ENGINEERING INVENTIONS.

A rotary engine has been patented by Mr. John T. Davis, of New York city. The construction covers two hemispheres and two cones arranged therein, with a slot through their centers for the piston, the cones forcing the piston around the sphere to give motion to the shafts, the steam being cut off at the largest area of the steam chamber by the other half of the piston passing through the same point.

MECHANICAL INVENTIONS.

An engraving machine has been patented by Mr. Ira R. Beam, of Dryden, N. Y. It is for engraving jewelry, watches, plates, etc., and has holding devices with wide range of adjustment, improved construction and arrangement of the engraving tool and the apparatus for working it, and also for holding the copy, from which the movements of the engraving tool are directed by a style.

A friction pulley has been patented by Mr. Volney W. Mason, of Providence, R. I. A counter balance is combined with the shoe, the latter being made with an attached counter balance, and there is a method for throwing shoes in and out of contact with the pulley, the principal object of the invention being to counteract the effect of centrifugal force in the working parts of friction pulleys.

AGRICULTURAL INVENTIONS.

An improved seed planter has been patented by Mr. William L. Hutson, of St. Lawrence, N. C. This invention covers a special construction of a plow with removable hopper and means for dropping and covering the seeds, the space between the hills of seed to be regulated by driving wheels of different sizes, and the height of the plow beam to be regulated by an adjustable bolt.

MISCELLANEOUS INVENTIONS.

A folding table has been patented by Mr. William W. Quigley, of Santa Ana, Cal. The invention consists in a skirt board with a recess in one edge, with supports at that edge only, for receiving and supporting a skirt while the same is being sewed, so that all parts can be easily reached by the seamstress.

An improved pump has been patented by Mr. Luis G. Careaga y Saenz, of Puebla, Mexico. It is simple and easy of construction, not apt to get out of order, will raise large quantities of water with but little loss of power, and is not likely to be clogged by sand or other analogous impurities.

A process of removing oleine from linseed oil has been patented by Mr. Thomas H. Gray, of Brooklyn, N. Y. It consists in maintaining the oil at a temperature of 110° F., and in a state of agitation for a certain time, then mixing therewith a saline solution, drawing off, and washing the purified oil with water.

An artificial leg has been patented by Mr. Edgar D. Richmond, of Hart, Mich. The invention consists in improvements in the construction of the knee, ankle, and toe joints, with special arrangement for the suspension strap, the extension spring, and the thigh and lower sections of an artificial leg for thigh amputations.

An electric alarm for spring clocks has been patented by Mr. Edward Jungerman, of Gettysburg, Penn. An electric circuit is applied to a special form of clock, with contact points, to be closed by the expansion of the mainspring, whereby an audible signal may be given on a bell, or one made at a point remote from the clock.

Smoothing the inner surface of wooden tubing forms the subject of a patent issued to Mr. Merrill F. Wilcox, of Bay City, Mich. The method consists in forcing through said tubes a rapidly rotating smooth steel plug, slightly larger than the bore, and distributing resin or like substance for glazing the inner surface in advance of the rotating smoother.

An improved bee hive has been patented by Mr. Joshua Vanzandt, of Seward, Kendall County, Ill. The body has comb frames and a high cover, with a honey board having cleats or flanges upon the edges of its lower side, and with gauze-covered openings, so the board is kept out of contact with the comb frames, and the moist air is allowed to escape freely.

A sidewalk curb and surface case for electric wires has been patented by Mr. Richard Wylie, of Napa, Cal. The invention consists in a case made of grooved castings or blocks along curbs and across the streets at the crossings, with easily removable covers, and with corner pieces, all specially adapted for the easy laying, repair, and adjustment of wires.

A process for coloring and bronzing leather has been patented by Mr. Lorenz Klopfer, of Munich, Germany. The leather is wrapped in a cloth moistened with water and milk, washed with a mixture of white of egg, glycerine, and water, covered with a varnish and then a flexible collodion compound, followed by a coating of size or similar mixture, to which the metal coating is applied before the mixture has become dry.

A hat pouncing machine and lathe has been patented by Messrs. Willet Thompson and Joseph A. George, of Brooklyn, N. Y. The pouncing machine has a special form of counter balance, to prevent swaging or lurching movement, so the machine can be run at a high speed, and there are means for shifting the position of the still point, to adapt the machine for turning hat blocks and other irregular forms.

A wire fence stretcher and splicer has been patented by Mr. Jonathan E. Pierce, of Deming's Bridge, Texas. In the ends of an open box is journaled a screw, one end of which is prolonged, and has a vertical bevel pinion, a rotary motion being imparted to the screw by pinions, while springs force together the ends of levers to grasp an end of broken fence wire.

A combined cane and cigar case has been patented by Mr. David Lee, Jr., of Mount Willing, Ala. The cane is hollow, and the cigars are so placed therein, one above another, that a spiral spring in the bottom will force each one successively to the top, a removable tube adapting the space to sizes of different thickness, and a match receptacle being provided for in the handle.

A mill feeding device has been patented by Mr. James B. Allfree, of Cumberland, Md. The invention covers a shoe with a trough, to oscillate laterally to the path of the grain, the bottom of the trough being lower than its delivery edge, the shoe having a steep incline therefrom and a gate acting therewith, in order to spread the grain and deliver it in an even sheet the whole width of the delivery.

A riding saddle has been patented by Mr. William Frazier, of West Alexander, Penn. It is made of India rubber or its compounds, and is cheap, durable, and elastic, having no tree to break or sewing to rip, and is not liable to be injured by exposure to rain. The body of the saddle is made in one piece in a mould, and the whole may be shaped to prevent contact with the spine and withers.

A revolving map stand has been patented by Mr. Henry E. Hayes, of Brooklyn, N. Y. The base block has screw rod and nuts and a triangular socket; a revolving top block has sockets, supporting rods fitting into the sockets, a wedge block for securing the lower supporting rods in place, and a suspension rod for the upper supporting rods, all to promote convenience in exhibiting maps, charts, etc.

A spring board wagon has been patented by Mr. John C. F. Harris, of Littleton, N. H. A foot board is mounted on the spring board by springs more yielding and having longer range of movement than the spring board itself, to protect the feet of the rider from the benumbing jar of the spring board, and there is a novel arrangement of springs with the seat to render its motion easier.

