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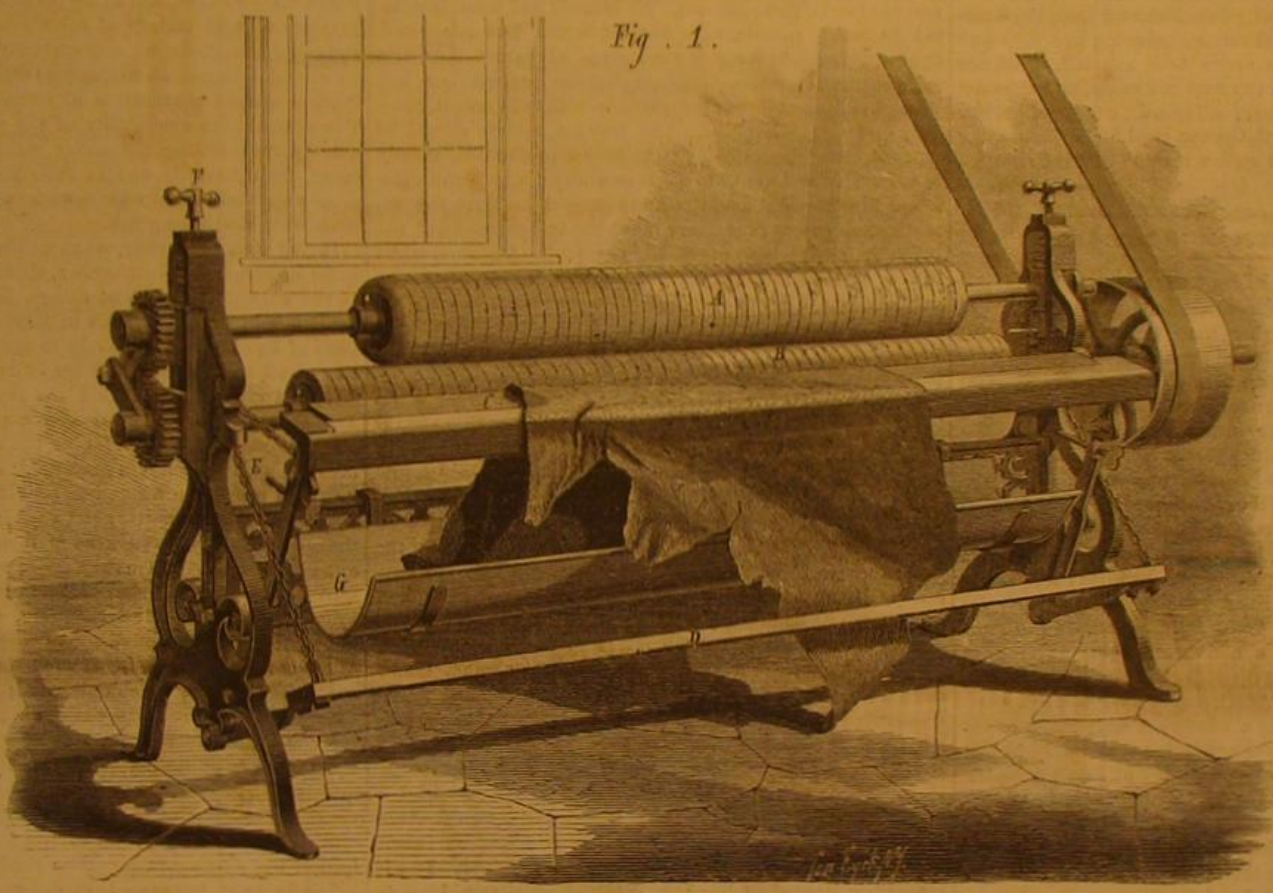
Machine for Boarding, Pebbling and Glossing Leather.

Our engraving illustrates a machine designed to accomplish the above purposes, for which important claims are made, both as to the economy resulting from its use and the superior quality of the work turned out. A large amount of work is done with very little expenditure of power and very much less effort, on the part of the operator, than is required in the old way. The machine is adjustable to any thickness of leather and to give any requisite pressure. The precision with which the lines can be run at any angle in graining is a matter of much importance, this facility being derived from the action of the feed plate.

The machine can board the largest whole hide if necessary, taking its entire breadth, even to the points of the shanks, at one operation, producing a superior appearance which, with thin leather, is very notable as compared to that boarded by hand.

The pebbling and polishing appliances are especially claimed to be superior to anything yet devised for the purpose, and their advantages will, we think, be apparent to practical men upon examination. The pebbling roll can be quite small and of any length, as there is no strain on its bearings. The pressure is also perfectly controlled while the work is rapidly performed, and the leather is held in position by the machine itself.

Fig. 1

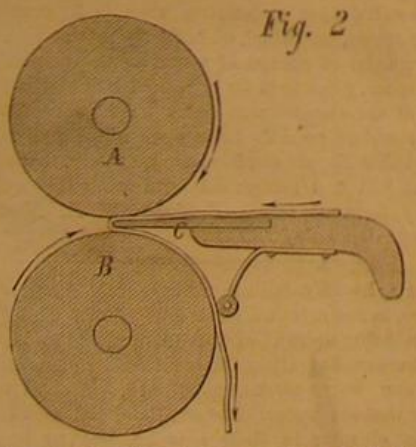


COOGAN'S MACHINE FOR BOARDING, PEBBLING AND GLOSSING LEATHER.

Fig. 1 is a perspective view of the machine as it appears in the operation of boarding, the object of which is to raise the grain and to give the leather pliability. Fig. 2 is a section showing the operation of some of the parts of the machine during this process. Fig. 3 is a section which shows the application of the pebbling roller. A represents the upper roller, B, the under roller (these rollers being preferably made of cork), C, the steel feed plate, D, the treadle which operates the feed plate, E, a chain running over suitable pulleys, which chain connects the treadle and feed plate; F represents adjusting screws; G, the trough, which receives the leather as it passes over the edge of the feed plate; and H, Fig. 3, is a section of the pebbling roller.

In boarding, the hide is placed over the feed plate as shown in Fig. 1. This plate is carried by pivoted arms, so constructed that the edge of the plate may be brought to exact line with the line of conjunction of the upper and lower rollers, A and B. Its motion toward the rollers is adjusted and limited by set screws in the vibrating arms which carry the plate. By suitable gearing, the rollers, A and B, are caused to revolve in the same direction, as shown by the arrows in Figs. 2 and 3.

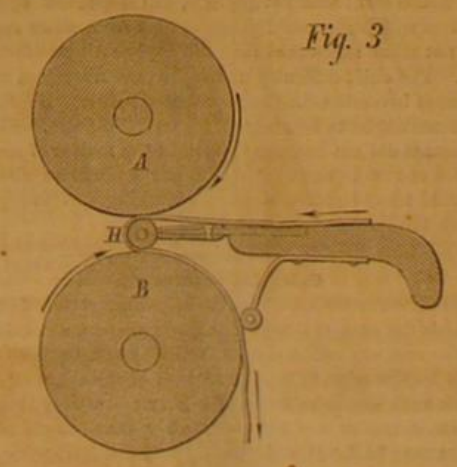
Fig. 2



The machine being in motion, and the hide placed as shown in Fig. 1, the operator places his foot upon the treadle D, which carries the plate, C, up flush to the rollers and slightly between them as shown in Fig. 2. The action of the rollers then causes the hide to pass over the edge of the feed plate in the direction shown by the arrows. The trough, G, receives the hide as it passes through, and the operation is repeated as often as may be necessary.

For pebbling, a pebbling roller, H, Fig. 3, is placed in suitable bearings found at the ends of the front edge of the feed plate, and the leather is handled in precisely the same way as in boarding. Polishing or glossing, and creasing, are also performed by suitable attachments carried by the feed plate, the general operation of which is analagous to that described for the pebbling roller.

Fig. 3



This machine was patented through the Scientific American Patent Agency, Oct. 10, 1871, by Owen Coogan, of Pittsfield, Mass., who may be addressed for further information.

Starting Flower Seeds.

The sudden arrival of extremely hot weather, in New York and adjacent States, has taken everybody by surprise, and turned public attention to the country and horticulture. The following paragraph will be of interest, at this time, to all who have a garden:

There is nothing like loving them, to coax flowers to grow. Some old ladies seem to quicken the sap in drooping plants the moment their kind hands touch them. They give them their hearts, and so a thoughtful, quick-witted care, and their fuchsias are always the largest and their pinks the sweetest. Beginners are often troubled at the outset to get seeds to germinate. Some will grow anywhere. Others need tenderer care, and for them we have these directions from an experienced hand.

If you have no loam laid away for this purpose, take, any warm day, the upper surface of loam from your richest garden beds. Bake it in the oven in an old tin pan; when so dry as to crumble in your hands, add one third white sand. Now fill your pots, boxes, or pans with the mixture. The pots made for planting seed, with large holes for drainage, are the best; but salt, raisin, or cigar boxes will answer. Fill to the brim with heated soil, press down firmly, and, while milk warm, plant your seed. If large enough, place them in one at a time, about one inch apart; if very small, like petunias, sprinkle over the soil, press them in gently with the hand, then sprinkle on sand. Take a piece of any old flannel, double it, and lay on the seeds, pressing it down at the corners; then water with lukewarm water over the flanel. Put your pots or boxes in some warm place, on the shelf of a range, or on a mantel piece. The kitchen hob is the best place, for the steam from the kettles keeps the air moist.

Leave the boxes there until the seeds begin to push, giving lukewarm water over the flannel every day: then put in a sunny window, and, if the nights are chilly, return the boxes to the mantel shelf or back of the range. This way of planting rarely fails: the earth, being warmed through, starts the seeds as well as a hot bed, and the flannel prevents the caking of the top of the soil and also keeps up a uniform heat.

Of course, the same treatment will be as effectual with seeds for the kitchen garden, though most of them do not need such careful nursing.—*J. S.*

STEAM FLYING SHIP.

As a contribution to the stock of lore on the subject of aerial navigation, we illustrate the following curious but impracticable machine, invented by a western correspondent:

This gentleman takes the ground that gas is too light, and has neither the elevating nor directing power essential to the proper guidance of a balloon. He thinks, however, that steam (although, as he says, hitherto employed with but little success in ballooning) has a natural ascending power, which may also be used as a means of propulsion. The main objection to it was in the great weight of the apparatus employed; and this objection he intends to remove by using

thin sheet metal vessels for its generation, and employing no cumbrous engine in applying its power. He proposes to carry out the idea by constructing an air ship, of sheet metal or of gummed rubber or other fabric made impervious to the action of steam, as delineated in the annexed cut; and the ship is thus described by him:

A is the body of the air ship for the reception of the elevating and propelling power—steam. B, B are two pipes leading to the car, C, below, one forming the chimney of the stove or furnace, D, and the other receiving through its funnel, F, the steam from the kettle or boiler, E; they both serve to conduct the smoke and steam into the body of the ship, A. As the body fills, the smoke and steam also enter into the circular bellows or expansive cylinders, G, G, which may be made of leather, or of rubber or other elastic material. The smoke and steam enter these cylinders through valves at the interior ends, and as they fill they are expanded outwardly. As soon as they reach their utmost outward limit, valves open and let out the steam and smoke. The outward expansion of the cylinders and the final escape of the steam and smoke are designed to propel the ship forward. As soon as the steam and smoke begin to escape, the inner valves close, thereby permitting the cylinders to contract, which they do by means of springs or elastic cords. These alternate expansions and contractions of the cylinders are the propelling power of the ship, and are equivalent to the operation of cylinder and piston in an ordinary steam engine. The other parts of the machine will fully be understood from the drawing, and consist of a metal rod surrounding the ship and supporting on its ends the arrow head and tail, which are made to turn on the rod to any required angle, and thus act as guides. There are, also, supporting rods, ropes and pulleys connecting the body, A, with the car, used for adjusting the relative position of each in such a manner that the required course shall be steered.

PATENT LAW REFORM IN ENGLAND.

The Committee of the House of Commons are now in session again on this subject, and are examining witnesses, *pro* and *con*, at great length, trying hard to satisfy themselves whether it is best to continue the patent laws in England or to abolish them. The lords and rich manufacturers want the abolition. But the active thinkers, workers, and go ahead people are emphatic in their demands to have the system continued, and greater facilities given.

Mr. C. W. Siemens deposed that he was a Fellow of the Royal Society, a member of the Council of the Institution of Civil Engineers, and that he was by profession a telegraph engineer. He was not born in England, but had resided in it for twenty years. As a patentee, he had had considerable experience in patents. He had taken out some patents for successful inventions and some for failures; among the more successful of his inventions were a steam engine governor, a regenerative furnace, and a process for making steel and iron. He had also taken out patents relative to telegraphic apparatus and cables, thus covering a somewhat wide range of experience. He was an engineer possessing that order of mind which led him to make new applications of first principles. He considered his branch of the engineering profession to be much influenced by the existence or non-existence of a patent law; he was drawn to England in the first instance by the fact of a patent law existing there, and he went there from Germany directly after he finished his theoretical and practical studies. He made England his home in consequence of there being no properly understood and regulated patent law in Germany; England, therefore, had had the benefit of his inventions in the first instance. He had made a few applications for patents in Germany, but in most cases with unsuccessful results. He could not patent in Germany things which can be patented in England, and as a rule, patents are granted in Germany for small mechanical improvements, but very rarely for inventions including new applications of first principles. In Germany, they refused him a patent for his regenerative furnace because some people had hot stoves in their houses there to warm them. At the present time, the regenerative furnace is more widely adopted in England, where a royalty is payable, than in Germany, where it can be used without the payment of a royalty. His experience told him that without the protection of letters patent he should probably have not undertaken the long series of experiments and the great expense necessary to perfect that furnace; England had had the advantage of its use in the first instance, and at the present time it is more generally adopted there than on the Continent. Although the invention is in use in Germany, England is more benefited by it than Germany. Many inventions would never have seen the light of day at all without a patent law, and in England there are more inventions than in Germany, and they are more quickly adopted.

Mr. J. Skerrow Wright, of Birmingham, and formerly President of the Birmingham Chamber of Commerce, deposed to the Committee that he had had experience in the patenting of small articles. So far as he knew, manufacturers were to a man in favor of a patent law, and so were working men. The trade of Birmingham had been, without doubt, largely benefited by a patent law, and much of the prosperity of the town was due to patented inventions. Patents sometimes improve articles, and sometimes reduce the cost of manufacture, or they may promote economy in the use of materials. Elkington's electro-plating invention, for instance, he believed, would never have attained its present perfection without a patent law; as, in this case, that law has transformed a manufacture which was positively declining into one of the chief trades of Birmingham, giving employment and excellent wages to numbers of mechanics and artizans. The old mercury gilding process was very unhealthy, but the present process is very healthy. The patent law accelerated this invention, if it did not actually form it; at all events, it would not have been perfected so soon without the protection of a patent law. He had considered the merits of various substitutes for a patent law, but thought that none of them were so satisfactory. A system of Government rewards, he thought to be utterly impossible, and sure to break down soon after it was established. His experience applied chiefly to inventions relating to small articles, some of which were of great importance, and he contended that patents should apply to these small inventions. For instance, the patent for a sleeve link might not have been thought worth $25, and for several years, it produced no profit; the owner paid $500 for it; during the last seven years, he made from $75,000 to $100,000 profit; nobody out of the trade could, at the outset, have assessed that invention at its true value. The public derive some benefit from it, otherwise they would not buy the links; no harm has been done to any individual, and it has stimulated other inventions, for he believed that other inventions had been brought out in consequence of that one. He had in his hand a watch, the result of an invention which might be assessed at a small sum; the watch was wound up by the act of opening, and could not be overwound. If it were not worth his while to buy that watch, he should not do it; it was, he believed, a Swiss invention which had been patented in England, and the extra cost of such a watch was perhaps two or three guineas. He himself had been interested in many patents, very few of which had succeeded. Operatives were in favor of a reduction of patent fees, and so were manufacturers. He held that the present law had worked satisfactorily; as compared with the old one, it was a very great advance indeed. The fees for patents should be reduced, there should be a preliminary examination, mainly as to novelty and not as to merit or utility; this is the opinion of Birmingham manufacturers generally. Half the patents taken out at present are taken out in ignorance of the invention having been previously patented. A person, when told by the Patent Office authorities that his invention was not new, would not be so foolish as to take out a patent, but if he wished to do so, he should be allowed to do so if he liked, but the verdict of the examiners should be put in the patent itself.

At present, the fees sometimes stand in the way of working men getting patents; if the fees were too low, there might be too many applications, but then each invention should be well examined. He thought that the first payment should be a very small one, and a higher one, perhaps, when the patent was sealed. He had never yet met an operative in favor of the abolition of the patent law. He thought the operatives could not sometimes pay the patent fees, but generally they found men willing to help them to carry out their inventions; no doubt they would be in a better position, to deal with those who aided them, if they could get protection cheaply. The French law is that a patentee must manufacture the article in France within a given time, but the law was evaded; he had worked two days in Paris to continue a patent. A foreigner who patents things in England should be compelled to make them here, and not to import them. England does nearly all the electro-plating business of the world, for very little of this kind of work is done on the continent outside of Paris. If foreign inventors patent things here, it gives a stimulus to inventions in England. If the patent law were abolished here, our best men would go to other countries, and we should lose our trade in novelties, whereby both British trade and British workmen would suffer. The idea of getting money is the thing which spurs on an inventor; men did not invent for the sake of inventing, but to make profit.

If England went without patents, and depended upon the inventions which she could pirate or filch from other nations, he did not think she would take the lead as a manufacturing people. The chief difficulty under the present system was to know what inventions had been patented before. He thought that patents ought to be granted for trivial objects, and that such patents did not hamper trade. In the matter of novelty, he would not make the decision of the examiners absolute, but should let the risk and *onus* of taking out the patent rest with the intending patentee.

Celestial Space.

When astronomers assure us that the diameters, of the circles which the planets describe in their perpetual revolutions round the sun, are millions upon millions of miles—how is it possible for the mind to take in an idea of the space or room in which such globes as those of eighty and ninety thousand miles in diameter are running, thirty times more rapidly than a cannon ball, without the slightest interference with others?

Space—without limit! There is no boundary, no barrier, no precipitous termination, but space forever and ever, and there the intellect leaves the pursuit—the brain of man cannot grasp it.

But there is something more perplexing in the belief that interminable space is filled with billions, aye, with countless organized worlds, beyond all human computation, far excelling our own in grandeur of proportions, physical resources and beauty, so immensely distant that no telescope can ever survey those on the nearest border of that celestial space which they occupy; and yet still beyond and beyond, so far that the light they send abroad, at the speed of one hundred and ninety-two millions of miles in one second, may not reach this earth for a hundred of millions of years to come, and there again and again there are globes infinitely multiplied. Space, then, is a field in which the Almighty displays the majesty of His supreme power.

One Primordial Form of Matter—One Primary Form of Force.

I. Matter exists certainly under two, and probably under three, varieties: namely, *ordinary* or *gross matter*, directly recognized by our senses; *universal* or *luminiferous ether*, filling all space, and pervading the interstitial spaces of all bodies of ordinary matter, the existence of which is inferred from optical phenomena; and *electric ether*, associated with all bodies of ordinary matter, whose existence is inferred from electrical phenomena.

