on the viscera, on the contrary, increase its energy, and facilitate its diffusion through the economy. 2d, That calcined magnesia, suspended in boiled water, and administered largely, is the best antidote, and, at the same time, the most appropriate purgative to facilitate the elimination of the toxic agent. 3d, That the acetate of potash is extremely useful when there is dysuria in poisoning with phosphorus. 4th, That the mucilaginous drinks which are given to the patent should always be prepared with boiled water, so that those beverages may contain as little air as possible.

VENTILATION AND HEALTH.

In a recent lecture before the Royal Institution, on the relations of town architecture to public health, Dr. Drewitt stated that close bedroom air was an efficient cause of scrofula and consumption. Thirteen contagious diseases producible at will were enumerated; and the lecturer stated his belief that in time epidemic diseases will be made subject to human control; and that the surest mode of protecting the dwellings of the rich was to cleanse and ventilate the dwellings of the poor.

This work is published by Gould & Lincoln, Boston; Phinney, Blakeman & Mason, New York; George S. Blanchard, Cincinnati; and Trubner & Co., London.

Recent American Invention.

PRINTERS' GALLEY.

This invention relates to an improved means for securing the types in the galley, whereby the types may, by a very simple adjustment, be firmly secured in a proper position in the galley whatever the width of the columns or lines of types may be. The object of the invention is to dispense with the wedges, furniture, &c., hitherto employed for the purpose of securing the types in galleys, and to avoid the manipulation—frequently troublesome—of sorting cut wedges of different thickness to suit lines of types or columns of different width. This end is attained by the employment or use of sliding and stationary bars attached to galleys and forming a fixture thereof, provided with oblique lateral projections, and so arranged that by a longitudinal movement of one bar another is moved laterally, and made to clamp the type between it and a stationary ledge at one side of the galley. Stephen W. Brown, of Syracuse, N. Y., is the patentee of this invention.

The Next World's Fair of Industry.

We learn by our foreign exchanges it is now decided that another universal exhibition of industry will be held in London some time next year. A commission to hold it has been granted by Royal Charter, and about $1,500,000 have been subscribed by wealthy parties to construct a suitable building and carry on the enterprise. An architect has been chosen in the person of Captain Fowke, R.E. The buildings to be erected for the grand exhibition are divided by the designs adopted as follows:—

A, a building about 2,300 feet of picture gallery, varying from 55 to 35 feet wide, and from 70 to 60 feet high, to be built of brick. B, a hall about 550 feet long, 250 feet wide and 220 feet high, to be built chiefly of iron, wood, and glass. C includes the naves and transepts, about 2,200 feet long, 80 feet wide, and 100 feet high, and polygonal entrances, about 150 feet high, to be erected in iron, wood and glass. D consists of about 260,000 superficial feet of buildings, about 50 feet high, with galleries, built chiefly of iron, wood and glass. E consists of sheds of wood and glass, about 4,000 feet long, in widths of about 50 feet, and about 35 feet high.

The contracts have not yet been given out owing, it is stated, to the defective specifications of the architect; contractors refuse to make estimates upon them.

MONS. F. ATHLAND, division director of telegraph lines in France, has come to the United States, by order of Napoleon III., for the purpose of studying the various systems of telegraphing in this country, modes of insulating, the construction and working of the lines, as well as the method of keeping the accounts connected therewith. He has visited Phelps' manufactory of telegraph instruments in Williamsburgh, and was delighted with what he saw there.

THE UNITED STATES NAVY.—The statistics of the present state of our navy, which will be found on another page, have been very carefully prepared, expressly for the SCIENTIFIC AMERICAN, under the supervision of a gentlemen whose position has made him familiar with the subject, and the table may be relied upon for completeness and accuracy.

The New Commissioner of Patents.

It is announced that Hon. David P. Halloway has been appointed to the important office of Commissioner of Patents. This gentleman comes from the thrifty town of Richmond, Indiana, which numbers amongst its citizens many ingenious inventors and mechanics. We may therefore conclude that Mr. Halloway brings to this high office generous feelings toward those who will seek its protection, and who will look to him as the appointed conservator of their rights. Whenever the new Commissioner fairly gets the "hang" of his duties, he will be very likely to discover that the Patent Office needs some vigorous measures of reform to restore it to its former efficiency and popularity.

The *Washington Star*, in noticing this appointment, says: "It was settled in Cabinet council to appoint Mr. Halloway, of Indiana, late a member of the House of Representatives, to the position of Commissioner of Patents. Mr. Halloway is a man of clear head, excellent judgment, much energy of character, and unapproachable integrity. He is a mechanic rather than a lawyer, by profession, though through connection with general business and public trusts at home and here, he is sufficiently familiar with the principles of law (as shown in the manner in which he discharged the duties of his late position in Congress) to enable him to make a very successful administration of the important trust about to be confided to him."

It is generally known to our readers that an Appeal Board has existed in the Patent Office for a considerable time. It was constituted by Commissioner Holt with a view to facilitate the business of the Office, but until now it has had no *positive* legal standing. Under the new law this Board is legalized, and is to consist of three persons, who are to be appointed by the President, by and with the advice and consent of the Senate. They are designated as Examiners-in-Chief, and are to receive a yearly salary of $3,000 each. Next to the Commissioner, these offices are by far the most important in the Patent Office, and ought to be filled by true men, upon whose ability and integrity there rests not one film of doubt.

The Examiners who are now performing the duties of this Board are Messrs. D. C. Lawrence and A. B. Little, both of whom have given much satisfaction to all who have had business with this department of the Office.

Our readers will learn with much pleasure that the President has appointed Hon. Thomas C. Theaker, of Ohio, to the chairmanship of this new Board. We hope Mr. Theaker will accept the position, as he is admitted to be well qualified for it.

The two remaining appointments will settle the policy of the Patent Office for the next four years; they are therefore of much importance to the interests of inventors.

We would respectfully suggest to the President that the two vacancies ought to be filled by those who have had practical experience in connection with the duties of this Board. To appoint new and inexperienced Examiners would seriously retard the large amount of business that constantly presses upon this department, and thus injury would be done to the claims of many applicants.

MALLEABLE IRON.—Copper and brass unite together in various proportions, and form alloys possessing very diversified characteristics. Some of these are very brittle and unfit for common purposes when they are subjected to tensile strains; therefore it is of great importance to know the best proportions for obtaining the most serviceable alloy. This is believed to be what is commonly called "Muntz metal," which is composed of 60 per cent of copper and 40 of zinc. This alloy can be rolled either hot or cold, and also hammered and drawn. The copper is first melted in preparing it, and then the zinc added in small pieces. It is homogeneous in its fracture, whether it is cooled quickly or slowly; this is the test of the perfect combination of the two metals.