An improved inserted tooth fastening for ice plows has been patented by Mr. John G. Rodenstein, of Staatsburg, N. Y. The invention consists in a fastening with a stop plate having a specially shaped head at its upper end and a shoulder at its lower end, with a wedge key having a screw and a nut on its upper end to adapt it to be inserted between the parts of a plow beam, to clamp an inserted tooth against the edge of a plow plate section.

A safety stop for elevators has been patented by Mr. Ellison Saunders, of Austin, Texas. A lever is pivoted to the bottom of the car, with a spring for throwing it into position transversely to the car bottom, so that the ends of the lever can catch on horizontal bars on the sides of the elevator shafts, a rope on one end of the lever to the car cable keeping the spring taut and preventing it from throwing the lever unless the elevating cable brakes.

An apparatus for manufacturing illuminating gas has been patented by Mr. James J. Shedlock, of Barnet, Eng.; with the retorts for first distilling the tar, the condensing devices and tar receptacle, is a vertical retort, having a feed pipe at its upper end connected with the tar receptacle, and an outlet pipe for gas leading to the mains, the retort being adapted to be filled with coke, and connected with a superheated steam coil, so all the volatile hydrocarbons will be converted into permanent gases.

An improved railway gate has been patented by Mr. Lawrence C. Walsh, of Webster, Mass. The object of the invention is to provide a simple and trustworthy means for closing railroad crossings on the approach of trains, for which purpose a suitably sized gate is so hung by pulleys from a bar above that the gate may be rolled to one side and back again by wires or levers properly connected with a station, or by mechanism in position to be operated by passing trains.

NEW BOOKS AND PUBLICATIONS.

NEW YORK STATE SURVEY. Report for the year 1883. By the Board of Commissioners and James T. Gardiner, Director.

In 1876 the first accurate trigonometrical survey of the State of New York was commenced, a work which has since been prosecuted in a manner which reflects credit upon the Board of Commissioners and upon the able director in charge and his assistants. During 1883, beyond the general work of the survey, considerable attention was given to the hydrography and drainage of Niagara, Erie, Genesee, and Orleans Counties, at the request of the State Board of Health, the results reached in which have, also, an important bearing on questions relating to the maintenance of water supply in streams. These reports have been growing more valuable each year, but now have an added interest, as people are more earnestly looking into the matter of forest preservation, average rainfall, and the maintenance of the larger streams and navigable channels of the State.

SHAVINGS AND SAWDUST; A BOOK ON WOODWORKING MACHINERY. By John Kane, "Observer." C. A. Wenborne, Buffalo, N. Y. Price, $1.50.

This book, consisting largely of articles formerly published in the *Lumber World*, is the work of a practical man, and speaks as with the authority of an experienced workmen on the designing, construction, care, and operation of machinery used in planing mills, sash, blind, and cabinet factories, car shops, etc. It is well calculated to be of value to purchasers and owners of machinery, and has much of instruction and needed warning for inexperienced or careless operators.

THE GLASS DEALER'S READY RECKONER. A series of tables of superficial measurement, from 1 to 132 in. in width by 2 to 180 in. in length. John Thorpe, New York. Price, $1.50.

Special.

A CLERGYMAN'S REMARKABLE EXPERIENCE.

Evidence of the wonderful results which are following the use of Compound Oxygen accumulates with an almost bewildering rapidity. There seems to be no phase of bodily suffering, and no type of disease, which this subtle agent will not reach. The subjoined communication gives the history of one of a class of cases especially found among clergymen and all professional men and brain workers. The changes wrought in three months, as related by the writer, are truly marvelous. From a state of physical and nervous prostration, which had become alarming, he was restored to such vigorous health that, to use his own language, "I found myself able to preach Sunday morning, teach a Bible class of seventy-five or a hundred after sermon, attend an afternoon service often, and preach to a congregation of a thousand persons in the evening, and say in truth, at the close of my evening service, that I was not conscious of any more weariness than when I began in the morning."

This seems almost incredible, but Dr. Cushing, pastor of the First M. E. Church, Rochester, N. Y., is a clergyman of wide repute, and no one who knows him will for a moment question his statement. It is given herewith in his own words:

16 N. Fitzhugh St., Rochester, N. Y., January 11, 1884.

DRS. STARKEY & PALEN:

Dear Sirs: It is nearly four years since I first used Compound Oxygen. I have often spoken of its effects to others, but have never, I think, made any statement to you. There are others, doubtless, who would be glad to know of its effects in a case like mine. I was not sick, though my strength had been greatly impaired by sickness in earlier life. But for fifteen years I had been carrying very heavy burdens and doing very hard work. I found myself gradually losing the power of endurance, so that my work left me too much exhausted. I could see that my whole nervous system was giving way; that there was a manifest lack of vital force. This was most apparent and almost alarming when I went to my study. There I discovered a lack of the usual quickness of perception—a lack of power to hold on. My mind was losing its grip. At the point where I needed most strength, I found it suddenly failing me. This alarmed me, though I am not aware that my friends had discovered it. Connected with this case was a lack of that physical vigor necessary for good digestion, and a consequent lack of nutrition. Sleep was fitful, insufficient, and unrefreshing. Under these circumstances I began the use of Compound Oxygen. At first I saw no results. After a time I observed my digestion was much improved. More restful sleep followed. At the end of three months I found myself able to preach Sunday morning, teach a Bible class of seventy-five or a hundred after sermon, attend an afternoon service often, and preach to a congregation of a thousand persons in the evening, and say in truth, at the close of my evening service, that I was not conscious of any more weariness than when I began in the morning. My sleep was as refreshing on Sunday night as on any other night of the week. My mind has never worked better than during these four years, and in no other time of my life could I do as much work, or do it with as much ease.

I do not use the Oxygen now unless I find myself getting a little weary. Then a resort to it for two or three weeks puts me in normal condition again.

This is my experience, and I have much reason to be grateful for it. Sincerely,

CHAS. W. CUSHING, D.D.