These varieties of material substance may possibly not differ in their essential nature. It is at least conceivable that the atoms, so called, of ordinary matter, and of electric ether, are condensed groups of atoms of the universal ether; and hence that there is, essentially, but one form of matter in existence, namely, that which, as made up of single atoms homogeneously aggregated, forms the ether of space.

It may be that the electric ether, the supposed agent of electrical phenomena, may ultimately be shown to be identical with the luminiferous ether; but in the present state of physical science, it cannot be so regarded.

The existence of an electric ether has not been as conclusively established as that of the luminiferous, but all the phenomena give decided intimations of the operation of such an agent, and thus serve to confer upon the hypothesis of an electric ether a high probability.

Now that the ethereal is known to be one of the forms in which matter exists, and as we perceive that ordinary matter presents a great variety of substances, differing in density and other conditions, we may certainly just as reasonably refer electric phenomena to a special ethereal agent as to hypothetical atomic movements of ordinary bodies of matter. The comparative availability of the two hypotheses, in adequately representing the entire series of electrical phenomena, both formally and in their precise laws, is the only proper ground upon which we can decide to which the preference should be given.

II. All atoms of matter, when within a certain range of distance, attract or repel each other, either actually or virtually. In the normal condition of things, in the instance of each distinct body of matter, each of its constituent atoms is in a state of equilibrium, relatively to the rest, under the operation of all the forces, attractive or repulsive, exerted upon it by all other atoms within the range of sensible action. This is true of the universal ether, each atom of which is conceived to be at rest, so far as the natural action of other ethereal atoms upon it is concerned; and this action is supposed to consist in a force of repulsion. It is also true of bodies of ordinary matter; but each integrant atom is under the operation of attractive as well as repulsive forces, exerted by other contiguous atoms—or at least of forces which tend to urge it from or toward the atoms acting on it. It is by virtue of this statical condition, and the change in the intensities of the effective forces when the relative distance of the atoms is altered, that all existing collections of matter are *media*, through which extraneous forces applied to them at any point are propagated to other points.

III. All atomic forces, whether operating at small or great distances, are of the nature of *incessant forces*; that is, are made up of impulses which are renewed every instant. In the case, certainly, of the forces propagated in the waves of radiant heat and light, and taking effect upon the atoms of bodies, the number of impulses received per second is not infinitely great, but capable of determination though enormously great. It is conceivable that all the other incessant forces in operation (gravitation, molecular forces, electric forces) are of the same essential character: that is, consist of, or result from, *actual recurring impulses* propagated in ethereal waves. Upon this hypothesis, these forces should conform to the law of inverse squares, like the radiations of heat and light; as they in fact do, in every instance in which the law of variation of intensity with the distance has been determined. The *effective* molecular forces may furnish an exception; but we have no reason to suppose that the law does not hold good for the actual attractive and repulsive forces, from the antagonistic operation of which these effective forces result.

IV. In the light of these fundamental principles, we may assume, as the basis of an entire scheme of Nature, the hypothesis that all matter has but the one fundamental property of repulsion: and that the three great varieties of matter, and all the various substances known to us, differ essentially only in the mass, size, or perhaps in certain cases also the specific intensity of repulsion, of their atoms. We may reach a still deeper underlying principle by conceiving that all the atoms, so called, of ordinary matter and of electric ether, consist of groups of atoms of the one primary universal ether, condensed by reason of a diminished repulsive action of their constituent atoms. This conception brings us to the simplest possible basis upon which a physical theory of inanimate Nature can be erected, namely, that of the existence of but one primordial form of matter and but one primary form of force.—*Professor W. A. Norton, in the American Journal of Science.*

IT is a healthy indication, says the *American Builder*, Chicago, to see artesian wells going down while new buildings are going up in the burnt district, and to know that, in the future conflagration, coming in consequence of tar roofs, when our water works again burn, we shall not be left wholly without water. Messrs. Hale, Emerson & Co. are to have an elevator in their new building, to be driven by water from the well, and they expect the well to save them from three to four thousand dollars a year. Messrs. J. V. Farwell & Co., have sunk a well very successfully on their premises.

Transferring Negative Films.

M. Gobert's method of transferring collodion images is a very simple one, and capable of application to obtain reversed negatives, or simple collodion prints.

The cliché upon glass is moistened with strong alcohol, and upon it is laid a sheet of albumenized paper, which has also been wetted with the spirit. Contact is easily brought about between the two surfaces as they are both covered with an excess of fluid; the spare alcohol is drained off, and the paper pressed into contact by means of a pad of blotting paper. After the lapse of a quarter of an hour, all the alcohol has been absorbed and the drying can be continued in the open air. The albumenized paper will then have become perfectly attached to the varnished or unvarnished collodion surface. To remove the sheet from the glass, the margins are cut round with a penknife, and the paper then moistened by means of a sponge dipped in water. After a few minutes a corner can be lifted up, and the paper gradually removed from the plate without trouble. Or, if desired, the plate can be put into a water bath and allowed to remain therein until the albumenized sheet floats from the glass, bearing with it the film.

In either case the sheet is allowed to dry, and is then rendered of a transparent nature by the use of wax in the ordinary way. In this manner, a reversed negative is obtained, which can, of course, be well employed for carbon printing and such like purposes. To obtain the image transferred in its proper position, it is necessary to employ gelatin paper, which is used in pretty well the same manner. The image is first obtained upon the gelatin paper, and afterwards this is pressed in contact with a sheet of albumenized paper moistened with alcohol, the two surfaces being pressed together in a printing frame. After perfect contact has been made, and the sheets have dried in one compact body, this is put into a bath of warm water; the image will then be found to be attached to the albumen film, which has been coagulated by alcohol and is, therefore, insoluble.

For detaching a cliché by means of the gelatin, Gobert recommends the use of a solution of 10 parts of gelatin in 100 parts of water, which is poured upon the negative. After the same has dried, there is poured upon the gelatin film a normal collodion, containing one per cent of pyroxylin; stronger collodion cannot be used, for the reason that it shrinks too much, and does not, therefore, answer the purpose. The addition of glycerin is not recommended, as by this means the film is rendered too hygroscopic. Gobert also warns the operator against employing very thick gelatin films, as the image, on leaving the glass, is very apt to become broken.—[*Photographic News.*

Bitumen of Judea Paper.

At a recent meeting of the French Photographic Society, M. Despaquis exhibited some specimens of a new photographic material, being paper or sheets of mica sensitized by means of bitumen of Judea, prepared in several different ways according to the manner in which it is to be used, M. Despaquis, in calling attention to this novelty, made the following observations relating to it:—

The paper may be preserved for an indefinite period, if screened from light and protected from the effects of moisture, and yields prints of an unalterable nature. The manipulations necessary to its employment are of the most simple character, and are confined to placing the paper under a cliché, exposing the same to light, and washing subsequently in essence of turpentine.

The samples of paper are of various kinds. No. 1 is as transparent as glass, and is covered with a sensitive film of bitumen; it serves for the production of transparent positives, and for reproducing clichés, which may be put into the frame reversed if desired, according as the image is required for photo-engraving or carbon printing.

No. 2 material is also transparent, but possesses more the appearance of ground glass. It is suitable for making transparent prints for stereoscopes, transparencies, etc., at a low price. With prints of this kind, the stereoscope needs no glass, and is, therefore, very light and portable. This same material answers well for the preparation of so-called photo-miniatures, which are produced by means of two prints superposed, the lower one being vigorously colored; the tints, when viewed by transparency through the upper print, possess very fine gradations. The upper print is produced upon this No. 2 paper, which will doubtless be found to answer the purpose much better than albumenized silver paper rendered transparent by varnish.

No. 3 has a matt or opal white surface, formed by means of oxide of zinc and starch. It serves very well for the production of the second or lower print required for the object previously mentioned, and is also suitable for the preparation of transparencies.

All three papers may be attached or mounted upon cardboard like ordinary prints. To do this, the print is put upon a glass plate and covered with thin card slightly moistened; the two surfaces are then passed through a rolling press, and complete adhesion takes place.

There is yet a fourth material, which is likewise sensitized by means of bitumen, and is capable of important applications. It is prepared specially for the transfer of photographic prints, with all their half tones, to stone or zinc, for working up with fatty inks, and printing upon wood, glass, enamel, painter's canvas, etc.

In the last named material, there is a film of gum in between the mica and the bitumen, and as no washing in water is required for developing and fixing, it is attached while still wet, with essence. If already washed and dried, the print is again treated with the essence upon the stone, zinc, wood, etc.; then by the aid of a sheet of thick and moist blotting paper, which is placed upon it and pressed down to chase away air bubbles, the print is allowed to dry under a slight pressure, as in carbon printing. The blotting paper should somewhat overlap the print. One or two dry sheets of the same kind are placed over the wet paper, and these are then covered with a few glass plates. After the lapse of a few hours, the dried sheets are removed by means of a sponge, water is applied to the last sheet of blotting paper, and the gelatin being softened, the gum is dissolved, and the film, consequently, comes away from the bitumen image.

The preparation of bitumen paper is, of course, no novelty, but it is the special employment of gelatin that is new. This renders the application of water unnecessary in development, and the film does not cockle or roll in washing; by the addition of starch, carbonate of baryta, oxide of zinc, and various colors, it is possible to impart to the film any degree of transparency desirable. The two principal points of importance are the application of bitumen of Judea to a support of gelatin, which, not being dissolved in the liquids used as solvents for the bitumen, is not modified or changed in any way during the process of washing; and the special preparation of the bitumen, whereby it is very adherent to its basis, and of so solid a nature that it will allow of the application of a layer of printer's ink by means of a roller. The employment of acids for etching may be employed with impunity, seeing the solidity of the film.

This is a very important mattter for photo-engraving or photo-lithographic purposes. Maps and drawings have been prepared upon glass by M. Despaquis in the manner indicated, and in these cases not only is the etching of extraordinary depth, but the fineness of detail is perfect, proving beyond doubt that the hydrofluoric acid which had been employed for etching had in no way attacked the film. These same qualities are only to be seen upon metal engravings; and although M. Despaquis is himself but an indifferent operator, he has been enabled to obtain these results very easily.

As to the transparent pictures produced by means of this material, they are certainly very beautiful when mounted between two plates of glass, forming very charming illuminated designs. The manipulations are exceedingly simple; there is no sensitizing, no fixing, and no toning, inasmuch as the whole operation consists in placing the mica paper under a cliché, in exposing to light, and washing it in essence of turpentine.

Care of Lawns.

There is no season of the year when careful and persistent watchful attention and labor are more requisite to the perfection of a lawn than that of the early spring months. Nor is there any season during which the same amount of labor is better repaid by the future results. A severe rain, followed by a sharp frost, or a half dozen clear days, warm and bright, with cold, freezing nights, always result in throwing more or less of the turf and grass roots, which, if not at once and almost daily rolled and again pressed down, would by exposure at this time die out; besides, if the lawn be now left to take its own course without the use of the roller, there will ensue more or less of a rough uneven surface, caused by some lines of soil being finer and heavier than others, and therefore settling more rapidly and firmly.

If, by any previous neglect, the lawn has already got upon its surface small pit holes or undulations, varying from four to six inches across and half thereof in depth, now is the time to go over it with a barrow of fine soil and fill them up, at the same time filling the soil with a heavy seeding of pure lawn grass seed; then finish by rolling again and again.

If the lawn has become impoverished, make a mixture of pulverized hen manure or guano, two parts; two parts of fine, very fine, bone meal—not bone dust; one part of plaster (gypsum); together with two parts common salt (seven parts in all), and sow at the rate of eight bushels to the acre. Sow just before rain, and as soon as the rain is over roll thoroughly, and then follow with two bushels of clean lawn grass seed to the acre, and another, and another, and yet another rolling. Before doing any thing, however, rake the lawn thoroughly to clear it of chips, stones, etc.—*Addi.*

Particulars of the New Steamship "Adriatic."

The following are the interesting notes regarding tunnage, speed, engines, etc., of the new steamship *Adriatic*;

Tunnage, 4,200; maximum speed, 16·4 knots; length, 450 feet; breadth, 41 feet, draft, 23; weight of cargo, 2,800 tuns. Her engines are compound, by Maudsley, Sons, and Field, 2 cylinders of 42 inches diameter, and 2 of 78 inches. The high pressure cylinders are on the top of the low; and all the pistons are of 5 feet stroke. The cranks make 50 revolutions per minute. The boiler pressure is 65 lbs., and the vacuum 27 inches. The temperature in the hot well is 120° Fahr. The engines have surface condensers and a centrifugal circulating pump driven by an independent engine. The air pump is 43 inches in diameter and has 2½ feet stroke. The maximum indicated horse power is 3,500; and the consumption of coal per horse power per hour is 2¼ lbs.

The *Adriatic* has 12 boilers (cylindrical shells), with 2 furnaces each. The grate surface is 444 square feet, and the heating surface, 12,320 square feet, thus having a ratio of heating to grate surfaces of 28 to 1. She carries coal to the amount of 800 tuns, consuming 65 tuns per day. Her propeller is 22½ feet diameter and 31½ feet pitch. It has 4 blades, and is made of Vickers' steel; the slip is 8 per cent, and the area of the blades is 116 square feet. The coefficient of the power of her propeller, $MV_3 \div IHP$, is 992±.

Disinfectants.

A commission appointed by the French Academy, to investigate the relative merits of various disinfectants for use in hospitals where contagious diseases are treated, have made the following report as the result of their experiments:

HYPONITROUS ACID.

The members of the commission agree that the first place among agents for attacking and destroying infectious germs must be accorded to *hyponitrous* acid. Extraordinary precautions must, of course, be observed in making use of this dangerous gas; the doors and windows must be carefully sealed with gummed paper when disinfecting a room containing 40 or 50 cubic yards. The materials are taken in the following proportions: 2 quarts of water, 3½ pounds of ordinary commercial nitric acid, and ¼ pound of copper turnings or filings. A stoneware vessel is employed, holding two or three gallons. The exit doors are carefully pasted up, and the room left closed for 48 hours. The person opening the room at the expiration of the time should be protected in some way from breathing the gas, by a suitable respirator.

CARBOLIC ACID.

This is cheaper, more easily used, less dangerous, and has proved equally efficacious. It is best employed mixed with sand or sawdust—one pound of acid to three pounds of an indifferent substance. The mixture, placed in earthen vessels, was used for the same purpose as the hyponitrous acid. Carbolic acid, diluted with 15 or 20 parts by weight of water, was found useful for daily sprinkling of the floor and bedclothes.

An interesting case is mentioned in the report where neither chlorine nor hypochlorous acid was able to destroy or render odorless the gases given off from the corpses in the Paris Morgue during the heat of summer. The object was attained by dissolving a quart of liquid carbolic acid in 500 gallons of fresh water, contained in the reservoir and used to sprinkle the bodies. Putrefaction was entirely stopped.

Devergie found that water containing only one to four thousand part of its weight of carbolic acid sufficed to disinfect a dead house, even in the hottest weather, when six to eight corpses were in it.

For fumigating linen, mattresses and other bedding with chlorine, Régnault's latest method was used, namely: One pound of chlorine of lime (bleaching powder) is sewn up in a strong bag of sail cloth, holding about a quart, and put in an earthen pot containing a quart of common muriatic acid (sp. gr. 1·15) and three quarts of water. As soon as the acid comes in contact with the chloride of lime the room is closed, and the things exposed to the action of chlorine gas for 24 hours; the room is then aired for 48 hours. Ten such earthen pots give off 500 litres of chlorine, sufficient to disinfect from 20 to 25, more or less, dirty mattresses.

Beet Sugar in Illinois.

The Freeport, Ill., Beet Sugar factory, a new institution, will commence grinding beets as soon as the vegetables are ready about the middle of the coming September. The Freeport *Journal* says that contracts have already been closed for the cultivation of nearly seven hundred acres of sugar beets. The contract price per tun is four dollars. The yield per acre is from fifteen to forty tuns, a fair average being twenty-five tuns. When in full operation, it will require two hundred and fifty hands to run the factory; and fifty tuns of beets per day will be consumed.

It is expected that there will be paid out for beets no less than $60,000, which would purchase 15,000 tuns, enough for 50 tuns per day for three hundred days, the full working time of a year.

The factory itself is a firm and thoroughly built brick structure, 300 feet long and 200 wide, being two stories high. The cost of the building and machinery is $150,000. There will be in the factory 11 engines, ranging from 4 to 80 horse power. Thus it will be seen that the Freeport Beet Sugar Factory is a magnificent and important enterprise. Beets weighing two and a half pounds yield as much sugar as those that weigh five or six pounds, the latter being coarse and having a less percentage of saccharine matter. Farmers who raise beets for the factory will use the large, coarse ones to fatten stock.

Curculio on Plums.

A correspondent says that he wraps plum trees, below the lower limbs, with cotton, which he keeps wet with camphor and spirits of ammonia. He wets the cotton twice a week, and the result has been a good crop of plums and no curculio. A correspondent in another journal says:

"I have seen various methods for keeping these insects off plum trees, but none so simple or yet so effectual as the following: Soak corn cobs in sweetened water until thoroughly saturated, then suspend them to the limbs of the trees a little while after blossoming, being sure to burn the cobs after the fruit ripens, as they will be found full of the young insects. A good plan is to change the cobs every few weeks. My theory is this—that the insects deposit their eggs in the cobs in preference to doing so in the young plums. The first season I tried it upon one or two only, and in the summer was rewarded by a good crop of as fine plums as ever ripened, while those on the other trees fell off when about half grown. I have since tried it more thoroughly and have never known it to fail.

THE *Telegrapher* states that the Paine Electro-Magnetic Engine Company bubble, late of Newark, N. J., has gone up, that the inventor has left for the East, where the wise men came from, and that the stockholders have experienced a galvanic shock in the shape of a total loss of their interests.

Expansive Pivot for Sewing Machines, Cutter Bars for Harvesters, etc.

The wear of pivots in machinery is a frequent source of annoyance, and often of positive loss, as in case of the imperfect operation of the valve gear of steam engines. The object of the present invention is to provide means whereby this wear can be constantly taken up, and thus prevent the rattling of loosely connected joints and other evils attending imperfect fitting. The device is ingenious, yet simple and of easy application to many kinds of machinery.

Fig. 1 of the accompanying engravings shows the device attached to the cutter bar and pitman of a harvester or mowing machine. Fig. 2 represents the expansion pivot, attached to the frame or stand for carrying the driving wheel, of a sewing machine; and as this engraving shows every part of the invention, we shall refer by letters to it.

A represents the central pivot piece. It is prismatic in form, its cross section being triangular. The three sides of this piece are toothed after the manner of a ratchet. B represents a bushing used in the hole in the sewing machine stand, when this hole is larger than one half an inch in diameter. C, D, and E are washers.

