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PECULIARITIES OF ANNEALING.

Some one once wrote on the "perversity of materials;" he must have had experience with cast steel—crucible steel. Certainly the behavior of this metal is queer, if not perverse, at times. Sometimes a bar of the best cast steel will submit to a "black annealing," and be just as soft under working as though it had passed through the regular annealing bath. "Black annealing" means simply the heating of the steel to a cherry red, allowing it to cool in the air until it shows no redness in the shade, and then plunging in cold water. Under such treatment the writer has frequently used Sanderson's and Jessup's and other well-known steels in the lathe and under the file, where they were cut as freely as iron. Wardlaw's steel was particularly amenable to this heroic treatment; and yet there never was a steel capable of taking a finer temper. And sometimes it requires all the coaxing and persuasion of an airtight bed of charcoal and a heating and cooling of twenty-four hours to induce the steel to yield to working cold. Usually, however, a generous heating and a temporary burial in the dry forge ashes is sufficient to soften the ordinary cast steel.

In a somewhat varied apprenticeship, it became the duty of the writer to cut off to two foot lengths, in the lathe, bars of fine cast steel, to be used for engraving for calico printing—the making of dies and mills. To this duty was added that of annealing these short bars, which varied in diameter from three inches to three-eighths of an inch. The bars were packed "on end" in cast iron pots of cylindrical form, with powdered lime and charcoal, and the cast iron cover luted down with fire clay. These pots were placed in a furnace, raised to a red heat, kept at a red heat for twenty-four hours, and allowed to cool gradually. If, in packing, one of the bars rested its length against another, the line of contact became soft on each bar, and could not be afterward hardened. This was so often observed that two men were required to pack the bars. This was many years ago, but recently a similar experience has been related, that shows that it is absolutely necessary that the infilling between the bars to be annealed shall be so complete as to entirely isolate them.

In an establishment for the manufacture of hand tools—screw plates, taps, dies, and similar shop articles—the superintendent recently stated a similar experience. He had a number of taps—some of them very valuable from their extraordinary length—which did not give satisfaction. They were returned with a showing from use that there were soft places in the steel. It seemed queer that while all the tap was hardened and tempered at once, there should be little spots extending across one row of threads, which were perfectly soft, and which "blunted up," as he expressed it, as soon as they were brought to the work. It required much investigation to ascertain the source of the trouble. Finally, it was discovered that the annealer packed long bars in his square annealing box crosswise, or rather "catty-cornered," over other bars, allowing the long bars to rest diagonally on the parallel short bars; and that where this contact occurred the steel in both bars lost its capacity of hardening and tempering.

These peculiarities in steel seem as odd as the statement of an old worker in britannia metal, who says that the exposure of cast tin and its compounds to the sun and air softens the metal so that it may be bent or indented without cracking, and almost as easily as lead.

SOMETHING ABOUT BRUSHES.

There is not a household convenience or a personal implement that is of more importance than the brush, and its name is many; a catalogue of different brushes would fill a column in this paper. Yet few know how a brush is made, and of what it is composed. It has been supposed by some that split whalebone—which is only another form of hair or horn—was used as a cheap substitute for bristles, and readers of forty or fifty years old remember that black bristled brushes were avoided, and only white ones were salable. In fact, however, whalebone is much more costly than bristles, and is only used for special brushes.

And even the bristle supply is becoming costly and scarce. Hereaway we raise no more bristled hogs; most of them have a coating of soft hairs sparsely distributed, and some of the finer sorts have a curly wool. Even the Southern hogs, which self-fared in the nutty woods, are dying out, and a higher type of the class *Sus* is taking their place. Nearly all the bristles that are used in this country come from Russia, and they cost the brush maker from $1.25 to $3 a pound. They come tied up in neat rolls, and assorted as to lengths and stiffness.

Horse hair is largely used for brushes; there is no material that will so finely polish sewing machine needles, as they come from the last machine process, as horse hair brushes. Horse hair makes the soft brushes for plush, velvet, and for the silk hat makers.

The vegetable kingdom is largely drawn upon for brush material. To say nothing of brooms, there is a grass called Tampico, from the place of its exportation, that is used in the making of hand scrubbing brushes. It is a round fiber of light straw color, quite tough and elastic, and possessing the unusual quality of retaining its rigidity and elasticity however much soaked it may be in water.

Flattened steel wire, with the temper in, is used for flue cleaning brushes and for street and stable use. These are so coarse and rigid that they would be better designated as scrapers.

But there is a wire brush that is the very opposite of these. It is made of steel or brass wire that is so very fine that it goes quite beyond the finest gauge made in this country. It goes to what is known to the trade as 44 English gauge. Brushes made from this are employed in the production of a peculiar finish on silver. When silver is used in plate, whether it is solid or an external deposit, it is not often compressed, or hardened, by any mechanical means, except when it is burnished to make a polish. The "satin finish" of plate and silver ornaments, so much admired of late years, is produced by these brushes of fine steel and brass wire. The brushes are rotary, and are run at a high velocity. The effect of their action on *the soft* surface of silver is to raise the particles so that they will not reflect the light as a polished surface will, but give a soft, velvety, refractive light to the eye. This elegant effect is produced by the soft wire brushes that feel under the hand almost like cylinders of down.

The common way of fastening bristles and hairs and Tampico grass in brushes is with common pitch, which is kept hot at a convenient bench, and is kept fluid by the admixture of a little tallow. The workman grasps from a bunch or pile of bristles a few in his fingers, doubles them over at the middle, winds a bit of fine twine about the butt or bend, dips that end in the hot pitch, and presses the bunch in a hole in the wooden back of the brush to be.

But a better process is wiring or twining; in either case the looped brush being held by a wire or twine that passes through a small hole in the back of the larger hole that receives the bristles. But, as all these wires or strings are seen on the back of the brush, they must be concealed by a false back for nice work.

The writer has a specimen with a solid back that was made more than fifteen years ago. In this the bristles, doubled, were led by a wire staple into the holes, and the ends of the staple being crossed by a die, the wire was forced into the wood by a plunger, and really locked in the solid material. The brush has been in constant use during these years, and is "as good as new."

PATTERN MAKING.

As good an opportunity awaits the really ambitious young man, mechanically inclined, in the pattern shop as in any other branch of skillful work. The superiority of the machinist is not much, and consists, mainly, in more decisively accurate measurements than are required of the pattern maker; but the latter must make closer calculations, because he works from amorphous and unformed material, while the machinist has the formed casting, or the shaped forging, or the sized bar as a guide.

More hand skill, combined with good judgment, is required from the pattern maker than from the machinist. Notwithstanding all the improvements in wood working machinery and the multiplication of hand tools for wood working, the pattern maker is greatly dependent for his success in a job to his skilled hand, his mechanical eye, his judgment of proportions, his readiness to make legible to his apprehension the lines of the draughtsman—and sometimes to his facility in detecting an error on the drawing board.

Great temptations are in the way of the pattern maker to make poor fits go, to coax, and doctor, and manipulate his material. Clear pine is easy to form into shapes; when waxed and shellacked, it is easy to conceal minor imperfections temporarily. But soon as the pattern comes out of the mould the man's work is manifest. The pattern maker may cheat once, but that *is* the end.

On the contrary, the pattern maker's work is wonderfully enduring when its use and exposure is considered. It is wet and almost soaked in a damp sand mould; it is taken out and hung up or piled loosely with others on a shelf in a foundry where the steam from the contact of melted iron and damp sand mingles with the heat of a roaring cupola fire and the outer blasts through open doors. And yet patterns of wood that have been used a hundred times and are forty years old are good to-day.

Utilization of Bones.

The value of ox bones is considerable. The four feet of an ordinary ox will make a pint of neatsfoot oil. The thigh bone is the most valuable, being worth $80 per ton for cutting into cloth brush handles. The foreleg bones are worth $30 per ton, and are made into collar buttons, parasol handles, and jewelry. The water in which the bones are boiled is reduced to glue, the dust which comes from sawing the bones is food to cattle and poultry, and all bones that cannot be used as noted, or for boneblack used in refining sugar, are made into fertilizers, and help to enrich the soil.

AERIAL TRAVELING.

The following explanation was intended to precede the article "A New Aerial Machine," published in the SCIENTIFIC AMERICAN of May 9. Without it, that article, with its drawing, may be deemed a mere fanciful project, whereas we designed to show that with the appliances there illustrated we can travel above the earth as readily and as safely as we now ride on its surface. Let us examine the inherent difficulties in raising ourselves into the air, and see whether they are insurmountable.

We can gain but little instruction from the flying of a bird, neither is it probable that anything analogous to a bird's wing can be utilized. Something much more simple must answer our purpose. The requisite power is the only obstacle, and to that we will now look.

The "balloon" idea is practically unmanageable. The enormous bulk places them entirely at the mercy of the wind. Unnumbered efforts to drive balloons against the course of the wind leave little hope that they can ever become a means of daily transit. The reason is simple: No steam vessel can stem a current of, say, fifteen miles an hour, and yet a fresh summer breeze has a velocity of twenty, to say nothing of storms. A balloon is swept before such a force like chaff. Its ascent or return subjects it to imminent danger. We must discard such agency for something more manageable—a power which can lift us by active mechanical appliances, sustain us for any required time, and can be obtained without a fatal increase of weight. Steam will give us power *ad libitum*, but it necessitates such an accumulation of weight that for the present it is not available.

But fortunately we have another elastic gas free from this objection. Compressed air is able to accomplish the work under consideration; not to *fly*, for there is small resemblance to bird motion, but to *travel through the air* at any desired elevation.

Let us examine the problem and its difficulties. It is required to raise and sustain the weight of a man and machine. To accomplish this, I propose to utilize both compressed air and the muscular power of the rider. Any man of fair strength can raise his own weight on a horizontal bar, and did not his muscles become fatigued could sustain it indefinitely. For this effort he does not exercise all his strength, but only that of one set of muscles, or decidedly less than *one man power*, which is commonly reckoned as one-sixth *horse power*. So long, therefore, as I provide him with one-sixth horse power, I give him that which can sustain him freely and easily A machine constructed as illustrated weighs but 65 pounds, which a man can easily raise by the use of his own lower limb, or, if preferred, by the reserved force stored in the air receivers.

We know at present no better means of propulsion than screw propellers, driven at high speed. The form shown in the figure can be much improved. These propellers, driven horizontally, must necessarily expend their energy in direct vertical lifting. Two receivers of the dimensions shown, starting at a pressure of 3,000 pounds, will furnish one-sixth of a nominal horse power for two hours and a half, and still show a residual pressure of 1,000 pounds. Our problem is solved; I have not considered heavy loads, nor traveling by the day or the week, all that is for the future. But the possibility we have demonstrated is a great conquest. He who sails with confidence over the fence rails will soon learn to look down on the tree tops, and who shall say where he will find his limit?

I have said nothing of the means for forward propulsion, for in that no difficulty exists, more than in ordinary bicycle riding.

Assuming that our machine is perfected, and will carry us smoothly away at our own discretion, much yet remains to be accomplished, for we must learn *how to use* the newly acquired power, which would otherwise be only a source of disappointment and danger. It is for all of us now perfectly easy to walk. We do it so automatically that mentally we are conscious of no effort. But it is simply because we learned to walk in infancy. If we had never learned, we not only should be unable to walk, but we could not even stand erect, for in either we are at each moment engaged in a complicated series of necessary balancing movements, but of whose existence we are commonly not conscious.

This will be our condition in aerial traveling. The power, and the perfect machine, will be useless until we have learned how to use them with confidence. A beam which affords an easy path becomes almost impassable if laid across a mountain chasm. Rising from the ground must of necessity be at first a matter of apprehension, and even terror. The confidence of habit will alone make it enjoyable. We creep before we walk. The first trials will naturally be made under cover, perhaps without a rider. Loading the saddle with his equivalent weight, or less, we must patiently learn, by experiment, what amount of lifting power can be secured by the horizontal propellers; the necessary number of revolutions to raise a given weight, and the amount of air to obtain these revolutions. This attained, the rider can start the propellers, applying his own strength also, until he feels that he is lifted from the floor, and his effort will then be to remain there, at an elevation of only a few inches. His center of gravity is so suspended that his machine will remain as quiet, if the power is steady, as though he were floating in the air, gravitation being evenly balanced by the lifting power of the fans. This will be almost the critical point; if this position is gained, future success will be sure, and every subsequent movement easier.

The next step will be taken by diminishing the power, and allowing the feet of the machine to rest on the floor. With many repetitions the ascents will become higher and higher as confidence is increased. The addition of the arm power brings a new complication, and ought to be attempted for the first time only at the very slightest elevation. The addition of the steering appliances, both vertical and horizontal, will present no difficulties.

When the rider is able regularly and without trouble to rise and to alight, directing his course gently and easily about the hall, we may consider the victory won. Trials in the open air will add no difficulty except from the force of the wind. At times aerial traveling will be impossible, but inasmuch as the rider presents no greater surface to the wind than a man when walking, except by his propellers, it is not unfair to conclude that he can travel through the air in any ordinary weather.

Of the longer and higher flights I say nothing. They will come in their proper time. The young man shown in the illustration, without cap, and hair flying, with villages and such things far below him, is no beatific vision of mine; the engraver is responsible for the rider and his surroundings. It was shown that in order to elevate ourselves free from the ground we needed only an increase of power without excessive weight, and I submit that this difficulty has been met. I by no means claim that the precise form which I have indicated is the only available one, or even the best one, though I believe it to be one that *will work*. I have proposed it in the hope that I might start the active brains of some of our numerous inventors to developing that which the duties of professional life place beyond my reach. The field is immense, and the advantages, not only to the one who shall put the ideas here suggested into their real forms of steel and brass, but to the world at large, are too great to be lightly set aside. W. O. AYRES.

The Calorimetry of Coal.

In consequence of the criticisms of German observers upon the high value assigned by MM. Meunier-Dolfus and Scheurer-Kestner for the heat of combustion of various descriptions of coals, the latter has conducted a fresh series of experiments for the purpose of verifying his previous results, and has communicated some remarks thereon to the Academie des Sciences. In stating the analyses of coal examined by him, M. Scheurer-Kestner only mentions the pure combustible, after deducting ashes, instead of stating the latter as a constituent of the fuel. He follows this rule in order to obtain comparative results with respect to the coal itself, because the proportion of ash varies so seriously from one fragment of the same coal to another that it is indispensable to express results calculated only upon the pure combustible.

It has been found, for instance, that a lump of coal apparently unusually homogeneous, when reduced to fragments, and the fragment divided into equal portions, gives very different calorimetric results for different portions when the ash is included, although the results may be constant enough when the chemically pure fuel only is taken into account. This has been found to be true in many instances, although no differences between the separate portions of combustible could be detected by the eye. The reason is that fragments chosen from the same small lump show a proportion of ash varying from 2·82 to 18·60 per cent. These considerations are of vital importance in relation to calorimetric experiments upon fuel, especially when the fuel so tested is considerably charged with ash. It is preferable, therefore, to make use of calorimeters in which the mineral portion of the fuel does not disappear, but may be collected and estimated. After all, as only very small portions of fuel can be examined in this way, a large number of experiments are necessary in order to arrive at fairly average results. The most generally interesting consequence of M. Scheurer-Kestner's latest researches is to establish the fact that the heat of combustion of coal is very much greater than has been commonly supposed. The practical importance of this statement lies in the additional light which it throws upon the comparative efficiency of various heating arrangements. If M. Scheurer-Kestner's figures are to be adopted, it follows that the proportion of heat unaccounted for by the best boilers and furnaces must be increased by a considerable percentage beyond the general estimate.

IRON and steel workers will be interested to learn that at the New Orleans World's Fair the medal of the first class for hammers was awarded, over all competitors, to the Upright Power Hammer manufactured by Beaudry & Cunningham, Boston, Mass.

The Clyndograph.

The clyndograph of M. Moessard is a new panoramic photographic apparatus, which by a simple rotation of the objective gives the cylindrical perspective of the earth. A view furnished by the apparatus embraces an angle of 170°, so that a complete turn of the horizon is obtained in two views and a fraction of 20° range. The instrument is based on the principle that a lens or combination of lenses, constituting a photographic objective, may be subjected to any movement whatever without the image it produces on a screen changing its form or position, provided that the movement takes place around the nodal point behind, which is maintained immovable. This follows from the known property of the nodal point being the point of view of the perspective produced. Suppose, then, there be (1) an objective suspended horizontally and turning round a vertical axis, passing by its after nodal point; (2) two vertical shutters fixed behind to right and left of the objective, to limit the field in the horizontal direction and arrest rays too oblique; (3) a screen, of cylindrical form, vertically centered upon the axis of rotation, and having for radius the distance of the nodal point from the principal focus of the objective. In any position whatever of the objective the lie of the country comprised in the field of the instrument will be projected on the screen. If the objective be put in motion, one gets successively for each point of the panorama an immovable image which impresses the eye or sensitive paper, while the point remains between the two shutters. In M. Moessard's actual apparatus Thiebaut sensitive plates are used to receive the impressions. The instrument is expected to prove useful in preliminary surveying and military operations.