NEW SUBSCRIBERS.—Those who subscribe for the SCIENTIFIC AMERICAN can be furnished with the back numbers to make their volumes complete, by expressing a wish to receive them either at the time of subscribing or subsequently. During the balance of this volume we shall commence sending the papers from the time of receiving the subscription unless instructed to the contrary.

ISSUED FROM THE UNITED STATES PATENT OFFICE

FOR THE WEEK ENDING MARCH 12, 1861.

Reported Officially for the Scientific American.

*** Pamphlets giving full particulars of the mode of applying for patents, under the new law which went into force March 4, 1861, specifying size of model required, and much other information useful to inventors, may be had gratis by addressing MUNN & CO., Publishers of the SCIENTIFIC AMERICAN, New York.

648.—J. H. Bell, of Chelsea, Mass., for an Improved Stove-Pipe Connection:

I claim the specified improved stove-pipe connection, as composed of the box, A, and the two adjustable joints, B C, constructed, arranged and combined together, substantially in manner and so as to operate as explained.

649.—I. A. Benedict and G. W. Cummings, of Conneaut, Ohio, for an Improved Ditching Machine:

I claim the inclined rotating shovels, k k k k, constructed as described, in combination with plow, G, inclined and curved guard, H, and the inclined side guard, I, all arranged and operating as and for the purposes set forth.

[This invention relates to an improvement in machines for forming ditches through land for the purpose of drawing off water, whereby the earth is rapidly plowed up, elevated to the surface, and thrown off at a proper distance from the side of the ditch by the operation of rotary shovels or elevators and inclined guards.]

650.—L. D. Burch, of Sherburn, N. Y., for an Improvement in Plows:

I claim, first, The perforated colter, A, nearly balanced on its axis of oscillation braced and supported at its upper end, so constructed and arranged as that it may be adjusted vertically and laterally by an attendant, and at the same time oscillate sufficiently to allow stone or other obstructions to pass freely between the point of the plow and the lower extremity of the colter, substantially in the manner and for the purposes set forth.

651.—Joseph Corduan, of Brooklyn, N. Y., for an Improvement in Lining Journal Boxes:

I claim the lining of a metallic journal box with horn, substantially in the manner described.

652.—Jonathan Creager, of Cincinnati, Ohio, for an Improvement in Machines for Turning Irregular Forms:

I claim the combination with the spindle, D, pattern, C, and gage, J, of a machine for turning irregular forms; of the cutter, G H I, having a hemispherical or approximately hemispherical contour and rotated on its axis at right angles to the axis of rotation of the spindle, D, substantially as and for the purposes set forth.

653.—J. A. Cutting, of Boston, Mass., for an Improvement in Aquariums:

I claim the combination of a tank or aquarium for containing water, fishes, aquatic plants, &c., with a reservoir of air, said reservoir so operating as to gradually force into and keep up a supply of air in the said tank, as set forth.

654.—R. Daniels and G. P. Cobb, of Woodstock, Vt., for an Improvement in Bee-hives:

We claim providing the removable and replaceable comb frames, constructed as described, with guide blocks, for so guiding all portions of these frames in placing them in and taking them out of the hive, as to prevent the comb in the frames, and the frames themselves from contact with the hive or comb and honey of the next contiguous frames and preventing the bees uniting their comb to both hive and frame.

We also claim providing the comb frames with small wires for effectually sustaining the comb, and around and on to which the bees may build and unite their comb without impeding their progress.

We also claim providing the comb frames with movable needles for securing the comb after being placed therein from the common hive.

We also claim providing the comb frames with their ribs, L, fixed around and on the inside and central portion of the comb frame to facilitate the commencing of the comb by the bees, and continuing their work, and in securely retaining the comb when sawed.

655.—F. P. Dimpfel, of Philadelphia, Pa., for an Improvement in Friction Gearing for Machinery:

I claim, first, The application and use of friction gearing, constructed and arranged in the manner and for the purpose described.

Second, I also claim the described arrangement in combination with a blower, for the purpose of economizing space and power.

656.—Levi Dodge, of Waterford, N. Y., for an Improvement in Forming and Punching Articles of Irregular Forms:

I claim in the manufacture of axes of a swelled form, punching the eyes of the same when enclosed in conforming dies made to open and close upon such swelled forms, substantially in the manner set forth.

I also claim combining the punch with said dies in the manner set forth.

657.—A. S. Eastham, of Wharton, Texas, for an Improvement in Cotton Cleaners:

I claim the brush cylinders, D G J, brush boards, E F H I, and the oblique boards, K, arranged relatively with each other, as shown, in connection with the combined fans and brush cylinders, O' O O, stripping boards, Q, and concave screens, L L' P, and card or brush cylinder, M, all arranged for joint operation, substantially as and for the purpose set forth.

[This invention consists in the employment or use of a series of revolving bush cylinders in connection with stationary brush and stripping boards and wire screens, whereby cotton, preparatory to ginning, may have dust, dirt, hulls and all foreign substances separated from it.]

658.—W. B. Goodrich, of Ashley, Ohio, for an Improvement in Apparatus for Evaporating Sugar Solutions:

I claim the employment of the supplementary pan, B, raised above the bottom of the main pan projecting beyond the fire space provided with an inclined bottom, and separated from said main pan, A. by means of a guaze partition, D, for the purpose of preventing the scum and sediment from mingling with the body of the sirup when agitated by ebullition, substantially as specified.

659.—Walter Hart, of Philadelphia, Pa., for an Improved Egg-beater:

I claim the tube, B, its screw thread, the nut, D, and beaters or dashers, b, in combination with the internal rod, G, and its disk or button, e, the whole being constructed and arranged substantially as and for the purpose set forth.

660.—L. W. Hayden, of Wilkesbarre, Pa., for an Improved Machine for Crimping Boots:

I claim the employment of the rack bar, G, and the bars, D D, as constructed, the clamps, a a, the straps, d d, the treadle, e, clamp, E, chuck, R, and set screw, N, arranged and connected to form a machine for crimping leather, substantially as specified.

661.—C. W. S. Heaton, of Salem, Ill., for an Improvement in Cultivators:

I claim the arrangement of the slotted adjustable crosspieces, B B', reversible adjustabe braces, F F', and adjustable standards, D D', with the curved main beam, A, deflecting rod, i, and crosspieces, C C, in the manner and for the purposes shown and described.

[The object of this invention is to provide the means for conveniently adjusting the shovels of a cultivator in a lateral as well as in a longitudinal direction, and to change the position of the braces, which serve to steady the shovels, according to the nature of the work to be performed.]

662.—C. H. Helms, of Poughkeepsie, N. Y., for an Improved Machine for Trimming Heels of Boots and Shoes:

I claim the arrangement of the heel plate, I, and centering pin, b, with the rotary cutters, G, in the manner and for the purposes shown and described.