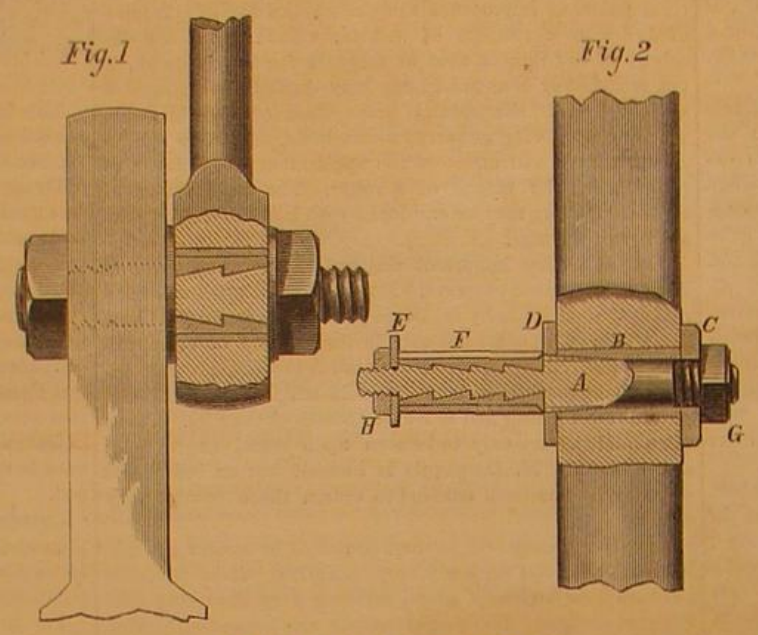
Upon the sides of the central pivot piece are placed two plates having teeth corresponding to those of the triangular center piece, the outer sides of these plates being rounded, so that when applied to the central piece their united outward contour is cylindrical.

An external sleeve or split ring, F, is placed around the internally toothed and externally cylindrical plates described. Projecting ribs, on the part of the central pivot which enters the frame, fit corresponding grooves to prevent the pivot from turning on its longitudinal axis.

The inner ends of toothed plates which lie between the parts, A, and the sleeve, F, abut against the washer D. The outer ends of the plates do not quite reach the nut, H, or the washer, E, held by the nut, H, that bears against the split ring or sleeve, F. The latter furnishes the bearing surface. When the pivot wears smaller through use, the nut, G, is turned up, which draws the central pivot piece, A, along the reversed inclined planes on it and the plates lying between it and the sleeve, F, acting to expand the latter and take up the wear.

Patented through the Scientific American Patent Agency, February 13, 1872, by E. Motz.

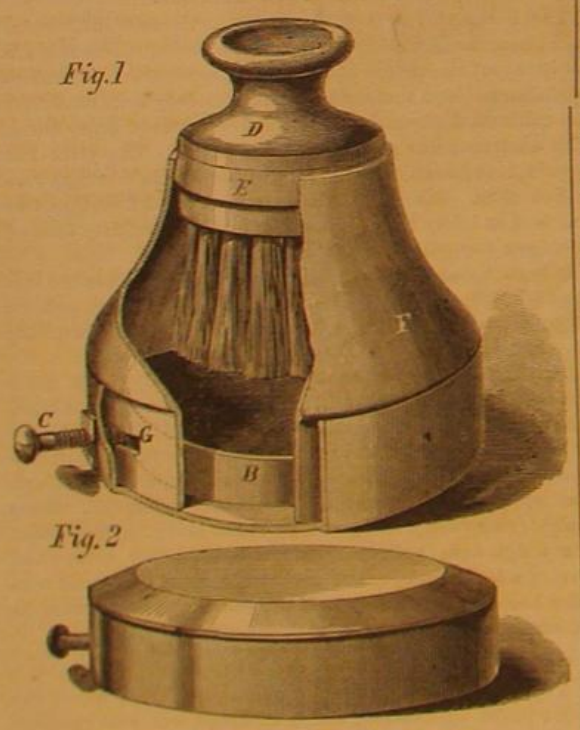
For further information address Michael M. Motz, Woodward, Center county, Pa.



MOTZ'S EXPANSIVE PIVOT.

SWEETZER'S BLACKING AND BRUSH HOLDER.

This is one of those simple, practical, and cheap, yet useful inventions from which inventors often reap large rewards. The obvious utility and convenience of such a



blacking and brush holder, will, we think, secure for it a wide popularity. The object has been to form a convenient blacking and brush holder, so constructed that, while the blacking is fully covered and excluded from the action of the air, the knob of the brush shall form a handle for the entire apparatus.

Fig. 1 is a prospective view with a portion broken out to show the internal construction.

The external and lower part, A, is a receptacle for the blacking box, B, from which the cover is taken off when it is placed in A. One side of the blacking box rests against a lug soldered to the bottom of A, and the other side is engaged by the screw C, so that the box is firmly held in position. In this way the arrangement may be adopted to four sizes of blacking boxes, but it is preferred to employ two different sizes of holders, the smaller size forming a very neat and tasteful device for travelers' use.

D represents the daubing brush which is made slightly tapering at the part E, and has a suitable knot at the top. The part E engages and covers F, when the apparatus is not in use, in which case the parts are in the position shown in Fig. 1, a right angled slot, G, in the cover engaging the screw C, in the same way as a lantern top is sometimes made to engage lugs in the bottom. When it is desired to use the blacking, a smart tap on the knob of the brush releases it from its engagement with the cover, F. The latter is then slightly turned to release it from its engagement with the screw C, when it may be lifted off, and the brush is then left free.

When a brush combining a daubing brush with a polishing brush is preferred, a common cover for the blacking box and holder is employed, as shown in Fig. 2.

This invention was patented through the Scientific American Patent Agency, March 26th, 1872. For further information address E. H. Sweetzer, Box 317, Salem, Mass.

Jasper and Bloodstone.

Jasper, one of the many varieties of quartz, is very compact, and is found of various colors—dark green, red, brown, yellow, grayish, and sometimes bluish and black. It is very hard and takes a fine polish. Occasionally it is found banded or in stripes of different colors, when it is termed ribbon jasper; the stripes are usually red and green alternating. Jasper alone is infusible before the blowpipe, but it will melt with the addition of carbonate of soda. It is sometimes found imbedded in trap rock, but more frequently in pebbles in the beds of rivers.

The yellow jasper is found near the bay of Smyrna, in Greece, and other places, the red in the plains of Argos; the variety known as ribbon jasper comes from Siberia and Saxony; and another kind, termed Egyptian jasper, is found on the banks of the Nile. This latter is of a fine brown on the exterior and clouded with brown of various shades, frequently spotted with black, the markings in this variety occasionally resembling natural objects. A specimen in the British Museum is thought to exhibit a likeness of the poet Chaucer. The yellow variety is used in the Florentine mosaic work called *pietra dura*.

The ancients were well acquainted with this stone, and prized it most highly. Onomakritos, 500 years before the Christian era, speaks of the "grass green jasper, which rejoices the eye of man, and is looked on with pleasure by the immortals." The emeralds spoken of by Roman and Greek authors were most probably green jasper, as we hear of pillars of temples cut out of one piece. Pliny, who describes no less than ten kinds of jasper, relates that it was worn by the natives of the East as an amulet or charm. This stone was much used for cameos; many specimens are extant, having several layers, and the objects represented are cut deep or shallow so as to bring the colors into contrast: for instance, in some specimens may be seen the head of a warrior in red jasper, the helmet green and the breast plate yellow. In the collection of the Vatican are two marvellous vases of this substance: one of red jasper with white stripes, the other of black jasper with yellow stripes.

This stone is cut on copper wheels with fine sand and emery, and polished on wooden or metal wheels with pumice and tripoli. The jasper, according to the authorized version of the Scriptures, was the twelfth stone in the breast plate of the High Priest; and as the Hebrew name is "yashpeh," which is strikingly similar to jasper, and almost all the translations agree, there can be little doubt as to its identity. Galen, among other sage advice, relates that, if a jasper be hung about the neck, it will strengthen the stomach.

The bloodstone is another jasper variety of quartz, of a dark green color, and having those minute blood red specks disseminated throughout which give its name.

The word heliotrope, from ἥλιος the sun and τροπη a turning, is derived from the notion that when immersed in water it changed the image of the sun into blood red. Pliny relates that the sun could be viewed in it as in a mirror, and that it made visible its eclipses. It is found in large quantities in India, Bokhara, Siberia, and Tartary, and also in the Isle of Rum in the Hebrides, occurring generally in masses of considerable size. It is translucent and susceptible of a beautiful polish; its commercial value, as in the case of other stones, varies with the quality of the specimen. The bloodstone is used for the same purpose as agate and onyx.

There is a tradition that at the Crucifixion the blood which followed the spear thrust fell upon a dark green jasper lying at the foot of the cross, and from this circumstance sprang the variety. In the middle ages, the red specks alluded to were supposed to represent the blood of Christ; and this stone was thought to possess the same medicinal and magical virtues as the jasper.

The Future of Iron.

Unless the present scarcity and high prices of iron are the temporary effects of causes which may be speedily removed, they must operate as a serious check to the prosperity and progress of all civilized nations. The rapidly increasing demand for and consumption of this metal, in its various manufactured forms, has already been brought to a halt; and enterprises of great utility, and even of national importance, are now awaiting further developments upon this subject.

This enhanced cost falls with the most severe and paralyzing effect upon railroad building enterprises, and hence indirectly upon the general interests of commerce and production, so largely dependent upon transportation facilities.

Unfortunately, this large advance has come upon us at a time when the railroad system of the country is being extended at the rate of some seven or eight thousand miles a year, when new building projects were about to be entered upon in nearly every State and Territory in the Union, and when vast railroad schemes are being matured in South America, Russia, Egypt, India, China, and other non-producing countries, which have just begun to develop their material resources, and need iron to do it with, in immense quantities and in every possible utilized shape.

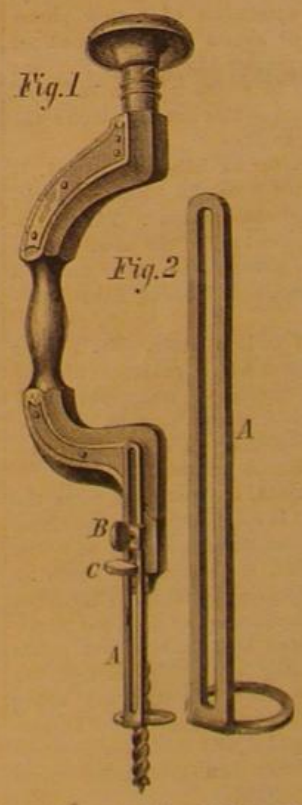
Where is all this iron coming from? And if the present demand so much exceeds the supply and forces up prices to so high a range, what may be expected of the prospective demand, which promises to be much larger in proportion than any prospective or even possible increase of production?

It is difficult to perceive how the increased supply, requisite to keep prices within bounds, can come from Europe. It is very evident that the cost of production there is not likely to be reduced, with mines growing deeper and more difficult to work, and operatives clamoring for more pay or deserting for other fields of labor.

It really seems that, with our abundant supply of coal and ore, lying close to the surface and so easily mined and brought together, we ought not only to be able to supply our own domestic wants but those of nearly all the world.—*Commercial Bulletin.*

WHITUS' ATTACHMENT FOR BIT BRACES.

This is a very simple invention, the application of which to bit braces will add much to their utility while it does not greatly enhance their cost. We hardly need say that it is customary to keep on hand a number of wooden tubes or pods, of various lengths and sizes, to slip over bits to gage the depths of holes. This invention obviates the necessity of using such appliances.



A sliding gage, A, Fig. 2, is attached to the side of the bit stock and held in the desired position by the thumb screw, B, Fig. 1. C is the thumb screw which holds the bit in the stock. The gage bar has a ring shaped foot, which, meeting the surface of the material to be bored, limits the depth of the hole. The gage may be graduated in inches and fractions of an inch if desired.

This very practical and useful attachment is the invention of Mr. Charles Whitus, of Philadelphia, Pa., assignor to himself, Edward C. Smith, and William Martin, Jr., of the same place. It was patented April 9, 1872. For further particulars address William Martin, Jr., 1702 Gerard avenue, Philadelphia, Pa.

Nitrate of Ammonia in Respiration.

The formation of nitrate of ammonia in respiration may be shown by the following experiment: On breathing for a few moments from the chest into a large glass, the sides of which are moistened, and afterward rinsing out the glass into a test tube, the presence of free nitric acid is shown by the ordinary reagents (iodide of potassium and dilute sulphuric acid). The presence of ammonia is shown by the usual reagents. M. Struve has remarked that the formation of nitrate of ammonia, in the act of respiration, is more feeble in the morning before dinner than in the afternoon. He concludes from this that the nitrogen in the atmospheric air does not play an entirely passive role in respiration, which is evidently contrary to the experience of MM. Régnault and Reiset. It is natural to suppose that nitrate of ammonia present in saliva plays an important part in digestion.

Fig. 1.—HILL OF GUANO AT THE CHINCHA ISLANDS.

GUANO.

The Chincha islands, whence have come the immense supplies of the well known fertilizer termed "guano," consist of a group of three small islands, which rise from the sea at a distance of fourteen miles from the coast of Peru, to which government they belong. These islands vary in hight from 150 to 300 feet, are about a mile in diameter, and the guano is found upon them in the form of a covering or deposit of varying depths, but in some cases 150 feet in thickness, the underlying rocks being of volcanic character.

Our engravings show the manner in which the valuable commodity is mined. The laborers employed are Chinese coolies, who are obliged, at the point of the bayonet, to submit to a servitude more galling than African slavery.

One of the views (Fig. 1) shows the largest remaining hill of guano, which is carted in dirt cars to the brink of the cliffs, and then dumped (Fig. 2) into cribs, from the lower corners of which it is made to slide down through strong canvas chutes into small boats, shown in Fig. 3.

Fig. 3.—CHUTING THE GUANO INTO THE BOATS.

The mode of fastening the chutes to the boats, so as to prevent loss of the material, will be readily understood by a glance at the engraving. The small boats convey the guano to the ships which ride at anchor at some little distance from the islands. It is not uncommon to find over a hundred ships, of various nations, waiting to receive cargoes of the precious earth, which they convey to all parts of the civilized world. Many millions of tuns of guano have been removed from these islands during the past thirty years, and their supply is now approaching exhaustion. There are twelve other guano islands on the Peruvian coast, which are now being worked; among them are the Guanape islands, which are north of the Chinchas. Other islands in the Pacific furnish guano, as, for example, Jarvis and Baker's islands.

It was formerly the popular belief that the guano deposits were wholly the excreta of wild birds, but careful investigations of geologists show that this is

Fig. 2.—DUMPING THE GUANO INTO THE CRIBS.

not correct, and that guano is the result of the accumulation of the bodies of animals and plants, and is in many cases associated with bitumen.

At a meeting of the Natural History Society in this city, Professor A. M. Edwards made the following instructive remarks upon the subject:

I am not prepared at the present time to enter fully into the consideration of this subject of the origin of guano, but I would merely mention that my views on the subject were first made public at a meeting of the American Microscopical Society, during the winter of 1868. Thereafter, on the 4th of January, 1869, I gave the results of my investigations and the deductions I drew therefrom at a meeting of the Essex Institute at Salem, Mass., and an abstract of what I then said was published in the bulletin of that association, Vol. I, page 11. The main points then brought forth, and which I desire to dwell upon now, are for the purpose more particularly of calling the attention of scientists to this interesting and important subject. I have spent several years in investigating this subject and have become acquainted with some facts of great moment as bearing upon several branches of science, more particularly geology, agriculture, biology, and chemistry, as well as commerce. I have also been, for the last fifteen years or more, studying the so-called infusorial deposits of marine origin; that is to say, those which are proved, by the character of the remains contained in them, to have been formed beneath salt water.

Among the specimens thus examined, are some of the rocks or shales making up the great mass of the mountains of the coast range which extend down the Pacific shore, from Washington Territory to the borders of Lower California and even perhaps down as far as the southernmost extremity of that peninsula. These shales are usually of a light cream color and mainly consist of the siliceous skeletons of *diatomaceæ* and *polycystina*, the former being commonly considered as plants, the latter as animals. These are of extremely minute size, and often require for their study the use of the highest magnifying powers. Many of them prove to be indistinguishable from forms living at the present day on the Californian coast. Exuding through and often appearing at the upper portion of these rocks, to which situation they have evidently been driven by heat, are found the petroleum, bitumen, and asphalt of California. Hence the survey has conferred upon these strata the name of bituminous shales. Along the Pacific coast, and lying generally parallel to it, are islands often bearing upon their summits deposits of guano of more or less commercial value.

We find that guano is not confined to islands only, but occurs in large quantities on the contiguous headlands; and many ravines extending into the interior of the country contain guano in smaller and larger quantities. With regard to the upheaval of such coasts, along which guano occurs, it is well known from Darwin's investigations that the whole Pacific coast of South America is in constant motion and upheaval, and that "on the mainland near Lima, and on the adjoining island of San Lorenzo, Mr. Darwin found proofs that the ancient bed of the sea had been raised to the hight of more than eighty feet above water, within the human epoch, strata having been discovered at that altitude, containing pieces of cotton thread and plaited rush, together with sea weed and marine shells."

When the portion of guano which is insoluble in water and acids is examined by means of the microscope, it is found to be made up of the skeletons of *diatomaceæ*, *polycystina* and sponges, invariably of marine origin, and sometimes identical with those living in the adjoining ocean, and fossilized in the adjacent infusorial strata. Also we find that some of these forms occur in patches exactly as they grow in Nature, and as they would present themselves if they were deposited from water, and not as they would be if they had to pass through the alimentary canals of mollusca and similar small animals, then through the same organs of fish and birds, in turn, as they would have to do, to get into the guano in the manner commonly supposed.

I have stated that in California we have a deposit of infusoria, improperly so called, accompanied by bitumen, which bitumen the gentlemen of the State survey believe has been derived from those infusoria, and that contiguous thereto we have guano deposits. Now let us see if we have a similar association of facts anywhere else. At Payta in Peru, Dr. C. F. Winslow discovered an infusorial deposit, almost identical in character with the California one; near by are bitumen springs, and lying off the coast are the guano islands of Lobos, Chincha, Guanape and others; at Natanai, Japan, we have extensive infusorial strata and bitumen; it is not recorded whether guano occurs in that quarter. In the island of Barbadoes we have infusorial strata, bitumen, and near by the guano islands of the Caribean sea; and I am informed that guano is abundant on the small islands and rocks nearly throughout the West Indian archipelago. In the island of Trinidad, we have infusorial strata and bitumen, and of course adjacent guano. At all of these localities volcanic action is evident, but we have some localities of guano without infusorial strata or bitumen as yet recorded, while we have the celebrated infusorial strata of Virginia, which by a little stretch of the imagination, may be supposed to be related in some way to the petroleum of West Virginia and Pennsylvania. In Algeria we have infusorial strata and bitumen, but I never heard of guano having been found near by. However, now that attention is called to this fact, it is to be hoped that more careful observations will be made connected with the subject, and I hereby call on all scientists and travellers to do all they can to assist in the elucidation of this interesting and important matter. From all of these facts, and others that I have collected of no less importance, derived from chemical and microscopical characters, I have come to the conclusion that guano is not the excreta of birds, deposited upon the islands and main land after its upheaval, but that it is the result of the accumulation of the bodies of animals and plants, for the most part minute and belonging to the group which Haeckel has included in a new kingdom, separate from the animal as well as the vegetable, under the name of *protista*, and subsequently upheaved from the bottom of the ocean. Subsequent chemical changes have transformed it into guano, or heat and pressure have so acted upon it, that the organic matter has been transformed into bitumen, while the mineral constituents are preserved in the beautiful atomies that make up the mass of the extensive infusorial strata, found in various parts of the world.