Many other eminent clergymen bear testimony to the efficacy of Compound Oxygen as a curative agent. It is also unequivocally indorsed by such leading public men as Hon. W. D. Kelley, Member of Congress from Penna.; Judge Flanders, of New York City, for many years law partner of Vice-President Wheeler; T. S. Arthur, the veteran author and temperance writer; and Wm. Penn Nixon, publisher of the Chicago *Inter-Ocean*.

Drs. Starkey & Palen, 1109 and 1111 Girard St., Philadelphia, are the sole dispensers of this remarkable curative agent, and will send, without charge, their Treatise on Compound Oxygen, giving all desired information in regard to it, to any one who will write to them.

Business and Personal.

The Charge for Insertion under this head is One Dollar a line for each insertion; about eight words to a line. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

Notes & Queries

HINTS TO CORRESPONDENTS.

No attention will be paid to communications unless accompanied with the full name and address of the writer.

Names and addresses of correspondents will not be given to inquirers.

We renew our request that correspondents, in referring to former answers or articles, will be kind enough to name the date of the paper and the page, or the number of the question.

Correspondents whose inquiries do not appear after a reasonable time should repeat them. If not then published, they may conclude that, for good reasons, the Editor declines them.

Persons desiring special information which is purely of a personal character, and not of general interest, should remit from $1 to $5, according to the subject, as we cannot be expected to spend time and labor to obtain such information without remuneration.

Any numbers of the SCIENTIFIC AMERICAN SUPPLEMENT referred to in these columns may be had at the office. Price 10 cents each

Correspondents sending samples of minerals, etc., for examination, should be careful to distinctly mark or label their specimens so as to avoid error in their identification.

(1) W. A. E. asks: How is the gelatine made which the plaster of Paris workers use for their moulds? Can I find a book on this kind of casting? A. The gelatine used for moulds is made by soaking good white or light colored glue with a little water until it is thoroughly swelled; have no excess of water. Then add four times its weight of glycerine. Melt and stir, keeping up the heat for an hour to boil off the water that was in the glue. If too hard, add glycerine; if too soft, add soaked glue, reheating each time until you get the exact consistence for moulding; pour your moulds hot; grease the matrix.

(2) C. S. F. asks: Which is the better way to set a small circular rip saw (14 in.)—so that it will just reach through the stuff, or lower the table that it will move perpendicularly? Which method requires the most power? A. A saw cuts easier across the grain. Cutting at the top of the saw is lengthwise of the grain of the wood, and cuts harder and of course takes more power. Saws cut easier or with less power with the top of the table as near the center as possible, or so that the flange that holds the saw just clears the stuff to be sawed. This is the practice with the makers of frames. Sometimes the tables are made to raise for some special purpose—not for the saving of power.

(3) J. B. W. asks for a formula for the velocity of steam in steam pipes under different heads. A rule that can be used to find the area of steam pipe is what I desire. A. You will find the formula for flow or velocity under different pressures, also table of velocities, in Clark's "Manual for Engineers," pages 890, 895, etc.; they are too large to extract and send in a written communication. For ordinary air pressure engine steam pipes of area one-twelfth to one-fifteenth the area of cylinder will do well; the greater the speed of the engine, the larger the pipes.

(4) H. W. S. says: I have long noticed in church or other public assemblies, the women almost universally sit upright in a natural attitude, while men almost universally take a lounging position, leaning on one hand, or with back much humped, or with one leg over the other, or in some other unnatural position Can there be any reason for the difference except foolishly contracted habit? A. The ungracefnl attitude of the men is doubtless owing to careless habits. The erect and finely developed physique of the ancient Egyptian women was said to be due to the habit of carrying water pitchers on their heads; bonnets and hair suffice for modern ladies.

(5) W. M. P. writes: 1. We are about to put in three 5 ft. by 16 ft. boilers, forty-four 4 in. tubes. I contend that it is not safe to carry the fire over the shell of the boiler to the stack or chimney; others contend it is safe, and some boiler makers claim it is the proper way to set a boiler. A. Returning the flue over the top of the boiler is much practiced for economy, and is perfectly safe. The arches must bear upon the side walls and be thoroughly stayed, because the arch has a tendency to push the walls apart, which is the only objection. 2. What size flue do we want to build in the chimney for 3 boilers 5 ft. by 16 ft., 44 4 in. tubes, furnace 5 ft. square, to each boiler? Also would you build the flue larger at top than at bottom to burn shavings and wood? A. Build the flue 4 ft. square (16 square feet area) for shavings. The universal way is to build straight inside and taper outside. Do not know that there is any gain in widening toward the top if a straight flue is large enough.

(6) C. S. writes: I want to use a rope and pulley, and at a certain point on the rope there is a clutch or grip brought against the same to hold the rope and its load, but the grip wears the rope in a short time. Is there no substance that could be put on the rope to prevent the wear? A. A rubber varnish upon the rope would give it more stickin ess, but the kind of grip that you describe will tear anything that you may put on the rope. Instead of the short hold of your grip on one side of the rope, make a groove in two straight pieces of lignum vitæ and fasten one piece near the pulley so as to bear on the straight part of the rope. Fasten the other piece to a lever opposite to the first piece, so that you can grip a long surface of the rope at once; then you will not have to press so hard.

(7) J. S. K. asks: How is the cost of grading the bed of a railroad through an unbroken country easiest and best determined? The land is of a sandy soil, and quite level, with an occasional small swamp to cross. A. If you can run your road so that the cuts and fills will be equal to each other, the subject is very much simplified. The cost of excavating is computed at so much the cubic yard, the prices being affected by the quantity and quality of the material and the disposition of it. If there is not excavated material enough, the cost of filling is ascertained by the same method. If the swamp cannot be readily filled, you can compute the cost of pilling at so much the pile or running foot. The cost of ballast, ties, and rails can be obtained upon any given length of road.

(8) G. F. L. asks: 1. What load will a flat boat 15 ft. wide and 40 ft. long, carry? A. If the scow outline is a parallelogram with vertical sides and ends, it will carry one ton to each one inch additional dranght of water in *fresh* water. 2. If boat empty sinks in water 3 in., how much load will it take to sink it down to 4 in., then inch by inch to 12 in. deep? A. If boat of same dimensions, 4 tons will sink it 4 in., and 1 ton for each additional inch.