I also claim the arrangement of the cutter stock with the carriage, B, as shown and described, that is to say, the stock passing through a slot in the carriage, but leaving the cutter free to move, all as set forth.

663.—I. G. Inskeep, of West Middleburgh, Ohio, for an Improvement in Field Fences:

I claim the upper and lowermost notched boards or strips, a, of the panels in connection with the adjustable reversely notched boards or strips, a', and the wedge, B, arranged substantially as and for the purpose set forth.

664.—G. W. Jennings, of Boston, Mass., for an Improvement in Mowing Machines:

I claim the arrangement of the cam wheel, E, shaft, e, driving wheels, B B, bed plate, A, and cutters, D D', provided with the arms and friction rollers, b and c, working in the cam groove, a, the several parts being combined in the machine and operating in the manner and for the purpose specified.

665.—J. H. Landis, of Eden, Pa., for an Improved Meat Chopper:

I claim the chopper-fulcrum, G, revolving on pins, H, in combination with the lever-arm, F, and its strap, I, and hook, J, when made substantially as set forth for the purpose specified.

666.—H. J. Lombaert, of Philadelphia, Pa., for an Improvement in Draught Bars for Railroad Cars:

I claim a draught bar for railroad cars, consisting of the rigid bar or bars, D, buffer heads, F F, and springs, E E, the same being constructed and arranged together in combination with the bolsters, B B, so as to operate in the manner described.

667.—M. B. Lord and S. J. Lord, of Ellsworth, Maine, for an Improvement in Brakes for Sleighs:

We claim the arrangement of the cams, d, pivoted to the end of the sliding arms, E, and operating in combination with the cranks, a, and with the draught-pole, D, in the manner and for the purpose specified.

[This invention consists in the arrangement of two hinged cams or teeth, one on each runner, and connected to arms which are attached to the draught-pole in such a manner that said teeth are forced down into the ground as soon as the sled, in going down hill, crowds in upon the team, and that, in backing or turning, said cams do not interfere with the motion of the sled.]

668.—John Loudon and H. Iversen, of New York City, for an Improvement in Ventilators for Windows:

We claim the metallic sockets, a a, formed with eyelet centers, secured in a metallic frame and receiving slats, c c, of glass, or other material, as set forth.

We also claim the bar, d, attached to said metallic sockets, a a, by the eyelet centers, 2 2, as set forth, for moving the said slats to open or shut the same, as specified.

669.—G. A. Mitchell, of Turner, Maine, for an Improved Tip for Boots and Shoes:

I claim my described boot and shoe tip, constructed, slotted and applied essentially in the manner and for the purposes fully set forth and described.

670.—P. C. Perkins, of Waterford, N. Y., for an Improved Punching and Shearing Machine:

I claim the construction of the frame, A, with a series of bolsters, C, and the frame, B, with a series of crossbars, e, to carry, respectively, punches, dies, stampers or shears, when the above parts are arranged to operate together in the manner shown and described.

[This invention consists in having a reciprocating frame provided with crossbars, having benches and shears attached, and fitted within a suitable stationary framing provided with bolster plates and cutters, the parts being so arranged that several punches and sets of shears may be operated simultaneously, and any one used separately, or two or more used simultaneously, as may be required.]

671.—Byron Rice, of Schuyler, N. Y., for an Improvement in Grain Separators;

I claim, first, The arrangement of the sieves, I I', concave, D, provided with arms, F, cams, N, and lever, M, in the manner and for the purposes set forth.

Second, The combination and arrangement of adjustable concave, D, crooked prongs, H H, and guard, R, operating in connection with the shaking shoe, J, in the manner and for the purpose set forth.

[This invention consists, in the first place, in a simple and effective device for imparting a rapid vertical shaking motion to the shoe in grain separators; and, secondly, in a new and improved construction of rake and its accessories for separating the grain and chaff from the straw.]

672.—M. M. Rounds, of New Haven, Conn., for an Improvement in Furnace Grates:

I claim the improved grate or combination of stationary comb grates and rocker grates, arranged in relation to each other and made to operate together substantially in manner and for the purpose as described.

673.—Isaac Rulofson and D. De Garmo, of Rochester, N. Y., for an Improvement in Plows:

I claim the arrangement of the beam, B, plate, f, rests, u and v, slots, c, and clamping bolts, b, the whole being constructed substantially in the manner shown and described.

674.—A. T. Serrell, of New York City, for an Improved Binding Roller for Rotary Planers:

I claim the feed rollers, g, formed with serrations upon its edge which are oblique to the surface of the bed upon which the wood moves, so that the action of the rotary cutter upon said wood shall cause the same to remain firmly upon said bed, as set forth.

I also claim the rollers, e e, in combination with the aforesaid serrated roller, g, and rotary cutter, c, in the manner specified for the purpose of planing curved moldings, as set forth.

675.—J. P. Simmons, of Fulton, N. Y., for an Improvement in Packings for Barometers:

I claim the described process of preparing chamois leather, or equivalent material, to serve as a packing for hermetically sealing the joints of barometers, and other similar purposes, substantially as specified.

676.—J. S. Smith, of Brooklyn, N. Y., for an Improvement in Cartridge Boxes:

I claim the employment, in combination with a cartridge box, C, of a tin case, A, constructed of a series of slotted vertical tubes, B, substantially in the manner and for the purpose specified.

And I also claim the described manner of constructing the tubes, B, out of corrugated strips, b, connected by staples, c, as set forth.

677.—David Sprague, of Elizabethport, N. J., for an Improved Punching Machine:

I claim the removable die, F, with a slot, f, in combination with the cam, a, on main cam shaft, B, the whole constructed and operating as described for the purpose set forth.

678.—J. B. Turner, of Jacksonville, Ill., for an Improvement in Cultivators:

I claim, first, The arrangement of the frame, A, with the draught-pole, B, triangular frame, D, and bar, C, substantially as shown, to admit of the independent lateral movement of the frame, A, as set forth.

Second, The arrangement in the described connection with a cultivator of the double tree, E, and stirrups, G G, connected by chains, F, the stirrups being fitted loosely on the rod, H, at the front part of the frame, A, to prevent the draught mechanism interfering in the least with the adjusting movement of frame, A, and to render the line of draft perfectly adjustable.

Third, The combination of the hinged guard frame, K, chain, p, and seat, I, constructed, arranged and operating in the manner and for the purposes set forth.

Fourth, The combination of the curved bars, O and w, and sliding collar, P, constructed and operating as described to adjust the hight of of the plows, K''.

Fifth, The employment or use of the adjustable cutters or scrapers, L L, applied to the frame, A, and in front of the rollers, M M, for the purpose set forth.

Sixth, The arrangement of the driver's seat, I, with the cultivator frames, J J, and guard frame, K, attached in connection with the adjustable bar, q, as and for the purpose specified.