In conclusion, I have to state that the Chincha islands have been visited by a competent geologist, Mr. Kinahan, of Dublin, and he has pointed out that they have been upheaved by volcanic action within a recent period, geologically considered, and that I have found a remarkable confirmation of my theory in a paper, read before the American Institute some years since by Mr. Alanson Nash, detailing the observations of a Mr. F. Nash, made during a residence on the Chincha islands, while engaged in the guano trade, for nearly six months. Therein I find it stated that Mr. Nash was of opinion that guano was formed in the way I have described; that the anchors of vessels in that locality bring up guano from the bottom of the ocean; that "the guano is (much of it) not composed of bird dung, but it is composed of the mud of the ocean." That "the composition taken from the islands, called guano, is stratified and lies in the same form it did before it was lifted up from the ocean; that the bottom of the ocean on the west coast of Peru, contains vast deposits of guano. An island, during an earthquake, rose up in the bay of Callao some years since from the sea, containing guano four feet deep, the formation the same as the Chincha islands."

In conclusion, he says "the day will come when the guano at these islands will be dredged up with boats like mud from our rivers and harbors." And in this expectation I fully coincide with Mr. Nash. Need I again point to the interest connected with, and the value of further knowledge of, this subject, or call on every one for a contribution of facts to aid in its thorough elucidation?

Sea Sickness.

From an article in the *British Medical Journal* by Sir James Alderson, M.D., D.C.L., F.R.S., consulting physician to St. Mary's Hospital, we make the following extracts on this very nauseating subject:

The cause of sea sickness and its possible amelioration is a subject particularly appropriate at the present time.

Referring to the experience of sufferers from sea sickness, it is admitted by all that they are most sensible of the miserable feeling at the moment of the descent of the ship. They are also conscious, at that particular time, of an instinctive effort to sigh or take a deep inspiration, the meaning of which is manifest. During deep inspiration, the chest is dilated for the reception of air, and its vessels become more open to admit blood, so that a return of blood from the head is then more free than at any other period of complete respiration; while on the contrary, by the act of expelling air from the lungs the ingress of blood is obstructed. This obstruction is proved by observation when the surface of the brain is exposed by the operation of trephining; a successive turgescence and subsidence of the brain is then seen in alternate motion with different states of the chest. A deep inspiration, therefore, at the time of the descent of the ship tends to counteract the turgescence of the brain.

Sickness is sometimes produced by waltzing. In this case, the same theory of pressure on the brain holds good; but during rapid gyration in waltzing, the blood is acted on differently; it is centrifugal force which causes the blood to rise in the vessels supplied to the brain. There is an additional cause of cerebral disturbance from the confusion of objects rapidly presented to the eye; from this comes giddiness.

In reference to sickness brought on by swinging, I cannot do better than quote Dr. Wollaston: "Sickness, by swinging, is evidently from the same cause as sea sickness, and that direction of the motion which occasions the most piercing sensation of uneasiness is conformable to the same explanation already given. It is in descending forward that this sensation is perceived, for then the blood has the greatest tendency to move from the feet towards the head, since the line joining them is in the direction of the motion; but when, in the descent backwards, the motion is transverse to the line of the body, it occasions but little inconvenience, because the tendency to propel the blood towards the head is then inconsiderable."

The last observation of Dr. Wollaston, quite accurate as to the result, plainly suggests the practical bearing of the subject. Knowing the mode in which the ship's movement acts on the brain, we are at once furnished with the only rational way of averting sea sickness.

The first point is wholly to avoid the upright posture. Every one knows that it is a common practice to lie down, and this is done almost instinctively, but it is also known that to do so, though frequently successful, is not invariably so. The way in which the motion in a swing affects the brain affords the proper explanation why lying down is not invariably successful, and shows that it is necessary, not only to take a recumbent position, but to lie in the right direction. A person lying down with the feet towards the bows of the ship is, while it descends in pitching, in the same position as a person in a swing descending forwards, in which case we have seen that sickness is produced by blood being forced upon the brain. On the contrary, a person lying down with his head towards the bows is, during the descent of a ship, in the position of one descending backwards in a swing, in which case the pressure by the blood will be towards the feet, and, therefore, relief rather than inconvenience will be experienced, as the tendency will be to reduce the natural supply of blood to the brain. It is necessary, therefore, not only to lie down, but to do so with the head to the bows; and it is highly desirable that this position should be assumed before the ship begins to move. There is a secondary advantage to be gained by closing the eyes, and so shutting out the confusion arising from the movement of surrounding objects.

If the philosophical explanation here given be the correct one, which there is no reason to doubt, it adds one more to many unanswerable objections to the device of taking passengers in railway carriages on board gigantic vessels. No relief would be afforded by that plan to the miseries of sea sickness, since, except in a perfect calm, nothing can prevent the rising and falling of the ship and the consequent action of the blood upon the brain. The sitting posture would be equally unfavorable with the upright, and there would be, in addition, the common motion of a carriage, which alone, with some persons, produces sickness.

The Laws of Boat Racing.

A meeting, of the boating fraternities of Oxford and Cambridge Universities and the principal boat clubs of London, was recently held at Putney, at which the following laws to govern the racing of those clubs were agreed upon:

1. All the boat races shall be started in the following manner: The starter, on being satisfied that the competitors are ready, shall give the signal to start.

2. If the starter considers the start false, he shall at once recall the boats to their stations, and any boat refusing to start again shall be disqualified.

3. Any boat not at its post at the time specified shall be liable to be disqualified by the umpire.

4. The umpire may act as starter, if he thinks fit; where he does not so act, the starter shall be subject to the control of the umpire.

5. No fouling whatever shall be allowed; the boat committing a foul shall be disqualified.

6. Each boat shall keep its own water throughout the race, any boat departing from its own water will do so at its peril.

7. A boat's own water is its straight course, parallel with those of the other competing boats, from the station assigned to it at starting to the finish; and the umpire shall be sole judge of a boat's own water and proper course during the race.

8. The umpiro, when appealed to, shall decide all questions as to foul.

9. A claim of foul must be made to the judge or to the umpire by the competitor himself before getting out of his boat.

10. It shall be considered a foul when, after the race has commenced, any competitor, by his oar, boat, or person, comes in contact with the boat, oar, or person of another competitor: unless, in the opinion of the umpire, such contact is so slight as not to influence the race.

11. In case of a foul, the umpire shall have the power—

(*a.*) To place the boats—except the boat committing the foul, which is disqualified—in the order in which they come in.

(*b.*) To order the boats engaged in the race, other than the boat committing the foul, to row over again on the same or another day.

(*c.*) To restart the qualified boats from the place where the foul was committed.

12. The umpire, may, during a race, caution any competitor in danger of committing a foul.

13. Every boat shall abide by its accidents.

14. No boat shall be allowed to accompany a competitor for the purpose of directing his course or affording him other assistance. The boat receiving such direction or assistance shall be disqualified at the discretion of the umpire.

15. The jurisdiction of the umpire shall extend over the race, and all matters connected with it, from the time the race is specified to start until its final termination; and his decision in all cases shall be final and without appeal.

16. Any competitor refusing to abide by the decision or to follow the direction of the umpire shall be disqualified.

17. The umpire, if he thinks proper, may reserve his decision, provided that such decision be given on the day of the race.

DR. PINCUS states that ozone is formed during the burning of hydrogen, and that if a flame of this gas is allowed to burn from a fine point, the smell of ozone can be be distinctly recognized. This statement recalls to mind the announcement made some time since by Loew, of New York, that ozone might be obtained, in sufficient quantity for purposes of lecture demonstration, by simply blowing the heated air on the edge of an ordinary Bunsen flame, with the aid of a glass tube, into a glass receiver containing the ordinary reagent for testing an oxidizing agent—iodide of potassium, acetic acid and starch—when the blue coloration of the iodide of starch almost instantly makes its appearance. At the time, Loew's announcement met with some objectors who sought to explain the phenomenon by assuming that the oxidizing process originated with certain oxidized nitrogen compounds formed by the heat of the flame. From the fact, however, which is well known to chemists, that it is impossible to unite nitrogen and oxygen directly, by any means short of the electrical spark, the explanation of Loew would seem to be the correct one.

SCIENTIFIC AND PRACTICAL INFORMATION.

THE COMBUSTIBILITY OF IRON.

The combustibility of iron is shown by any means that exposes a large surface to the action of the atmosphere. For that purpose, the late Professor Magnus, of Berlin, devised the method of using a magnet, to which iron filings readily attach themselves like a beard, all radiating from the poles in such a manner as to leave small interstices. On igniting these with an alcohol lamp or gas burner, they continue to burn most brilliantly; and if the experimenter stands on some elevation, like a step ladder, and waves the magnet, a most magnificent rain of fire is produced. When this experiment was first performed in Berlin, it was received with applause by the King and court of Prussia.

It is well known to physicists that a magnet of some strength may be made by placing a bar of iron or steel in the magnetic meridian, and striking it a few sharp blows with a hammer.

If no magnet can be procured for the experiment, a bunch of cotton wool is saturated with alcohol, placed on some support, and the alcohol ignited. Some fine iron filings, placed on a sheet of paper, are allowed to fall in a fine stream on the burning mass, when they burn with brilliant scintillations, showing that iron is combustible if only the supply of air is sufficient.

Still more remarkable is the experiment showing that iron is more combustible than gunpowder. A mixture of fine iron filings and coarse gunpowder is thrown on a small quantity of burning alcohol. As the iron falls through the flame, it takes fire and burns with its characteristic color and scintillations. The gunpowder falls through the flame without taking fire, and lies quietly in the bottom of the saucer until the alcohol is nearly consumed and the flame is brought into contact with it, when it flashes, showing that it was the powder, not the iron, that passed through the flame without taking fire.

The influences which the minute size of the particles, by which a large surface is exposed to the air, has on the combustibility of a substance is well illustrated in pyromorphic iron. If the oxide of iron be reduced, by passing over it a current of hydrogen, the heat employed being less than that of boiling mercury, the metallic iron is left in such a fine state of subdivision as to take fire spontaneously when allowed to fall through the air.

It may not be out of place here to refer to the fact that spontaneous combustion of greasy rags and oily cotton waste is due to rapid oxidation of the oil or grease, of which a very large surface is thus exposed.

REMEDIES FOR CANCER.

Our readers will remember that we published (on page 5 of the current volume) a recommendation of the use of wild tea as a cure for cancer. Mr. J. B. Williams, who wrote the letter, has since been accused of an attempt to impose on the public, some of our readers having tried in vain to obtain or hear of such a herb. Dr. W. W. Hall states that it is to be had in drug stores, that its names are various, pipsissewa, partridge berry, deer berry, tea berry, wintergreen, and mountain tea being among them; and he gives its botanical name as *chimaphila umbellata*. There is, we believe, a little confusion in this description. Pipsissewa is the *chimaphila umbellata*, and is known in the country as "spotted wintergreen." The real wintergreen is *gaultheria procumbens*, and "partridge berry" is a common name for it. Again, *Mitchella repens* is also called partridge berry. These three herbs are widely different in appearance as well as in their medicinal effects. It is probable that Mr. Williams meant the *Mitchella repens*, which is said to be in use among the Indian medicine men to facilitate parturition. No one would announce as a discovery that wintergreen (*gaultheria*) or pipsissewa was a specific for cancer, the characteristics of these herbs being known to every tyro in pharmacy.

DYEING COTTON YARN WITH MAGENTA.

If cotton yarn be washed in pure water, heated to nearly boiling point, the material being supported on rods in the wash boiler and turned frequently during three quarters of an hour, then well rinsed in running cold water, and dyed according to the following directions, a mordant can be dispensed with. The color bath is prepared by using four ounces of the hydrochlorate of rosanilin (sometimes called diamond fuchsin) in ten gallons of boiling water. The yarn should be entered in parcels of about twenty pounds each, the color being also put in gradually. The heat of the water will impart a blue shade to the dye, and the yarn should be dried at a low temperature. This method is economical, and can easily be tried.

REGELATION.

This curious phenomenon can be exhibited by placing a block of ice on a netting of fine wire. The ice will be melted by the wire, and, passing down therethrough, will become frozen into a mass again below the wire. A single wire can, in a similar manner, be drawn slowly through a block of ice, the ice uniting again behind the wire and finally showing no sign of having been cut at all.

COLOR AND TEMPER OF STEEL.

In an interesting work entitled "The Metallurgy of Iron," we find some figures that will be useful to our very many readers who ask for particulars as to the tempering of steel for different purposes:

"The process of tempering steel consists in reheating hardened steel to a temperature varying with the degree of hardness required, and cooling it by immersion in the same manner. This proper temperature is indicated by the color of the thin film of oxide formed on the surface of the heated metal, according to the following scale:

	Color.	For
220°	Pale yellow.....	Lancets.
230°	Straw yellow.....	Razors and surgical instruments.
243°	Golden yellow.....	Common razors and penknives.
255°	Brown	Cold chisels, shears, scissors.
265°	Brown, dappled with purple	Axes, planes, etc.
277°	Purple	Table knives, large shears.
288°	Bright blue.....	Swords, coiled springs.
293°	Full blue.....	Fine saws, augurs, etc.
316°	Dark blue.....	Hand and pit saws.

The reheating is generally effected in baths of molten metals, or metallic alloys having definite fusing points. Thus, alloys of tin and lead, in varying proportions, may be used up to a temperature of 300°; above which boiling linseed oil and pure lead are to be employed. The tenacity of steel is highly increased by tempering with oil instead of water."

Concentrated Ozone.

Professor A. Houzeau has devised a very simple electrical tube, by which he is enabled, by passing air through the tube, to produce ozone, so concentrated as to be from fifteen to twenty times stronger than has hitherto been obtained. He has thus been enabled to review many of the most important properties of this substance, and besides to determine the part it plays in Nature.

With the ozonizing tube, the following lecture experiments may be performed. The gas can be collected over water, in flasks of the capacity of half a liter (water dissolves about the 100,000th part of its weight of ozone.)

SILVER.—A bright leaf of silver is immediately blackened in most ozone (Schönbein). The oxide of silver formed is alkaline, and produces a strong blue with reddened litmus paper (A. H.) In spite of this absorption of ozone by the silver, the volume of the gas undergoes no visible diminution (A. H.)

IODIDE OF POTASSIUM.—A solution of iodide of potassium, poured into ozone, is decomposed and becomes of a reddish brown color, through the liberation of iodine (Schönbein). Free potassa is also formed (A. H.) The reaction is rendered more striking if, for a simple solution of iodide of potassium, we substitute a colorless mixture composed of four to six cubic centimeters of a neutral solution of iodide (6 to 100), and 2 c.c. of the dilute sulphuric acid containing 0·122 grammes SO_3 HO. The liquid colors slightly and nearly the whole of the iodine is precipitated.

HYDROCHLORIC ACID.—5 c.c. of pure colorless solution of hydrochloric acid in water, holding in suspension finely divided gold leaf, when agitated for two minutes with concentrated ozone, becomes of a yellow color; the metal is entirely dissolved, and at the same time a manifest odor of chlorine is produced (A. H.)

AMMONIA.—A few c.c. of the volatile alkali, turned into a half liter flask of ozone, emitted white vapors consisting of nitrate of ammonia (A. H.) A transparent mixture of ozone and dry gaseous ammonia nitrifies when water is introduced (A. H.)

SULPHURETTED HYDROGEN.—A strong reaction, sulphur deposited, and white vapors produced.

PHOSPHURETTED HYDROGEN.—(Ph H_3 of M. Thénard.) This gas, which is unaffected by ordinary oxygen, burns with a vivid light in contact with ozone. The experiment may be made without danger, if only one c.c. of gas is used over water in a tube several decimeters long. As each bubble of ozone is introduced, a brilliant flash of light appears (A. H.)

A mixture, composed of two volumes of phosphurretted hydrogen (not spontaneously inflammable), and one volume of oxygen, blown into a soap bubble, detonates with violence on contact with a globule of ozone (containing only 0·03 milligramme of ozone.) The ozone acts as though it were charged with electricity.

ORGANIC MATTERS.—Ozone rapidly corrodes caoutchouc, whether vulcanized or not (Frémy and Bécquerel.) A current of ozone, made to pass through a tube filled with fragments of caoutchouc, becomes charged with carbonic acid, and produces a precipitate with baryta water (A. H.) The alteration of caoutchouc by ozone is therefore the result of a combustion. Solution of aniline red is instantly bleached by ozone. A weak solution of indigo is likewise decolorized.

Chinese Plumagery.

Confucius informs us that in remote antiquity, ere the art of weaving silk or hemp was understood, mankind were clothed in the skins of beasts and feathers. How the latter were held together is not stated, but it must have been in a rude manner by cords or thread; at a later period, feathers were in general demand as ornaments to banners and articles of attire, and subsequently for the manufacture of door screens and caps. Tradition states that garments made of feathers and resembling fur dresses were presented to the Emperor Shan-shau, who reigned twenty-five centuries before our era. The earliest allusion to robes woven with feathers occurs in the history of the Tsin dynasty. In the year 272, A. D., Dr. Ching, the Court physician, presented the emperor with a gown made of feathers from the golden headed pheasant. His Majesty, being the founder of a new dynasty, was anxious to induce economical habits among his subjects; he therefore immediately ordered the splendid garment to be publicly burnt before the palace door, and issued, on the following day, stringent prohibitions against the presentation of articles of luxury.

The Emperor Wuti, who flourished in the latter part of the fifth century, had a son who was notorious for his extravagance, having among other costly articles a robe woven with peacocks' feathers.

The Chinese have lost the art of weaving feathers. Plumagery is still practiced, however, in the decoration of metallic ornaments worn by all classes of females, chiefly on the head. The mode of procedure is as follows:

"On the table at which the workman sits, he has a faleencellus of feathers, a small furnace with a few embers for keeping warm a cup of glue, a small cutting instrument like a screw driver, a pencil or brush, and the articles, either silver, gilt, copper, tinsel, or pasteboard, which are to be feathered.

"The thumb and index finger being smeared with glue, the feathers are gently drawn between them, which stiffens the barbs, causing them to adhere firmly together; and when dry, the perpendicular blade is drawn close to the shaft, dividing it from the barbed portion. Holding the cutting implement as in writing *a la Chinoise*, the artist, by pressing on the strips of barb with the knife, cuts them into the desired size and shape, which is a work of some delicacy, the pieces being very small, in the form of petals, scales, diamonds, squares, and the like, and requiring to be of same size as the particular spot on which they are to be laid. Besides fingering this tool in the manner described, he holds the pencil nearly as we do the pen, dips it into the glue, brushes the spot to be covered, then, expertly reversing it, touches with its opposite point a tiny bit of feather, which is thus lifted up and laid on the part for which it was fitted. Care is requisite also in giving a proper direction to this twilled work, for such, of course, is the appearance presented by the barbs.

The feathers most in demand for this purpose are from a beautiful species of *Alcedo*, brought from the tropical regions of Asia; they are employed for silver articles. Kingfishers, of coarser plumage and less brilliant hues, found throughout the country, are used for ornaments made of copper or pasteboard. Blue always greatly predominates over lighter or darker shades, relieved by purple, white or yellow.

A New Railroad Safety Signal.

The Boston and Maine road has ordered the construction on trial of a new safety signal, which bids fair to supply a very important want. The invention contains a dial about four feet in diameter, divided as to its circumference into ten parts. The sets of figures in this dial, from 1 to 10, inclusive, are each nine inches in length, and show white on a large ground of red glass. Back of the dial, and protected from the weather, is a clockwork, and also the light. This dial and the work attached thereto are mounted by the side of the tracks on a post sixteen feet high. Another part of the invention is a large signal arm presenting white with red spots.