(9) W. S. asks how to read the indicator or registering dials of an ordinary gas meter, and also describe the cold water annealing process? A. For reading your meter dial commence at the right hand dial; it is marked 1 thousand, which means for the whole circuit each division is one hundred cubic feet. The second dial hand turns to the left on account of the construction of the gearing upon the inside for simplicity; this dial is marked 10 thousand, each division reading one thousand. The third dial hand again turns to the right and is marked 100 thousand, which also is the sum of the whole circuit, each division reading 10 thousand. Always enter the *figure following the hand* (not before) in the way the hand is turning. Enter each figure, and place 00 at the right. The small dial marked cubic feet is not used except for testing. Water annealing of steel is simply heating the piece to a full red heat; lay it in some dry ashes or lime until it ceases to be red, or what is called a black heat, then plunge in warm water—80° to 100°. This makes steel soft for die cutting.

(10) E. C. O. writes: 1. I have an iron cylinder 50 in. internal diameter, 3 ft. long, and ⅜ in. thick. This cylinder is placed inside of a somewhat larger cylinder whose internal diameter is 51¾ in., leaving a space between the concentric cylinders of ½ in. This space is tightly filled with water under pressure of 1 atmosphere. The ends of the cylinders are closed with heavy iron plates capable of withstanding almost any pressure. Now, how much external pressufe per square inch will this double cylinder stand, supposing it were placed inside of a large iron box and water pumped into the iron box by hydraulic pressure? A. Under the conditions you name, if your cylinders are of the same thickness and quality, you will get, theoretically, the combined strength of the two. The intervening water jacket permits of this. But if you make the cylinders with flat heads, the question of distortion comes in, the problem becomes much more complicated, and the power of resistance of your cylinders will be greatly reduced. The two cylinders, if made of good quality of wrought iron and with heads of proper form and strength, should sustain practically an exterior pressure of 200 pounds per square inch. 2. A log 16 ft. long and 4½ ft. in diameter with the ends somewhat pointed is floating in a lake with about an inch of its upper surface projecting above the water. The log weighs 8,000 pounds. How much forward traction will it require to pull the log slowly? A. This cannot be answered, as no form of ends, condition of surface, or velocity is given: you will find the results of experiments in towing logs in Beaufoy's "Nautical Experiments."

(11) J. M. H. asks: What will whiten the ivory keys of an old organ that have turned yellow by standing in a church? A. Bleach them by treatment with hydrogen peroxide; see SCIENTIFIC AMERICAN SUPPLEMENT, No. 339.

(12) R. H. M. writes: A. has a circular farm containing 80,000 square rods. What will be the diameter of three small circles inside of large circle, so they will just touch each other? A. For the solution of your problem—rule for finding the diameter: divide the area by 0·7854, and the square root of the quotient will give the diameter of the circle. Thus:

$$\frac{80{,}000}{0{\cdot}7854} \text{ sq. rods} = 101{,}858{\cdot}9. \qquad \sqrt{101{,}858{\cdot}9} = 319{\cdot}1 \text{ rods}$$

diameter. Its half diameter is 159·55 rods. The center of the great circle is the apex of the two sides of a hexagon around the proposed small circles. The ratio of the sides of hexagon to the radius of its inscribed circle is 1·156 to 1, which by adding equals 2·156 = the semi-diameter of the great circle in semi-diameters of the lesser circles. Then from above

$$\frac{159{\cdot}55}{2{\cdot}156} = 74 \text{ rods} = \text{semi-diameter of lesser circles, 148 rods}$$

being their diameter.

(13) F. J. M. asks: Is there in successful operation any motive power (other than the steam engine) for propelling small boats and launches? A. We know of none, but many experiments have been made with electricity, some of which are claimed to be successful. None, however, are in more than the experimental stage.

(14) W. R. H. asks: 1. What is the cause of pipes bursting in cold weather? Is it that water expands when freezing? A. Water expands when freezing, the ice occupying a larger space than the water that produced it; but as the process of freezing is a gradual one, the water in a pipe partially frees itself from constraint, and the pipe may become filled with solid ice and not burst until the temperature has fallen so low that the contraction of the iron over the rigid ice produces rupture in the iron. Pipes are also burst by freezing solid at different points. The falling temperature of the intermediate water-filled space will cause an expansion of the water between the point of greatest density, 40°, and the freezing point sufficient to produce the requisite pressure for rupture. 2. And what is meant by 40 pounds pressure in cylinder when boiler is under 60 pounds pressure? Is that obtained by throttling steam? I have a 2½ in. Judson governor: it works as well as possible up to 80 ponnds, but above that amount of steam it competely fails to regulate speed of engine. In supply pipe, above governor, I have attached a Baker's automatic lubricator, and use pure lard oil, but got no better result. A. The 40 pound pressure may be the mean pressure caused by cutting off by the set of the slide valves, or may possibly mean the initial pressure caused by throttling. Governor valves, when speeded for a certain number of revolutions of the engine within certain limits of pressure, require readjustment for change of speed by change of the size of the speed pulley, and for change in the boiler pressure by adjustment of the cut-off position of the governor valve. For a given amount of work a governor valve set for an average of 60 pounds pressure with a variation of 10 pounds will not operate satisfactorily with 80 or 90 pounds pressure without readjusting the valve.

(15) C. W. V. writes: There is in this city a coal run which rises 5 ft. in 100, or the rise is one-twentieth of the length. Now, a locomotive standing on this incline can just hold her own with her brakes set on her drivers, that is, the friction between the drivers and track will keep her from sliding down hill. The locomotive weighs say 100 tons with tender. The same locomotive will draw on a level 40 cars weighing 1,200 tons. I reason as follows—the locomotive holds one-twentieth of its weight, equals 5 tons, that is, on a level it would pull 5 tons. This 5 tons dead pull pulls 1,200 tons on wheels, that is, 1 ton pulls 250; the coefficient of friction is therefore one two hundred and fiftieth, equals two-fifths of 1 per cent for freight cars. Is this right? A. It is found that, with an exceptionally good track, and cars in good condition, after motion is started 6 pounds per ton (2,000 pounds) will keep up a slow movement—but 8 pounds per ton is usually allowed. The resistance increases with the speed—at 20 miles per hour to about 11 pounds per ton, and at 30 miles per hour about 14½ pounds per ton. Eight pounds per ton on 1,200 tons equals 9,600 pounds, not quite 5 tons.