[This invention has for its object the cultivation of crops in a mature state of growth without injuring the plants by any parts of the machine coming in contact with them; and also so constructing and arranging the frame that the same may be placed under the complete control of the operator, a guiding movement being allowed it independently of the team. The invention has further for its object the complete cultivation of crops grown in hills or drills, the soil between the latter being perfectly acted upon, and at the same time the plants protected from clods of earth, trash or substances which, in the use of ordinary cultivators, are liable to fall on them.]

679.—William Strieby, of Wagontown, Pa., for an Improvement in Cultivators:

I claim the beam, A, its teeth, e and f, and its hinged shares or vanes, h and h'; the latter being rendered adjustable by the hooked rods, i, and perforated plate, j, and their teeth, m and n, when the said beams are so connected to the beam, A, as to be adjusted laterally as well as vertically by means of the devices described or their equivalents, and when the whole of the above-mentioned parts are arranged as and for the purpose set forth.

680.—G. A. Walker, of Annville, Pa., for an Improvement in Plows:

I claim the arrangement of the detachable and reversible plow point, B, with land side recess, D, said point having a tapering shank, C, with concave upper and lower edges, d d, and being otherwise constructed as described.

681.—P. P. Warriner, of Holland Patent, N. Y., for an Improved Table:

I claim the combination of the levers, E, and knob, F, with the buttons, G, curved bars, C, and leaves, A, in the manner and for the purposes shown and described.

[The object of this invention is to obtain a table leaf support which will adjust itself in proper position to support the leaf when the latter is raised, and at the same time admit of being readily released so as to allow the leaf to fall when desired.]

682.—Cyrenus Wheeler, Jr., of Poplar Ridge, N. Y., for an Improvement in Reaping and Mowing Machines:

I claim the combination of the hinged shoe, H, and pivoted plate, G, for allowing the finger bar connected with said shoe to be folded to or around by the main frame and be supported by and carried on its hinges, substantially as described.

I also claim the combination of the two frames, A P, connected to the same axle, the former supporting the gearing and cutting apparatus, and the latter extending rearward and by means of its caster supporting the driver or conductor and a raising and lowering apparatus, for raising, lowering or suspending the frame, A, upon itself, substantially as described.

I also claim the combination of the pivoted plate, G, carrying the finger bar, the stationary plate, F, the guides, r s, and the lever, w, for allowing one plate to move freely and truly upon the other, and for holding them rigid when desired, substantially as described.

I also claim the clutching and unclutching mechanism composed of the obliquely-slotted stationary plate, j, the inclined movable plate, o, with its flange p, and the lever, l, arranged substantially as described.

I also claim, in combination with a hinged finger bar and platform that are free to rise and fall at their outer ends, and that carry the reel supports, a belt guide on the main frame, to prevent the end motion of the reel shaft from throwing the belt off from its driving pulleys, substantially as described.

I also claim, in combination with the pivoted lever, I, and its catch pin and foot, 40, resting upon the shoe, H, the hinged hook and latch, y, for catching in one position and holding the lever and finger bar in another position, substantially as described.

I also claim the manner of holding the cutter plate, 18, in place by means of its own projections and those upon the upper part of the finger, substantially as described.

I also claim hanging casters to one side of a shank that is, in turn, hinged by an inclined pivot pin, so that they will freely swing around to ease the machine in turning, and be easily got at to be cleaned of all grass or straw that may wind around them or their journals, substantially as described.

I also claim, in combination with a hinged track clearer, the lock, 11 12, for the purpose of making said track clearer rigid or flexible as occasion may require, substantially as described.

683.—E. S. Willson, of Saratoga Springs, N. Y., for an Improvement in Safety Ships:

I claim a refuge cabin in combination with the layers of cement and water bed, air boxes, and device for ventilation—the whole constructed and all its parts arranged substantially as specified.

684.—S. W. Brown, of Syracuse, N. Y., assignor to himself and J. McComber, of Watertown, N. Y., for an Improvement in the Method of Locking Type Galleys:

I claim the arrangement, in the construction of a printer's galley, of the parts, B C D E F, oblique slots, e e, guides, d d, slots, g g, and screws or pins, f f, in the manner and for the purposes described.

685.—E. S. Holmes (assignor to O. E. Holmes and William Perrigo), of Wilson, N. Y., for an Improvement in Machines for pressing Fruit in Barrels, &c.:

I claim the link, E E, or its equivalent, operating in combination with the lever, A A, and the plunger, C D, in the manner and for the purpose substantially as described.

686.—Jacob Jenkins, of Lynn, Mass., assignor to J. C. Stimpson, W. D. Waters, and M. W. Sheperd, of Salem, Mass., and G. W. Keene, of said Lynn, for an Improved Machine for Applying Heels to Boots and Shoes:

I claim, first, The rotary heel bed, O, provided with the nail holes, P', and operating as described, in combination with the plungers, P and arm, M, or its equivalent, for the purpose specified.

Second, The combination and arrangement of the adjustable swinging arm, K, shaft, H, frame, B, spring, J, and connecting rod, L, substantially as and for the purposes described.

Third, The combination and arrangement, substantially as described, of the rotary heel beds, O and F, rotating frame, B, arm, K, and lever, D, for the purpose of compressing the lifts and sole, and holding the heel in any desired position for finishing the edge.

Fourth, The use of the rubber or elastic cushion, G, as and for the purpose set forth.

Fifth, In combination with the punch, 8, the centering arms, 4 5 6, sliding yoke, 7, and adjustable yoke, 2, substantially as described and for the object specified.

687.—George Juengst (assignor to J. McCrossan and T. J. McArthur), of New York City, for an Improvement in Sewing Machines:

I claim, first, The arrangement of the shafts, cranks and link, as set forth, for operating the take-up and needle, so as to leave the loop of the needle's thread in proper position and condition for allowing the shuttle to pass freely and safely through.

Second, The take-up attached to the connecting rod of the needle bar, and so arranged, in relation to the two stationary guides, as to control the thread through all its movements and tighten the stitch, as described.

Third, Regulating the feed by the screw and stud, the two being in contact at all times, and operating as described.

688.—E. R. Pease, of Poughkeepsie, N. Y., assignor to R. P. Pease, of Brooklyn, N. Y., for an Improvement in Mowing Machines:

I claim the dividing lever, I, arranged in relation to the main frame and driver's seat substantially as described, for operating the finger bar in the manner and for the purpose set forth.

689.—G. B. Phillips (assignor to J. S. Littell), of Newark, N. J., for an Improved Wagon Wrench:

I claim, as a new article of manufacture, the wrench described in the foregoing specification and represented in the accompanying drawing.