The method of operation is as follows: When a train passes, a staple on the top of the engine cab strikes a trip rod depending from the signal, which sets the clock work in operation. The result is that the arm giving the danger signal at once falls, and remains in a horizontal position ten minutes. The dial also begins to revolve, and for ten minutes shows red to indicate danger, and at the same time presents the large figure or figures indicating how many minutes have elapsed since the train passed. Both the board and the illuminated dial can be seen a long way off, the latter being applicable particularly for night and the former for day trains.

THE way they boil rice in India is as follows: Into a saucepan of 2 quarts of water, when boiling, throw a tablespoonful of salt; then throw in one pint of rice, after it has been well washed in cold water; let it boil 20 minutes. Throw it out on a cullender, and drain off the water. When this has been done, put the rice back into the can or saucepan, dried by the fire, and let it stand near the fire for some minutes, or until required to be dished up; thus the grains appear separate and not mashed together.

FIRE KINDLINGS.—In France, a very convenient and economical kindling is made by dipping corn cobs for about one minute in a bath composed of 60 parts melted resin and 40 parts tar. They are next spread out to dry on metallic plates heated to the temperature of boiling water. They are then assorted, according to size, and tied up in bundles. They sell for one to two centimes (¼ cent) apiece. The "Compagnie des Allumettes Landaises" employes 30 workmen and makes about $40,000 worth a year.

M. C. Robin states that matters injected into the spongy tissues of the bones in the living subject are absorbed as rapidly as if they were introduced directly into the veins, from which he inferred that this spongy tissue is in direct connection with the veins, and must be regarded as forming a system of sinuses.

IT is curious how great ideas will float about in the world. There is Mr. Darwin who, after extensive research and deep study, has hit upon the idea of the descent of man from animals. Now comes Mr. Poole, another Englishman, just from the Queen Charlotte Islands, who tells us that the natives claim their descent from the crow; they also give reverent form to the idea by protecting crow nests and never killing the birds.

A NEW Chinese temple was recently consecrated in San Francisco, with no less than seventy-five gods, two of which are twenty feet high and correspondingly large.

FOUR years ago, Lincoln, the capital of Nebraska, was "away out on the prairie," and was called "Young's Colony." Before the close of the present season, it will have six railroads, and will be lighted with gas.

Patent Pulley Bridle Bit.

This bit is used as a common bit, with the ordinary reins, and, it is claimed, gives the driver absolute control of his horse. A pulling horse is soon taught not to pull, and a vicious or frightened horse is easily managed.

It is argued by the inventor that control of a horse should be secured without extra reins or extra manipulation of them, and it is claimed this *desideratum* is, in this invention, secured for the first time. The driver can never be surprised or taken off his guard, for the reins are the ordinary reins, and he holds and handles them just as he has been accustomed to do. In this bit, in place of the ring in the ordinary bit, is a small pulley, A, Fig. 2, through which is passed a round strap to a buckle immediately under the blinder. A supplementary strap, attached to the same buckle, holds the bit in its proper place; or the bit may be supported by attaching two small rubber or leather balls to the reins under the pulleys.

Fig. 1.

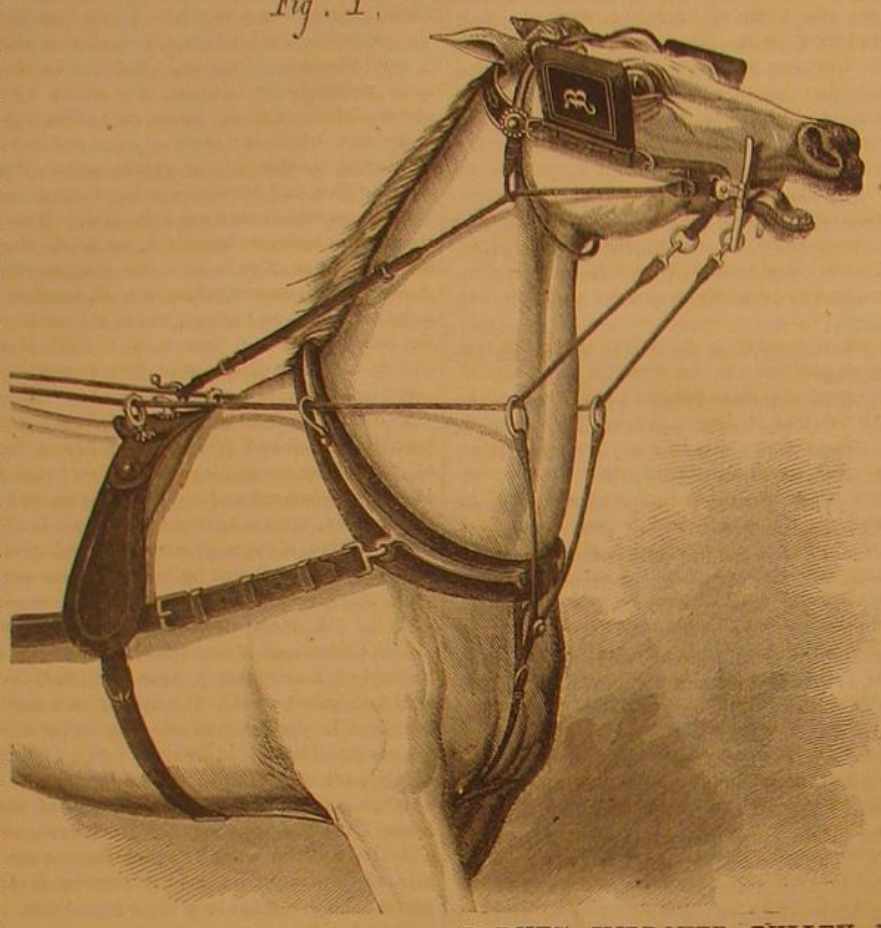
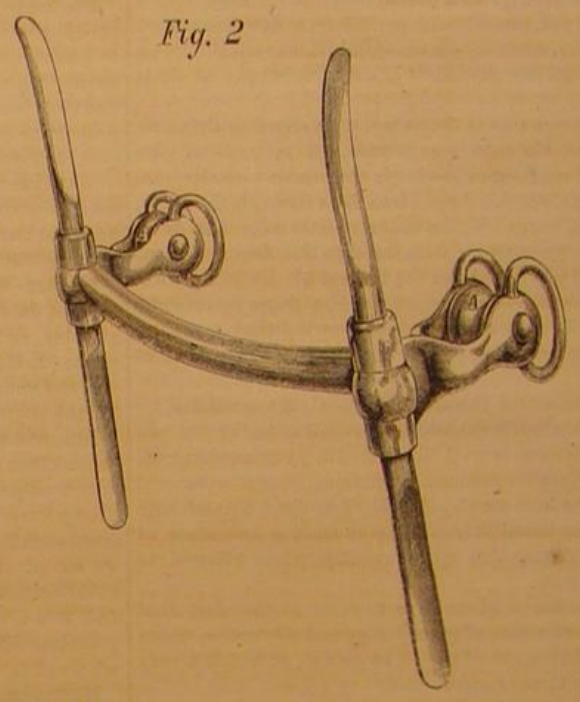


Fig. 2



BARNES' IMPROVED PULLEY BRIDLE BIT.

Now, in pulling on the reins the bit is lifted into the corners of the horse's mouth; he cannot hold it in his teeth, nor receive the pull on his jaw, and therefore is compelled to yield and throw up his head; in this position he cannot kick or run.

At first, if the horse is a hard puller, it is necessary to drive him without martingale, as the length of the martingale regulates the force of the bit.

It is admitted that no man can hold or control a horse with the common bit, if the horse exercises his strength. A great deal of damage is done to life, limb, and property by horses becoming unmanageable and running away, which the old device made by our ancestors is inadequate to prevent.

No man wants a pulling horse. We drive for pleasure, and do not wish to "work our passage." By this bit, it is claimed, a horse may be taught never to pull, and a horse not so educated may be kept under full control until he has learnt the reason.

Patented, March 19, 1872, by G. W. Barnes, No. 12 First st., New York city.

Improved Brick Kiln.

This invention consists in applying to the top of a brick kiln a series of intersecting horizontal flues, with registers at the intersections of the flues, whereby the products of combustion can be directed in their course. Fig. 1 is a perspective view of the kiln, and Fig. 2 is a partial top view, and Fig. 3, a partial side elevation,

Upon a brick kiln of suitable size and shape, and built up of raw brick in the ordinary manner, with furnaces, eyes, and crevices for the proper distribution of the heat, is placed a course, A, of bricks, in such a manner as to leave horizontal, longitudinal, and transverse flues, D E, which intersect at C, the outermost flues being placed quite near the verge of the kiln. All these flues are in proper connection with the smoke crevices, so that all products of combustion enter them.

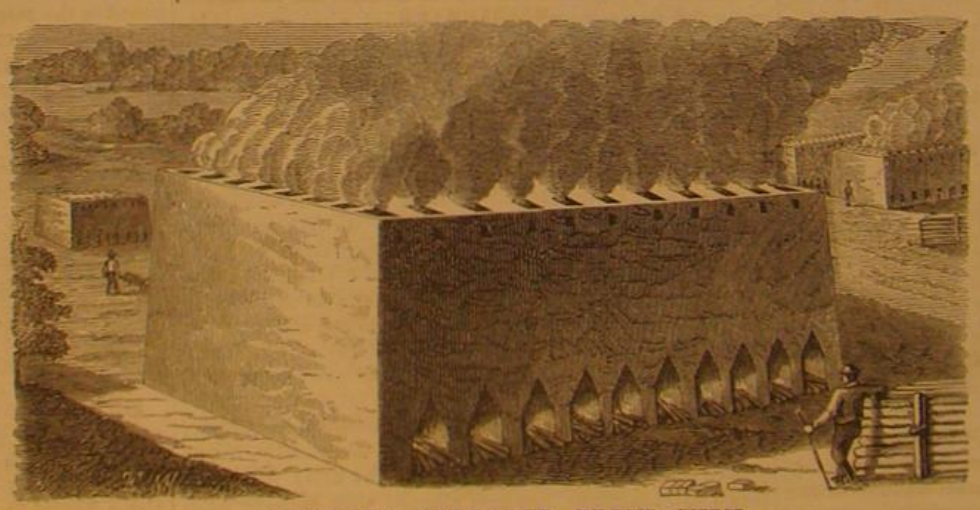
Upon the course, A, is laid another course, B, of bricks set on edge and close together, so as to cover the flues made in the first course. The bricks of the top course are preferably of burnt brick or fire brick, which will protect the kiln from injury by rain. Cement may be used to close the joints of the top course.

Each of the intersections of the flues has, placed over it, a register of cast iron or other suitable material, as shown in the center of Figs. 2 and 3.

In describing what led to this invention and the general operation and the advantages claimed for this cheap modification of ordinary brick kilns, we cannot do better than to copy the inventor's own statement:

"I have been engaged in making and burning brick for nearly the third of a century, and have, during that period, tried various experiments to discover a mode that should produce better results than are usually seen throughout the southern country—a mode by which, with less fuel, a larger portion of well burnt brick might be produced. In this I have utterly failed until recently. Upon a paved foundation, twenty-four feet by forty-two feet, I constructed a kiln or clamp, with ten eyes through it (the short way), eleven feet six inches high, reduced by battering one foot on each side, making an upper base or surface twenty-two feet by forty feet. It was thirty-three courses high, with benches between the eyes four bricks thick. The eyes were two bricks wide, and closed with the twelfth course. The partitions or widths were two bricks thick, closing the eyes at the center of the kiln. The short flues at the ends of the eyes —say two feet long—were closed by cast iron fronts, with dampers hinged on. The kiln was banked, with loose earth over the eyes and at its ends, to within five feet of its top, ries of horizontal flues (three inches wide and four deep), the first flue passing along the sides and ends of the whole kiln, within three inches of the outer verge, with also ten flues of similar size crossing the kiln in the direction of the eyes, terminating in the long flues near the verge of the kiln. Each of these flues were, and should be, placed over the center of the eye below. There were also eight flues placed within three feet of each other, running lengthwise and terminating in the flues at the ends, thus making ninety-six intersections or flues. The courses of bricks forming all the flues were, and should be, half an inch apart. Upon this course I set another course of burnt brick edgewise, closely packed (with their joints broken in the length) except at the intersections of the flues below, where there should be left apertures nine inches square, to be closed with cast iron registers, made tight by fitting them in soft clay mortar. The whole upper surface should be flushed with soft clay mortar, and plastered smooth and tight so as to be impervious to smoke or flame.

"With the registers all open, I commenced a moderate fire, which was continued for fifty hours, when flame escaped from the central registers, which assumed a red heat. These I then closed, and continued the fire and closed others as they became red hot. In 70 hours black smoke and flame issued freely from all of them, and the outer walls of the kiln showed considerable heat. I then increased the fuel, and so manipulated the registers as to keep up a good draft, giving the most draft where there seemed the least heat. At the end of 96 hours, the whole upper surface shrank (with great uniformity, making no rent or break through which flame escaped) from four to six inches, when I supposed it was sufficiently burned and closed the eyes and awaited its cooling. I had on the ground eighty cords of wood, the quantity I had heretofore used in burning such a kiln; this I reduced to a little less than thirty cords. The labor was performed by eight laborers instead of five. Seventy-five to eighty per cent of merchantable bricks was the best yield under the old system. On opening the kiln I found it burned to the surface as high as the earthen embankment (say six feet). From the embankment up, on one side and end, the bricks were thoroughly burned to the outside stretching course, which were themselves half burned. On the other side and end, owing to a continuous heavy wind blowing on them, the bricks were burnt to within the length of a brick of the outer surface. I stripped the kiln of all the salmon brick, which amounted to thirty-eight hundred, leaving ninety-eight per cent of merchantable brick, an advantage of eighteen per cent over the usual result, equal to thirty-six thousand bricks in the kiln, the increased value being four dollars per thousand. The saving of twenty-eight cords of wood was equal to eighty-four dollars, and the saving in labor, thirty-two dollars.



BREWER'S IMPROVED BRICK KILN.

Fig. 2

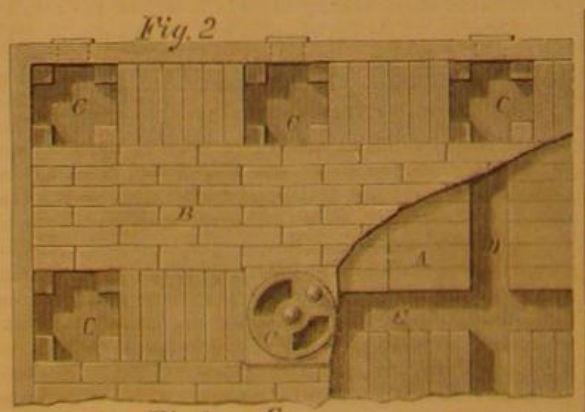


Fig. 3

so that, in every particular thus far, the kiln was just such as I and others have been putting up in this country for the last twenty years. Upon this structure, I placed an additional course of bricks upon the top of the kiln, so as to form a se

"The ninety-six registers cost seven cents per pound, which amounted to eighty-six dollars and sixty-four cents, and were not injured by the use, showing that they may be used over and over for an indefinite period."

The inventor and other credible witnesses say that the foregoing statement has been several times corroborated in actual practice, and from this it seems that the new kiln is a very valuable improvement, which can be employed at small cost.

It was patented, through the Scientific American Patent Agency, June 20, 1871, by Samuel C. Brewer, of Water Valley, Miss., whom address for further information.

LEARN to do something, young man, and learn it well. Set it down that no man ever succeeded in this world without knowing how to do some particular thing better than his fellows. Whether it was in a store or a tinshop, in a bank or on the seat of an express wagon, excellence was shown, and made the beginning that is the foundation of a successful career. The doom of the slouch and the sluggard is told in the legend that appalled the Babylonian king: "Weighed in the balances and found wanting." Hard work is the price asked for success, and it can be purchased with no other kind of currency.

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Contents:

(Illustrated articles are marked with an asterisk.)

OUR OBLIGATIONS TO THE ARABIAN ALCHEMISTS.

It is well known that our modern chemistry, that wonderful science which, in this nineteenth century, is revolutionizing the industry of the world, is of recent growth. One century ago, it deserved hardly the name of a science; and only since the discoveries of Priestly and Lavoisier can it lay claim to be a systematic whole. And it has since grown in a twofold aspect: first, as a most practically useful pursuit; and, secondly, as one of the branches which ought to enter, more or less, into the curriculum of the studies of every man and even woman who lays claim to a civilized education, as it has a peculiar influence in the development of the human mind.

Still, notwithstanding the youth of this science as a systematic whole, it stands on a basis built ten centuries ago; in fact, our modern chemists may be considered to stand on the shoulders of the ancient alchemists, who, notwithstanding that they were always searching for unattainable results, have succeeded in discovering thousands of facts which have laid the foundation for that wonderful knowledge which gives us an insight into the secret recesses of the composition of matter. It is, therefore, highly interesting to trace the slow progress of that alchemistic science, chiefly nursed by the cupidity of men who wanted nothing but the increase of their personal possessions, and who, in place of that, increased the knowledge and well-being of the human race.

The *Divine Art*, as the ancient alchemists called their pursuit, appears to have been practiced first in Egypt, that cradle of knowledge; for historians tell us that the Emperor Diocletian, after the conquest of the rebellious Egyptians in the year 296, ordered that all the writings on the alchemy of gold should be burnt, in order that the people should not, by making gold, grow so rich as to commence a second rebellion. It was thus already known, at that time, that the success of revolutions and rebellions depends on the possession of money.

In the large European libraries, manuscripts on alchemy are preserved, many of them dating from Alexandria in the fifth century, and written by Greeks living in Egypt and practising alchemy there. It appears, further, that when the Arabs invaded the north of Africa and the south of Europe, they learnt this art from the conquered nations; and the results of their labors and their wonderful advance are recorded in the archives of the Spanish Moors. So we find that Djafar, better known under the name of Geber, who lived in the end of the eighth and the beginning of the ninth century, in Seville, Spain, and who was wise enough not to believe that any one had succeeded in making gold, discovered that a metal when calcined, which we now call oxidized, becomes heavier. It took 1,000 years to bring such facts to bear on the destruction of Stahl's theory of the Phlogiston, which taught that during this calcination, or burning of metals, something was driven out which had negative weight. Geber also was the first to make nitric acid by mixing blue vitriol, alum, and saltpeter, and distilling the mixture; he changed it into *aqua regia* by adding sal ammoniac; then he dissolved gold in the same, and obtained thus the solution of gold, so long searched for by other alchemists and supposed to be the elixir of life which would cure all diseases and even prevent death. The experiments undoubtedly made in this direction, however, failed, of course, and the results therefore have neither been recorded nor handed down. We know now that gold is one of the most dangerous elements to introduce into the human system, because its insolubility makes its removal afterward very difficult. Geber gives very clear instructions in many chemical operations, as sublimation, distillation, filtration, water and sand baths, cupels of bone earth to absorb the metals which become calcined (oxidized), etc.; and there is no wonder that, in the middle ages, he was called the master of all masters in alchemy.