(16) J. A. T. says: In the inspection and repair of freight cars built of the best material and manufactured in first class shops, one of the defects frequently discovered is loose wheels. The wheels are sometimes found to be loose on comparatively new cars, that have never been wrecked in any manner whatever. These wheels are bored to a certain size, the axle turned to what machinists term "the wheel fit," and left enough larger to require a pressure of from 25 to 30 tons to force the axle into the wheel. Now, in the absence of an accident of any kind to the car, what can be assigned as the cause of these wheels getting loose? Would the bore of the wheel, next to a journal that for some distance had been running hot and heating the wheel, be after cooling again the same size as when originally bored out? A. Loose wheels in 99 out of 100 cases are due to bad fitting; generally in such cases the axle fit is straight, and through wear of boring tool of car wheel boring machine the wheel fit is slightly taper, and the wheel works loose. With *straight* fit in both axle and wheel, and an allowance in size requiring 30 tons to press on, no trouble is experienced. If the bearing runs hot and is suddenly cooled with water, the tendency would be to loosen the wheel, owing to the shrinkage of axle due to sudden cooling, etc. Excessive clearance between flange of wheel and rail, especially on sharp curves, if the car is heavily loaded, tends, owing to the snddenblow on the flange, to drive the wheel in and loosen it. Difference in hardness of iron of wheels changes pressure required to press wheel on, sometimes as much as 10 tons, and loose wheels sometimes result from this. The chilled tread puts a strain on the wheel like a tire, and when this is worn away the strain is lessened, allowing wheels to slip on axle if an aggravating cause occurs, such as sharp curves. Loose wheels sometimes are occasioned from using too pointed a tool with too coarse feed, the fit presenting a surface of being threaded. When the wheel is pressed on, it may go on with the required pressure, but the broken ridges left by tool jar out and allow wheel to slip.

(17) S. P. writes: 1. Can I make the telephone, Fig. 4, SUP. 421, for my own use and experimental purpose, but not to sell? A. You can make it for experiment, but not for use or sale. 2. What is the best kind of glue for sticking carbon to wood and ferrotype, etc.? A. Use gutta-percha and pitch equal parts melted together. 3. What would be about the power of the dynamo in SUP. 161, enlarged five times? A. If you propose to make a large dynamo, it would be best to make it after Siemens' recent pattern.

(18) C. N. S. asks the best plan to moisten the atmosphere of a closet or chest by cold water alone? A. By rearranging the shelves you might get room enough next to the top above the shelf to slide in a shallow tray of water, with partitions standing about 2 in. above the water, with cotton or linen cloth folded over them so as to dip into the water, which will greatly increase the surface for evaporation. The shelves should be of slats, or with an open space at the back and front for circulation of the moist air.

(19) C. W. H. asks: What will caseharden malleable iron, and directions for use? I have tried prussiate of potash, and it does not harden the surface. A. Make a powder of common salt 8 parts by weight, prussiate of potash 7 parts, and bichromate of potash 1 part. Heat the iron red hot, cover it with the powder, melt it on, and chill in a water bath while the iron is hot.

(20) I. L. H. writes: My engine has a 20 ft. by 10 in. stack, twenty-three 2 in. flues; size of fire box, length 30 in., width 18 in., depth 27 in.; length of flues, 60 in., but does not steam as it should; will you please tell me what is wrong? Also what horse power would I get from this engine with 60 pounds steam, cylinder 5½ x 8, running 225 revolutions? A. Your description of the boiler is not sufficient for exact estimate of its power. We estimate it as an 8 horse boiler. The engine at the pressure and speed you mention is estimated at 10 horse power. Your boiler is not large enough by 50 per cent for the engine rate.

(21) J. L. C.—Steel upon steel has less friction than steel upon yellow brass. Steel upon a composition of copper and tin, such as hard journal boxes are made of, has the least friction. A slide having a flat bearing has less friction than with a round bearing.

(22) G. H. M. asks: Does a vessel passing over the span of an aqueduct increase the weight sustained by such span, and reasons, *pro* or *con*.? A. Yes. Theoretically, by the amount that the water is raised by displacement. Of course this is not appreciable in a large expanse of water, but in a confined reservoir the weight would be considerable. This calls to mind the anecdote of how King James puzzled the philosophers in regard to weight of the fishes and the bowl of water.

(23) J. H. Z. asks: 1. Can you give me through the columns of your paper the composition and the process of making the alloy used for hard soldering brass, copper, etc.? A. A hard solder may be made of brass 1, zinc or tin 1; a soft solder: tin 2, antimony 1; or of brass 6, zinc 1, tin 1—these by weight. Melt the brass in a crucible, add the softer metals, and when solidified but not cold, beat the mass in an iron mortar to a granular consistency. 2. Also process of making gold solution to plate without battery, that is, to give gold color by rubbing solution on article to be plated? A. Dissolve gold leaf in quicksilver and apply with a woolen cloth. This method of gilding is evanescent and almost valueless. 3. Are muriatic and hydrochloric acid the same? A. Yes. 4. Is not borate of soda common borax? A. Borax is produced from the borate of soda.

(24) E. E. H. asks: 1. What is the best method of varnishing slate table tops which have been ornamented by painting on them a design in oil colors? What varnish is used, and how applied? If with a brush, how can the strokes of the brush be prevented from showing? If dipped, give particulars? A. Use a soft camel's hair brush and cover the table with a coat of heavy body varnish, such as can be purchased of any paint house. 2. A receipt for ebonizing liquid. I have used nut galls and acetate of iron, formerly with good results, but lately the iron acetate will not produce the black. A. The majority of the receipts given include acetate of iron in some form or other. The following is one entirely free from iron salts, and may be found desirable: First sponge the wood with a solution chlorhydrate of aniline in water, to which a little copper chloride has been added. When dry, repeat with a solution of potassium bichromate. Do this two or three times.