690.—Arcalous Wyckoff and Lafayette Stevens, of Elmira, N. Y., assignors to Arcalous Wyckoff aforesaid, for an Improvement in Hollow Augers:

We claim constructing the cutter head of annular augers by the combination of two rings, first accurately fitted together by annular tongue and groove respectively on and in the adjacent surfaces thereof, and then, by dividing one ring into sections or separate cutters, d d, and properly finishing and hardening them, while the other ring, f, remains entire and unchanged from its original accurate form, so that, upon attaching the sections to the entire ring by screws or otherwise, unerring accuracy of form and perfection of parts are secured, substantially as specified.

We also claim the advance blunt terminal point, m, of the prime cutter, i, constructed and operating substantially in the manner and for the purpose shown and described.

RE-ISSUE.

45.—D. W. Shares, of Hamden, Conn., for an Improvement in Harrows. Patented Jan. 27, 1857:

I claim a series of coulter teeth, H, formed substantially as specified, and arranged diagonally to the line of motion, so as to form a harrow that loosens, mollifies and harrows the soil, as described.

I also claim the tooth, G, at the front end of the center bar, formed with two divergent wings, in combination with a series of harrow teeth, H, on the diagonal bars, B'B', as set forth.

ADDITIONAL IMPROVEMENTS.

317.—Douglas Bly, of Rochester, N. Y., for an Improvement in Attaching Thills to Vehicles. Patented April 12, 1859:

I claim the tightening block, D, in combination with the movable collar, G, and nut, H, substantially as and for the purpose specified.

318.—S. B. H. Vance, of New York City, for an Improved Electrical Apparatus for Lighting Gas. Patented Feb. 5, 1861:

I claim the employment or use of the stationary electric machine, as described, in place of the lamp, candle, taper, or other match, generally used for lighting gas.

EXTENSION.

E. B. Bigelow, of Boston, Mass., for an Improvement in Brussel Looms. Patented March 20, 1847; re-issued Sept. 11, 1849:

I claim, first, Giving to the two parts of the mechanism—that which weaves the cloth or forms the body of the fabric, and the one which operates the figuring wires—a separate and distinct organization, substantially as described, when these are connected and confined by an intermediate mechanism which shifts the motive or driving power from one to the other, substantially as described; and, in combination with this, I also claim the employment of two brakes to arrest the momentum of the moving parts, to prevent any conflict in the operations of the two parts of the mechanism.

Second, I claim, in combination with a loom for weaving such looped fabrics as designated, the employment of a box, trough, or the equivalent thereof, for receiving and holding the figuring wires preparatory to their being introduced under the figuring warps, substantially as described.

Third, I claim the fingers, or their equivalents, which receive the figuring wires from under the pile or figuring loops, in combination with the trough box, or the equivalent thereof, into which they are deposited preparatory to the introduction of them under the figuring warps, substantially as described.

Fourth, I claim, in combination with the mechanism which withdraws the figuring wires from under the pile or figuring loops, the finfiers, or their equivalent, for transferring the said wires to the trough or the equivalent thereof, from which or by which they are transferred to the open shed of the figuring warps, substantially as described.

Fifth, I claim the method, substantially as described, of introducing and dropping the figuring wires in the open shed of the figuring warps, as described.

Sixth, And finally I claim the method, substantially as described, of supporting the figuring wires in the opening shed of the figuring warps when they are being introduced, as described.

Notes & Queries

T. D. A., of N. Y.—Your siphon will keep the water in your two tanks at the same level. The water will not separate in the middle of the siphon when the water comes to a level as your friends affirm.

G. L. P., of N. Y.—Leaves may be reduced to skeletons and made perfectly white by first pouring some boiling water over them in a suitable vessel, then exposing them in a pan placed in a moderately warm situation until they ferment. After this the pulpy parts can be easily removed with the thumb and fingers, so as to leave the skeleton only. This is now bleached by immersion in weak chloride of lime, or by smoking it with the fumes of burning sulphur in a close wooden box. The operation requires patience and care, but is not difficult to perform. The leaves of trees containing tannin or resin are unsuited for making phantom bouquets; oak, willow, pine, &c., are therefore not well adapted to such purposes.

C. F., of Ohio.—There have been several patents taken out for machines for dressing millstones.

E. C. C., of Ohio.—We are not able to give you the price of peanut oil in this market.

B. F. W., of Conn.—We are not familiar with the rules and regulations of the West Point Military Academy.

W. C., of Ill.—We do not remember the name of the patentee of the lock which you describe. We could probably ascertain by making a preliminary examination, which we advise. The work to which you refer was published by Blackie & Son, of this city.

C. W. S. H., of Mass.—Gouge-formed grooves, as substitutes for square grooves in rifles, are old, and in many instances have been used. We have a diagram of a rifle that was made with such grooves 16 years ago. According to the opinion of Colonel Jacobs, an author on rifled firearms, three grooves are just as good as five or six. The French rifle pistols are made with triangular grooves, which are perhaps better than either the square or rounded grooves.

G. W. M., of C. E.—The atmosphere is diathermic, that is to say, it allows the rays of heat to pass through it; but this is not the case with brick. Hence, a chimney becomes heated by absorbing the sun's rays, and transmitting the heat to the air within, rarifies the air and produces an upward current.

W. B. M., of Mass.—Address Charles A. Seely, No. 424 Broadway, this city, for the price of the photographs you inquire about.

C. P., of Ind.—Iron to be placed in water may be prevented from corroding by coating it with zinc. We know of no paint better than that made from lead for preserving wood.

W. F., of Va.—There are so many rifles, each claiming to be the best, that we must let you select for yourself.

C. P. K., of Cal.—The objection to the use of water from city works as a motor is that it is too expensive.

J. R. L., of Ind.—Rotary engine motion would be preferred by machinists were it not for mechanical difficulties, one of which is the difficulty of packing without great increase of friction. There would be no gain, however, from "lever power"; what is gained in power is lost in time.

W. C. D., of Fla.—We advise you to buy a steam engine. If the wind in your locality is sufficiently constant, a windmill might answer your purpose, but you would probably find it a source of constant vexation.

A. J. W., of Conn.—About 60 per cent of the power is all that you will probably get from an overshot wheel as usually constructed. Stevenson's turbine yielded, at the trial at Philadelphia, 87 per cent. Turbines, however, are not adapted to work in which there are great changes in the amount of power required. Your several improvements could probably be embraced in one patent, though this would depend on the circumstances of the case.

C. C., of Ill.—Whether the water you speak of will produce foam in a steam boiler could be most readily ascertained by trying it. Sulphuric acid would be injurious to your boiler unless the quantity was very minute.

O. C. H., of Conn.—Smee's "Electro-metalurgy," published by John Wiley, No. 56 Walker-street, this city, is the work you want.