Hardening Plaster.

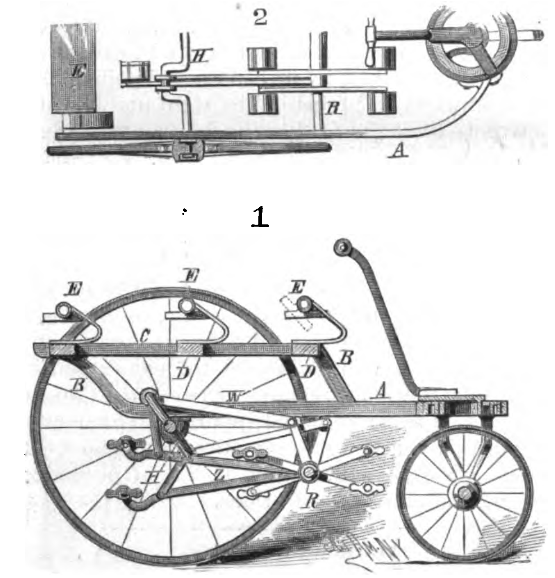
A new process for rendering plaster very hard, and capable of being substituted for wood in flooring, has been brought out by M. Julhe. Plaster has this advantage over cements, and even over wood, that it increases rather than diminishes in bulk on being applied to structures; but it fails in hardness and surface resistance. To overcome this difficulty M. Julhe mixes six parts of good plaster with one part of rich lime, recently slaked and finely sifted. This mixture is to be used like ordinary plaster, and the object made from it, when it is very dry, is caused to imbibe a solution of a sulphate which has a base precipitable by lime, and this precipitate insoluble. Such are the sulphates of zinc or iron. The theory of the process is as follows: The lime contained in the pores of the plaster decomposes the sulphate, with production of two insoluble bodies, to wit, sulphate of lime and oxide, which fill the pores of the object submitted to the treatment in question. With sulphate of zinc the object keeps of a white color, but with sulphate of iron the object, at first greenish, takes on drying, and with lapse of time, the color of the sesquioxide of iron. With sulphate of iron the hardest surfaces are obtained, the resistance to rupture being twenty times greater than with ordinary plaster. To obtain the maximum hardness and tenacity it is necessary that the object should first be very dry, and steeped in a solution which is practically saturated. The first immersion of the object in the solution ought not to last over two hours, as a too long immersion at first is apt to render the surface friable. On drying the plaster object afresh after the first immersion, there is no further fear of its becoming friable. If the proportion of slaked lime is too great, the surface is apt to take a very hard marble-like skin, which prevents the hardening of the inner portions of the object. The proportion of one of lime to six of plaster as stated above has given the best results. Plaques made in this way can be browned by rubbing them with linseed oil and litharge and glazed on the surface with hard copal varnish. A beautiful glossy flooring like polished oak can in this way be prepared.

Drawing Wire from Fluid Steel.

The *Manufacturers' Gazette* says: Wires and bars are now produced direct from fluid steel, by pressing it out through dies in a manner similar to the production of lead pipes from lead. An iron vessel, lined with refractory material, is provided with a manhole and a cover at the top, and securely closed. At the bottom opposite the manhole there is a cast iron outlet pipe, through which passes a steel tube with water circulating round it exactly like a "tuyere," by which the steel pipe or die can be cooled. The inner end of the steel tube is lined with fire clay, where the very hot fluid steel meets it. The tube is plugged up by a steel stopper, and the liquid steel is filled into the vessel with liquid carbon dioxide above it. The stopper being withdrawn the liquid steel is forced out by pressure of the carbon dioxide in a red hot rod or wire, which goes from the vessel into the rolling mill while still hot, and is there finished off. We may also add that steel is now produced direct from the ore by a new process of a French engineer. The ore in a powdered condition is submitted to the action of carbonic oxide gas at a high temperature in a cupola or blast furnace, where it is reduced by the incandescent gas to pure iron or steel.

SIX-SEAT TRICYCLE.

The frame of the tricycle is composed of side pieces, A and C, united by the arms, B, the upper side pieces being connected by the cross bars, D, which support the seats, E, upon curved spring plates. In the upper ends of these plates are formed eyes in which the seats are pivoted, so that each seat is free to turn to any angle to accommodate itself to the movements of the riders. The main side bars rest upon a double crank axle carrying two wheels, only one of which is rigidly mounted; the opposite wheel, being journaled upon the axle, is free to revolve to permit the tricycle to be turned. The forward ends of the bars are bolted to a circle, within which is a well designed fifth wheel car-



HENNIG'S SIX-SEAT TRICYCLE.

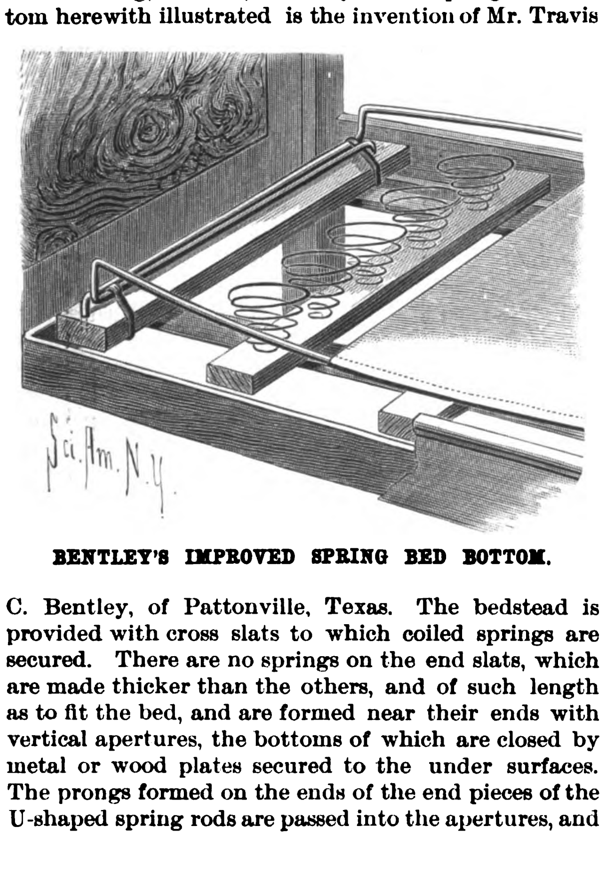
rying the guide wheel and operated by means of a lever extending to within reach of the forward rider.

From the main side bars of the frame depend arms supporting the shaft, R, near each end of which is fixed a treadle provided with a pedal upon each end; one of these treadles is provided with an upwardly projecting rocker arm that is connected by a rod with one of the cranks of the axle. Placed loosely upon the shaft, R, is a sleeve, secured to each end of which is a treadle formed with a pedal at each end; one of the treadles has a rocker arm connected by a rod with the second crank of the axle. Thus are formed four pairs of treadles reaching in front and rear of the shaft, R, which work together and are operated by four persons, two sitting upon the forward seat and two upon the middle seat. Upon the shaft between each of the end treadles above described is loosely placed the end of the treadle, Z. These treadles extend back under and beyond the axle, and connect with the two cranks by rods. The rear end of each of these treadles is provided with a pedal; the feet of a person upon the rear seat rest upon these pedals. Although the tricycle here shown is made to carry six persons, the seats being made of considerable length for that purpose, it is evident that the same principle of treadles may be employed in a tricycle carrying three persons, in which case three single seats would be used and one set of double treadles would be omitted.

This invention has been patented by Mr. Carl G. E. Hennig, of Paterson, New Jersey.

IMPROVED SPRING BED BOTTOM.

The strong, durable, and very elastic spring bed bottom herewith illustrated is the invention of Mr. Travis



BENTLEY'S IMPROVED SPRING BED BOTTOM.

C. Bentley, of Pattonville, Texas. The bedstead is provided with cross slats to which coiled springs are secured. There are no springs on the end slats, which are made thicker than the others, and of such length as to fit the bed, and are formed near their ends with vertical apertures, the bottoms of which are closed by metal or wood plates secured to the under surfaces. The prongs formed on the ends of the end pieces of the U-shaped spring rods are passed into the apertures, and rest on the plates. The upward movement of the spring frames is limited by bands or cords passed around the slats and the end pieces a short distance from the bends. The spring bars are so arranged that their longitudinal pieces, which are curved slightly, are adjacent to the inner sides of the side rails of the bed, and the end pieces cross each other. The side edges of canvas or ducking are fastened to the longitudinal parts of the rods; the canvas rests upon the springs, and is held taut by the frame formed by the spring rods. A spring bed of this description may be used without mattresses or other bedding, owing to its elasticity.

Cleaning Printers' Forms.

The following directions for washing type, from so good authority as *British and Colonial Printer*, will be found useful to the inexperienced "typo," and its suggestions will likely remind a foreman in some press room that he is not using the best means for cleaning his forms and preserving his woodcuts.

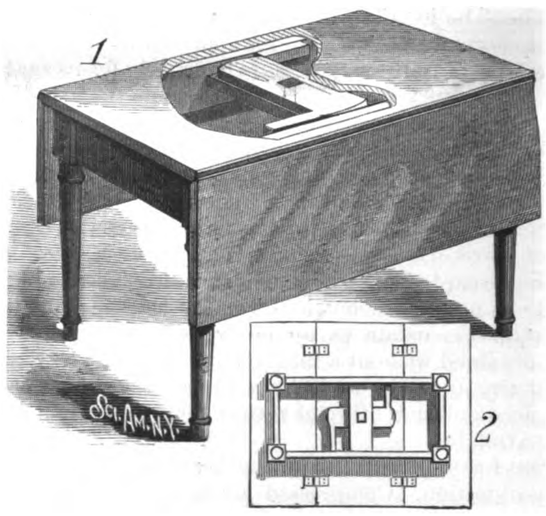
For many years printers have been accustomed to wash all forms with lye, but since benzine came into use, it has been adopted for forms composed of wood type. The former was objectionable, because, while it made the type perfectly clean, it warped wood letters; the latter, in that the benzine evaporating so quickly, it left the dissolved ink on the face of the type in a hard form, that eventually filled the open spaces. Of late, where forms are composed wholly of wood and metal job type, it is as well to wash them with paraffin. Go over them with a rag saturated with the oil, and then afterward take a clean rag and wipe the forms carefully. The wood type will be perfectly cleaned of the ink, and the metal almost as clean as the type washed with lye. Wood types thus treated are never warped and are never coated with ink, after adopting the coal oil as a wash. After giving it a fair trial, no one will want a better wash. As a matter of course, nothing will take the place of lye for washing metal type, and when persons prefer lifting their wood type out and washing their metal type with it, so much the better; but they will find nothing more convenient or better for wood type than what is here recommended. Many printers find it a difficult task to thoroughly clean a form of metal type on which colored ink has been used, especially red and green. An easy and simple way is to take the form, as soon as the job is off, unlock it, tie it up, put it in a basin or jar, and cover it with strong lye. In a few hours take it out, rub it lightly with a soft brush, rinse it with water, and it will be as clean as if it had never been used, especially if the type is new. This is also a good way to clean type on which the ink has been allowed to dry, or to remove the dirt and the ink from shaded letters and rule. Benzine is good, but it is nowhere compared with this mode. Stereos and electros should be turned face downward, using a block at each end to rest them on, with only enough lye to cover about two-thirds of the metal. Type should never be rubbed much in cleaning it; poor lye and hard rubbing will make the face of the letters bright, but the type is not clean; besides, it is injured by the rubbing. Do not be too sparing with the lye and water, but save the brush. A much better way, when ink persistently refuses to come off, is to wash the type with sweet oil, and let the form stand for half an hour; then use the strong lye as directed above. Colored inks are very tenacious when dry, and we have known an entire form rendered useless by allowing red ink (a very "painty" substance) to remain on until it was hard. It is always best not to neglect a form with ink, but wash as soon as taken from the machine.

Whooping Cough.

Dr. C. R. Illingworth writes in *The Lancet:* "I have found a popular remedy very efficacious in the treatment of whooping cough. I refer to picked oakum, worn by the patient either round the neck in muslin or on the chest as a pad stitched to the underclothing. Locally I apply the glycerine of tannic acid with a laryngeal brush two or three times a day, and internally I prescribe one, two, or three grain doses of chloral, one, two, or three minims of belladonna, one grain of alum, and one minim of carbolic acid, in sirup, every two or three hours. A liniment of turpentine, acetic acid, and yolk of egg is an excellent application for the chest, back, and neck, night and morning, with the liniment of belladonna added in the proportion of 1 to 7. In children of two years or more, I have applied carbolic acid and glycerine, in the proportion of 1 to 15, to the larynx with success, each application checking a paroxysm at once. With the above-mentioned treatment I cure the worst cases in from seven to ten days."

REVOLVING DROP-LEAF TABLE.

The cut shows a table in which the frame serves to support the leaves when in a raised position. The leaves are hinged to the side edges of the top plate, in the middle of the under side of which a crosspiece is fastened. The sides of the supporting frame are united by a flat crosspiece. A bolt secured in the upper crosspiece projects down through the lower one, and receives a nut on its lower end; the bolt holds the top plate on the frame, on which it can turn. Projecting from the side edges of the diagonal corners of the upper crosspiece are stop pieces (shown in both figures), so arranged that their outer ends are separated a distance transversely equal to the width of the frame; these stops are attached to the under side of the top plate. When the longitudinal axes of the frame and top plate are parallel, the leaves swing down against the sides. When the leaves are to be used they are raised, and the top plate is turned so that it rests transversely upon the frame, the ends of which support the leaves. The side pieces of the frame strike the outer ends of the stops, thus holding the parts in proper position.



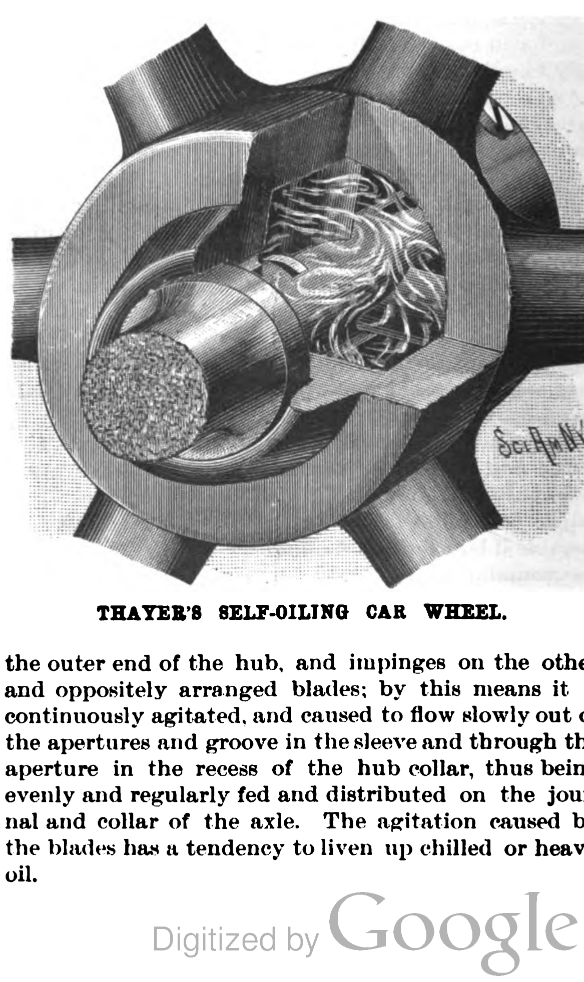
JOHNSTON'S REVOLVING DROP-LEAF TABLE.

Additional information regarding this invention can be obtained from Messrs. D. Johnston & Son, of Tamaroa, Ill.

SELF-OILING CAR WHEEL.