(25) J. H. K. asks for a stain for violins of a dark chestnut or seal brown color? A. The following will give a boxwood brown stain: Hold your work near the fire, so that it may receive a gentle warming; then take aquafortis, and with a feather pass it over the work till you find it change to a fine brown (always keeping it near the fire); you may then varnish or polish it.

(26) P. K. W. asks: 1. What can I put into calcimine that will harden it so it will bear washing? A. The addition of a small quantity of potassium bichromate to the calcimine will probably render it sufficiently insoluble for your purpose. 2. What can I put into a wash made of sizing and Venetian red, that will harden it sufficient for outside work on brick walls? A. There is nothing we can recommend to you other than the use of a better quality of paint. If it were possible to accomplish the end you suggest, we think that such an article would entirely supplant the use of paint, and therefore would be directly procurable from the paint houses.

(27) A. S. C. asks: Is there any paint or any material with which I can paint an inside plastered wall to keep out moistnre or dampness? The plastering is done on rock, and I think the moisture is mostly from perspiration. I wish to paper the wall. A You might coat it with silicate of potash or soda, which would result in a very hard surface, or two or three good coats of zinc ground in linseed oil would do. But we think your best plan would be to have a wall within a wall, one of which would receive the perspiration and permit it to drip and run off, and the other could take the paper hanging.

(28) W. F. T. writes: Have steam yacht; length of keel, 45½ ft.; length over all, 56 ft.; beam, 10 ft.; draught of water, 4 ft.; engine, 25 horse power; diameter of cylinder, 9⅜ in.; length of stroke, 9½ in. We are using 43 in. 3 bladed screw. 1. Would we gain in speed by using 4 bladed screw? A. We think not. 2. If so, what size would you recommend? A. Your propeller would do better if 3 or 4 in. larger in diameter. If you have ample boiler, you may get increased speed by making a propeller 3 or 4 in. larger and of *less pitch* than the present one.

(29) S. B. D. asks: What size wheel he should use for a yacht 35 ft. long, 6 ft. wide, 3 ft. deep? When not loaded draws 18 in. at the bow and 28 in. at the stern. Engine, 4 x 6; boiler of steel, 27 x 46; fifty 1½ in. flues; pitch of shaft, 1 in. to the foot. A. Two feet 8 in. diameter and 3 ft. 4 in. to 3 ft. 6 in. pitch; we doubt if you have boiler enough for good speed.

(30) J. M. La B. asks: 1. Which is the best way to put a patch on a boiler—to rivet, or with patch bolts? A. Riveting it on. 2. What lap should the sheets of a boiler have, size of boiler 17 ft. long, 66 in. diameter, iron ⅜ in. thick, and seventy-two 4 in. flues, and at what pressnre would they be safe with only ⅞ in. lap? A. If single riveted, and using ¾ in. rivets, the lap should not be less than 2⅜ in.; if double riveted, 3¼ in. We cannot understand what you mean by ⅞ in. lap; ¾ in. rivet is the smallest that should be used in ⅜ in. plate; you would then have but ½ in. outside the rivet. If you mean ⅞ in. outside rivet hole, then by Government rule you could carry safely, if single riveted, 85 to 95 pounds per square inch according to the quality of the iron.

(31) J. J. A. asks: 1. How to find the shape of a plank or planks of a boat about 20 ft. long, so that it will assume the shape of the ordinary planking. I have the drawings of the boat I would like to make, and perhaps you could inform me how to proceed therefrom? A. The width at the several sections is taken from the mould loft floor and set off on the plank, and a batten setto strike through the points set off. 2. Also how to find the pitch of propeller, size of engine and boiler for a given boat? A. There is no general rule which will apply; size of vessel, the model, and draught of water all affect the question.

(32) F. F. asks: Can air be forced through a pipe a mile long by a pump, and if so, would it make a slight pressure? A. Yes; the pressure would depend upon the power applied to the pump.

(33) J. H. M. asks: How are nickel plated articles treated previous to being plated with silver? A. The articles are first dipped in caustic potash and so thoroughly cleansed, then dipped for a moment in nitric acid followed by a dip in water, after which the article is put into the silver bath.

(34) W. S. C. asks: In a steam engine, which gives the most power—lap or lead of the valve? A. Lap increases economy by working the steam to a limited extent. Lead does not increase the power, except in cases where passages are so small that the initial pressure cannot be maintained, when it does so to a slight degree.

(35) S. S. C. asks for a receipt to make common newspaper water tight and tough? A. Strong unsized paper is immersed for a few seconds in sulphuric acid diluted with half its volume of water. It is then washed in pure water or in a weak ammonium hydroxide solution. The acid liquid must be of the same temperature as the surrounding atmosphere. 2. Also a mucilage that does not soften by being exposed to the water? A. The addition of 2 per cent of potassium bichromate to the water in which glue is dissolved, just prior to its use, and exposing the glued article to light, will make it insoluble even in hot water. See also "Cements," SCIENTIFIC AMERICAN SUPPLEMENT, 158.

(36) E. L. B. writes: 1. I have a lot of shop worn nickel plated yellow brass harness trimmings. Can you tell how to mix a solution that will remove the nickel and not injure the surface of the brass? Can it be done without employing electricity? A. The only way that the nickel can be recovered is by buffing it off There is no other satisfactory method. Any solution that will dissolve nickel will likewise dissolve the other metals. 2. Would also like receipt for making yellow brass and red or bronze metal. I have experimented some in this direction, but cannot get the metal to run good and fetch the work? A. Yellow brass for turning: copper, 20 lb.; zinc, 10 lb.; lead, from 1 to 5 oz. Put in the lead last before pouring off. Red brass, free, for turning: copper, 160 lb.; zinc, 50 lb.; lead, 10 lb.; antimony, 44 oz.