Sulphuric acid was first made in the end of the ninth century by Rhazes, head physician to the great Bagdad hospital. He made it in the same way as at present practiced to make the Nordhausen vitriol, by distilling copperas. He also made absolute alcohol by distilling spirits of wine over quicklime, while phosphorus was made by Achill Bechil, who sublimated a mixture of urine, clay, lime and charcoal; he called it an artificial carbuncle, and said it shone in the dark like the moon. This was a lost discovery, when, in 1669, Brand in Hamburg made phosphorus in a similar manner. Geber had a clear conception of the evolution and combination of gases, which he called ghosts or spirits (whence our word "gas"). This is proved by his account which, translated, runs thus: "When spirits fix themselves in solid bodies, they lose their form and are in their nature no longer what they were before. When you compel them to be disengaged again, this is what happens: Either the spirit alone escapes in the air, and the solid body remains fixed in the alembic, or the spirit and the solid body escape (volatilize) at the same time."

As a few other eminent Arabian alchemists, must be mentioned El-Raii, Ebid-Durr, and Togbagré, who wrote an alchemical poem, and Djildegi, one of whose chemical works is called "The Lantern," a very significant title for such a subject. But the most astonishing fact of all is the definition which some of these authors give of the chemical science they practiced, and which is worthy of the nineteenth century. It is: "The science of combustion, the science of weight, the science of the balance."

PUDDLING IRON BY MACHINERY.---AN IMPORTANT IMPROVEMENT.

Many attempts have been made to supersede, by mechanism, the laborious and expensive hand processes, employed in making wrought iron, known as puddling. But until within the past four years, all efforts have failed. To Mr. Samuel Danks, of Cincinnati, Ohio, belongs the credit of having successfully solved the problem. He has invented improvements, now in successful operation, which promise to revolutionize the art, and which are recognized as indispensable to the trade by the leading iron puddlers of this country and England. Last year, Mr. Danks appeared before the Iron and Steel Institute in England, and read a very instructive paper, in which he described the practical workings of his inventions, as shown at Cincinnati, in such forcible terms, exhibiting, at the same time, such thorough knowledge of the whole subject, that the attention of the members was immediately called to its importance. They voted to appoint a committee to visit the United States, examine the practical operation of Mr. Danks' alleged improvements, and report in full to the Institute. The committee consisted of some of its most scientific as well as most practical members, and they came over here determined to make the most crucial tests possible. Every facility was granted them, and they went home fully satisfied that all that Mr. Danks had claimed had been realized in their presence, and even more, and they have so reported to the Institute. The invention is now being rapidly introduced in England, where hand puddling is declared to be doomed, and rotary puddling announced among the iron men as an accomplished fact. The saving effected by the use of the Danks machinery is placed at $5 per tun of iron.

In puddling iron by the Danks process, a revolving furnace is employed in which the pig iron is melted down. This furnace is provided with a fire grate, and a blowing fan to urge the fire and supply the necessary gas. The revolving furnace rests on rollers, and its exterior has cog teeth by which motion is imparted. Mr. Danks gives the following particulars:

A suitable engine is attached to each machine, so that the furnace can be made to revolve at any speed that may be required according to the different stages of the operation. The most important feature in connection with the invention is the lining of the vessel. The foundation consists of what is termed the "initial" lining, which is composed of a mixture of pulverized iron ore and pure lime, worked with water into the consistency of a thick paste. The method of putting on this "initial" lining is fully described, and, when completed, the author says that upon it is placed the fettling proper. A quantity of pulverized iron ore—about one fifth of the total amount required to fettle the apparatus—is thrown in, the furnace is heated and made to revolve slowly until the iron is found to be completely melted, and the apparatus is then stopped. That part of the molten iron, which has not been consumed by glazing of the "initial" lining surface, runs to the lowest level of the furnace, and there forms a pool, into which there are put a number of small and large lumps of iron ore of such dimensions as will be required to allow the said lumps to project over the surface of the liquid ore by from two to six inches. This part of the fettling is allowed to set, when a fresh quantity of pulverized ore is thrown in. The furnace is again made to rotate slightly until the newly added ore is liquefied, when the apparatus is again stopped, and the pool is filled with lumps as before. The operation is continued in this way until the whole of the vessel is properly fettled. From 2 to 2½ tuns of iron ore are required to fettle a 700 pound furnace.

The iron is charged into the furnace either in a solid or molten condition. When charged in the shape of pig iron, the melting down occupies from thirty to thirty-five minutes, during which a partial rotation is given to the furnace, from time to time, in order to expose equally all sides of the charge to the flame. When the whole of this is thoroughly melted, the furnace is made to rotate once or twice per minute only during the first five or ten minutes, in order to obtain the most perfect action of the cinder upon the molten iron. A stream of water is injected through the stopper hole along and just above the line of contact between the floating cinder and the inner surface of the vessel on the descending side. A certain portion of uncontaminated cinder is thereby solidified on the metal surface, and is carried down into or below the bath of molten iron in a continuous stream, which, in rising up through the iron, combines with the impurities of the latter in a far more effectual and complete manner than any mode of puddling hitherto known can effect. On the expiration of the said five or ten minutes, the iron begins to thicken and the motion is stopped. The heat is then raised so that the cinder shall be perfectly liquefied, and the vessel is brought into such a position that the tap hole shall be just over the level of the iron, which by this time has become partly pasty. The puddler gently pushes back the iron and the cinder is made to run off. The heat is again raised, and the furnace is put in motion at a velocity of from six to eight revolutions per minute, by which means the charge is dashed about violently in the furnace. A high temperature being kept up, and the charge being continually turned over, the particles begin to adhere, when the velocity of the apparatus is lowered to from two to three revolutions per minute, upon which the ball then very speedily forms. The puddler then solidifies the front end of the ball by a few blows from a tool applied through the stopper hole. The props of the movable piece are then removed, and the flue hanging from the overhead rail is moved away. A large fork, suspended from a crane is put into the vessel along one side, and the ball, which by a turn of the vessel is rolled on to the fork, is then taken out by means of the crane. The ball is then worked in a squeezer. The flue is replaced after the requisite quantities of cinder and metal have been again charged, and the process is continued. From eight to ten charges are made before any refettling is required, and these heats are worked in a day of ten hours.

Mr. Danks claimed for the revolving furnace the following advantages: A great saving in the cost of labor and also in the consumption of coal, varying according to the size of the furnace; a superior and more regular quality of puddled iron from a given quantity of pig; a yield of puddled iron much in excess of the charge of pig metal, instead of the usual loss, the extra yield being obtained by the reduction of the rich fettling used in the machine; eight to ten heats, whether of from five to ten cwts., are made in a day of ten hours when suitable metal is used; the refining process is very complete, the whole of the phosphorus and silica, and the sulphur to a large extent, being removed by the chemical action of the lining mixture; the very heavy and exhaustive labor of puddling is performed by steam power, thereby enabling one skilled man to attend to the working of a large quantity of iron; the bringing to nature and balling of the iron is completed by the rotary action, without the use of rabbling, except when the heat has to be divided into smaller balls; and the capacity may be suited for heats of any weight from five cwt. upwards. The cost of the furnace, weight of product considered, is about the same as that of the usual hand puddling furnaces.

RESULT OF ILLUSTRATING A NEW INVENTION.

We have received a letter from Captain W. F. Goodwin, whose invention for the propulsion of canal boats was illustrated in these columns a few weeks ago, in which he alludes to the success he has attained in the introduction of his screw gear mower and reaper, which was illustrated in the SCIENTIFIC AMERICAN, November 25, 1871. After alluding in a complimentary manner to the great number of patents he has obtained through this office, he states that he has made some money out of his patents, but the amount would have been much larger had he earlier appreciated the advantages to be derived by placing his inventions before the public through the medium of the press. Immediately after the publication of the engraving and description of the mower and reaper in this paper, he states that he had so many letters of enquiry, from manufacturers and agriculturists for rights to build and for the purchase of machines, from every State in the Union and from Canada, that he was for a time exceedingly embar-

rassed, not having the facilities for supplying the machines. "And much to my surprise and satisfaction," he says, "I found I had established, before I hardly knew it, a large business abroad; orders were received for machines from Europe, and applications for agencies as far north as Russia poured in upon me by every mail." The result has been the establishment of agencies in London, Edinburgh, Vienna, and St. Petersburgh, and arrangements are about being consummated in Prussia. Captain Goodwin accords his success in the introduction of his harvester to the publication of it in the SCIENTIFIC AMERICAN, and closes his letter by stating that he hopes the same good result will follow the publication of his system of propelling canal boats that resulted from the publication of his mower.

ON ATMOSPHERIC AND PNEUMATIC PROPULSION.

The workings of the weather bureau have confirmed what was anticipated, namely, that the changes in barometric pressure are the causes of the winds, which, in their turn, become the causes of the different conditions of weather. If we trace the changes in the barometric pressure further back, we come finally to the solar heat which expands the air in some localities, and causes it to become specifically lighter than the colder air, and to the solar and lunar attractions which cause continual atmospheric tidal waves to run around our globe. In this way, our atmosphere is kept in a permanently agitated condition; and the cosmical power expended in keeping up this agitation is something startling when we attempt to reduce it to our common measure of force, the foot pound. We have only to consider what an infinitely small portion of this force is utilized by sailing vessels, and what an enormous power is required to move about the sailing fleets of the world. Little Holland gives in its windmills an example of how this power may be further utilized; there are in that country (where the construction of windmills has been improved since more than 1,000 years, thanks to the study of the most profound mechanical thinkers) more than 12,000 windmills for the pumping of water alone, not like the mere toys we see in this country, but colossal structures of masonry 100 and more feet high, attended to by a regular crew, as is customary on shipboard, each mill lifting from ten millions to fifty millions gallons of water per day; there is an equal number of mills for sawing lumber, and at least an equal number for grinding corn. The total labor, performed by the utilization of the wind alone in that country of four million very industrious inhabitants, is estimated to equal that of four million horses.

In order to fix in the memory the relation between the velocity of the wind and the pressure exerted on a surface, it is best to remember that the velocity of a violent hurricane, of 100 miles per hour, exerts a pressure equivalent to 50 pounds on a vertical surface of one foot square, and that as the velocities decrease the pressures decrease as the squares of the velocities; so with half the velocity of the wind, or a storm of 50 miles per hour, the pressure is one fourth of 50 pounds or 12·5 pounds per foot; at one third the velocity, or a brisk wind of 33 miles per hour, the pressure is one ninth, or 7 pounds per square foot; at one quarter the velocity, 25 feet per hour, the pressure is one sixteenth of 50, or 3 pounds upon each square foot, etc. These rules hold for one square foot while the wind is in motion and can glide off all around the surface; when several square feet are united in one whole, so that the wind cannot glide off around each square foot, as in the case of the sails of a vessel, the pressures become considerably greater, and more still when the surface on which the pressure acts is enclosed in a tube or tunnel so that the wind or air is entirely prevented from gliding off or passing beyond the surface acted upon. The latter is practically the case with the system of pneumatic propulsion; and in order to see at once the great advantage of this mode of applying power, we have only to consider the effect of a difference of atmospheric pressure on both sides of the surface, acting as a piston in the tunnel of a pneumatic railroad, and separately attached to the car, or the effect on a well fitting car itself. Suppose the blowing machinery is able to raise the barometric column on one side of the car only one inch: this will be nearly one thirtieth of the whole mercurial column; and thus one thirtieth of the atmospheric pressure of 15 pounds, or half a pound per square inch, which is 72 pounds per square foot, will be exercised. If now the diameter of the tunnel is 8½ feet, the surface of the section will be nearly 55 square feet, and the total pressure, 55×72 or 3,960 pounds, almost two tuns. This means that such a car will be propelled with an initial velocity equal to the effect of two tuns suspended on a rope and the rope passed over a pulley to change the vertical traction into a horizontal one. As, now, on a level railroad, the friction resisting the propulsion is about one per cent of the total weight, the power thus obtained will be able to start any load less than 200 tuns weight, and this load will move with increasing velocity, only limited by the capacity of the air blasts to supply more air as fast as the motion of the car diminishes the pressure.

Another consideration, greatly in favor of the system of pneumatic propulsion, is that a column of air enclosed in a tube or tunnel is in fact equivalent to an infinitely flexible and elastic rod, which may push a load forward through any number of curves and inclines; but what is most curious, it may be also used as a rope for pulling trains towards the source of power, by simply inverting the current and thus producing suction; or, in more correct scientific language, by diminishing the normal atmospheric pressure, it will propel the load by a simple excess of the ordinary pressure over the partial vacuum produced in front of the car. But the most beautiful consideration of all this, is that this wonderful, infinitely flexible and elastic pushing rod and pulling rope costs nothing, never wears out, can never have a break or loss of connection; while, at the same time, we obtain the secondary but immensely important advantage of a most thorough ventilation in every part of the road, which is a necessity in localities so entirely excluded, from the atmospheric vicissitudes of hot and cold, rain and snow, as will be the case in the comfortable tunnel which, we flatter ourselves, will soon practically demonstrate its advantages to the population of our metropolis.

PROPOSED BOOK ON PATENTS.

There is a very general but erroneous opinion among a large class of people that patents are humbugs, and that more money is lost than made by them. Now the fact is that the greater part of the wealth acquired by manufacturers in every branch of industry has been acquired through some advantage, gained by inventive skill and secured by patent. There is hardly a successful manufacturing business in the country but owes its success in some way to patents. We do not say that all inventions are improvements, or that all patents are good; but we do say that nearly all valuable inventions are, or have been, patented.

We received a call a few days ago from a gentleman who is collecting facts and statistics for a book of successful inventions. We commend the idea as well calculated to remove the prejudice against patents, and as a matter of interest to all who are connected therewith. Instances enough have come under our own observation, of men who have made ample fortunes from patents, to fill a large volume had we written them down. But among the cares of business, many details have escaped our memory, while others are so dim that we cannot state them with the precision necessary for such a work. Nevertheless, we shall afford the author such facilities as are in our power, and in his behalf we cordially invite the co-operation of our readers. If they will send us statements of such instances as they may be acquainted with:

First. Where inventors have sold their patents in whole or in part for large sums.

Second. Where they have received or are receiving large sums as royalties.

Third. Where a large and successful business has been built up by manufacturing patented articles.

Fourth. Where articles are made cheaper by means of patented machinery.

Fifth. Where joint stock companies have been founded in part or wholly upon patents, and the stock has greatly advanced in value.

Names and figures and reliable information are wanted as far as possible. The book is designed to prove the actual benefit which has been derived from patents in the various branches of industry. If each one will contribute the facts within his knowledge, a work may be soon published which will be of inestimable value to inventors. Parties possessing such information will oblige by sending the facts to this office.

SUPPLEMENT TO THIS WEEK'S EDITION.

The attention of our readers is called to a supplement to this week's issue of the SCIENTIFIC AMERICAN, containing a full and exhaustive history of the discovery of petroleum, with complete descriptions of all the processes used in its refinement and manufacture. The works selected for illustrating this article are those of Charles Pratt's extensive manufactory. His establishment and appliances afford the best opportunities for describing the most recent and improved methods of treatment.

Subscribers are requested to see that their news agents deliver a supplement with each copy of our issue of May 18.

Balancing Slide Valves.

A correspondent, L. A. T., in commenting on the remark of a western engineer, published on page 121 of the current volume, states that "if a slide valve were relieved of all the pressure above and the cylinder filled with steam, the valve would of course be lifted from the seat.

When the engine is in motion and the steam chest filled with steam, the pressure on the slide valve is equal to that in any part of the chest; but then the valve gets considerable relief, although it is constantly increasing and decreasing as the valve slides to and fro upon its seat. For instance, when the valve opens a port, it instantly fills with steam, and at the time the valve cuts off that port, the pressure is equal above and below that edge of the valve; but as the piston travels back in the cylinder, the pressure in the port decreases until the valve exhausts that port; and then, from the time of the exhaust until the opposite port is opened, the cylinder is empty; and at this time the valve needs the most relief and gets none.

Now, if we relieve the valve of all its pressure, we commit an error. Why? Because it relieves itself, and the longer the steam follows the piston, the more we relieve the valve. For instance, we relieve it more when it is working at full stroke than when at half stroke, because we let a greater amount of steam into the cylinder at full stroke than we do at half stroke; and consequently we get a greater amount of pressure therefrom to relieve the valve just when it cuts off and before it exhausts.

To balance a slide valve successfully, we must take into consideration the relief as much as we do the pressure."

A MAN'S actions are effaced and vanish with him. But his intellect is immortal and bequeathed, unimpaired, to posterity. Words are the only things that last for ever.

American Ideas in China.

The Chinese government, influenced by the counsels of Yung Wing, an intelligent and enterprising native who enjoyed the advantages of a thorough college education in this country, has now determined to send over to us quite a number of young men for educational and professional training.

The plan, as it is now being carried out, is understood to be as follows:

1. The Chinese government to select thirty boys each year for five consecutive years, 150 in all, without distinction of rank and by competitive examination. They are not to exceed fourteen years of age when they enter the preparatory school at Shanghai or other schools that may hereafter be organized. Their education in Chinese is to be made as thorough as possible before they are sent to the United States.

2. The entire expense for their support and education in the preparatory schools and also while in the United States will be borne by the Chinese government.

3. An educated native of rank to be appointed as instructor to each yearly instalment, who is to accompany them to the United States and remain with them. He is charged with the instruction of the youths in the Chinese language and literature while in the United States, and is required to devote a portion of each week to that object.

4. The students are required to prosecute their studies for twelve years, and during that time each is expected to acquire one of the professions. They will not be allowed to remain in the United States beyond that period, nor to enter upon any private occupation.

5. Each student is regarded from the first as in the service of the Chinese government. A definite rank is assigned to him on the completion of his education, and he goes immediately into service on his return. In case the parents of any student are in narrow circumstances, a certain indemnity is to be paid them by the government.

6. The students will not be permitted to divest themselves of their Chinese nationality or become naturalized citizens of the United States.

From New York to New Orleans in Pneumatic Tubes.

A bill is now pending in Congress to incorporate the "National Pneumatic Tube Company," capital one hundred millions of dollars, with authority to lay pneumatic tubes between New York and New Orleans. The freight is to be carried in hollow balls, which are to be blown through the tubes, and this the projector thinks can be done at a high velocity and cheap cost. This plan of using "hollow spheres" in pneumatic tubes is very old. It was patented in England by James in 1842, and again patented in this country, by Brisbane in 1869.

The idea of competing with long lines of ordinary railways by means of pneumatic tubes is chimerical. Pneumatics is well adapted for short routes in cities, where the traffic is large and the use of locomotives objectionable. But for extended lines through the country, the cost of construction, maintenance, and operation would be greatly in excess of an ordinary railway of same capacity and speed.

Measuring the Velocity of Railway Trains.

Several devices have been invented for registering the velocity of trains, but none of sufficient simplicity to come into general use have yet been suggested. Messrs Samman and von Weber's construction, a German invention, consists of a disk driven by clockwork and a recording pencil. While the train is halting, this describes a circle, but during the journey, a crooked line is produced by the vibration. In M. Cremer's apparatus, a strip of paper moves by clockwork. This paper is graduated and marked in minutes. A needle with an up and down movement, which is in connection with an axle, pricks the paper. The distance of the holes serves as a guide in ascertaining the speed. On French lines, an apparatus is met with in principle not unlike the centrifugal governor, the coupling box of which is in connection with and moves a pencil. In Schiff's apparatus, which is not unlike that of Cremer, the needle is moved by a battery, which renders its working more complicated and uncertain.