The invention shown in the accompanying engraving has been patented by Mr. Ellis T. Thayer, P. O. Box 826, Charleston, West Virginia. Integral with the hub, which is cast hollow, is an inner bearing sleeve; the shell of the hub and the sleeve being connected and sustained by a series of blades tapering about equally and ranging parallel with the length of the sleeve, and placed equidistant or quartering. One blade is formed at the outer end of the hub, two are arranged opposite each other at about the center, and one is a short distance from the inner face of the inner end, thereby leaving a space between the end of the blade and face of the hub. On the inner end of the hub is a collar having a recess from which one or more apertures lead to the oil chamber, or space between the hub and sleeve. One or more apertures are formed in the sleeve in front of the rear blade; these apertures connect with grooves in the inner face of the sleeve bearing which conduct the oil to the journal. Apertures are also formed at the outer end of the sleeve. The hub and sleeve revolve on a journal of the axle which has the usual collar entering a recess formed in the hub collar.

The hub is filled with the lubricant through a hole closed by a screw plug. When the wheel is revolved, the oil in the hub is propelled forward by the blade in

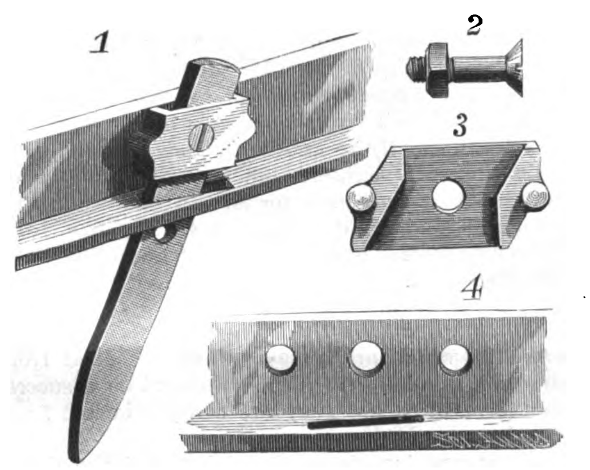


THAYER'S SELF-OILING CAR WHEEL.

the outer end of the hub, and impinges on the other and oppositely arranged blades; by this means it is continuously agitated, and caused to flow slowly out of the apertures and groove in the sleeve and through the aperture in the recess of the hub collar, thus being evenly and regularly fed and distributed on the journal and collar of the axle. The agitation caused by the blades has a tendency to liven up chilled or heavy oil.

IMPROVED HARROW.

The object of the invention herewith illustrated is to produce a harrow with adjustable teeth, which shall be light, strong, durable, cheap, and effective in every kind of work required of the implement. Fig. 1 is a side view of one of the beams of a harrow frame, with an adjustable tooth and the holding plate or clamp;



PATCH'S IMPROVED HARROW.

Fig. 3 is an inside view of the clamp, and Fig. 4 is a side view of part of the beam. The lower flange of the angle iron or metal beam has a longitudinal slot in it for each tooth, and which may be in line with the beam, or slightly diagonal. The slot is of such length as to allow the tooth shifting from an upright to an inclined position, so that it will form not only a lateral support for the tooth, but also a lower support in both of its working positions. Arranged at suitable distances apart, along the upper flange of the beam above the slot, are three holes for attachment of the clamp.

The clamp used to hold the tooth in either of its working positions is a simple plate having bent inner ends and lugs, the latter entering the holes in the beam, and being riveted or not to the beam. The clamp may be further secured to the beam by a bolt passing through a center hole in the clamp, through one of the holes in the tooth, and through the center hole in the beam, and forming the pivot on which the tooth turns. One of the bent ends of the clamp is made with an upright inner side surface, and the other with an inclined inner side surface (Fig. 3), thereby forming bearings above the pivot for the tooth in the vertical and inclined positions. The tooth may be of a flat or other shape, and has one or more holes through it near its upper end.

A harrow of this construction requires no special means for adjusting the teeth, and the pivots are relieved from working or lateral strain; it also provides for a ready detachment of the teeth when required.

This invention has been patented by Mr. A. H. Patch, of Clarksville, Tenn.

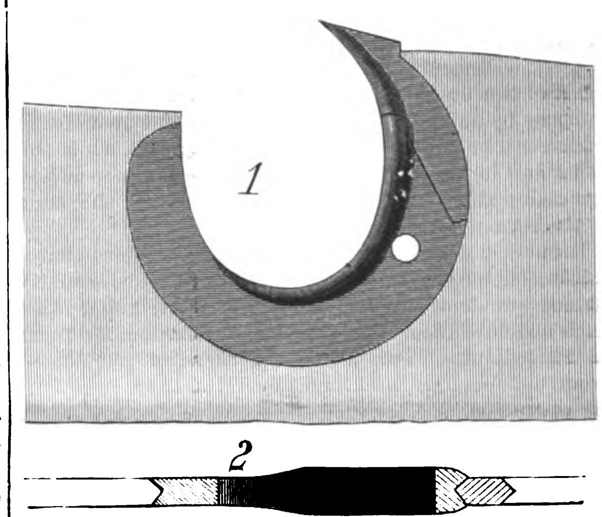
Atmospheric Electricity.

Professor Palmieri, of the Vesuvian Observatory, has recently published some observations of interest on atmospheric electricity. In clear weather the atmospheric electricity is usually positive; if negative, a downfall of rain, etc., may be inferred to be going on at some little distance. There is a maximum of atmospheric electricity at 9 A.M., another soon after sunset, which often continues during a great part of the night. A minimum takes place before daybreak, and another in the afternoon. This periodicity is, however, disturbed by atmospheric movements. When the maxima, a very pronounced cloudy weather often follows. If the sky becomes overcast, the electric indications grow stronger, and if at the time of the evening maximum the relative moisture increases with a heavy dew, maxima of special duration and intensity may be expected. The assumption that atmospheric electricity becomes stronger with altitude is not borne out by the Vesuvian observations. Lower potentials are generally observed on hot summer days; in spring and autumn the indications are stronger; in winter they are uncertain. On cloudy days the potential is less intense, but positive; during rain the potential increases. A rain zone is positive, but surrounded by a negative zone, which again is surrounded by a zone of positive electricity. According to Palmieri, there is no thunder and lightning without rain.

INSERTIBLE SAW TOOTH.

In this form of teeth as ordinarily constructed the edge of the mouth piece which forms the throat is of the same thickness as the rest of the mouth piece or the blade. This soon causes the mouth piece to become rounded and even sharp on its edge, by reason of the constant friction of the sawdust; it often becomes so thin that the sawdust is forced past the tooth on each side in such quantities as to produce a great pressure on the saw, which accordingly soon becomes heated. In consequence of this it is frequently necessary to renew the worn-out mouth pieces. This defect is remedied in the invention herewith shown, recently patented by Mr. Abram Adsit, of Traverse City, Mich. The edge of the mouth piece of the tooth is made of greater thickness than the saw blade, as indicated in the section, Fig. 2. The bit and mouth piece are first joined together, and then slipped to place in the saw plate.

No beveled edges are exposed above the mouth piece. As this style of bit is made in much the same shape as the mouth piece, the two join nicely to form a good throat, and the dust passes freely down the face of both bit and mouth piece. The saw will do its work freely and well, will keep cool, while its durability is materially increased.



ADSIT'S INSERTIBLE SAW TOOTH.

A NEW BEVEL GEAR CUTTER.

The making of accurate bevel gear wheels, which will work smoothly, without rattling, or waste of power, has, until within a comparatively recent period, been one of the most difficult jobs coming into a machine shop, and has been a kind of work in which many have failed. In correctly formed teeth of a bevel gear the curvature of the sections is not uniform, so that formed tools cannot give correct results, but the novel machine shown in the accompanying illustration is intended to obviate all defects arising from such cause. The principle of this machine is based on the fact that any two gear wheels which gear correctly with one rack belonging to an interchangeable set of gears, will gear correctly with one another. By a mutual rolling against each other of a gear blank and such a rack, the teeth of the wheel must obviously be formed with perfect accuracy. It is convenient to consider all the motions as taking place in one plane, as would be represented by the diagram in Fig. 2, where it is shown how the tooth of an involute rack would cut its way through a rolling blank, thus forming one of the spaces between two teeth. In this case the cutting tool represents one tooth of a rack pertaining to an interchangeable set of gears, and it obtains a reciprocating motion in the manner of a shaper tool, the blank receiving a movement as though it were rolling on its pitch surface.

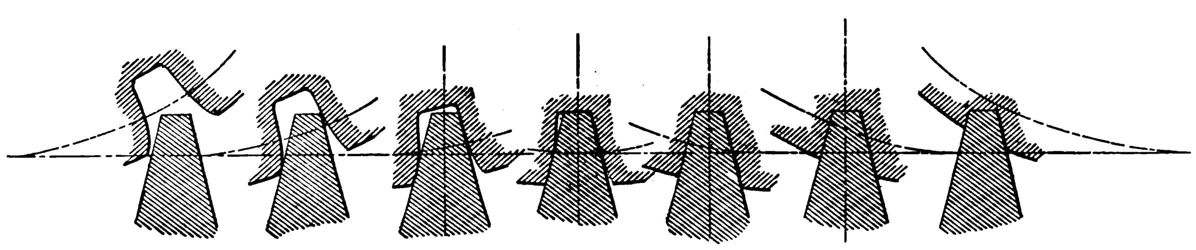


Fig. 2.—BILGRAM'S BEVEL GEAR CUTTER.

The machine embraces two principal parts: the shaper, which holds and operates the tool, and the arbor, which turns the blanks. As the blank should imitate the movement of a rolling cone, the bearing of its arbor is held in an inclined position between two uprights attached to a semicircular horizontal plate, which can be oscillated on a vertical axis passing through the apex of the blank. The arbor also receives the proper rotation by a portion of a cone attached to it, corresponding with the pitch cone of the blank, and held by steel bands, which prevent the cone from making any but a rolling motion when the arbor receives a conical swinging motion.

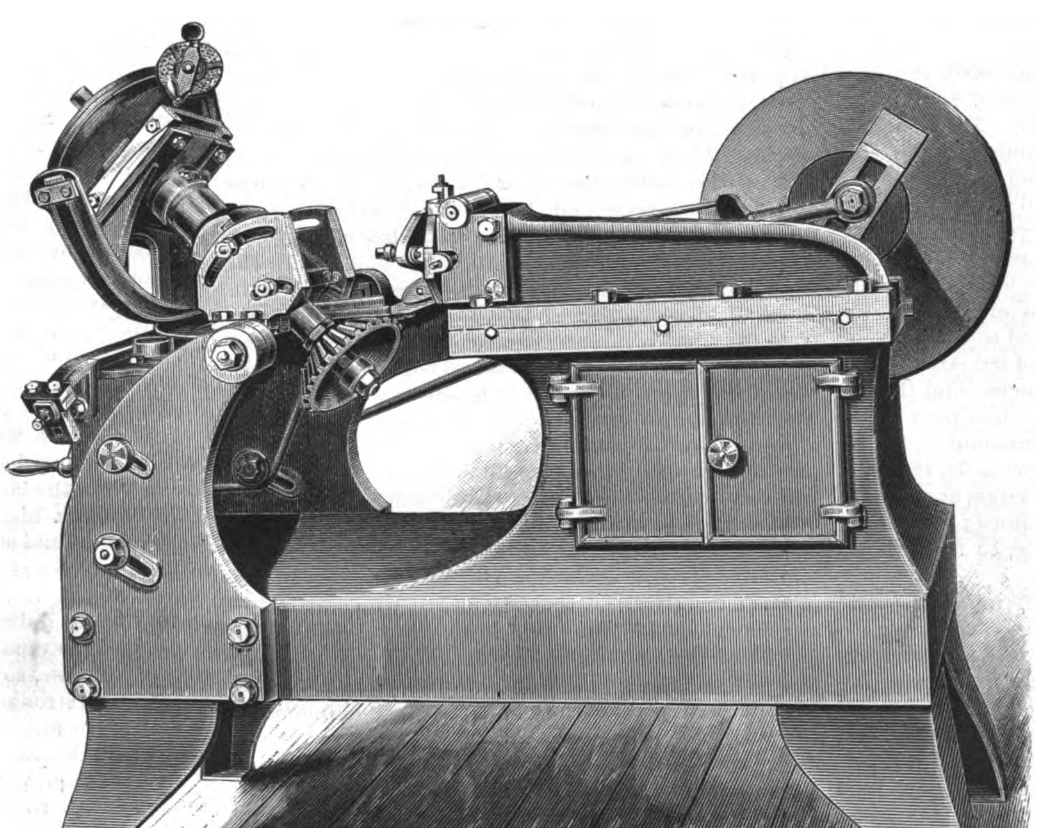


Fig. 1.—BILGRAM'S BEVEL GEAR CUTTER.

The feed mechanism of the machine effects a slow, intermittent movement of the semicircular plate, rolling the blank while the reciprocating tool forces its way through the metal. The arbor carrying the blank can be rotated independent of the rolling cone by means of a worm wheel and worm and index plate, which enable the blank to be presented to the cutting device at properly spaced divisions, corresponding with the number of teeth desired in the wheel. There is a gauge by which the tool can be adjusted so the lowest point of its cutting side shall move exactly toward the apex of the blank, and a distance block is used between this gauge and the tool, so variations of distances can be detected with the touch instead of by sight. The diagram, Fig. 2, shows how the tool takes out the stock when a wheel is to be cut out of the solid, the tool being first adjusted at a slight distance from its correct position, and all spaces being afterward treated in the same manner by using the index device. The tool is then carefully adjusted to its correct position, first for one and afterwards for the other side, to finish both sides of the teeth. The inclination of the arbor holding the blank is made adjustable, to adapt it to the angle of gear desired, and the rolling cone is detachable, to be replaced by such cones as correspond with the angle of the blank to be cut, but by a special device the machine is so adjustable that a limited number of cones may be made to suffice for a large variety of work.

The cutting tool is a triangular bar of steel, so formed as to make an angle of fifteen degrees on each side, and held by a special holder, the up and down and sideway adjustment being effected by slides working at right angles and operated by screws, the clamp which fastens the tool holder also clamping the slides to the apron, and giving great stability. A device for lifting the apron during the return stroke prevents the dragging of the tool, the oscillating movement of the connecting rod being employed for this purpose by having a bar hinged at one end to a clamp which can be shifted on the connecting rod, while the other end impinges on the apron. It is easy to so adjust the clamp that this lifting action will occupy the time of the return stroke.

In cutting gears by this machine it is evident that a milling cutter plays no part, but the teeth are actually planed out element by element, the work being done with absolute theoretical precision. Brehmer Brothers of Philadelphia, Pa., are the owners of the above described machine, and have several of them in practical operation.

How the Sewage of Paris is Disposed of.

La Semaine des Constructeurs quotes from a pamphlet just published by M. Durand-Claye some definite statistics in regard to the Gennevilliers irrigation and the sewerage of Paris, which are well worth remembering. For some reason, the results of the Gennevilliers experiments have been for a long time obscured by a curious indefiniteness, not to say wildness, of statement on the part of those who pretended to have examined them, which no impartial person seemed to think it his business to correct; but the city of Paris has now definitely committed itself to irrigation as a mode of sewage disposal, and it has become necessary to obtain exact statistics of what has been accomplished, for the benefit of the city engineers, and incidentally for that of the rest of the world.

To begin at the beginning, the entire efflux through the sewers of Paris is ascertained to amount, on an average, to 362,000 cubic meters a day, or about 96,000,000 gallons. This is almost exactly three-quarters of the total amount of water furnished by the aqueducts and the rainfall, the other quarter being carried off by evaporation, absorption into the soil, or by flow over the surface directly into the Seine. All the drainage flow, before leaving the city, is collected into three great intercepting sewers, two of which, conveying 318,000 cubic meters a day, join into one at Clichy, just above a pumping station, where engines of eleven hundred horse power lift a part of the liquid into the pipes, which convey it to Gennevilliers, while the surplus is allowed to flow into the Seine. The remaining intercepting sewer carries 44,000 meters a day by gravitation to the Seine at Saint Denis, but a branch is taken from this early in its course, which conducts a portion of its flow to Gennevilliers, to supplement the main irrigation system.

The main irrigation conduit, which leaves the great double intercepting sewer at Clichy, is of rubble and Portland cement, 49 inches in diameter. After reaching the irrigated field, it gradually diminishes in size, throwing off branches, formed of concrete, and varying from 14 to 40 inches in diameter, until it ends in a small pipe, of 20 inches diameter, which serves as an overflow, to carry the surplus liquid of storms into the river. The supplementary irrigation main branches in the same manner over a different portion of the territory, and the filtered effluent is conducted to the Seine by collecting drains. The present area of irrigated land in the Gennevilliers peninsula is 1,430 acres, and the system is continually being extended to new land at the request of the owners. The whole amount of sewage brought to the peninsula by the drains is 18,000,000 of cubic meters a year, or about 12,000 meters annually to the acre—not far from 3,000,000 of gallons per acre—an amount sufficient, if delivered at once, to cover it all about 9 feet deep.