W. N. R.—We know of no work on the manufacture of corn starch. You will find articles on the subject on pages 151, 167 and 181, Vol. II. (new series), of the Scientific American.

S. S. R., of Tenn.—You can get the combined iron and steel plates made in large quantity at the Novelty Works or the Allaire Works, in this city, and we have no doubt that there are plenty of establishments in Cincinnati and St. Louis which would fill your order. The price would depend on the quality of steel that you require.

J. M. L., of Mich.—To enable electricity to pass to a distance through an imperfect conductor, it must possess high intensity, while for chemical decomposition its power is in proportion to the quantity. The Ruhmkorff coil will charge a Leyden jar the same as an electrical machine. 80,000 feet of No. 32 copper wire have been used by Ritchie, of Boston, in the construction of one of these coils. This projected a shower of sparks 16 inches in length. The power of the magnetic machine described would depend on its size.

S. C. S., of Mass.—Take a strong solution of logwood and mix it with some common lac varnish, and you will obtain a quick drying stain for wood. The black enamel which you have noticed on certain wooden articles is produced by several coats of paint, rubbed down after drying, and then varnished and polished.

C. D., of La.—We advise you to communicate directly with Mr. Kase respecting his rice mill. We think it is a good improvement.

J. W. P., of Mass.—You will find the process of enameling hollow iron ware described on page 318, Vol. XIV. (old series), of the Scientific American.

J. D. A., of N. Y.—You can distil bituminous shales and obtain oil from them by admitting highly heated steam into the retort among the shale and then condensing the products of distillation. This method of distilling such substances is not patented; it is an old process, and may be remunerative in your hands.

E. F. A., of Mo.—We have seen machine-made bricks equal in quality to any made by hand. Those who informed you to the contrary must be mistaken.

Money Received

At the Scientific American Office on account of Patent Office business, for the week ending Saturday, March 16, 1861:—

J. R., of N. Y., $15; O. H. & M. R. B., of Mass., $25; A. M., of N. Y., $500; L. C., of N. J., $10; C. M., of Conn., $100; J. G., of Mass., $25; M. & B., of Conn., $40; R. R., of N. Y., $65; H. McD., of Pa., $25; J. B. D., of Mass., $15; M. D. B., of Cal., $22; E. G., of Mass., $10; J. O. F., of Mass., $10; G. L. T., of N. Y., $15; H. C. H., of Ill., $60; M. & C., of Pa., $15; J. P. S., of N. Y., $10; G. P. W., of N. Y., $15; M. F., of N. Y., $40; G. T. L., of Pa., $25; R. T., of N. Y., $15; P. H., of Mo., $20; J. N., of N. Y., $25; N. H. B., of Ill., $35; B. & H., of N. Y., $40; D. R., of N. Y., $30; W. D. L., of N. Y., $35; T. H. M., of La., $55; J. N., of N. Y., $10; E. F. F., of Tenn., $150; R. R., of N. Y., $55; C. M., of N. Y., $15; H. McK., of Ala., $30; G. M., Jr., of Ill., $10; L. H. A., of Mass., $15; D. B., of Ill., $25; W. M., of N. Y., $30; B. J., of Mass., $35; T. S. B., of N. Y., $30; F. W. Y., of Ohio, $25; C. & W. R., of Mass., $15; J. V. B., of N. J., $10; P. G. B., of Cal., $25; L. A. B., of N. Y., $40; W. H., of Pa., $25; F. H., of Mass., $25; G. M., of N. Y., $25; V. C., of Va., $25; L. D. B., of N. Y., $40; C. A. W., of Mass., $25; T. P., of Ill., $25; J. H. B., of N. J., $100; C. V., of N. Y., $15; M. T. G., of Ill., $30; S. J., of N. J., $10; E. H. L., of N. Y., $25; C. C. H., of N. Y., $25; T. D., of Iowa, $30; S. R. D., of N. Y., $15; P. C., of N. Y., $15; W. C. C., of Wis., $30; C. & S., of N. Y., $10; E. L., of L. I., $10; E. L. W., of Pa., $30; A. M., of Pa., $15; F. C., of N. Y., $15; A. D., of Oregon, $35; D. P., of Iowa, $30; W. & L., of N. Y., $30; J. M. H., of Cal., $25; G. I. M., of Conn., $25; G. H. C., of N. Y., $25; W. H. N., of N. Y., $55; D. E. T., of N. Y., $25; N. & B., of Mass., $22; J. M. B., of N. Y., $10; G. B. T., of N. Y., $22.

Specifications, drawings and models belonging to parties with the following initials have been forwarded to the Patent Office during the week ending March 16, 1861:—

[The patents on these cases, when issued, will be granted for seventeen years under the new Patent Law.]

J. G., of Mass.; O. H. & W. R. B., of Mass.; D. R. P., of Conn.; W. & L., of N. Y.; R. R., of N. Y.; H. McD., of Pa.; C. P. W., of N. Y.; H. C. S., of Ohio; E. F. H., of Ill.; A. D., of Oregon; L. D. B., of N. Y.; G. H. C., of N. Y.; I. V. B., of N. J.; L. & K., of Iowa; L. C., of N. J.; G. B. T., of N. Y.; J. R. R., of Mass.; H. McK., of Ala.; E. G., of Mass.; N. H. B., of Ill.; J. H. Van R., of N. Y.; G. T. L., of Pa.; M. F., of N. Y.; F. W. Y., of Ohio; V. C., of Va.; T. P., of Ill.; T. H. M., of La.; J. N., of N. Y.; E. H. L., of N. Y.; D. B., of Ill.; C. C. H., of N. Y.; J. O. F., of Mass.; M. D. B., of Cal.; S. J., of N. J.; W. H., of Pa.; W. D. L., of N. Y.; C. & S., of N. Y.; J. P. S., of N. Y.; W. H. N., of N. Y.; J. M. B., of N. Y.; N. & B., of Mass.

New Books and Periodicals Received.

The American Journal of Science and Art—Conducted by Professors B. Silliman, B. Silliman, Jr., and James H. Dana, in connection with Professor Asa Gray and Professor Louis Agassiz, of Cambridge, and Dr. Wolcott Gibbs, of New York. Published by the editors at New Haven, Conn.

This old established and substantial bi-monthly journal continues to present to its readers the latest discoveries in every department of science, all treated in the most profoundly learned style. The March number contains some letters from the eminent French palæontologist, J. Barrande, which tend very strongly towards settling the old dispute between Dr. Emmons and Professor Hall, in favor of Dr. Emmons.

Notes on Screw Propulsion.—By W. M. Walker, Commander, U. S. N. Published by D. Van Nostrand, No. 192 Broadway, this city.

This is a little sketch of the history of screw propulsion, from the first efforts of John Stevens, of Hoboken, in 1804, down to the present time. Captain Ericsson receives the credit of practically introducing the system.