(37) C. H. writes: 1. I am a fisherman, and in the course of a year catch a good many dog fish, gars, turtles, and other unsalable fish, amounting to several tons. How can I cheaply reduce them to fertilizers, so that they may be kept till wanted for use? A. Let the fish rot in open tanks or covered underground. After they have partially rotted, add sufficient dilute sulphuric acid to cover them, then neutralize by adding lime. Work the mass up and dry it. 2. What is the best preparation to use on fish nets, such as are set in the water to remain for a time? Am now using coal tar. Do you think pine tar better? A. Either coal or wood tar can be used; perhaps linseed oil would be better. 3. I would like to know how to reduce old bones to fertilizers, so that they will keep till wanted? A. Bones may be treated by filling an old barrel with alternate layers of wood ashes and fresh bones, slightly wetting from time to time with hot water. 4. What is a good bait to draw eels? A. Try tripe.

(38) D. W. E. asks: 1. How to temper open coiled springs, so that the coils do not close in heating and hardening. What is put between the coils when being heated? A. Nothing. 2. In winding a spring, after hardening and tempering, it broke; was the cause coiling it cold, getting it too hot, or hardening it too much? A. The spring should be heated evenly over a charcoal fire or in a muffle (oven) to a clear red, chilled in animal oil, and tempered by blazing over a charcoal fire. 3. What is the difference between a char-

coal and a coke fire for heating for tempering? A. Charcoal is preferable, as all coke contains more or less of sulphur, which is injurious to the integrity of the steel.

(39) J. S. C. asks: 1. Can molten brass be successfully run into iron moulds? If not, can you say the reason? A. The composition of brass—partly zinc, a volatile metal—precludes its successful casting in a cast iron mould, there being no adequate escape for the heated gases. 2. If that is impossible, is there any mixture which would do so, and take a silver plate by deposit or wash? A. Use a composition of which tin is the basis, and it will pour readily and plate easily.

(40) J. G. W. asks if there is an English translation of "Brehm's Animal Life"? A. "Brehm's Animal Life" is not yet translated into English.

(41) G. L. F. asks how to prevent his melted tin moulds from sticking to his sheet tin patterns when poured, the blacking of the pattern over a lamp proving futile? A. Use a blacking made of ordinary lampblack mixed with lard or sperm oil, and dust with powdered plumbago through a muslin bag.

(42) S. F. F. asks: Can malleable metals be compressed by pressure or hammering to one-half thickness, the edges being confined; or can the weight of metals be increased by pressure or condensing of the metal? A. No. All metals are subject to condensation by pressure, but none to the amount of one-half their bulk. No increase of weight is given to metals by condensation—the blank coin weighs the same as the finished coin. The only use of pressure of metals is making a better surface for finishing.

(43) A. C. G. says: 1. He has difficulty in procuring a fancy casting in an iron mould, using lead, solder, and a mixture of both, and heating the mould. The metals do not run. He asks what composition will do? A. Neither lead, nor lead and antimony—solder—will make a metal fluid enough for the purpose if the casting is thin. Use pure Banca tin, or tin 8, zinc 2, or a composition having tin for a base and no antimony. 2. He asks also how to make his ink black at the time of writing, or to become so afterward? A. We recommend you to examine article on inks in SCIENTIFIC AMERICAN SUPPLEMENT, 157.

(44) D. and T. ask: Can you inform us how light hardware, such as hat and coat hooks, curtain fixtures, etc., are bronzed? A. Dull bronze is given by a coating of bronze powder in white (bleached) shellac varnish—shellac dissolved in alcohol. A brilliant bronze is given by a coating of furniture polish left until "tacky," and then the bronze powder applied with chamois leather.

(45) S. R. R.—To sand wood: Paint the wood with a thick paint and dust the sand on through a sieve fixed to a small tin box in which the sand is placed.

(46) E. F. H. asks how Seidlitz powders are made? A. The following ingredients are mixed—in a blue paper: 40 grains soda bicarbonate, 120 grains Rochelle salts; and in white paper, 35 grains Rochelle salts.

(47) J. J. G. asks what is best compound to paint row boats with? A. Use zinc paint mixed with raw linseed oil.

(48) W. M. H. asks for a receipt for the liquid used to ebonize wood, and how to apply it? A. One gallon of vinegar, one-half pound of green copperas, one-quarter pound of China blue, two ounces nut galls, two pounds of extract of logwood. Boil over a slow fire, then add a pint of iron rust. Wash the wood with this. 2. Also, the receipt used by instrument makers for staining or lacquering brass that dark green seen on surveying instruments? A. Dissolve shellac in alcohol, strain, and add turmeric or gamboge in sufficient quantity to produce the desired shade.

(49) M. and W. ask how to boil soap water and kerosene, so that it would become a solid mass. What could be put in to make it become hard? Also, would it be dangerous to boil the kerosene? A. It is not possible to produce a solid mass in the way you suggest, for the reason that kerosene does not contain any fatty acid, and hence will not saponify. An emulsion can, however, be produced. Great care is necessary in boiling kerosene to prevent an explosion.

(50) W. S. M. asks: If coal oil, supposed to be 175°, should "flash" at a lower temperature at this altitude (10,200 feet), also the correct way to make the test? A. We do not know that the high altitude test for coal oil is known. We should judge that the "flash" temperature will be higher at the altitude you name. You may easily try it, by placing a thermometer in a small cup of the oil, and gently heating until by repeated trials of a lighted match passed over the cup about an inch above the oil a flash is produced; then note the temperature by the thermometer.

(51) J. B. H. writes: In the shop where I am employed there is an engine, 14 in. bore, 30 in. stroke, making 90 revolutions per minute; the steam pipe is 3½ in. gas pipe. The exhaust leads into a tight steam box, never in open air, about 60 feet away from engine; about one-half of the exhaust pipe is 4 in. gas pipe, balance 6 in. sheet iron pipe. question: is the exhaust sufficient? I have claimed that to take away the 4 in. gas pipe and to put in 6 or 8 in. escape pipe will improve it, inasmuch as the exhaust must be cramped at box. Is this so? A. You are right; if the box into which you exhaust is really tight, back pressure may be produced there, more than by the small exhaust pipe. Is there *any* escape for the exhaust steam from this box?

(52) A. J. asks: What to paint wood with, so that glued paper will not stick to the wood while the glue is drying? A. We would recommend you to coat the painted work with paraffine.

(53) S. L. asks: Which is the best wood for making violin tops? Norway pine and spruce are what we can get here. A. The body of the instrument is made by the best makers of straight grained deal, and the back of maple, sometimes of sycamore, and in very old instruments of pear wood.