Experiments have been made to determine whether a larger flow could be advantageously used, and for growing beets it seems likely that much more could be absorbed; but for general purposes the present flow is well proportioned to the needs of the ground, and the annual return from the crops is from $250 to $800 per acre, and even more where a cultivator has made a fortunate choice of a special product. The rent paid for the land has tripled within a few years, and averages now $38 an acre; while the population of the place increases constantly by the arrival of farmers anxious to share in the profits of sewage cultivation. Judging from the results obtained here, the engineers of the city have concluded that 10,000 acres of ground will satisfactorily and profitably purify the whole of the sewage of Paris, and have set about inquiring for suitable territory to that amount. The districts of Acheres and Saint Germain, which have already been condemned and taken for the purpose, will furnish only 3,000 acres, in addition to the 2,000 contained in the Gennevilliers peninsula, so that 5,000 more must, sooner or later, be found somewhere; but there can be no doubt that, with anything like the high rents paid at Gennevilliers, the returns from the land taken for irrigation would make the expense of taking it a safe and profitable investment for the Parisians. It is rather singular that the experiment of sewage irrigation, although rather rudely tried, should have proved so much more successful at Paris than in most places in England, but something is undoubtedly to be allowed for the difference in climate, and the science of sewage utilization will not advance much further until careful investigations are made in regard to this point.—*American Architect.*

A NEW SLIDING OFFICE CHAIR.

The accompanying illustration presents an arrangement for an office chair which, we doubt not, will attract considerable attention among bookkeepers and accountants. It is the invention of Mr. George B. Edwards, a commission merchant of Charleston, S. C. To those who sit perched on stools at high desks, as bookkeepers usually do, the long hours' work is made doubly tiresome where one has to keep getting up and down, in order to refer to different books, and many are compelled to do almost all their work standing on this account. Our picture of a sliding chair shows at a glance how this difficulty may be overcome, as, with this arrangement, the rolling runners on the light frame allow of the sitter easily moving his position from end to end of his desk. It can readily be seen how this device may be arranged as a neat and not unattractive looking piece of office furniture, the slide to be of greater or less length according to the desk and number of books to be consulted.

EDWARDS' SLIDING OFFICE CHAIR.

Trees of the United States.

There has recently been placed on exhibition, at the New York Museum of Natural History, an almost complete representation of the trees of the United States, between 400 and 500 trunk sections of the different species. These specimens are about 5 feet 8 inches long each, cut in such manner as to display their barks and the transverse and longitudinal sections of the wood. This is done by cutting away one side of each specimen at the top to the depth of one-half the diameter of the trunk and for one-third of its length. One-half of each exposed portion is polished to illustrate the effect of this treatment of the wood, the remainder being left in the natural condition, with the top of the upper divided part finished by beveling. In the case of trees of commercial importance this form of representation is supplemented by carefully selected planks, or by burls, showing better than the logs the true industrial value of the wood. Among specimens of this kind is a plank of redwood (*Sequoia sempervirens*), measuring 8½ feet in width. A species remarkable for slow growth, and which is only 24 inches in diameter, shows an age of 410 years, being the oldest tree in the collection. This is the *Picea Engelmanni*, named for its discoverer, Dr. Engelmann, and known also as Engelmann's spruce. Another example of slow growth is seen in the *Pinus edulis*, or edible pine, from Arizona, called also nut pine. The seed of this pine, which resembles a good sized bean, is used by the Indians for food. A tree of this species which is 369 years old measures only 15 inches in diameter. Another specimen, which is 341 years old, shows a diameter of 37 inches. It is the western shell bark hickory (*Carya suleata*), from Allenton, Mo. The same locality is represented by a specimen of the *Tilia Americana*, or basswood, which is 40 inches in diameter, and 150 years old.

This valuable collection, numerically exceeding that made in connection with the census reports, includes examples of many curious and interesting species, of which probably the complete natural series could never have been viewed in their native soil by any single traveler, however diligent. Among specimens of such interest is that of the *Gleditschia triacanthus*, or honey locust, from Missouri. This is a tree of singular appearance. Its trunk is covered with thorn clusters, the spikes shooting raylike in all directions from their growth centers. These thorn formations have their basis in the bark alone, without any source whatever in the wood itself, not even reaching it, and are easily detached. It was, therefore, necessary to suspend the tree from the ceiling of the car in its journey from the West.

Another equally extraordinary tree is a representative of Texas. This is the *Cereus gigantus*, which resembles a fluted column. It is a tree which can be readily taken all to pieces. Its component parts are in the form of vertical sections of twisting curvatures in the line of their circumference, whereby one portion is fitted exactly to another. They can be separated without the slightest difficulty, in the absence of any heart at the center for their attachment. The Washington palm (*Washingtoniani filifera*) from Southern California is also curious. The specimen includes the top of the tree, which is severed from the body, and bears its dried and yellow wide spreading leaves. Its peculiarity is in the ring formations of the trunk, which are almost wholly detached from each other, standing one within another like a succession of forms of bark. They are easily detached from each other.

The cocoanut tree from Key West and the finely odorous nutmeg tree from California are among other specimens of importance. The catalpa is represented as a species most remarkable for its durability. Some of this wood known to have been buried in the earth for seventy-five years has been brought out in perfectly sound condition. Specimens of beautiful woods are seen in the holapensis, the arbutus, sweet bay (*Persea carolinensis*), Alaska cedar (*Chamæ cyparis nutkansas*), and the beautifully figured maple burl from Missouri.

With only seven unimportant exceptions, the specific gravity, ash, and fuel value of the wood of every indigenous aborescent species of the United States have been scientifically determined. The specific gravity is obtained by weighing carefully measured specimens 100 millimeters long and about thirty-five millimeters square, previously subjected to a temperature of 100° until their weight became constant. The ash is given in percentages of dry wood, which are determined by burning small blocks of the wood in a muffle furnace at a low temperature. The relative approximate full value of any wood is obtained by deducting its percentage of ash from its specific gravity. The correctness of the result thus found is based upon the hypothesis, first proposed by Count Rumford, that the value of equal weights of all woods for fuel is the same, which is considered to be approximately true.

Animal and Vegetable Fibers.

Between the fibers of vegetable and animal origin there is one great chemical difference.

The basis of all vegetable cells is cellulose, a substance which, when perfectly pure, consists of carbon, hydrogen, and oxygen, in the proportions indicated by the formula $C_6H_{10}O_5$, and which possesses great chemical inertness, having very little affinity for other bodies, and which can scarcely be acted upon by any reagents except strong acids and alkalies.

The basis of all animal fibers is gelatine, or some albuminoid body allied to it. We never find a trace of cellulose in the animal kingdom. While our albuminoid molecule contains the same substances in its composition as the molecule of cellulose, it also contains two others—nitrogen and sulphur.

This substance or its cogeners forms the solid walls of the animal cells which build up the fibers; and whether the materials we have to work upon be the secretion from a worm, such as silk, or the hairs of a goat, or the wool of a sheep, it is the material basis which forms the largest portion of the solid structure. Gelatine has a higher specific gravity than cellulose, and hence animal substances sink in water, while vegetable substances swim. As a general rule, the ultimate vegetable cells are larger than the animal cells, and hence there are a larger number of the latter in the same space, and the tenacity of gelatine is also greater than that of cellulose, so that animal substances and fibers are as a rule stronger than vegetable fibers.

Most of the animal fibers are too minute to be examined with the naked eye, except in their general aspect. Hence, we require the use of a powerful microscope when we wish to notice their structure more closely, and especially when we are examining the differences between the various fibers in detail.—*Dr. Bowman.*

Cast Iron Columns as Main Supports.

The employment of cast iron columns as main supports has been greatly restricted at Berlin by a regulation issued from the architect's department of the police authorities of that city. The order has been issued in consequence of a discovery made last winter at a fire, when it was found that the cast iron columns had been cracked by the effect of the cold water playing on them while hot. The authorities now insist that where partition walls rest upon cast iron columns, the latter are to be covered with plaster or bricked in, with n air space between the bricks and the column.

Natural Gas in Pittsburg.

Natural gas is now conveyed to Pittsburg through four lines of 5⅝ inch pipe and one line of 8 inch pipe. A line of 10 inch pipe is also being laid. The pressure of the gas at the wells is from 150 to 230 pounds to the square inch. As the wells are on one side 18 and on the other about 25 miles distant, and as the consumption is variable, the pressure at the city cannot be given. Greater pressure might be obtained at the wells, but this would increase the liability to leakage and bursting of pipes. For the prevention of such casualties safety valves are provided at the wells, permitting the escape of all superfluous gas. The enormous force of this gas may be appreciated from a comparison of say 200 pounds pressure at the wells with a 2 ounce pressure of common gas for ordinary lighting.

The amount of natural gas now furnished for use in Pittsburg is supposed to be something like 25,000,000 cubic feet per day; the 10 inch pipe now laying is estimated to increase the supply to 40,000,000 feet. The amount of manufactured gas used for lighting the same city probably falls below 3,000,000 feet. About fifty mills and factories of various kinds in Pittsburg now use natural gas. It is used for domestic purposes in two hundred houses. Its superiority over coal in the manufacture of window glass is unquestioned. That it is not used in all the glass houses of Pittsburg is due to the fact that its advantages were not fully known when the furnaces were fired last summer, and it costs a large sum to permit the furnaces to cool off after being heated for melting. When the fires cool down, and before they are started up again, the furnaces now using coal will doubtless all be changed so as to admit natural gas. The superiority of French over American glass is said to be due to the fact that the French use wood and the Americans coal in their furnaces, wood being free from sulphur, phosphorus, etc. The substitution of gas for coal, while not increasing the cost, improves the quality of American glass, making it as nearly perfect as possible.

While the gas is not used as yet in any smelting furnace, nor in the Bessemer converters, it is preferred in open hearth and crucible steel furnaces, and is said to be vastly superior to coal for puddling. The charge of a puddling furnace, consisting of 500 pounds of pig metal and 80 pounds of "fix," produces with coal fuel 490 to 500 pounds of iron. With gas for fuel, it is claimed that the same charge will yield 520 to 530 pounds of iron. In an iron mill of thirty furnaces, running eight heats each for twenty-four hours, this would make a difference in favor of the gas of say $8 \times 30 \times 25 = 6{,}000$ pounds of iron per day. This is an important item of itself, leaving out the cost of firing with coal and hauling ashes. For generating steam in large establishments, one man will attend a battery of twelve or twenty boilers, using gas as fuel, keep the pressure uniform, and have the fire room clean as a parlor. For burning brick and earthenware, gas offers the double advantage of freedom from smoke and a uniform heat. The use of gas in public bakeries promises the abolition of the ash box and its accumulation of miscellaneous filth, which is said to often impregnate the "sponge" with impurities.

In short, the advantages of natural gas as a fuel are so obvious to those who have given it a trial, that the prediction is made that, should the supply fail, many who are now using it will never return to the consumption of crude coal in factories, but, if necessary, convert it or petroleum into gas at their own works.

It seems, indeed, that until we shall have acquired the wisdom enabling us to conserve and concentrate the heat of the sun, gas must be the fuel of the future. —*Popular Science Monthly.*

Treatment of Sheep.

There are many reasons why the few growers who still persist should abandon the habit of washing their sheep before shearing, and we know of not a single argument in its favor. The practice was inaugurated at an early day, and it is a relic of old times, when the wool shorn from the small flocks in the Eastern States was largely used up at home. Then it was necessary to wash it either before or after shearing, to prepare it for carding and spinning. Those days are passed, and both the sheep and their owners ought to be glad of it.

The yolk in a healthy fleece is nature's preservation of the fiber. It is a soapy matter, with a strong potash base, resembling no other animal secretion; it is, in fact, a soap, with more or less free oil. It preserves the elasticity of the fiber, and should be left in the wool until it is wanted for manufacturing use. Manufacturers well know that scoured wool, in time, becomes brittle and loses its elasticity, while unwashed retains all its good qualities indefinitely. It is doubtful if anybody ever saw a moth in unwashed wool. It is, as a rule, free from all vermin. The percentage of yolk in healthy flocks of even grade is quite uniform, but varying in different breeds from twenty-five per cent in the Leicester and other coarse breeds to fifty to seventy-five per cent in the very finest Saxon, the bucks always carrying more than the ewes. The system of washing in cold water on the sheep's back never results in a washed fleece fit for the manufacturer, but only the eradication of an unknown and uncertain part of the yolk, contained in the fleece, which is thus changed into an unmerchantable commodity to be sold on its uncertain merits as to shrinkage. The name or designation of *washed* wool has ceased to have any charm, and the sooner the practice of washing is entirely abandoned, the better it will be for the sheep, their owners, and the trade generally.—*Wool Journal.*

Prize for a New Treatment of Copper.

The French "Societe d'Encouragement pour l'Industrie Nationale," at its general meeting on December 26, 1884, offered a prize of 1,000 francs for the discovery of a "new alloy useful in the arts." This prize has been awarded to M. P. Manhes, now so well known for his successful application of the Bessemer process in the metallurgy of copper, on account of his discovery of the value of an alloy of copper and manganese for improving the quality of commercial copper. It is stated that copper always contains more or less suboxide of copper irregularly disseminated throughout its mass, and that in consequence of this it loses some of its tenacity. M. Mahnes prepares an alloy of 75 per cent copper and 25 per cent manganese, and adds it in small quantities to the molten copper after refining, and just before casting, stirring the bath of metal at the same time. The manganese of the alloy is stated to immediately combine with the oxygen of the dissolved cuprous oxide, forming a manganiferous slag which is easily removed. The operation is cheap, and very much improves the quality of the copper so treated. Also several of the principal alloys of copper, bronze, gun metal, and brass are of superior quality when prepared with copper purified in this manner. It is stated, too, that a series of experiments have proved that copper so treated is much better suited for sheathing ships' bottoms than ordinary copper, as it is more slowly acted upon by the sea water. On these grounds the committee of the society have awarded the prize to M. Manhes.

New English Fleet of Torpedo Boats.

The torpedo boat flotilla at Portsmouth has just been increased by the arrival of a new sea-going torpedo boat from Messrs. Thornycroft & Co., of Chiswick. The vessel is a great advance upon the first-class boats at present possessed by the navy, and is stated to be more powerfully armed than any torpedo boat afloat. She measures 113 feet in length and 12 feet 6 inches in beam, and has a draught of 1 foot 11 inches forward and 5 feet 9 inches aft. With a weight of 8¼ tons on board, she has realized a mean speed of 19·23 knots, and developed 711 indicated horse power.

The new boat has, in common with most of the larger sea-going torpedo boats of foreign navies, two torpedo tubes built into the hull of the vessel forward and covered by the deck. These are arranged to discharge 14 inch Whitehead torpedoes in line of keel by means of compressed air. The attack from the broadside being preferred lower by our officers, a third torpedo tube is placed upon the stern of this latest addition to the fleet, which can be trained from below the deck to fire at any angle upon either beam. A torpedo can be discharged from this tube at an enemy while the torpedo boat is running past at full speed. The director is placed in the conning tower. The officer stationed there instructs the man at the training wheel by means of a voice pipe at what angle to train the tube, and then he himself discharges the torpedo by electricity when his sights come on. Very accurate practice has been recently obtained with the broadside tube fitted on the Lightning at Portsmouth. The target aimed at was a small cask carrying a flag, and moored with a rope to the bottom. When running past at full speed at a distance of about 200 yards, the mooring rope below the target has been more than once hit—that is, a target 1 inch broad at 200 yards. These may, of course, be described as lucky shots, but the general practice shows that almost absolute certainty of hitting a ship at 200 or 300 yards distance may be counted upon. In addition to the torpedo equipment, the boat (which is known as No. 21) carries a Nordenfelt 1 inch double-barreled gun on deck, giving a nearly all-round fire. Her coal bunker capacity will enable her to steam 1,100 knots at a moderate speed. She is also fitted with masts and sails, as in the case of the Childers torpedo boat, built for the Australian government.