THE polarizing instrument, known as the Nicol prism, is composed of a prism of Iceland spar, divided at an angle into two halves, the angular surfaces polished and again united with Canada balsam. Professor H. F. Talbot finds that glass may be substituted for one of the halves of spar, and a good prism will be thus produced.

NOT long ago, the whole stock of the paraffin wax in the world did not exceed four ounces, which was carefully preserved in the laboratory of Professor Liebig as a chemical curiosity. There is now produced in Scotland alone a quantity of not less than 5,800 tuns annually.

HERE is the business done by the Western Union Telegraph Company in one hour, by means of one wire, between New York and Boston, employing the Stearns instruments for sending messages both ways at the same time. From New York to Boston, 72 messages; from Boston to New York, 62 messages. Total, 134. This remarkable improvement in telegraph instruments doubles the capacity of every existing wire without increasing the cost of maintenance.

Edwin F. Johnson, one of the most eminent of American engineers, died on the 12th inst., and was buried at his home in Middleton, Conn. He was Engineer in Chief of the Northern Pacific Railroad until a little more than a year ago, and since has been Consulting Engineer of that company.

Fluorescence.

At a recent meeting of the American Institute, President Henry Morton, of the Stevens Institute of Technology, read a paper on "Fluorescence," or that action by which rays of the higher purple or even invisible light, such as produce photographic action most strongly, excite in certain bodies lower rates of vibration, resulting in the emission of light, generally of a red, green, or clear blue color. This paper was illustrated by a number of striking experiments. Thus, a flask of solution of chlorophyll (green coloring matter obtained from leaves), which is of an olive green color, being held in a beam of blue light proceeding from a "vertical lantern," appeared to be full of a blood red liquid. Various solutions, colorless in ordinary light, were then shown to exhibit the brightest hues, when illuminated by the violet rays of the lantern or those obtained from the electrical discharge of the Professor's large coil in rarefied gases. The speaker then announced that, in the course of the examination which he had been making of such substances, he had encountered one which he believed to be as yet unknown, and which possessed the property of developing light by fluorescence in a preëminent degree. This body was obtained from petroleum, and he would propose to take for it the name "viridin." The word viridin had been already applied as a synonym for chlorophyll, but was now practically obsolete, and too appropriate to the present substance to be thrown away. A large drawing of a flower, with leaves painted seemingly in light umber tints, was then shown and illuminated by electric discharges, when it appeared of the most vivid green. The peculiar fluorescent spectrum of this body and its relations to the spectra of other substances was explained, and many other illustrations were exhibited.

Experiments in a Compressed Atmosphere.

MM. Deville and Gernez are making a series of experiments in a chamber containing compressed air. In a cylindrical iron chamber of one hundred cubic feet contents, the sides of which have been proved to 165 pounds to the inch, these gentlemen have installed a complete set of apparatus. When the operators are shut in their cylinder, the air is compressed by means of a steam pump, when they proceed, as if in the open air, to ascertain the real condition of various substances, at the moment they combine in homogeneous flames, and the resulting temperatures. With certain precautions, the compression to which they are subjected presents no serious danger, and after a few moments, the difficulty of breathing disappears, even though the pressure amounts to nearly 45 lbs. to the square inch. At present the experiments are made only with the homogeneous flame of oxide of carbon and oxygen. With this and a pressure equal to one and seven tenths atmospheres, platinum melts, flying off in sparks with a facility that it never exhibits in the air; it melts in the elevated portions of the flame, which in the air would only heat it to redness. The temperature of these flames then augments with the pressure which they support, and, by consequence, the quantities of matter which combine are greater, and the dissociation diminished. Mr. Frankland's experiments have shown that the brilliancy of the flame of hydrogen gas increased considerably with the pressure, so that with a pressure of twenty atmospheres it surpasses that of a composition candle. In the same manner, when a mixture of oxygen and hydrogen is burned in an endiometer, the flame is brilliant, while it would be nothing in the open air. M. Deville is of opinion that if you measure the quantity of heat disengaged by a substance which burns with brilliancy, the result would not be the same in operating with an opaque calorimeter as in one which allows the light and chemical rays to pass through it. This deserves noting for industrial applications.

Old Leather.

What becomes of all the old leather? We know that the scraps and trimmings that fall from the shoemaker's bench are collected and sold, and that these finally reach manufacturers of leather board, which, in cheap shoes, is used to give thickness to a sole which has but little real leather in it But what becomes of worn out boots and shoes, and all other articles made of leather which have been cast aside as of no further use? It was in pursuit of this inquiry that we learned that worn out hose and belting are cut up into soles for boots, and that the "uppers," of boots and shoes whereof the soles have become demoralized, are carefully separated, subjected to various processes, which make them take on the semblance of newness, and then trimmed round, leaving them sufficiently large to make the "uppers" for smaller feet than they covered before. Thousands of such "uppers" are marketed annually, and it is not safe for those who buy their boots without regard to the standing of the dealers to assume that their understandings are new throughout.

A Mechanical Cat.

Leonard, of the Cleveland *Leader*, has invented a sheet iron cat, with cylindrical attachment and steel claws and teeth. It is worked by clockwork. A bellows inside swells up the tail at will to a belligerent size, and by a *tremolo* attachment, causes, at the same time, the patent cat to emit all noises of which the living bird is capable. When you want fun, you wind up your cat and place him on the roof. Every cat within half a mile hears him, girds on his armor and sallies forth. Frequently fifty or one hundred attack him at once. No sooner does the patent cat feel the weight of an assailant than his teeth and claws work with lightning rapidity. Adversaries within six feet of him are torn to shreds. Fresh battalions come on to meet a similar fate, and in an hour several bushels of hair, toe nails and fiddle strings alone remain.

Californian Estimates.

Californians are making estimates of the probable gross value of the products of the State during the present year. They give $38,054,500 as the aggregate for wheat and barley; wool, $12,000,000, or 30,000,000 pounds; fruit, $6,000,000. The whole value of agricultural products is put down at $50,000,000, of which, it is claimed, at least $35,000,000 will be exported to Europe, Asia and the Eastern States. Add to this $18,000,000 as the yield of the mines, and as much more for lumber, fish and live stock, and the total will reach $89,000,000. A great many persons believe it will not fall short of $100,000,000. Such an immense production and export, from a State comparatively so sparsely settled, shows that its producing powers are enormous.

The *American Builder*, Chicago, says, unsolicited, that: "Among the exchanges that come to our table we find none of greater value than the SCIENTIFIC AMERICAN, published by Munn & Co., New York; and if, during the three past years, we have quoted freely from its columns, our readers will bear witness that the matter has been well worth reproducing. It is not an easy task to conduct a journal devoted to industrial interests in such a manner that it shall be adapted to the tastes and capacity of the average reader, and yet command the respect and patronage of more thoughtful and scholarly minds. The SCIENTIFIC AMERICAN, while its contributors, many of them, rank among our most noted men of letters and science, is, nevertheless, most emphatically the people's paper. And there is not an artist or apprentice among our growing family of readers that would not be richer, in every true sense, at the end of every year, if he were to subscribe for it and take it regularly."

A CORRESPONDENT says: "The most deadly physical danger, threatening the whole community, in this country is the absorption of metallic poisons in water, food, medicines, washes, paints, dyes, enamels, etc., prepared and sold by the thoughtless and unprincipled; and the demand of every thoughtful patriot should be that no description of poisons should be sold under any other than its proper name. The public, in the segregate, is, and always will be, powerless to adequately protect itself against insidious poisons used in the many adulterations of the present day, and must perforce look for that protection to a government professing to guard the life and property of the citizen. Health is the most valuable property possessed by any one, and is life itself.

F. E. WILLIAMS, of Mount Washington, Md., writes as follows: "Sirs: I have received the steel engraving in good order, and I am exceedingly pleased with it. I am well rewarded for my exertions in raising a club for your paper, and I shall use my influence to keep it up, and to get all I can to become subscribers to it."

THE annual meeting of the American Railway Master Mechanics' Association is to be held at the American House, Boston, Mass., June 11th, 1872.

The *Engineer* states that the oxyhydric light has not proved a success in Paris, and that it has been discontinued in the public lamps on the Boulevard des Italiens.

Business and Personal.

The Charge for Insertion under this head is One Dollar a Line. If the Notices exceed Four Lines, One Dollar and a Half per Line will be charged.

Notes & Queries.

[We present herewith a series of enquiries embracing a variety of topics of greater or less general interest. The questions are simple, it is true, but we prefer to elicit practical answers from our readers.]

1.—POISONOUS COLLARS.—What is the best test for discovery of lead in the enamel of paper collars?—S. K.

2.—PARIS GREEN.—What is the chemical composition of Paris green, which is much used to kill the potato bug? By what name is it known in works on chemistry?—J. C. K.

3.—SEWAGE.—Where can I find reliable information relative to the value and management of sewage?—F. T. F.

4.—KILN-DRYING LUMBER.—I wish to know how to construct a building for kiln-drying lumber, the length of time required for drying, and how such lumber compares with that seasoned out of doors.—O. C. B.

5.—ANNEALING STEEL.—What is the best and easiest way to anneal pieces of steel, say ⅜x¼ square and about six inches long? I use them in lots of 100 and 200.—U. E.

6.—POWER FOR BOAT PROPULSION.—Will some correspondents tell us how large a boat can be driven by a boiler with twenty-one feet fire surface? What should be the power of the engine? Should the boat be a stern wheel, side wheel or screw propeller, in order to get the greatest speed and power?—F. & W.

7.—DYEING OR STAINING HORN.—Will some reader of the SCIENTIFIC AMERICAN inform me how I can dye or stain horn a jet black without injuring it? I would prefer something that will not stain the hands in applying it. I have read somewhere that the people of one of the eastern races dye their finger nails black. What do they use?—E. C. S.

8.—WORMS IN HICKORY.—Will some of your correspondents inform me what will stop the ravages of worms in the sap of hickory plank? The plank was cut in winter, put up under cover, and the bark taken off.—B. C.

9.—PROTECTING SHEET IRON FROM CORROSION.—How can I coat my sheet iron hood inside, to protect it from the corrosive effects of acid or chemical fumes, so that the coating will not be impaired by heat? G. B. M.

10.—ELECTRO-DEPOSIT OF STEEL.—How may electrotypes be faced with steel?—G. B. M.

11.—TRANSPARENT VARNISH.—Can any of your readers inform me how to make a thin glaze or varnish that will not dim a pure white ground or pigment, but allow the white to shine through clearly and transparently? It must at the same time be capable of being cleaned with soap and tepid water, and not be sticky to the touch. The ordinary varnishes tend to make the white ground appear a pale yellow.—W. S.

12.—DISSOLVING WOOL OUT OF MIXED FABRICS.—Which is the best method of extracting wool from woolen and cotton rags? At present I use muriatic and sulphuric acid: but I have been given to understand that there is a much better process with vegetable and mineral matter combined.—J. S.

13.—HYDROGEN LAMP.—Will E. X., who gave directions for making a hydrogen lamp, or some one else, please inform me: First, how to tell when the air is expelled and it is safe to light the lamp? Second, when the materials are all in, if the lamp be corked tight and the vent closed, will the gas keep on forming until it forces out the cork or breaks the lamp, or does it only fill the space above the water and then cease forming until some is let out at the vent? Third, about how long would a lamp (of say about four or six ounces) keep in order without a renewal of the materials being required?—L.

14.—REMOVING INK STAINS FROM PAPER.—A valuable work of mine having been damaged by ink on the margins and the plates, I wish to remove it without defacing the paper. I have tried to remove it, but am unable to keep the paper from wrinkling and buckling. I have used oxalic acid and also salt of lemon, and I can partly succeed, but still it leaves a stain. What process is used to remove the ink from checks when they are altered? The process must work well, as I have seen checks from which the ink was so completely removed that it could not be found by acid or the microscope. There can hardly be any secret in it, as it is done so often.—R. W. A.

15.—PAINT FOR IRON WORK.—What is the best paint to put on iron railing, so that it will keep glossy and shining? I have used asphaltum and shellac, but the effect of the weather soon makes it look dead. I want something that will make the railing look as if just varnished.—J. O.

16.—PRESERVING BIRD SKINS.—Is there any preparation or preserving skins of birds, etc., that is not poisonous? Arsenic, strychnine, etc. are rather unsafe to handle and to have about the house.—G. C. T.

17.—SMOOTH BRASS CASTINGS.—Will some one please inform me how smooth brass castings, such as globe valves, etc., are produced? Has the composition of the brass anything to do with it?—P. P. Q.

18.—CEMENT FOR TEXTILE FABRICS.—Can any one tell me of a waterproof cement for textile fabrics, very adhesive on instant contact?—E. F.

19.—FINISHING GAS FITTINGS.—Will some one inform me, through your paper, how I may produce the bright brown finish we see on modern gas fixtures? The composition I use is spelter.—W. A. M.

Answers to Correspondents.

SPECIAL NOTE.—This column is designed for the general interest and instruction of our readers, not for gratuitous replies to questions of a purely business or personal nature. We will publish such inquiries, however, when paid for as advertisements at 1 00 a line, under the head of "Business and Personal.

ALL reference to back numbers must be by volume and page.

A. D. T., of Mo.—The white specimens which you send are chalcedony; the translucent red is carnelian; the opaque red, jasper. The carnelian is the only one of any value.

S. H., of Pa.—The specimen you send consists of mica and quartz, of no use in the arts.

F. & W.—We publish your first query; the second is a business enquiry. See notice at the head of this column.

PREPARING SKELETON.—If G. L. F., query 10, page 200, will place his animal on an ant hill, the ants will make the skeleton as clean as a contribution box in dog days.—S. A. T., of Mass.

OZONE.—C. R. will find directions for the preparation of ozone on pages 324 and 325 of this issue of the SCIENTIFIC AMERICAN.

CONE PULLEYS.—E. B. T., of Pa., is referred to pages 138, 139, 186 of Vol. XXV. of the SCIENTIFIC AMERICAN for a full discussion of this subject.

TELEGRAPH SOUNDER.—To C. P. P., query 17, page 281.—Your magnet is wound with No. 16 wire, which is too coarse. Use No. 20 or 22, and your sounders will work together perfectly.—S. G. S., of N. Y.

INFLAMMABLE LIQUID.—Is there any liquid sufficiently inflammable (retaining its inflammable quality when exposed for any length of time) to insure a cord or thread, that has been thoroughly saturated with it, being set in a blaze by the flash of a gun cap in its immediate vicinity?—A. B. C. Answer.—There is no liquid sufficiently inflammable for your purpose, except those which are too volatile to remain exposed for a short time without being evaporated. But there are pulverulent solids which you may make to a paste and then incorporate into your cord; such are dualin, giant powder, dynamite, picrolin,, etc.

RHUBARB IN TIN CANS.—Some rhubarb stalks were washed in cold water, boiled in an iron kettle, put into cans made of good charcoal tinned plate, and then soldered down. In December last my family were all made sick by eating a pie made of this fruit. To be sure of the cause of the sickness, we tried the rhubarb again with the same result. The effects were vomiting and purging. Can any one give me an explanation?—C. H. G.—Answer. The acidity of rhubarb is caused by oxalic acid, and this has dissolved the alloy of tin and lead of your tin cans, forming an oxalate of tin and of lead; these metallic oxalates are poisons, producing vomiting, etc.

PROPORTIONS OF TELESCOPE.—To T. J., query 16, page 281. Your eyepiece is too strong for your object glass. Use a longer and larger eyepiece, say one 6 inches long, which will give you a power of about forty times. This is ample for a two inch object glass for terrestrial objects.—S. G. S., of N. Y.

BATS.—I would say, in answer to J. E. P.'s query, that if he will find the hole that the bats visit, and put some cayenne pepper in it and around the edges, he will never be troubled with bats. Rats also cannot stand it; they are sure to leave.—H. C. R.

DURABLE WHITEWASH.—To E. C. W., page 265.—The addition of one pound of sulphate of zinc in solution, to a pail of whitewash, will improve the color and prevent the wash from rubbing off.—E. H. H., of Mass.

MORTAR FOR DRYING OVENS.—To J. K. C., query 13, page 265.—I have used, for a similar purpose, a mortar made with common glycerin and litharge to a not very thick consistence. If the bricks are hard burned, the composition may be stiffer than if soft, as, in the latter case, more glycerin will be absorbed, and the joint will not be good if the cement is too dry. My success was quite what I desired; the mortar was hard and firm.—E. H. H., of Mass.

COATING IRON WITH EMERY.—To J. M., query 3, page 281.—First paint your cylinder with a good body of white paint, and when perfectly dry and hard, apply your glue and emery.—E. H. H., of Mass.

CLEANING COTTON WASTE.—Query 9, page 281.—S. R. F. will find the following plan to answer: Pack the waste in a tin cylinder with a perforated false bottom and tube with stopcock at bottom. Pour on the waste, bisulphide of carbon sufficient to cover, and allow to soak a few minutes, then add more of the bisulphide, and so on for a time or two, and then squeeze out. By simple distillation, the whole of the bisulphide, or nearly all, can easily be recovered and so be used over again. The cotton may remain soiled with fine metallic particles, but it will be free from grease.—E. H. H., of Mass.

SEPARATION OF MERCURY IN A THERMOMETER.—To F. D. H., query 1, page 281.—Fasten a string two or three feet long securely to the instrument, and then swing it vigorously round your head for a turn or two. The centrifugal force will be sufficient to cause the broken column to unite, provided neither tube nor bulb is cracked. An almost imperceptible crack in either is quite sufficient to utterly spoil a thermometer. A barometer tube may be carefully inverted, or sometimes gentle tapping will be sufficient so long as the vacuum is perfect. But, in the latter instrument, it can only occur in a very small tube, where capillary attraction, or friction from a soiled tube, overcomes the gravity of the metal.—E. H. H., of Mass.

TELEGRAPH SOUNDER.—To C. P. P., query 17, page 281.—If your magnet were wound with No. 30 silk covered wire, your instrument would probably work, but the armature would not even then give a very distinct sound. The resistance in the relay coil is too great; and in order to have your sounder work well, you must equalize this resistance. Therefore construct a magnet of the same size as the relay.—W. H.

ÆOLIAN HARP.—To J. F., query 4, page 297.—This instrument consists of a long narrow box, of very thin wood, about five inches deep. A circle is cut, in the middle of the upper side, an inch and a half in diameter. Stretch on this side, over bridges, seven or more strings of very fine catgut; these must all be tuned in unison. Place where a current of air will pass over the strings. A window just the width of the length of harp is a good place.—G. C. T.

Recent American and Foreign Patents.

Under this heading we shall publish weekly notes of some of the more prominent home and foreign patents.

GRAIN STEAMING APPARATUS.—Samuel W. Campbell and James C. Evans, of Kansas city, Mo.—A new apparatus for steaming wheat or other grain preparatory to its introduction to a grind mill, with the object of thereby toughening the bran and preventing the flour from being specked by small particles of the bran constitutes the subject matter of this patent. The invention consists in the arrangement of a vessel containing a perforated inclined partition, over which the grain moves in its passage to the mill, and through which the steam reaches the grain.

RAILWAY SIGNAL.—Joseph F. Andrews, of Nashua, N. H.—This invention has for its object to provide an improved practical means of operating signals at railroad crossings by the trains that approach such crossings and at a suitable safe distance therefrom, to give timely warning to persons approaching the track when the trains are crossing. The invention consists in the arrangement of a vertically movable rail set on springs, which is crowded down by the weight of the train passing over it, and connected with the signal, moving the same when depressed.