North British Review.—Published by Leonard Scott & Co., Gold-street, this city.

This periodical is a representative of the Free Presbyterian Church of Scotland, and is second to none of the great British quarterlies. The number for the present quarter contains a long list of very able articles, and one on "Engineers and Engineering," by Sir David Brewster, is of the most instructive and interesting character to men of science.

Important Hints to Our Readers.

Back Numbers and Volumes of the Scientific American.—Volumes I., II. and III. (bound or unbound) may be had at this office and from all periodical dealers. Price, bound, $1.50 per volume by mail, $2—which includes postage. Price in sheets, $1. Every mechanic, inventor or artisan in the United States should have a complete set of this publication for reference. Subscribers should not fail to preserve their numbers for binding.

Patent Claims.—Persons desiring the claim of any invention which has been patented within thirty years, can obtain a copy by addressing a note to this office, stating the name of the patentee and date of patent, when known, and inclosing $1 as fee for copying. We can also furnish a sketch of any patented machine issued since 1853, to accompany the claim, on receipt of $2. Address MUNN & CO., Patent Solicitors, No. 37 Park Row, New York.

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of the State lies within the zone of the cotton regions, while the soil is admirably adapted to the growth of tobacco and hemp; and the wheat is worth from fifteen to twenty cents more per bushel than that raised further North.

RICH ROLLING PRAIRIE LANDS.

The deep rich loam of the prairies is cultivated with such wonderful facility that the farmers of the Eastern and Middle States are moving to Illinois in great numbers. The area of Illinois is about equal to that of England and the soil is so rich that it will support twenty millions of people.

EASTERN AND SOUTHERN MARKETS.

These lands are contiguous to a railroad 700 miles in length, which connects with other roads, and navigable lakes and rivers, thus affording an unbroken communication with the Eastern and Southern markets.

APPLICATION OF CAPITAL.

Thus far, capital and labor have been applied to developing the soil; the great resources of the State in coal and iron are almost untouched. The invariable rule that the mechanical arts flourish best where food and fuel are cheapest, will follow at an early day in Illinois, and in the course of the next ten years the natural laws and necessities of the case warrant the belief that at least five hundred thousand people will be engaged in the State of Illinois in various manufacturing pursuits.

RAILROAD SYSTEM OF ILLINOIS.

Over $100,000,000 of private capital have been expended on the rail roads of Illinois. Inasmuch as part of the income from several of these works, with a valuable public fund in lands, go to diminish the State expenses, the taxes are light, and must, consequently, every day decrease.

THE STATE DEBT.

The State debt is only $10,105,398.14, and, within the last three years has been reduced $2,959,746.80; and we may reasonably expect that in ten years it will become extinct.

PRESENT POPULATION.

The State is rapidly filling up with population; 868,026 persons having been added since 1850, making the present population 1,722,663—a ratio of 102 per cent in ten years.

AGRICULTURAL PRODUCTS.

The agricultural products of Illinois are greater than those of any other State. The products sent out during the past year exceeded 1,500,000 tuns. The wheat crop of 1860 approaches 35,000,000 of bushels, while the corn crop yields not less than 140,000,000 bushels.

FERTILITY OF THE SOIL.

Nowhere can the industrious farmer secure such immediate results for his labor as upon these prairie soils, they being composed of a deep, rich loam, the fertility of which is unsurpassed by any on the globe.

TO ACTUAL CULTIVATORS.

Since 1854, the company have sold 1,300,000 acres. They sell only to actual cultivators, and every contract contains an agreement to cultivate. The road has been constructed through these lands at an expense of $30,000,000. In 1850, the population of the forty-nine counties through which it passes was only 335,593, since which 479,923 have been added, making the whole population 814,891—a gain of 143 per cent.

EVIDENCES OF PROSPERITY.

As an evidence of the thrift of the people, it may be stated that 600,000 tuns of freight, including 8,600,000 bushels of grain and 250,000 barrels of flour, were forwarded over the line last year.

EDUCATION.

Mechanics and working men will find the free school system encouraged by the State, and endowed with a large revenue for the support of schools. Their children can live in sight of the church and schoolhouse and grow with the prosperity of the leading State in the Great Western Empire.

PRICES AND TERMS OF PAYMENT.

The prices of these lands vary from $6 to $25 per acre, according to location, quality, &c. First-class farming lands sell for about $10 or $12 per acre; and the relative expense of subduing prairie land as compared with wood land is in the ratio of 1 to 10 in favor of the former. The terms of sale for the bulk of these lands will be

ONE YEAR'S INTEREST IN ADVANCE,

at six per cent per annum, and six interest notes at six per cent, payable respectively in one, two, three, four, five and six years from date of sale; and four notes for principal, payable in four, five, six and seven years from date of sale; the contract stipulating that one-tenth of the tract purchased shall be fenced and cultivated, each and every year, for five years from the date of sale, so that, at the end of five years, one-half shall be fenced and under cultivation.

TWENTY PER CENT WILL BE DEDUCTED

from the valuation for cash, except the same should be at six dollars per acre, when the cash price will be five dollars.

Pamphlets descriptive of the lands, soil, climate, productions, prices, and terms of payment, can be had on application to
J. W. FOSTER, Land Commissioner,
Illinois Central Railroad,
Chicago, Ill.

For the names of the towns, villages and cities situated upon the Illinois Central Railroad, see pages 188, 189, 190, Appleton's Railway Guide.

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JOHN H. CHEEVER, Treasurer,
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Preis 20 Cts., per Post 25 Cts.