We are informed, says *Iron*, that Messrs. Thornycroft having received (on April 24) an order from the Admiralty for twenty-five first-class sea-going torpedo boats, of a further improved type, their workmen are working day and night to complete the order as quickly as possible. Each boat is to be 125 feet long and 12 feet 8 inches broad, with a maximum speed of 20 knots. They are to be built entirely of steel, and will be constructed with fourteen watertight compartments, and with a capacity for 20 tons of coal, which will be packed in bunkers around the boilers, so as to afford the latter protection. Twenty tons of coal will be sufficient to propel one of these boats at 10 knots an hour for eight days, giving a distance of about 2,000 miles. Each boat will have five torpedo guns or tubes—two forward (one on each side of the conning tower), two astern, and one masked in the nose or ram. The other armament will be two Nordenfelt guns. The boats, when fully loaded, will have a draught of 6½ feet, and will stand out of the water 5 feet. Besides the boats being built by the Chiswick firm, the Admiralty have given an order for twenty similar torpedo boats to Messrs. White, of Cowes. Each boat is to be fitted with the latest improvements, and is to cost £11,000, a further sum being granted to the two firms for expedition in completing the order, to effect which, as stated above, the firms are working day and night.

Assyrian Colors.

The colors which have revealed themselves during Layard's excavations at Nineveh, William Linton says in *The Architect,* display sufficient evidence that they are not inferior to those of the ancient Egyptians, either in number, variety, or brilliancy. Instead of the common earthy bole or reddle of the latter people, the Assyrians have left us a color almost equal to vermilion itself. The monochrome pictures which represented the Chaldeans on the wall (Ezekiel xxiii., 14) are said by Gesenius, the Septuagint, and the Vulgate, to have been painted with sinoper or rubrica, a native earthy oxide, like Indian red; while both the great English versions of the Bible now in use, as well as the rabbis, translate the word at issue ("shashar," Jeremiah xxii., 14) vermilion. At Khorsabad it appears that the red approached in hue to that brilliant color, while the sculptures at Nimroud exhibited a bright crimson or lake tint. Layard thinks there is no doubt of their having made great use of vegetable colors, the materials for which are so plenteous in the vicinity of Nineveh. The rapid evanescence of some specimens of blue and red on plaster, which were bright and perfect in color when first exposed, would appear to favor a vegetable origin, as no susceptibility of the kind is known to characterize any mineral reds or blues with which we are at present acquainted. Layard claims for the older Assyrian period the same colors which have been attributed to the early times of the Egyptians, viz., blue, red, yellow, black, and white. He also speaks of a green on the earlier monuments of Nimroud, and of green, purple, violet, brown, etc., enameled in paintings of figures on bricks at the northwest palace. In allusion to the analysis of Sir Gardner Wilkinson's specimens of the Alexandrian blue, by Dr. Ure, Layard conjectures that the coloring principle may be the same, but affirms that the Assyrian blue is much brighter. He concludes that the color was derived from copper, as he found an old mine of that ore in the neighborhood of Nineveh. Layard considers the greens of Assyria to be similar to those of Egypt, which are in many instances composed of iron ocher and copper blue. The yellows, and blacks, also, he conceives to resemble those from Egypt; and as specimens of the latter class of pigments he mentions calcined bone and black iron ocher. The whites are of alabaster and gypsum. At Khorsabad, the French antiquarian, M. Botta, found, green, red, black, white, yellow, and blue—the latter very lively in color.

Fir Leaf Wool.

Fir wool is a textile fiber which in Saxony is manufactured out of the needles of the fir tree, the process being partly chemical and partly mechanical. For this purpose the needles are gathered in spring and summer, when they are young and green; old and withered ones being unsuitable. They are taken into barns, and there dried in a current of air. When dried, they are subjected to a settling and fermenting process similar to that in use for flax. This softens the woody parts and loosens them from the fiber, but the complete separation is only obtained after a lengthy boiling by steam. During this boiling a by-product is obtained in the shape of an oil (fir wood oil), which is gathered and sold to chemists as a remedy for rheumatism and gout, its properties being similar to turpentine. The complete separation of bast and fiber is produced exactly as with flax. The fiber is now passed through a milling machine similar to that in use for woolen cloth, and is then carded and spun like cotton. Generally the carded fiber is mixed with a certain proportion of cotton or wool, and thus a kind of merino yarn is produced, which is worked in the hosiery frames into singlets, drawers, and stockings, these fabrics being then sold as anti-rheumatics and as a preventive of gout. When examined under the microscope the fiber appears as a tube, and striped, and as if covered by a fine network. Goods made with this fiber are sold to a considerable extent in Germany, though they are dearer than the ordinary merino goods.

Chinese Coal Resources.

According to a paper read before the Philosophical Society of Glasgow, by Mr. A. Williamson, the total area of the coal fields of China proper is about 400,000 square miles. Both the Shansi and Heenan coal fields are greater than that of the aggregate of the principal coal producing countries of Europe, and in other districts of North China the coal fields are said to be seven times larger than all those of Great Britain. The coal is of various descriptions, and it is said that iron ores are found in all parts in close proximity to the coal.

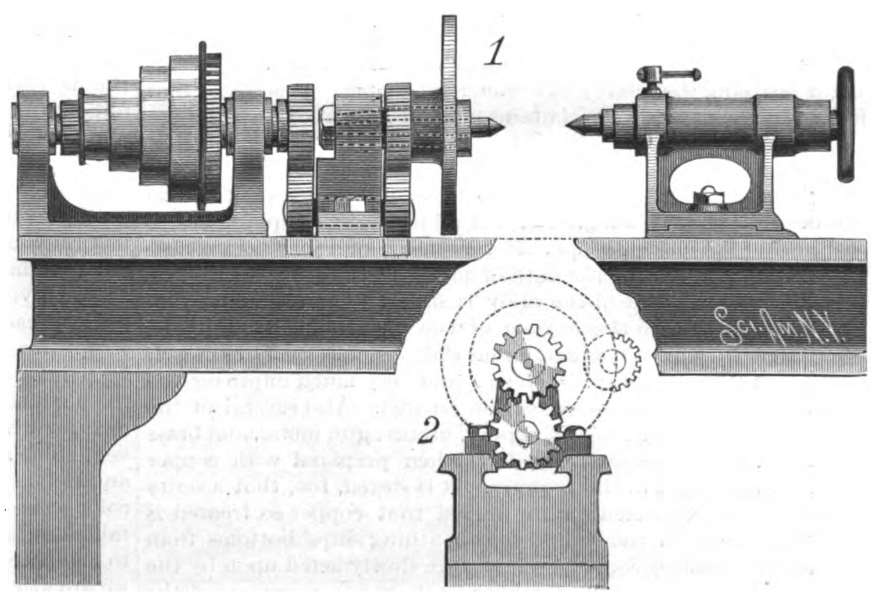
DEAD-CENTER DEVICE FOR LATHES.

The invention herewith illustrated relates to an attachment to any lathe for turning wood or metal, by which it can be changed from a live-center, or revolving center, lathe to a dead-center lathe. Fig. 1 is a side view of a lathe provided with this attachment, and Fig. 2 is an end view of the lathe bed and a front view of the attachment.

In place of a face plate on the end of the spindle is a spur wheel, which gears into another wheel of the same size, placed just below the first. A standard, resting upon and fitted to the lathe bed, carries a shaft, on one end of which is the second spur wheel. A third spur wheel is fastened upon the opposite end of the shaft, and meshes with a fourth wheel (the wheels are all alike) upon a cylindrical pin forming the forward part of a stud fitted conically in the standard; this stud is placed perfectly in line with the center of the spindle and center of the tail stock. The fourth wheel is secured to a face plate, and both are kept in place by a shoulder on the front end of the pin. Conically fitted in the stud, which is stationary, is a center, whose point is in line with the center in the tail stock.

When the lathe is set in motion, the face plate revolves in the same way as if it were fastened to the spindle in the usual manner. Both centers are now stationary, and anything turned on the centers must run perfectly true when reversed on them. The standard, being only bolted to the lathe bed, can be removed with the gears, and if a face plate is put on the spindle in place of the spur wheel, and a center inserted in the spindle, the lathe is reduced to a live-center one; while by replacing the standard and gears a dead-center lathe may be formed. The use of this attachment insures the accuracy of the work, since both centers stand still while the piece being turned revolves, and although the piece may be reversed, it will always run true on the centers. All trouble caused by a spindle running untrue is thus avoided.

Further particulars regarding this invention can be obtained from the patentee, Mr. Joseph Hampson, of Newburg, N. Y.



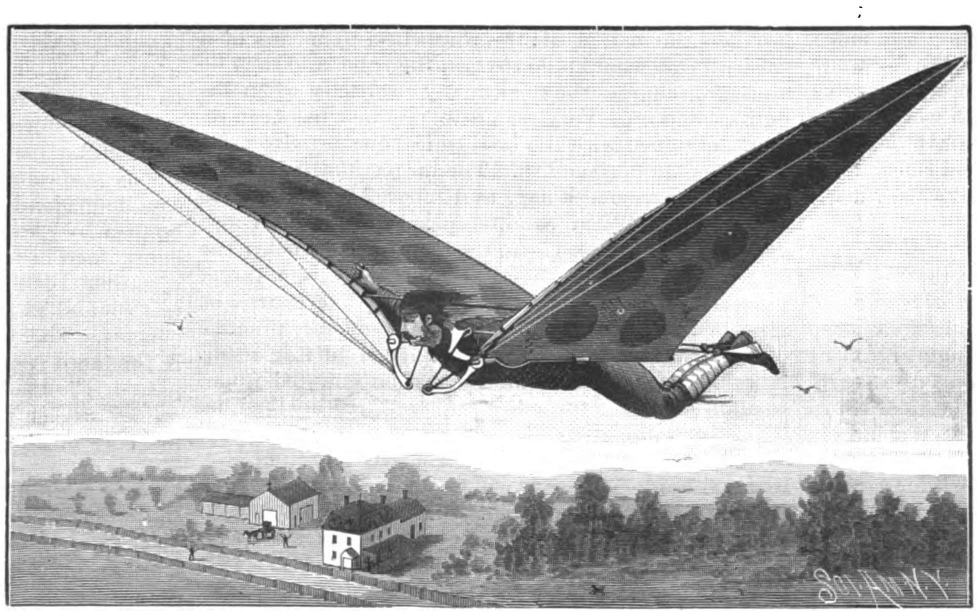
HAMPSON'S DEAD-CENTER DEVICE FOR LATHES.

A NEW FLYING MACHINE.

The easy and graceful flight of birds through the air has for the last hundred years been a problem occupying the acutest minds. Attempts have been made during the same period to imitate the motion of the bird in ethereal space, either by the aid of the application of the balloon or by the use of the muscles of the human body alone. Attempts in this direction, although none have as yet been crowned with success, are praiseworthy, and doubtless will in time achieve a fair degree of success. The accompanying engraving represents a flying machine, which is the invention of Dr. H. P. Booth, of Chippewa Falls, Wis. The fundamental principle of this flying machine is in using simultaneously every important muscle of the body for the purpose of elevating the body and propelling it forward through the air.

In harness a man has lifted 3,500 pounds, and this wonderful result is achieved only by allowing every muscle to act simultaneously to its fullest capacity, and under the most advantageous circumstances. This flying machine is merely a harness, by which the human body acts to its best advantage, to the end that it may be both lifted and propelled; and if flying by muscular force alone is ever accomplished, it must be by using all the power there is in the human frame. In this machine there are two wings, each of which is from 12 to 15 feet long, and the breadth equal to the length of the operator, from his shoulders to his feet. The frame of the wings consists of three bamboo poles lashed together, and bent to suitable shape, and covered with silk. A cord extends from one extremity to the other of each of these wings (that is, from the heel to the tip), which serves to give the wing proper shape and tension, being covered by the silk of the wing.

The wings are provided with suitable valves, which open on the upward and close on the downward movement. The frame of the wings forms a right angle in front of the shoulders, and below the breast of the operator, as shown in the engraving; and to these is attached two strong ropes of rawhide. Each of these ropes passes from the wing to which it is attached to the shoulder of the operator, who is supplied with a suitable collar, which supports the frames of the wings loosely, and runs along the back, forming a pair of loops for the feet to pass through. When the body is forcibly straightened, the wings are brought down with all the power of the most powerful muscles of the body, as is shown in the engraving, and this movement is also assisted by the strong muscles of the arms, operating the wings from the under side. Over the shoulders, extending from one wing to the other, is a strong rubber spring, the tendency of which is to lift the wings, thus assisting the arms in the upward movement. If desired, the hands, instead of operating the wings from the under side, may grasp the short lever forming the base of the wing, and thus make use of more powerful muscles of the arm than if the arms are extended. Which of these is best is, of course, a matter to be determined by experiment. Each wing may be operated independently of the other, it being only necessary to operate one foot or the other to give each wing just such a movement as may be desired. A canvas extends from the base of one wing to the other, forming a sort of stretcher, upon which the operator rests. From the lowest point of the base of the wings are several small stay ropes running to different points of the wings, which serve to stiffen and strengthen them. In this device the body of the operator offers the least possible resistance to the air, he being in precisely the same attitude that a bird is in during flight. The parts of the apparatus are constructed of the lightest as well as the strongest materials.


BOOTH'S NEW FLYING MACHINE.

Peppering Sparrows.

A trouble arises to those who train ivy and other vines on the sides of their dwellings from the noisy sparrows, who make their homes and build their nests in the branches, and chatter and quarrel to the annoyance of the inmates. The writer, after trying many expedients for getting rid of his tormentors, was most successful in the use of shot. A handful flung into the vines had the effect, after a few applications, to drive the chattering throng away, but they returned in less numbers in a few days.

But another has tried a plan which we should think would be more effective. He scatters red pepper from a window above into the vines, and he says the birds evinced their dislike to Cayenne by taking their departure, and that he has been comparatively free from their annoyance since.

When to Cut Timber.

The best time for cutting trees to insure the lumber the longest time from decay is a subject that has been discussed considerably lately by lumbermen and writers in newspapers devoted to the lumber interests.

Mr. C. W. Haskins, who claims to have investigated the subject in California pretty thoroughly, communicates in the *Oregonian* his conclusions as follows:

That if in the cutting of the timber the main object desired is to preserve the stumps, cut your trees in the fall and winter; but if the value of the timber is any consideration, cut your trees in the spring after the sap has ascended the tree, but before any growth has begun or new wood has been formed. I experimented for many years in the cutting of timber for fencing, fence posts, etc., and with the same results. Those which are cut in the spring and set after being seasoned were the most durable, such timber being much lighter, tougher, and in all respects better for all variety of purposes. Having given some little idea of the manner in which I experimented, and the conclusions arrived at as to the proper time when timber should be cut, I now propose to give what are, in my opinion, the reasons why timber cut in the early summer is much better, being lighter, tougher, and more durable than if cut at any other time. Therefore, in order to do this, it is necessary first to explain the nature and value of the sap and the growth of the tree.

We find it to be the general opinion at present, as it perhaps has always been among lumbermen and those who work among timber, that the sap of a tree is an evil which must be avoided if possible, for it is this which causes decay, and destroys the life and good qualities of all wood when allowed to remain in it for an unusual length of time, but that this is a mistaken idea I will endeavor to show, and that the decay is due not to the sap, but to the time when the tree is felled.

We find by experiment in evaporating a quantity of sap of pine, that it is water holding in solution a substance of a gummy nature, being composed of albumen and other elementary matters, which is deposited by the water within the pores of the wood from the new growth of the tree; that these substances in solution, which constitute the sap, and which promote the growth of the tree, should have a tendency to cause decay of the wood is an impossibility. The injury results from the water only, and the improper time of felling the tree.

Of the process in which the sap promotes the growth of the tree, the scientist informs us that it is extracted from the soil, and flows up the pores of the tree, where it is deposited upon the fiber, and by a peculiar process of nature the albumen forms new cells, which in process of formation crowd and push out from the center, thus constituting the growth of the tree in all directions from center to circumference. Consequently this new growth of wood, being composed principally of albumen, is of a soft, spongy nature, and under the proper condition, will decay very rapidly, which can be easily demonstrated by experiment.

Hence we must infer that the proper time for felling the tree is when the conditions are such that the rapid decay of a new growth of wood is impossible; and this I have found by experiment to be in early summer, after the sap has ascended the tree, but before any new growth of wood has been formed. The new growth of the previous season is now well matured, has become hard and firm, and will not decay. On the contrary, the tree being cut when such new growth has not well matured, decay soon takes place, and the value of the timber is destroyed. The effect of this cutting and use of timber under the wrong conditions can be seen all around us. In the timbers of bridges, in trestle works, and the ties of railroads, and in the piling of wharves, will be found portions showing rapid decay, while other portions are yet firm and in sound condition.

Long Range Guns.

The range of the most approved breech loading 10 in. cannon, throwing projectiles of 460 lb., is about 13,000 yards, or about 7½ miles. From this may be calculated the distances at which hostile fleets might lie off from some of our coast cities and inflict damage—unless we had the means to hit back or drive off the enemy.