LINK BLOCK FOR SLIDE VALVE.—Edward Marsland, of Sing Sing, N. Y.—To counteract the reduction in the size of a link block occasioned by wear is the object of this invention, which consists in making the block expansible and contractable—that is to say, making it in sections—so that it can be enlarged to fit the curved guides, or made to firmly embrace the pin that connects it with the valve. The invention seems well adapted to all link blocks for slide valve engines used on locomotives and other machinery.

WASHING MACHINE.—Newton C. Goodloe, of Okalona, Miss.—This invention relates to a new dashing apparatus of a washing machine, and consists in making the same in form of a hollow three sided prism, with perforated sides and a hinged door, and provided with projecting gudgeons, whereon it can be rapidly revolved within the suds box to insure efficient and expeditious results.

SAWING MACHINE.—Cornelius B. Morehous, of Washington, Iowa.—This invention relates to a new and useful improvement in machines for sawing firewood and for other purposes; and it consists mainly in an automatic feeder, in combination with one or more saws.

PAINT COMPOUND.—Samuel F. Mathews, of Harrisburg, Pa.—This invention relates to paints for covering and preserving various substances.

BREECH LOADING FIRE ARM.—Orville M. Robinson, Plattsburgh, N. Y., assignor in full to "The Robinson Arms Co.," same place.—This invention relates to an improvement in the loading, cartridge extracting, and adjusting mechanism of breech loading fire arms, and consists in a new arrangement of reciprocating carrier block, vibrating breech block, adjustable gage, and operating levers, whereby the necessary processes can be rapidly carried out.

PRAIRIE BREAKER.—Cornelius M. Clark, Seward, Neb.—This invention relates to a new plow for breaking prairie land, and consists in a new wire mold board for turning the sod with the least amount of friction, and in new arrangement of cutter, guide wheels, and handles for facilitating the operation.

MAP AND CHART RACKS.—Frank G. Johnson, Brooklyn, N. Y.—The object of this invention is to provide convenient means for exhibiting maps, charts, sheets of music, engravings, etc., designed more especially for school and lecture rooms, but applicable to all similar purposes; and it consists in lever brackets projecting from the wall or from a portable frame, and in suspending wires or rods, and in tension rods for straining the suspending wires, and in arranging the whole so that charts, maps, sheets of music, etc., may be allowed to slide laterally, and so that any single one may be exhibited in full or in part.

SPRING FOR RAILWAY CARS.—Henry Jeffrey and Henry Fisher, Aurora Station, Indiana.—This spring consists of a series of plates of square form, each supported on two diagonal corners by blocks in a cast iron shell or case, one above the other, two opposite diagonal corners being free. When weight is applied, each plate springs diagonally from corner to corner.

CART BODY CATCH.—Charles F. Chew, Swedesborough, N. J.—In this invention the cart body is hinged to the axle in the usual manner, and the front of the body is provided with a staple and hook of such length that the hook may pass down far enough to catch over the edge of a cross bar which extends across the shafts. When the hook is unfastened and thrown back, the body may be readily tilted and the load dumped. The body is again fastened on being simply raised, as the hook, by gravitation, secures itself upon the cross bar.

SEED DROPPER.—William C. Willey, Limerick, Ill.—This invention has for its object to furnish an improved seed dropping device, so constructed and arranged that it may be attached to any ordinary planter, and shall at the same time be simple in construction, easily and conveniently operated, and reliable and accurate in operation. It may be attached to any ordinary planter, and consists principally of the following parts: A vertical lever, giving reciprocating motion to a horizontal bar, and thereby oscillating the arms connected with horseshoe-like bars whose ends project upward into the seed chambers. These ends carry cups to take up the right quantity of seed: and, as the curved bar oscillates, the cups are alternately raised and discharged into a spout which conducts the seed to the ground.

FIRE PLACE.—Samuel D. Dearman, Rocky Hill, South Carolina.—This invention furnishes an improved cast iron fire place, so constructed as to serve as a security against fire and as a radiator of heat, and at the same time is simple in construction, easily applied, and durable. This fire place is constructed of three cast iron plates, standing and secured in the brickwork of the hearth. The back plate is bent forward until its top edge stands away from the rear brick work and crosses the mouth of the chimney about midway. The lower front of this plate is provided with projecting ribs to hold the wood forward, and to form a channel up which the heated air may pass to an opening in the upper front which leads to the space left between the back part of the plate and the brick work of the chimney. This arrangement produces a strong draft and prevents smoking. The opening is closed, when required, by shutting a damper hinged to its upper edge—which naturally, from the forward curve of the plate, hangs open. The chimney is also fitted with a damper, by which all draft may be shut off in case of fire.

CULTIVATOR.—Hugh Paxton Jordan, Victoria, Texas.—This improvement is intended to make this invention, patented January 10, 1871, more convenient and effective. To describe it in detail would occupy too much space. By this construction, the levers which guide the inner plows may be raised as required in driving, and yet leave the driver control of the plows by their lateral movement. By depressing these levers, the inner plow standards are raised from the ground, and may be kept so while turning, etc., by catching the lever ends on catches provided for them. To these inner standards are pivoted rods, which are hooked into holes in a plate attached to the outer standards; so that the outer standards are raised and lowered by corresponding motion given to the inner ones, and so that the outer plows may be set to work deeper or shallower than the inner, by adjusting the hooks in the plate.

FRUIT DRYER.—Charles A. Boynton, Vineland, N. J.—This invention relates to an improved apparatus for rapidly drying fruit and vegetables for preservation, and consists in the arrangement of a rotary rack that contains the fruit supporting shelves, with stationary top and bottom plates and conduits, whereby a series of up and down hot air passages through the several shelves is obtained, exposing all the fruit in the apparatus to varying degrees of heat, according to its distance from the place where it was put in. The invention also consists in the combination, with the apparatus, of a fan, by means of which air is drawn through it with desired effect.

COMBINED BUREAU AND WASH STAND.—Joseph Schneemann, New York city.—The object of this invention is to produce a convenient piece of furniture for hotel and private use, of pleasing exterior, and which will, though apparently a bureau, also fulfil the offices of a wash stand. The invention consists in the general arrangement of parts, and also in the combination, with a sliding wash bowl holder, of a vibrating soap cup.

CAR COUPLING.—George W. Loyd, Markleysburg, Pa.—This invention relates to a new car coupling, in which the system of detachable or removable coupling pins is dispensed with, and swinging hooks are substituted in their place. The entire mechanism seems to be extremely simple, not likely to get out of order, self coupling, and substantial, and for these and other reasons, better adapted to railroad cars than the couplings in common use.

PLOW.—William B. Bradford, Charlotte, North Carolina.—The object here is to construct a plow conveniently adjustable for use for subsoiling and other purposes. The rear end of the beam is curved downward and forward, so as to serve as a standard for the subsoil plow to be attached to. The handles are pivoted by their forward ends to the beam, a little in front of its downward curve. The upper plow standard is slotted or divided from its upper, to, almost, its lower end. The arms formed by the division pass outside the beam and are pivoted together to the handles some distance behind their pivoted ends. The standard is secured to the beam by a bolt passing through its arms and the enclosed beam. Several holes being made in the beam, the shifting of the bolt from one to another of them effects the adjustment of the standard for its different uses. The draft strain upon this upper standard is sustained by a brace pivoted into its slot; which brace is also slotted, so as to slide over the lower standard, to which it is again pivoted.

BAND SAW MILL.—Henry Peterson, of East Germantown, Ind.—It would be impossible to give an adequate description of this invention without several drawings and a lengthy description. Its principal features are an arrangement for operating the carriage and knees, on and against which the timber rests while being sawed, by means of a toothed bar and gear wheels which give motion to screws connected with the knees, and a combination of levers, etc., for the purpose of throwing out of gear automatically the apparatus for setting the timber up to the saw. It is a useful and ingenious device.

POTATO AND PEANUT DIGGER.—James M. Lumbard, of Decatur, Mich.—The axle of the digger is bent four times at right angles, so as to bring the middle part nearly to the ground. The rear end of the tongue has four arms, which are severally connected with the angular bend of the axle, and form therewith a vertical rectangle. The rear end of the plow or scoop is so bent as to rest on the lower bar of the rectangle without slipping when the draft strain comes on it. The front part is supported at the required inclination by chains attached to the lower arms, and the back end is provided with two curved handles for its management.

OYSTER DREDGE.—Thomas W. Landon, of Fairmount, Md.—To a frame work of ordinary construction is attached the usual wire bag or net; and a tooth plate is pivoted by its ends to the lower ends of the bows of the frame. A trip bar extends along the lower side of the rear part of the tooth plate and its ends are bent inward and attached to it. The whole is so arranged that when thrown overboard the resistance encountered by the trip bar will bring the tooth plate into working position; and when the dredge is raised, the weight of the oysters in the bag will bring it back into line with the frame so as to pass readily over the roller.

LINING FOR FURNACES, SAFES, ETC.—Augustus C. Hamlin, of Bangor, Me. —This invention consists in the application of itacolumite, as a lining for safes, furnaces, tweers, to the manufacture of crucibles, and similar uses where its heat resisting qualities can be utilized. The material named is a laminated granular quartz rock, consisting mainly of quartz sand, but containing a little talc, and possessing a degree of flexibility when in the lamina. It is, at present, mostly found in the States of North Carolina, South Carolina, and Georgia. Its flexibility allows it to be easily worked into the lining of heat resisting articles specified, and permits thus the direct and inexpensive application to practical purposes of the valuable properties of quartz and quartzite. The peculiarity of structure or composition of the itacolumite permits the expansion and contraction of heat and cold without destruction, and the material is therefore admirably adapted to all operations where the action of heat is to be resisted. It may be separated into sheets or slabs, and may also be pulverized and molded into crucibles.

OVERCOMING DEAD CENTERS AND PREVENTING BACK MOTION OF CRANK WHEELS.—John Coy, of Oswego, N. Y.—The invention consists in taking the pitman off the dead points by constructing it with a loose joint near end; also, in combining a flanged friction disk and cam on pitman to prevent back motion.

AWNING FRAME.—Jabez W. Loane, of Baltimore, Md.—The invention consists in a frame and side pieces so constructed that the awning can be raised, thrown back, or lowered with great ease and celerity, while it can be quickly taken to pieces and packed in a small compass for transportation. This device has great advantages, and should be in the possession of every one who uses a tent or awning.

BAND CUTTING FORK.—David Arnold, of West Lodi, Ohio.—A fork which has an attachment for cutting the bands of grain sheaves, and other attachments for holding the cut band and the sheaf while the same are on the fork, has long been desired by farmers, as in feeding sheaves of wheat, etc. to thrashing machines it is important to have the bands cut promptly prior to the entry of the sheaf into the machine. This object is attain by the use, on the main fork, of a knife and a yielding fork, and also by a peculiar kind of main fork. When a fork of this kind is applied to a sheaf in a position to bring the knife at right angles across the band wherewith such sheaf is tied, the knife will, after the prongs have entered the sheaf, commence to cut the band. The small fork will, at the same time, enter the band below the main fork and yield to the progress of the cutter.

FERTILIZER.—Joseph Ramsey Black, of Ninety-Six, S. C., has invented a new fertilizer compound, of such nature that by its use the most beneficent results on growing crops are intended to be obtained without impoverishing the soil or the owners thereof. The invention consists in a combination of stable manure with cheap chemicals, that thereby the elements of an excellent fertilizer are produced at comparatively little expense, and at a small outlay of labor. The chemicals are saltpeter, common salt, lime, and ashes.

DIE FOR SHAPING TEA KETTLE BAILS.—James Britton, of New York city, proposes the use of a new set of punches and dies for shaping tea kettle bails from flat sheet metal bands. The arrangement of projecting beads and receding grooves in the faces of said tools for the purpose of forming a bulge on the middle part of the bail constitutes the principal features of the invention.

DOOR SPRING.—Friedrich Stemmler, of East New York, N. Y.—This is a new means of connecting a door with a spring for closing it from both sides; and consists in a new combination of the door pivot with two spring contracting plates, and with the spring and drum, in such manner that when the door is swung open to either side the spring will be contracted for shutting as soon as the power opening the door is detached from the band.

MACHINE FOR MAKING CHAINS.—William C. Edge, of Newark, N. J.—This machine is intended for the manufacture of fine chains by jewelers, and consists principally in the use of reciprocating punches whereby the end of each chain link is expanded after it has been introduced to its place in the hain and previous to being bent.

[OFFICIAL.]

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DESIGNS PATENTED.

5,837.—CARPET.—W. De Hart, Amsterdam, N. Y.
5,838.—BURIAL CASKET.—G. Hasecoster, Richmond, Ind.
5,839.—BUTTER DISH.—J. Hill, West Meriden, Conn.
5,840.—METALLIC GRATING.—J. K. Ingalls, Starkey, N. Y.
5,841.—CARPET.—L. Jullien, Passy, France.
5,842.—CARPET.—W. Robinson, Halifax, England.
5,843.—RANGE STOVE.—G. Smith, H. Brown, Philadelphia, Pa.
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Applications have been duly filed, and are now pending, for the extension of the following Letters Patent. Hearings upon the respective application are appointed for the days hereinafter mentioned:

20,863.—ROCKING CHAIR.—I. P. Carrier. July 10, 1872.
25,635.—LABELS FOR PERIODICALS.—R. Dick. July 10, 1872.
21,329.—TELEGRAPHING.—M. G. Farmer. August 14, 1872.
21,099.—SLEEPING CAR.—E. Wheeler, July 17, 1872.
21,879.—SELF MOUSING HOOK.—J. R. Henshaw. October 9, 1872
21,122.—TREATMENT OF CAOUTCHOUC.—A. G. Day. July 24, 1872

EXTENSIONS GRANTED.

20,051.—COTTON GIN.—J. Du Bois.
20,091.—FLY TRAP.—W. Riley.
20,066.—PENCIL SHARPENER.—W. K. Foster.
20,106.—REGISTER AND VENTILATOR.—E. A. Tuttle.
20,111.—DAMPING APPARATUS.—C. A. Waterbury.
20,120.—COTTON GIN.—J. N. Wilson and G. W. Payne.
20,086.—COTTON GIN.—S. R. Parkhurst.
20,173.—SEWING MACHINE.—E. H. Smith.
20,136.—STEAM ENGINE.—D. Barnum.
20,180.—HARVESTER.—Three divisions. L. Miller.
20,181.—HARVESTER.—Two divisions. L. Miller

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ENGINE AND PUMP.—O. C. Lewis, Brooklyn, N. Y.
FILLING BOOT HEEL SHELLS.—F. Richardson, F. Hacker, J. A. Blake, Providence, R. I.
LAMP BURNER, ETC.—A. G. Myers, New York city.
SCREW DRIVER.—C. Law, Pittston, Pa.
STEAM ENGINE FOR STREET VEHICLES.—W. Baxter, Newark, N. J.
STEREOPTICON.—A. G. Busby, W. B. Woodbury, Philadelphia, Pa.
TREADLE.—S. K. Herrick, Boston, Mass.
TREATING BRISTLES, ETC.—W. Adamson, Philadelphia, Pa.
TREATING SUBSTANCES.—W. Adamson, Philadelphia, Pa.
TUCK MARKER, ETC.—Howe Machine Company, Bridgeport, Conn.
TYPE CASE.—R. M. Hoe, New York city.
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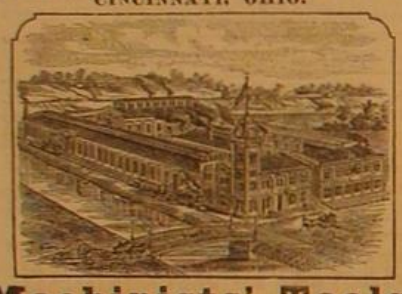

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Yours truly,
D. B. ALLEN.

How to Do It.

COVERT, March 18th, 1872.

MR. EDITOR:—On the ninth day of January last, a copy of Wood's Household Magazine strayed into the Covert Post-office, and our Post-master, Mr. D. B. ALLEN, who is also Superintendent of our Sabbath School, in glancing over the contents, noticed the offer to any Club, Lodge, or Sabbath School, of a Smith's American Organ, for the price of the instrument in subscriptions to the magazine. Here, thought our Superintendent, is our opportunity; we need an Organ, and we need good reading—why may we not have both? The price of the Magazine is one dollar per year, and for one hundred and twenty-five subscribers we can have a No. 1 Organ, price $125. With characteristic promptness he presented the matter to the school next day, and, though the scheme appeared visionary to the most of us, the ball was set in motion, and it was not suffered to rest until one hundred and fifty-three names were obtained, which, with the addition of twelve dollars in cash, entitled us to a Smith's American Organ, style No. 3, price one hundred and sixty-five dollars. The list, with the cash, was sent to the publishers, the Organ was promptly forwarded, and last Sabbath its powerful tones filled our place of worship for the first time. We can cheerfully testify to the reliability of the publishers of Wood's Household Magazine. They give us our money's worth of valuable reading, and, in addition, a first-class Cabinet Organ; and we will further say to all Clubs, or Societies, that are in want of an Instrument, first find a leader who has *go* in him, then GO and do likewise. * * * O. S. S.—[*From the Sentinel, South Haven, Mich., for March* 30, '72.]

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The increasing demand for, and reputation of, THE TANITE EMERY WHEEL warrants its manufacturers in at last making an advance from the price list which they have held rigidly fixed from the very infancy of the Company. Constant care and unremitting attention, the employment of the greatest mechanical and chemical skill, and the most assiduous study of the wants of Mechanics and Manufacturers, have enabled THE TANITE COMPANY to bring their specialty to the *highest point of perfection.* Constant outlays are required to meet the novel wants connected with this branch of industry; and this, with the necessity of maintaining and even increasing the high reputation of these goods, calls for a moderate increase in price. COMMON GOODS *can be made for ordinary prices, but* STANDARD GOODS, *of uniform quality; on whose perfection, both chemically and mechanically, not only the economy of the buyer, but the bodily safety of his hands depends; can only be furnished at full or high prices.* IT IS CHEAPER, SAFER, AND BETTER TO DEAL WITH A COMPANY WHO MAKE A DISTINCT SPECIALTY BOTH OF SOLID EMERY WHEELS AND OF EMERY GRINDING MACHINERY, THAN TO RISK THE POOR ECONOMY OF BUYING CHEAP AND UNSATISFACTORY GOODS.
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STROUDSBURG, MONROE CO., PA., March 18, 1872.
The Prices of the Tanite Co.'s Emery Grinding Machinery are *this day* advanced, as follows:

The Tanite Co.'s Saw Gummer			$15
" " "	No. 1 Emery Grinder		50
" " "	" "	on Table	50
" " "	No. 2 "		50
" " "	"	on Table	75
" " "	No. 3 "		110
" " "	Diamond Tools		15

The general and great advance in the price of Metals and Supplies, together with recent improvements in and additions to these Machines, necessitates the above advance. Notwithstanding this advance, the above Machines are the cheapest in the market. Take notice, that we make no charges for boxing and shipping, and no charges for Extra Rests. Each Emery Grinder is supplied (in addition to the two ordinary Rests) with one of our improved adjustable Face Rests, and one of our improved adjustable Side Rests. These Rests can be set at any angle.
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