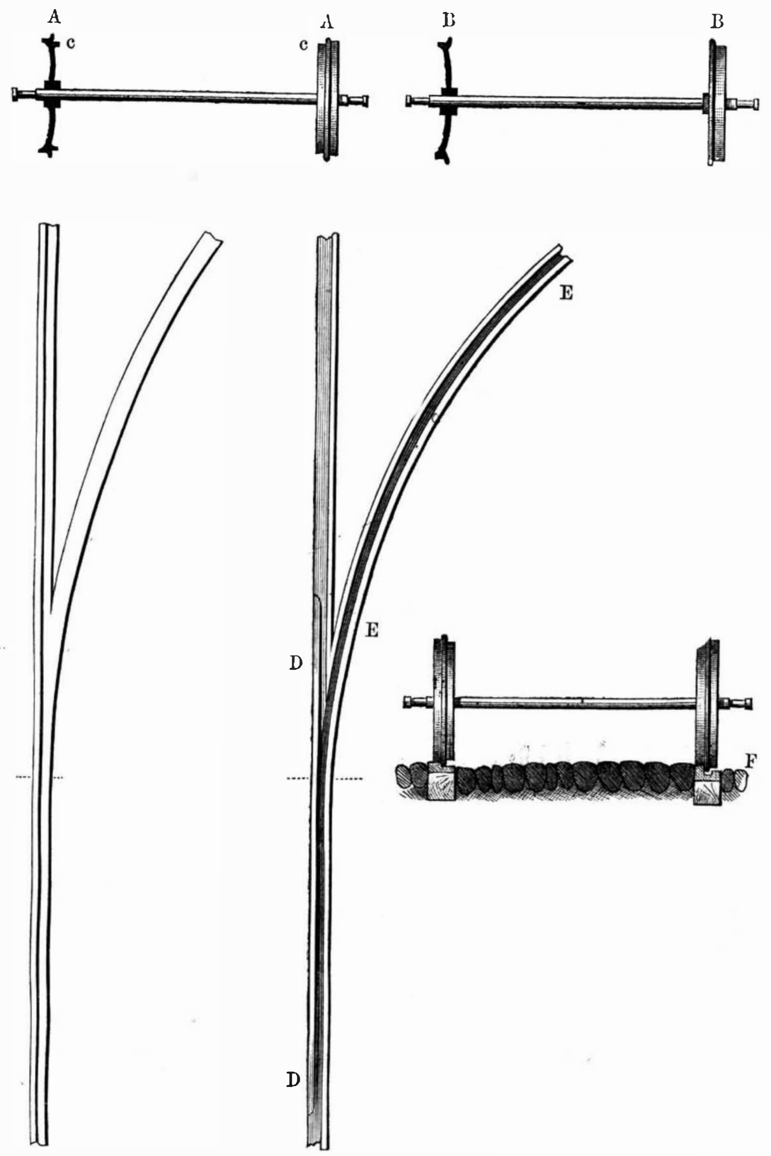
Plan for Dispensing with Railroad Switches.

The improvement which we here illustrate dispenses with railroad switches and the trouble and expense of switch tenders. It has for months past been in successful operation upon many city passenger railways in Philadelphia, Baltimore and Boston.

The result is obtained by having one line of cars use wheels, A A, with an extra tread, *c c*, in addition to the common tread, and a short inclined supplementary rail, D D, so placed at the turn-off that the extra tread shall run gently upon it, the wheels being gradually raised off their usual bearing, running on the extra tread alone, and passing over and above the usual grooved rail, E E, without touching it. Directly after the point of divergence is passed, the wheels, in the same gradual manner, come down again to their usual bearing on the common tread, and the cars proceed on the straight track, as before; the change of bearing from the common tread to the extra tread, and *vice versa*, being so smoothly accomplished as to be scarcely perceptible.

The other line of cars, provided with wheels, B B, of the ordinary form, will, of course, follow the ordinary grooved rails, E E, as usual, and be gradually deflected from the straight line, just as if the straight track did not exist beyond that point.

By varying the position and diameter of the extra tread, many combinations may be obtained, and thus a number of different lines of cars may use the same track in common; each line as it arrives at the point of diversion from the other lines, will follow its own course.



WHARTON'S PLAN FOR CITY RAILROADS.

The whole arrangement is entirely solid; the frog is cast in one piece, and there is nothing to get out of repair or to be affected by ice. The pavement is laid flush with the inclined rail, as seen at F, and the greatest elevation is merely enough to raise the flange of the double tread wheel over the grooved rail, and permit it to go straight on. Of course, the extra tread is only brought into use at turn-outs.

The cost of the frog casting is no more than that of the tongue switch heretofore in use, and it will last much longer. The cost of the double tread wheel is only one dollar more than the ordinary wheel; it is but little heavier and considerably stronger, the only difference being the extra tread, *c c*, one and a half inches wide, of unchilled iron, giving a lateral strength and stiffness.

When two lines of railroad intersect each other, it is only necessary to furnish the cars of one line with double tread wheels, the other line requiring no change whatever, and it is only necessary to have the patent wheels upon one side of the cars. The extra expense would therefore, in such cases, be only two dollars per car of the one line, and nothing for those of the other line. It seems to us that there could be no mechanical device to effect the purpose more compact, light and strong than this.

Of the numerous railway companies using this arrangement, it will be understood that a *portion only* have changed their wheels, or been put to any other expense; among them, some very complicated interlacing of railway lines exist. It is not necessary that the cars should be equipped with patent wheels all at one time; but as the old wheels wear out (city passenger railroad wheels last, on the average, about one year), they may be replaced by new wheels of the new construction at a trifling expense. When it is done, the patent frogs can be laid down without the cars losing a trip or the regular business of the road being in any way disturbed.

If, at any time, owing to the obstruction of the streets by fires or from other causes, it is desired to run the cars temporarily upon other routes than their own, it is effected by means of a short bar of wrought iron, weighing about eight pounds, which may be carried in the car for that purpose.

That the economy of dispensing with switch tenders can be successfully accomplished, is fully demonstrated by the experience of the railway companies now using the invention.

Patents for this invention were secured in Europe through the Scientific American Patent Agency. Date of American patent, Dec. 13, 1859; re-issued April 3, 1860.

The inventor will grant licenses, upon favorable terms, to other railroad companies to use this improvement; and, when desired, will contract to do the work, guaranteeing its success. For further particulars, address William Wharton, Jr., inventor and patentee, No. 28 South Third-street, Philadelphia, Pa.

Red Rain.—A paper has lately been published by M. Giovanni Campani, professor of chemistry at Sienna, in which he describes two falls of red rain, which occurred in that place on the 28th of December last. He states that the red rain was confined to a particular quarter of the town, near the Meteorological Observatory, and that it was not general. A shower of red rain is recorded to have fallen in 1819 at Blankenburg, when the rain, upon analysis, was found to contain cobalt. But none of this substance, has been discovered with rain which fell lately at Sienna.

Electrotyping Water Fountains.—The cast iron fountains of the Place de la Concorde, which are admired by all visitors to Paris for the richness and elegance of their designs, and the sparkling effect of the volume of water they daily throw up, are being taken to pieces in order to receive yet further improvements from one of those scientific proceedings which have lately been so much used in the decoration of the avenues and boulevards of the metropolis. On their first erection, these fountains, with the figures of the Tritons, Nereids, and other allegorical personages which adorn them, were painted to imitate Florentine bronze, the draperies simulated bronze verd-antique, and the ornaments and other accessories were gilt. This painting, however, was obliged to be renewed every two years, and even so, from exposure to the inclemencies of the weather and the action of the water, it proved very insufficient. It is now intended to apply galvanism in order to give the appearance and duration of bronze to all these figures and ornaments, as well as to the twenty columns and figures which decorate the Place de la Concorde, and the two hundred and twenty candelabras which serve to light it and the adjoining avenue, the Champs Elysées. Three million pounds of iron castings are thus to be electroplated with copper.

FROM THE STEAM PRESS OF JOHN A. GRAY.