LIBERTY ENLIGHTENING THE WORLD.

A few years since, some of the most eminent men of France conceived the idea of more firmly uniting the French and American people by the joint erection of some great work of art. The scheme was most favorably received in both countries; the Franco-American Union solicited subscriptions from every part of France, while an American commission performed a like work here. The statue, nearly completed, designed by the celebrated sculptor, Auguste Frederic Bartholdi, was formally delivered to the United States Minister at Paris on the fourth of July, 1884. It was recently placed on board the Isere, at Rouen; the vessel sailed for New York, May 20 last.

A few measurements will convey some idea of the great magnitude of the figure, an exact representation of which is shown in our frontispiece.

	ft.	in.
From bottom of plinth to top of torch	151·41	
From heel to top of head	111	
Height of head	13½	
Width of eye		28
Length of nose	3	9
Length of forefinger	7	11
Finger nail is 1·14 by 0·85 foot.		
Circumference of finger at second joint	4	9

The head will easily accommodate forty persons, and the torch, which will be reached by a spiral staircase, will hold twelve persons.

The statue is made of repousse copper, one-eighth of an inch thick. The envelope is kept in position by iron plates and braces uniting it to the framework shown in front and side elevation in Fig. 2. Each section of the shell is so supported from the frame that it will not be forced to carry the weight of any of the sections above it; in other words, each part will be self-sustaining. The frame consists of four angle iron corner posts united by horizontal and diagonal angle pieces dividing each side into panels. To approach more closely to the shell, the main frame is provided with side extensions located according to the contour of the figure. The frames supporting the head and arm are similar in design to the main frame, but of lighter material, and are united to the upper end of the main frame.

Bartholdi first made a study of the figure, measuring about 7 feet from the heel to the top of the head. This model, made with rigid precision, was increased four times, the resulting model having a total height of about 35 feet, and which, after having been studiously reviewed and corrected, was divided into a great number of sections, which, in their turn, were enlarged four times.

After this no change was possible, and the degree of accuracy with which the pieces were copied in copper governed the perfection obtained in the completed work. In a mammoth workshop devoted to the purpose were four large areas surrounded by frames divided into numbered sections. Frames corresponding with those below were suspended from the ceiling. The workmen made wood and plaster sections of the statue, the enlargement being made with geometrical precision by the aid of the frames. Each piece of the model was, in turn, placed in a frame one-quarter as large as those containing the full size pieces. Corresponding parts in each size of frame were united by wires, from which the various dimensions were laid off. A rough frame having the general form of the section to be worked out was then made; this was covered with plaster, when the principal measurements were verified, and the surface was finished, point by point, until it exactly resembled that particular part of the figure. The work was divided into courses, to reproduce each one of which required some nine thousand measurements.

The plaster model being finished, it was necessary to take an impression in wood, on which the sheets of copper could be shaped with the hammer. This was the work of the carpenters, who took the form of each part by means of planks cut out in silhouettes, which were placed close together or crossed, and in this wooden mould the workmen shaped the sheets of copper by the pressure of a lever or the blows of a mallet. The finishing touches were made with little hammers. The copper was again worked to conform to profiles taken with sheets of lead pressed upon the model. The iron braces uniting the copper shell with the supporting trussworks were forged to the form of the copper sheets after the latter had been entirely completed. The finished pieces were finally carried into the court of the workshop, and there assembled and fastened to the frame. The trusswork within the statue was designed and executed by the constructing engineer, M. Eiffel. The work was done at the establishment of Gaget, Gauthier & Co., Paris. The copper entering into the construction of the statue weighs 80,000 kilos, the iron 120,000, making a total weight of about 200,000 kilos, or about 400,000 pounds. The total cost of the statue, in-

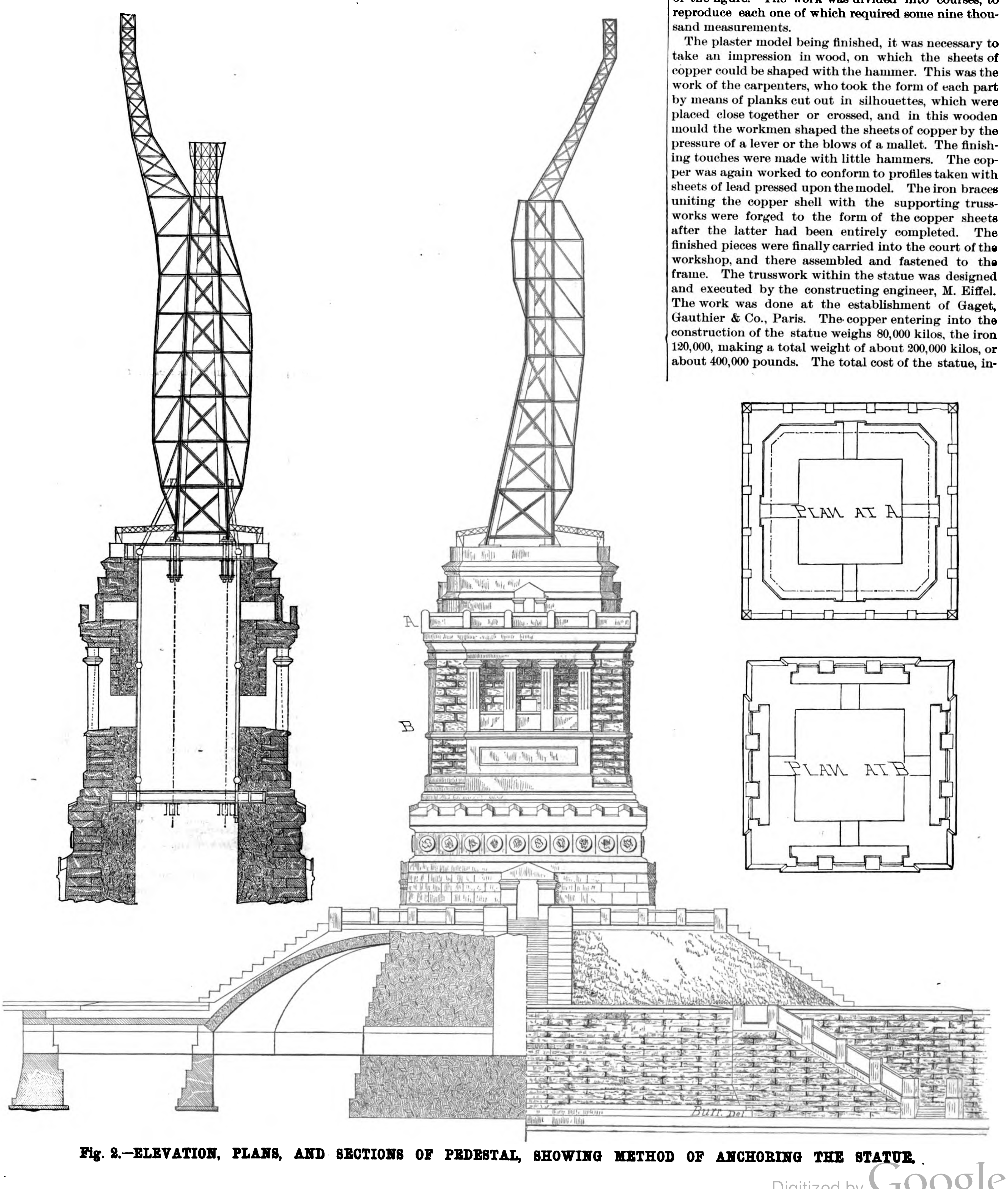


Fig. 2.—ELEVATION, PLANS, AND SECTIONS OF PEDESTAL, SHOWING METHOD OF ANCHORING THE STATUE.

cluding gifts, gratuitous work, and losses sustained by those who gave valuable assistance, is about $200,000. *L'Illustration* gives the cost of the statue proper at $40,000.

Unquestionably, the final artistic success of such a work as this depends upon the fact that the pedestal should bring out, without in any way detracting from or obscuring by too great prominence, the beauties of the figure. That this point will be gained by the pedestal it is now proposed to build will be seen by examining our frontispiece and the elevation in Fig. 2, the latter representing the main frame, the pedestal, and its approaches drawn to scale. That this object would not have been gained if the first plan had been pursued becomes apparent by glancing at Fig. 3, a perspective view of the pedestal that might have been built. This pedestal would have been 62 feet square at the base, 40 feet square at the top, and 114 feet high to the base of the statue. Although plain in general characteristics, it would have, on account of its great size, occupied the more conspicuous position in the combination.

The material underlying the foundation is compact clay, gravel, and bowlders. The foundation up to the terrace level—where the pedestal proper begins—is of solid concrete; it is 90 feet square at the bottom, 65 feet square at the top, and 52 feet 10 inches high. In the center of the mass is a well hole 10 feet square.

Leading from the sides to the base of the central shaft, or well hole, are four arched passage ways at the level of the parade. Spanning the space between the inside walls of the old fort and the foundation of the pedestal, and carrying the four flights of steps leading to the terrace and also the grassy mound between, is a concrete arch, about 3½ feet thick, and having a chord span of 49 feet.

The pedestal will be built of granite, backed with concrete, as indicated in the vertical section. The principal dimensions are:

From high water to top of sea wall	10 feet.
Top sea wall to foot of fort wall	2½ "
Foot fort wall to ground level at parapet of fort	23½ "
Parapet to foot of pedestal	24 "
Water level to foot of pedestal	60 feet 10 in.
Foot of pedestal to top of pedestal	89 feet.
Water level to top of pedestal	149 ft. 10 in.
Base of pedestal	62 ft. square

The top of the pedestal is 43½ feet square, and has the corners cut off, making it octagonal, as shown in plan A. The balcony at the top is 3 feet 7 inches wide in the clear, and extends all around. The loggia (plan B) is 26 feet 7 inches high, the opening being 27 feet 11 inches wide by 3 feet deep in the clear. The columns are 3¼ feet wide, the space between them being 6 feet. On each side of the base of the pedestal will be ten circular shields carrying coats of arms of the several States. The terrace will have a clear width of 15½ feet, while the stairways leading to it will be 10 feet wide.

The method of holding the statue to the pedestal is clearly shown in the drawing. Extending across the top of the pedestal are six channel bars arranged in two sets of three each; these bars are directly beneath the corner posts of the main frame in the interior of the statue. Beneath and at right angles to these are six other channel bars, also arranged in two sets, placed under the corner posts. These bars are 34 feet long, so that each end rests in the masonry to the depth of 3¾ feet, the well hole or shaft being 26½ feet square. The channel bars are 4 feet deep, the web plates are ⅝ inch thick, and the angles are 4 by 5 by ⅝ inches. The base of each post and the two sets of bars immediately beneath it are united by three bolts 5½ inches in diameter.

A little over 60 feet below is a second and similarly arranged system of girders 41 feet long, 36 inches deep, with web plate ⅝ inch thick; the angles are 4 by 5 by ⅝ inch. In the lower system there are only two channel bars in a set. These two systems are joined by four sets of eye bars placed as near as possible to the side walls of the shaft. Each set consists of four bars 4 inches wide by 1⅜ inches thick. Upon the sides of the statue the upper ends of these bars will be prolonged to join the main frame at the tops of the first and second panels. All bracing within the pedestal will be made of steel. This method of anchoring the statue is open to severe criticism. It practically hinges the statue at its base, the first section of the main frame serving as a fulcrum resisting the lateral pressure coming upon any side of the figure. This is the weakest part of the main frame, since it receives no support from the side extensions, which do not reach to the bottom of the lowest panel.

The following table shows the heights of celebrated statues:

	Feet.
Jupiter Olympus	43
Memnon	62
Borromeo, at Lake Maggiore	66
Arminius, in Westphalia (about)	92
Colossus Rhodes	105
Nero (about)	118
Statue Liberty	151

The pedestal shown in the engraving was designed by Mr. Richard M. Hunt, the architect; the plan of anchoring the statue was designed by Gen. Charles P. Stone, chief engineer, under whose direction the work is now being carried forward. The writer wishes to acknowledge the courtesy of Gen. Stone, who kindly loaned him working drawings and specifications.

A particularly interesting event occurred in Paris on May 13. It was the inauguration of an exact reproduction in bronze of the statue of Liberty, one-fifth the real size. It was presented by American citizens, and now stands in the Place des Etats Unis before the Hotel of the American Legation. Eminent representatives of both countries took part in the ceremonies, and attended the banquet in the evening. Ex-Minister Morton made the presentation address, which was answered by M. Brisson. M. De Lesseps the great constructor, also spoke. At this time, this is a peculiarly happy illustration of the friendly feeling existing between France and America.

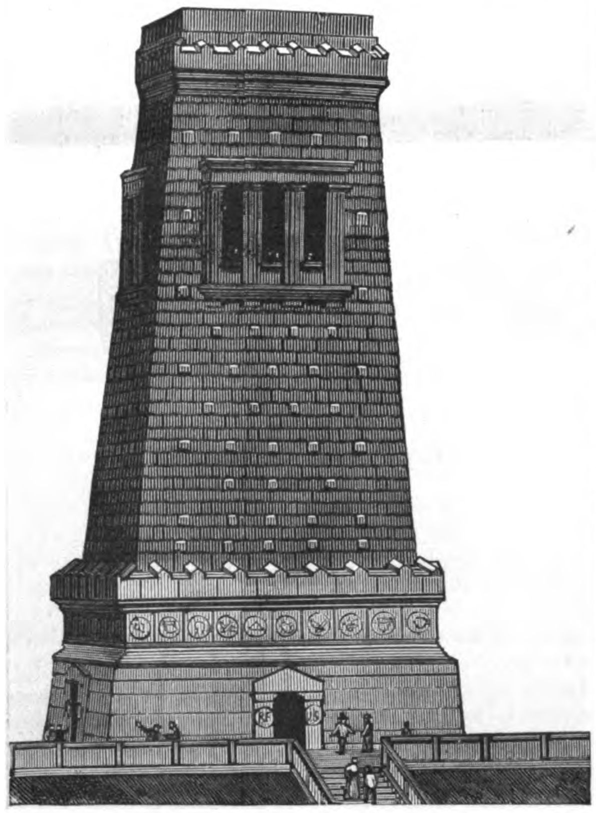


Fig. 3.—VIEW OF FIRST PROPOSED PEDESTAL.

The Oyster's Tenacity of Life.

H. C. HOVEY.

It has been estimated that a spawning oyster may deposit a million eggs in one season, of which not more than from ten to one hundred will arrive at maturity. The rest are devoured by enemies. Marketable oysters vary from three to seven years of age. It is not known to what age an oyster may live, under favorable circumstances; but I have seen specimens from the native beds along the shores of Connecticut, that were judged to be as much as twenty-five years old. The theory is that each year's growth is marked by a ridge on the shell, and the age can be told by counting these ridges. A venerable shell, lying before me as I write, has thirty such corrugations. The meat of these aged bivalves, however, is tough and indigestible.

When an oyster is removed from his habitat, for transportation to distant localities, experts are hardly agreed as to the best plan for keeping him alive and in good condition. Cargoes from Virginia for planting Connecticut waters are safely carried, if the run is made in the usual time; but if vessels are delayed by storms, or if warm weather comes on, much anxiety is felt, and the owners are sometimes losers to the extent of thousands of dollars by reason of the shell fish spoiling. Yet, on the other hand, it is not uncommon for those who understand the business to carry "seed oysters" from Long Island Sound to California to be planted there, and with a fair chance of success. Those who ship to the European market pack the oysters in barrels, ramming them down as tightly as can be done without breaking the shells; the object being to make them keep their mouths shut, thus preventing the nourishing liquid on which they must live during the voyage from escaping, as it would be sure to do through the parted valves.

Having occasion, in midsummer, to take several dozen oysters with me, from New Haven to Minneapolis, and being very desirous of keeping them as fresh as possible, I asked experienced packers for advice. One told me to carry them in a tub of sea water. Another thought they should be kept in ice cold fresh water frequently changed. A third advised me to pack them in ice, and let them take their chances. The plan finally adopted, and with perfect success, was to place a layer of broken ice on the bottom of a tub and cover it with sea weed, on which the oysters were carefully laid, each with its "bowl," or deepest valve, bulge down, so as to keep the mollusk in its own liquor. Renewing the ice only twice on the road, this lot made the trip of nearly 1,500 miles safely; and by occasional renewals of the ice, but never letting the shells touch it, they were kept alive for more than three weeks, during a very warm season; at the end of which time, having served the scientific end of their transportation, they were still in good condition for the table.

I have seen it stated by English and French authorities, that oysters have been kept alive on the floor of a cold cellar for three months. And a New Haven observer gives it as the result of his experiments, that, "if taken carefully from the water, and packed in barrels with numerous holes cut through to admit the air, and so packed as to keep the shells closed, and then kept at an even temperature of between 35 and 45 degrees Fahrenheit, they might be made to exist longer than three months, and yet be fit for use." It might here be added that "dry oysters," *i. e.*, those that have gradually absorbed all their own liquor, are regarded as very choice morsels by connoisseurs in good living.

Mr. H. W. Smith, of New Haven, vouches for the following remarkable facts: On the 13th of last December he bought a quantity of shell fish from the Messrs. Luddington, of Fair Haven, who gave him, as a curiosity, a rubber boot dredged from their beds near the Spindle Rock, in Long Island Sound, and to which a clump of oysters was attached. Mr. Smith hung this for exhibition in his shop window, where they remained alive, without any special care; for 86 days. At the end of this time some of the oysters were dry, but others yet retained some of their liquor, and none of them had begun to decompose. It would be well worth while for oyster growers to conduct careful experiments, under varying and accurately noted conditions, to ascertain how long it is possible to keep an oyster alive after it has been removed from its natural surroundings.

The Compression of Molten Steel.

In his recent inaugural address as President of the Iron and Steel Institute, Dr. Percy said: Various methods had been tried for the compression of steel, of which I will mention two. A kind of gunpowder was proposed for this purpose in the United States in 1869. It was recommended for the casting of steel cannon, with the special object of preventing blow holes. The metal was run into a suitable mould, the mouth of which was immediately afterward hermetically closed by a metallic cap, fixed firmly in its place by bolts or otherwise. In the center of the cap was fitted a vertical pipe, provided with a stop cock at its lower end, while its upper end was closed by a washer pressed by a bolt so as to act as a safety valve. Before attaching the cap at, say, an inch from the surface of the molten metal, a charge of about a quarter of an ounce of powder, composed of 80 per cent of niter and 20 of charcoal, was put into the vertical pipe between the stop cock and the washer. On opening the stop cock, the powder falls on the metal, ignites, and, it is said, produces about one-third of a cubic foot of gas at the temperature of 3,000° Fahr., which exerts a pressure equivalent to that of a head of liquid metal 90 feet high, supposing the capacity between the cap and the surface of the metal to amount to 30 cubic inches. Whether this process was ever tried, and if so with what result, I am unable to say.

Liquid carbonic acid has been used for compressing steel at Krupp's works, at Essen, and, it is reported, with success. The top of the mould when closed is connected by a pipe with a vessel containing liquid carbonic acid, heated sufficiently to produce the necessary degree of vapor tension, which, at 400° Fahr., is said to amount to 800 atmospheres, or only slightly to exceed 5 tons to the square inch. I have heard it rumored that the process has been abandoned, but whether truly or not I cannot say.

In 1876 Sir Joseph Whitworth had the kindness to permit me to see his process in operation, and was present at the time. The charge of molten steel was from 7 to 8 tons, and the pressure about 7 tons to the square inch.

Attention to Details.

The *Herald of Health* suggests that health, like success in life, is to be gained by paying attention to details. It is better to try to keep from catching cold than to be always trying to avoid infection. More can be done to check cholera by keeping houses clean than by using tons of disinfectants. Nature gives health. It is man's perversity in departing from Nature's teaching that leads to disease. Nature intended all to have fresh air, sufficient plain food, uncontaminated water, and exercise. Let us accept Nature's bequest, if we prefer health to disease.

MR. BURNET LANDRETH, of the famous Bloomsdale Seed Farm, near Bristol, Pa., has been appointed one of the Vice-Presidents of the American Exhibition to be held in London during the six months commencing May 6, 1886, to which attention has heretofore been called in our columns. Mr. Landreth believes that a proper display there of Yankee ingenuity in invention and skill in manufacture will materially aid our export trade, especially in the colonies of the British empire.

Correspondence.

Oil on the Water.

To the Editor of the Scientific American:

From time to time I have seen articles in the SCIENTIFIC AMERICAN, as well as in other papers, relative to the effects of pouring oil on a rough sea. There once came under my observation in the Pacific Ocean a case of this which may or may not be new. On the evening of August 1, 1883, I and two companions in adventure were thrown on one of the Santa Barbara Islands, about one hundred and fifty miles northwestward from San Diego, off the California coast. Two days later we were picked up by an Italian fisherman, and carried to Santa Barbara. In our passage across the channel which separates Buena Ventura from the island of Santa Cruz, we encountered a gale, and the white caps ran pretty high. Our boat was pretty small, and the flying spray drenched everything on board. In the midst of this the old fisherman called our attention to smoother sea ahead, and went on to explain that it was due to oil on the water, and that the oil came up from natural wells in the bottom of the ocean.

By this time the boat was gliding through the calmer sea. I noticed that the waves were running as high as ever, but the crests of them remained unbroken, and no white caps were to be seen. The tumbling and roaring of the white caps, the flying of the spray before the wind, and the crests of the waves blown off, were no longer to be seen or heard; but the size of the billows was not otherwise diminished. The waves were now huge swells of the ocean, following each other regularly and silently, and the wind appeared to glide smoothly along the surface of the sea, unable to ruffle or disturb the water.

The oiled water was only a narrow strip, running nearly east and west. I should judge that it was less than one-half mile wide. I could not observe its length. The oil field is just fourteen miles north of Santa Cruz Island. Perhaps the attention of the public has been called to it long ago, but I did not know of its existence until I saw it, and have not heard of it since.

HU MAXWELL.

St. George, W. Va.

Where the Architect and Plumber Meet.

The first place is in the architect's office, when the specifications for the work are open for bids. Many architects, when they are left to their own volition, will only permit a certain few plumbers, in whom they feel confidence, to bid on their work. This is perfectly natural, and, while it gives rise to the charge of favoritism, should not be entirely condemned. An architect of the better class can be trusted in his selection of workmen to figure on jobs, and a shyster architect would preferably select a skin plumber any way.

When the work is figured on, and the contract is awarded, the plumber should be careful about suggestions for changes in the plans. There are some architects who will listen to suggestions of that kind, and, if they are valuable, and do not increase the cost, will adopt them. But in the majority of cases, the architect has designed to have the plumbing fixtures as they are drawn, and any suggested change from the plans will be looked upon with suspicion. Hence, as the plumber has bid on the specifications as they existed, it is better for him to follow out those specifications to the letter.

The architect will usually notify the plumber when the building is ready for roughing in. There is not so much work to be done behind the plastered walls nowadays as formerly, owing to the desire to have all pipes so far as possible, in a position where they may be examined easily. The few iron waste and ventilation pipes which run between partitions must all be put in before lathing is completed.

In doing the gas piping, if it is provided for in the same contract with the plumbing, there should be much care. Cheap gas fitting is an abomination. In rooms arranged *en suite*, with a center light in the ceiling of each, the gas fitter should never notch the beams in the middle, and endeavor to run one straight line of pipe over all the centers. Beams should never be notched more than two feet from the bearing, and the center lights should be supplied by branches run from a pipe so placed.

Gas pipes should be so laid as to give a continuous fall toward the meter, otherwise the condensations from the gas will choke the pipe. The gas fitter should take great care to place center lights exactly where designed; if not, when the ceiling is decorated, it will be very annoying to the owner to find the light out of center. The height of bracket light outlets should be four feet and ten inches from the under floor, and this height should not be changed to save cutting the pipe. In halls, and in first story rooms, the height is usually five feet seven inches. Mirror lights should have outlets eight feet from the floor.

When the outlets are placed at proper height, care needs to be taken that the nipples are of correct length, and that they will permit the bracket fixture, when placed, to bear at right angles to the wall. In order to secure this accurately, a pipe of sufficient length, may be screwed on each nipple, as soon as set, and carefully made level and plumb, by testing with a carpenter's square. All deviations found should be corrected, before testing by a mercury gauge, so that any leaks caused by such correction will be discovered. Bends, tees, etc., for gas pipe under two inches in diameter are made of malleable iron, and it is wise to use these, as they will stand a little bending, and that is often the easiest way to bring pipes into place. The nipples projecting from the pipe to receive the fixture should be the proper length, so as to extend beyond the plastered wall not more than one and one-fourth inches, nor less than three-fourths of an inch. The gas fitter commonly uses miscellaneous scrap pipe for nipples, but he should endeavor to make them the proper length.

These are points in which all architects are, or ought to be, educated, and will be the foundation for criticising the man who has the contract if they are improperly done.

The architect, or his superintendent, after the whole gas fitting service is in place, will probably examine the entire system to see that the irresponsible journeyman has not used split or defective pipe, closed with putty or red lead. It would be well for the master plumber to do this himself. The caps are then screwed on, and the tightness of the work tested by a mercury gauge. A manometer is placed at one outlet, and air is pumped into the pipes until the pressure in the system approximates the pressure of the gas supply. The mercury should remain at one height in the gauge over one night. If it does that, the work may be relied upon. If the gas fitter does this work himself, very well; if not, the architect will probably require him to do it.

After the plastering is completed, the architect should notify the plumber that he may go on with his work. He should inquire as to the use of all stock which the plumber may bring to the building. The cast iron pipe for the soil pipe should be especially examined, and it should conform to the specifications as to weight. Manufacturers have been covering pipe with a coating of asphaltum, and it is now generally used, but some believe that the asphaltum simply fills up sand holes, and renders it difficult to detect doubtful pipe. Each length of pipe should be examined thoroughly for defects, thickness, strength of hub, etc., and all doubtful pieces promptly rejected. If possible, each length should be subjected to the oil test.

The requirements for joints in soil pipes are so few and simple that only the most careful architects will permit any other joint than the oakum and calked lead to be made. The plumber himself should be especially cautious concerning the making of soil pipe joints, because they, more than any other part, are indexes to the general character of the work. The architect will never allow the plumber to secure iron pipe by wires, but will insist on iron straps and hooks. No joints should be made before the pipe occupies the position in which it is to remain.

The architect will be especially careful concerning the weight and size of lead pipe used. When the end of the coil is cut off, the act of sawing increases the apparent thickness of the pipe, and it is difficult to judge of the weight and thickness of it. It is not generally considered safe to use pipe (except for a very light pressure) of a less thickness than three-sixteenths of an inch. Waste and vent pipes may be one-eighth of an inch. The plumber should refrain from using honey-combed or corroded pipe, and that which is of unequal thickness.

When brass tubing is used, the cold water supply pipes should be tin lined. Sometimes it is wise to use plain brass pipe for the hot water supply, and lead for the cold, as the brass pipe is not so injuriously affected by changes in temperature as is lead pipe. Brass pipe should not be confined rigidly in long lines, as it will soon break the joints if it is. It is customary to put a coat of shellac on exposed brass plumbing work, and often the plumber will leave that for the painter, who will refuse to do it.

If a superior piece of work is done, and zinc casings are required to carry off condensations, leaks, etc., the architect will see that the casings are well made, correctly applied, and have a proper fall to a safe outlet.

The course which the pipes take very often proclaims the skillful mechanic. If the several pipes used to connect up a bath room, for instance, go coursing under and over each other in hopeless confusion, the man that arranged them so may be set down as a botch. A good workman will follow straight lines, so far as possible, and will separate the hot water pipe from the cold water pipe far enough so that heat will not be lost from one to the other. The house service pipe should not lead so close to the furnace or range as to warm the water when standing. All pipes will be laid with a continuous fall toward some faucet by which all the water may be drained off.

It is generally the duty of the carpenter to place boards against walls or ceilings where pipes are to run. The plumber should see that these are adequately fastened. When pipes are attached to these boards vertically, they should be fastened every four feet; when on the under side of a ceiling, about once in two feet, and when lying on a horizontal surface, about once in eight feet. Metal tacks prevent vertical pipes from creeping downward by contraction and expansion. Brass bands are used by good plumbers to secure horizontal runs of pipes.

Architects judge of the general character of a man's work by his attention to details, sometimes rightly concluding that if the slightest portions of the work are performed neatly, the more important parts are not neglected.

It is frequently true, too frequently indeed, that the specifications for the plumbing are not at all distinct or definite. In such cases, it must be understood that the plumber will do the work as cheaply as he can. The superintendent or architect will know just how good work he may expect, gauging the work by the compensation. In such cases, it is manifestly better to have a smaller amount of work, and that well done, than to have the work scamped, and spread over all the house. By an attention to detail, and by avoiding captious authority, the architect may save the plumber money and reputation for careful work.

Whether a plumber should follow out a specification he knows to be bad or unnecessary will depend on his acquaintance with the architect. At any rate, all questions of difference should be settled without bringing in the owner, who would know nothing as to the propriety of the work, and judge by prejudice simply.—*The Sanitary News.*

The Hyaloglyphotype.

Hyaloglyphotype is an ivention of Mr. S. Crocker, of Melbourne, Australia. The gist of the invention is the using a hot pen, whereby a drawing can be made on glass or glassy substances with a waxy composition, which is solid and somewhat hard at ordinary temperatures. The pen is an original invention, and is very ingeniously contrived, so that it can be heated either by gas or by an electric current. The waxy material flows easily from the heated pen, and sets so quickly on the glass that cross-hatching can be done more rapidly than with ordinary pen and ink, without risk of blocking up the angles. Corrections can be made with the greatest ease, by means of a penknife, which leaves the surface afterward intact. After the drawing has been made, the plate is etched in the usual manner by fluoric acid. When complete, it can be either electrotyped, stereotyped, used direct, or applied to any purpose for which engraved surfaces are required.

The hyaloglyphotype competes most successfully with zinc blocks. In regard to its printing properties, the high polish of glass lends itself admirably to sound delivery of ink; there is no "mealiness" in the solids, and the finest lines are rendered sharp and clear. In regard to its properties as an etching ground, glass is remarkably suitable for the purpose. The fluoric acid bites glass downward; there is scarcely any lateral action. This considerably diminishes, therefore, the risk of "under-biting." The edges of the lines are cleaner, and if properly drawn are free from the rottenness to which zinc is especially liable, in consequence of impurities setting up voltaic local action. The surface of such blocks, too, is not liable to corrosion, like zinc when stored away.

Mr. Dallas, of London, has succeeded in working out an important application of the hot pen. He applies it to the reproduction of the drawing as an intaglio copper-plate, without the necessity of etching by acid or any etching solutions. The resulting plate can be printed from on the copper-plate press, and yields impressions which are a perfect automatic reproduction of the artist's work. There is no necessity for after "sophistication," although after-effects may be worked in if desired. The prints have the appearance of high-class etchings, and would deceive experts. The artist does not need to draw reversed, when copper-plate prints are desired, and he can see the full effect of his drawing, without the necessity of experimental stoppings out and rebitings.

The St. Petersburg Ship Canal.

The St. Petersburg Ship Canal, which is now completed and ready for business, was begun in 1878. This canal is from Cronstadt to St. Petersburg, its total length 17¾ English miles, with greatest width 350 feet, diminishing to 220 feet, and navigable for vessels drawing 20½ feet of water. The force employed upon its construction embraced 3,500 men, 13 dredging machines, 3 locomotives, with 230 cars, 86 lighters and barges, 12 steam tugs, and 7 stationary engines, and its total cost to the government was about $9,000,000, or $500,000 per mile. When the Neva River is free from ice (which is generally by May), vessels can proceed directly from the Gulf of Finland to St. Petersburg, instead of discharging or taking their cargo at Cronstadt, as heretofore.

Steamers and sailing vessels coming to Cronstadt can use the canal, provided their draught of water does not exceed 20½ English feet; if exceeding 20½ feet, vessels will have to lighten part of their cargo at Cronstadt, and can then proceed with a draught as well.

ENGINEERING INVENTIONS.

A railroad ditching machine has been patented by Mr. Alonzo H. McGrew, of Hurley, Dakota Ter. It is made with a movable platform, horizontally swinging derricks,levers, ditching scoops, etc., for opening or trimming ditches at the side of railway tracks, or for excavating railroad beds, or similar work.

A safety valve has been patented by Mr. Thomas Kays, of Newton, N. J. It is of piston form, held down by spring pressure, with lateral outlets for escaping steam controlled by the piston valve, and made of diminishing area in a downward direction, intended to act with great certainty, but also to close or open more gradually than ordinary safety valves.

A rail chair has been patented by Mr. Samuel M. Beery, of Omaha, Neb. It is made in two parts adapted to be fitted together, and each extending beneath the meeting ends of two rails and bearing on or clamping the respective sides of the same, making a self-locking chair, and one intended to afford increased security against accidents from turning or displacement of rails.

An automatic car brake has been patented by Mr. Garrett B. McLaughlin, of Petersburg, W. Va. This device is arranged to operate in connection with the common hand brakes, so that in each car the brakes may be set, through the drawheads or bumpers, by one bumper crowding against another ahead of it when moving forward, and while moving backward by the same drawheads pulling upon each other.

A railroad rail brace has been patented by Mr. Lewis Larchar, of Cedar Rapids, Iowa. It is made of a right angled plate with a recess at its right angle and bent at right angles to form a base plate, with a wing having its acute angle bent downward to form a point to be driven into the tie and perforated to receive the fastening spikes, the especial object being to prevent spreading of the rails by the lateral pressure of the engine.

MECHANICAL INVENTIONS.

A tool holder for planing machines has been patented by Mr. Robert R. Neild, of Stratford, Ont., Canada. This is a tool box to hold two cutting tools, one arranged to cut while the table is moving in one direction, and the other when the table is moving in the reverse direction, the tool being thrown in and out of action automatically by the movement of the rod which causes the tool box to travel across the cross head.

AGRICULTURAL INVENTIONS.

A check row corn planter has been patented by Messrs. Henry F. Pearson and George W. Jarmin, of Genoa, Neb. It consists essentially of frame, runners, spout, a peculiarly operated seed dropping mechanism, and other novel features, whereby seed will be dropped with certainty and at uniform distances apart.

A cutting apparatus for harvesters has been patented by Mr. Dana W. Hovey, of Winthrop, Iowa. Combined with a pair of circular cutters are worm wheels on the shaft, one right handed and the other left, making a machine to be drawn across fields to cut standing grain, corn, broom corn, etc., and bind it in bundles.

A cockle seed separator has been patented by Mr. George Adams, of Sherburne, Minn. It has rollers with face indentations and corrugated end wheels, with plates between the rollers, and end plates to engage with the end wheels, springs to hold the plates down and guard springs to prevent the indentations from carrying out small kernels of wheat, and other novel features, to separate cockle seed from wheat passing through the machine.

A straw stacker for grain separators has been patented by Mr. Lucien A. Chase, of Elsie, Mich. To the lower rear part of a grain separator is attached a circular plate or frame, with cross bar pivoted at its center, to the middle part of which is attached a vertical frame, with standards, for receiving the straw and delivering it to the carrier, with other novel features, making a machine for stacking straw coming from the separator.

MISCELLANEOUS INVENTIONS.

A design for a pulley frame has been patented by Mr. Daniel J. Weir, of New York city. It has reverse curved sides, terminating at their lower ends in ovals, and at their upper ends in an extension top, the leading feature consisting of the heart-shaped side or cheek pieces of the frame.

A bed clothes clamp has been patented by Mr. Benjamin Kiam, of Houston, Texas. This invention covers particular means of attaching a clasp to a bed rail, adjustable to any part of the bed rail, and intended to hold the bed clothes over sleeping children or invalids.

A hook for hats or garments has been patented by Mr. Eugene R. Richards, of New York city. It has bracket arms and horizontal hooked arms, with an upright to hold hat and cuffs, serving to hold a number of articles, while being simple in construction and strong and durable.

A windmill has been patented by Mr. John H. Rowell, of Solon, Me. It has light radial and tapering fans, of concave form on the side receiving the wind, with springs adapted to hold the fans in the required oblique position and for regulating the motion according as the wind is strong or light.

An adjustable chair has been patented by Mr. Daniel Wilcox, of Springwater, N. Y. Legs are pivoted on the rockers, and a seat and back pivoted on the legs, with telescopic braces secured to the rockers and to the back rest, with which are various novel details of construction and arrangement.

A bed spring has been patented by Mr. Joseph P. Leggett, of Carrollton, Mo. The construction is such that the spaces between the springs are in a great measure filled up, and the tick or mattress is prevented from being unduly depressed in places from an unequal disposition of the weight on the bed.

A grate has been patented by Messrs. William L. and William P. Golder, of Patchogue, N.Y. There is a damper plate hinged to the surrounding casing, and the construction is such that the grate can be used in open fireplaces, or stoves and ranges, and can be rocked or dumped easily, and can also be used for sifting the coals.

A box for meat and oil presses has been patented by Messrs. John J. Culbertson and Bernard Gaston, of Paris, Texas, and John C. O'Connell, of Montgomery, Ala. This invention consists in providing the box or receptacle with a lining, preferably of sheet metal, to prevent the adherence of meat, which is liable to accumulate and harden and cause breakage.

A shaft bearing has been patented by Mr. William A. Patrick, of Rutland, Vt. Combined with a rotary or reciprocating shaft and its bearing box is a journal sleeve of greater diameter for fitting within the bearing box, whereby a large bearing box is obtained for the shaft without a corresponding increase in its diameter and weight.

A wire fastening device for metal fence posts has been patented by Mr. William H. M. Reese, of Calliope, Iowa. Combined with a metal post to be driven into the ground is a clamping plate having a groove and a forked projection, with hook bolt and nut, so the fence wires may be held on the post by a wire loop, or by the clamping plate.

A mail bag has been patented by Messrs. Edward B. Young and Frank E. P'Pool, of Mansfield, Mo. Combined with a bag is a frame with four hinged bars, two having hook prongs and the others spring latches, also connected with a staple, in which the lock for locking the bag is held, to facilitate the closing and safe locking of mail bags.

A friction clutch has been patented by Mr. Charles M. Huntington, of East Randolph, N. Y. A grooved wheel is attached to the shaft whose motion is to be controlled, and a split ring is received by the groove and provided with wedge-shaped ears projecting near opposite sides of the slot of the ring, an apertured arm is adapted to receive the wedge-shaped ears, a lever turning on the shaft being pivoted to the arm.

A bee hive has been patented by Mr. John W. Martin, of Winchester, Ky. It has vertical grooves in the sides to receive springs attached to the side bars of the comb frames, whereby the latter are centered and kept in place, the lower ends of the side bars projecting below the bottom bars, and having recesses so the bees can pass back and forth between the spaces below and at the sides of the frames, and the bees more conveniently managed.

A link fitting apparatus has been patented by Mr. James H. Stimpson, of Springfield, Ill. This invention consists in improvements in contrivances for milling and grinding the inside wearing surfaces of reversing and regulating links of steam engines, and their sliding blocks, including a pendulum device adjustable as to its center pivot, and carrying rotary milling tools or emery grinders adapted to work in the link and on the slide, etc.

A car transfer apparatus has been patented by Mr. Riley L. Davis, of Mooresville, N. C. This invention covers a peculiar construction of the truck or platform with two sections of rails, whereby the main track is never left open, in combination with peculiar means for shifting the truck or platform, with recessed road bed and shifting truck, and covers for preventing the recessed road bed or truck pit from being uncovered or exposed.

An improved window has been patented by Mr. William C. Bullivant, of Boston, Mass. This invention covers a vertically sliding guide held in grooves in the sash and frame, with a spring plate, spring latch, etc., the object being to make a sash that will be weather tight without the use of weather strips, will move easily without rattling, the sash being easily removable for cleaning, and the device simple and cheap of construction; this device has already been much used in England and Scotland.

NEW BOOKS AND PUBLICATIONS.

THE STRUCTURE OF THE WOOL FIBER IN ITS RELATION TO THE USE OF WOOL FOR TECHNICAL PURPOSES. By F. H. Bowman, D.Sc. Manchester: Palmer & Howe, 1885.

This work contains, with some additions, the full text of five lectures delivered before the students of the Bradford Technical School, in the early part of the year. They were a continuation of a similar series of lectures delivered by the author several years ago on the structure of the cotton fiber. The main discussion naturally concerns itself with the typical structure of a wool fiber, and treats of the mechanical arrangement of its parts, its chemical composition, and its behavior toward reagents. The modifications of structure produced by climate, by disease, or by breeding are also considered. The structure of the wool and hair, and their comparison with other animal and vegetable fibers, are admirably shown by numerous microscopic sections. Some space has also been devoted to an account of the different breeds of sheep produced by civilization, and of the wool bearing animals generally; these are well illustrated by engravings and colored plates. The subject is clearly and attractively presented, and though of particular value to the manufacturer and wool grower, it will not prove uninteresting to the general scientific reader.

PORTRAITS OF HOLSTEIN CATTLE. The importation and raising of Holstein, or Dutch-Friesian cattle seems at the present time to be taking the place of the celebrated Jerseys. Messrs. Smiths & Powell, of Syracuse, N. Y., dealers in Holstein stock, have published a handsome lithographic engraving of a group of six cows, a bull, and a calf, all portraits from the Aaggie family. The same gentlemen have published on a separate sheet a superb portrait of the celebrated Holstein bull Netherland Prince. These two prints of the now fashionable Holland stock are of interest to stock raisers and amateur fanciers.

Notes & Queries

HINTS TO CORRESPONDENTS.

Names and Address must accompany all letters, or no attention will be paid thereto. This is for our information, and not for publication.

References to former articles or answers should give date of paper and page or number of *question.*

Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all, either by letter or in this department, each must take his turn.

Special Information requests on matters of personal rather than general interest, and requests for **Prompt Answers by Letter,** should be accompanied with remittance of $1 to $5, according to the subject, as we cannot be expected to perform such service without remuneration.

Scientific American Supplements referred to may be had at the office. Price 10 cents each.

Minerals sent for examination should be distinctly marked or labeled.

(1) W. S. asks (1) for the best stain to stain beech or cherry a mahogany color? A. For mahogany stain: Boil ¼ pound madder and 2 ounces logwood chips in 1 gallon of water, and brush well over while hot. When dry, go over with pearlash solution, 2 drachms to the quart. By using it strong or weak, the color can be varied at pleasure. 2. Whether there is anything that can be used to bleach hard maple so as to give it a fine white appearance? A. Saturate as completely as possible with a clear solution of 17¼ ounces chloride of lime and 2 ounces soda crystals in 10½ pints water. In this liquid the wood is steeped for half an hour, if it does not appear to injure its texture. After this bleaching it is immersed in a solution of sulphurous acid to remove all traces of chlorine, and then washed in pure water. The sulphurous acid which may cling to the wood in spite of washing does not appear to injure it, nor alter the colors which are applied.

(2) J. M. S. asks what to coat the inside of an aquarium with in order to render impervious to water, and also not cause the water to become impregnated with any taste from it that would be injurious to fish? A. Take of finely powdered litharge, fine, white dry sand, and plaster of Paris, each 3 parts by measure; finely pulverized resin, 1 part. Mix thoroughly, and make into a paste with the boiled linseed oil, to which drier has been added. Beat the mixture well, and let it stand 4 or 5 hours before using it. After it has stood for 15 hours, however, it loses its strength. When well made of good materials, this cement will unite glass and iron so firmly that the glass will often split in its own substance, rather than part from the cement. Glass cemented into its frame with this cement is good for either salt or fresh water. 2. Is there any book published on the care of gold fish? A. See Edward's "Life beneath the Water," price $2.

(3) G. P.—Artificial marble for fancy articles is made by soaking plaster of Paris in a solution of alum, baking it in an oven, and then grinding it to a powder. In using, mix it with water, and to produce the clouds and veins, stir in any dry color you wish; this will become very hard, and is susceptible of a high polish. Plaster figures are frequently made very durable in the following manner: First thoroughly dry the plaster figure in a warm, dry atmosphere; place it in a vessel, and cover with the clearest linseed oil just warm. After 12 hours take it out, drain, and let it dry in a place free from dust. When dry, it will look like wax, and can be washed without injury. Sometimes suspending the object in a strong clear solution of alum until the alum crystallizes on the surface and then polishing with a wet cloth accomplishes the object.

(4) S. M. F. writes: I am doing nickel plating in a tank holding about 500 gallons, and cannot succeed in getting the unpolished surface of iron work as white as it should be; can you tell me of any ingredient I can put in to make it whiter? A. In SCIENTIFIC AMERICAN SUPPLEMENT, No. 310, you will find elaborate information relative to the cleansing and preparing objects for electro plating, including formulæ for various pickles, etc. In case the iron resists the solution of acids, it must be cleaned by means of sand, pumice or rotten stone. 2. Can you give me a receipt for stripping the nickel from Britannia ware without injuring the Britannia? A. A mixture of nitric acid and water of suitable proportions can be used for this purpose, but the nickel is generally removed by being ground off.

(5) M. E. H. asks the best receipt for making soda and sarsaparilla such as is sold in small bottles. A. The ordinary soda water sold in bottles consists simply of carbonic acid water flavored in the usual way; thus for lemon the recipe is:

Sirup	1 gal.
Citric acid	2½ drachms.
Oil of lemon	1 drachm.

Triturate the acid and oil together until thoroughly mixed, then add the sirup gradually. For sarsaparilla:

Sassafras bark bruised	1 pound.
Licorice root bruised	7 oz.
Water	2½ gals.
Oil of sassafras	1½ drachms.
Oil of wintergreen	2 "
Alcohol 95 per cent	2 oz.

Boil the sassafras and licorice in the water half a hour. Strain through flannel, then add the sirup. Dissolve the oils in the alcohol, and add them to the sirup. Agitate the mixture freely.

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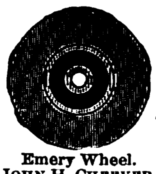

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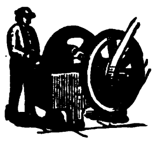

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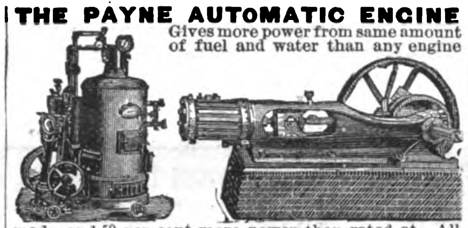

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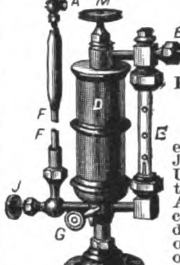

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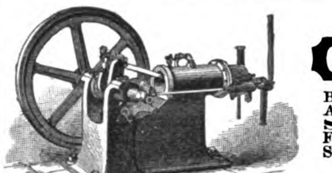

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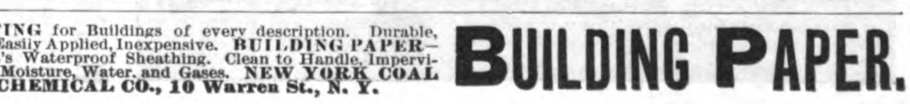

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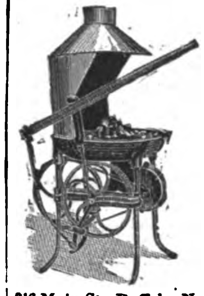

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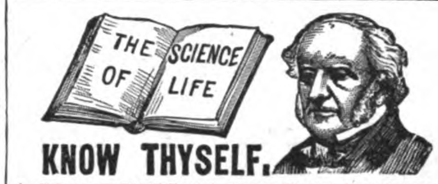

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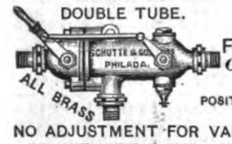

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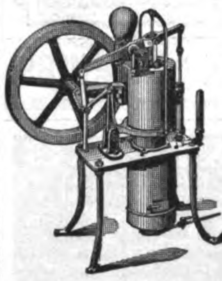

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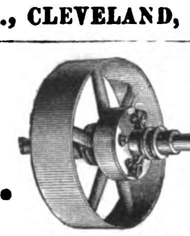

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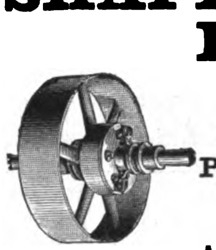

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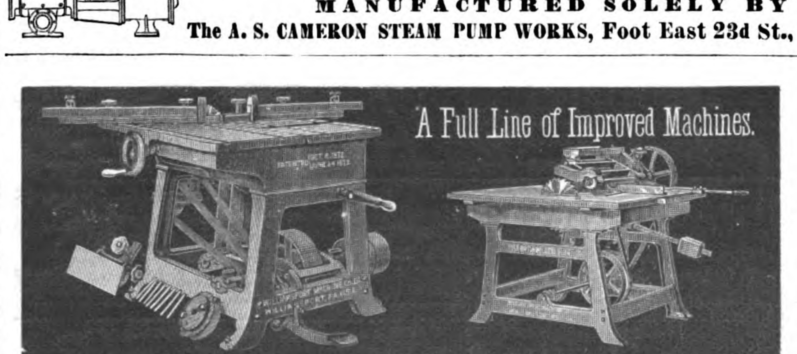

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