(54) W. S. asks: Will one cell be sufficient to operate a small vibrating bell? If so, what kind of cell must it be? A. Use one cell of Leclanche or Fuller battery.

(55) C. F. J.—We cannot furnish you with the formula of soapine unless a chemical analysis were made to determine its ingredients. We are disposed to believe, however, that the essential constituent of the article is either the crude soda ash or pearl ash. The use of the name "Soapine" is, we believe, protected by law.

(56) D. E. X. asks how small steel springs can be blued to make a first class job? A. After the springs are hardened and tempered, run them through wheels of cotton, or rags of cotton, charged with rottenstone or any other abrading material which will leave them bright, and then heat them in hot sand to color, quenching instantly in cold water.

(57) A. F. L. asks how to make a sand blast, how to get or construct a bellows? A. You will require about one pound pressure for your sand blast. You will also need power for driving the bellows or blower. For a very small arrangement a circular bellows might do. A Root blower would do better, or you might make a gas holder after the principle of those at the gas company, or you might make a water jet from the city water works, like an injector with a siphon to carry off the water under the required pressure. See SCIENTIFIC AMERICAN SUPPLEMENT, No. 416.

(58) C. G. C. asks: Can you inform me through your paper of a good process for casehardening cast iron? A. If the casting is too large to be conveniently packed in a box with cementing material—ground bone, rawhide, etc.—heat it to a red heat and sprinkle powdered prussiate of potash on it, and before it cools plunge it into a cold water bath.

(59) E. S. S. asks in what position the sounding post of the violin should be placed to get best effect? Also of what material it should be made? A. Make the pin of spruce, place it under the bridge step on the right hand side or under the E string.

(60) C. D. asks: 1. Can I use No. 36 cotton-covered wire in making induction coil described in SCIENTIFIC AMERICAN SUPPLEMENT? A. It can be used, but silk-covered is to be preferred. 2. How much would I require of both kinds, covered or uncovered, for both secondary and primary coils? A. Use the quantity mentioned in the SUPPLEMENT referred to.

(61) B. W. D. asks: What adherent force could a magnet be made to have, and what size would be necessary for a force of from 10 to 30 or 40 pounds, if such is possible? Can such be procured? Would it adhere to rubber as well as iron? A. A magnet has no appreciable effect on rubber. A compound, permanent magnet 10 inches long ought to sustain 40 pounds or more.

(62) N. P. B. asks: 1. Will an induction coil one-fourth the size of that described in SUPPLEMENT 160 charge a Leyden jar, said coil being run by one cell of Law's battery? A. It would charge a Leyden jar feebly. 2. How do the iron battery, and the battery composed of niter with iron and coke electrodes, work with an induction coil? A. Any battery with sufficient current will operate an induction coil. 3. Would common spirits of niter do for the latter battery? A. No. Use nitrate of potash. 4. What is the proper thing to fasten the tin foil to the outside of a Leyden jar? A. Use shellac varnish. 5. What makes the fixed stars twinkle? A. Atmospheric disturbances.

(63) A. K. writes: I claim that the vapor arising from gasoline will ascend, the same as any other vapor; M. claims that it will go down. A. It has been found that benzine vapors, which are frequently the cause of fires in paint factories, seek the lowest levels, which they follow for long distances; and it has been shown that a fire in a furnace, the grate of which was but a few inches above the ground or floor, has ignited benzine vapors that came from a tank 200 feet away, a thin stratum of gas following the line of the floor that distance.

(64) H. N. H. asks of what is phosphorus formed, how obtained, and is there any other substance as easily ignited, and how? A. A very full description of the properties and methods by which phosphorus is manufactured is given on page 1,029 of SCIENTIFIC AMERICAN SUPPLEMENT No. 65, and also on page 1,657 of SCIENTIFIC AMERICAN SUPPLEMENT 104. Phosphorus melts at about 99° to 100° F., but potassium becomes spontaneously ignited when exposed to the air.

(65) R. S. B.—Caustic soda is obtained by treating or decomposing dilute solutions of sodium carbonate by means of quick lime. Its manufacture will be found described very completely in "Dussauce's Treatise on the Manufacture of Soap," or in Geo. Lunge's work on the alkalies. Sufficient general information will be found in Spons' encyclopedia or Ure's dictionary.

(66) H. & B. ask what the ingredients are for making a white stain for shoe bottoms? A. Use a stain consisting of soft water one pint, oxalic acid two tablespoonfuls, or more if stronger be required, then dissolve and add a sufficient quantity of flake white. This we think will prove satisfactory.

(67) F. L. O. writes: 1. Will you please tell me where to put my water gauges in building a boiler of mercury flasks, as described in SUPPLEMENT 182? A. The water line should be about 3 inches below upper end of lower flasks. 2. And what amount of steam I can carry with safety? A. 150 pounds per square inch will be quite safe.

(68) G. S. L.—Tellurium is sold as a curiosity at about $72.00 per oz. It has no recognized market value, as there is no demand for it.

(69) B. F. B. asks: Is common salt good to mix with oil to prevent an explosion? A. We have never heard that salt mixed with oil would prevent explosions.

(70) G. S. M. asks what the thermostats are made of that are used for regulating purposes? A. Some thermostats consist simply of a rubber bar. Some of a compound bar of strips of brass and iron riveted together. Others are simply large thermometers.

71) R. W. J.—The principal use of tripoli is for polishing powders; it is, also, sometimes used to give body to soap. At one time it came largely into use in the manufacture of giant powder, but its use for this purpose is now supplanted by wood pulp. It is not bought. Those who sell it own their own mines, and, therefore, it has no market. Under the trade name of Electro Silicon it is largely sold by a company on John Street, New York, but they have more than they can dispose of.

(72) A. L. asks how to make dark resin clear, and how to clean resin that is full of dirt, leaves, and bark? A. Melt it and strain through a suitable filtering material, or else dissolve in turpentine, and filter.

(73) P. R. R. asks: With what white substance can I cover a draughting board that I may easily erase the black pencil lines after the drawing has been copied or used? A. For this purpose paint the board with three or four coats of white lead ground in Japan. Rub each coat down after it is thoroughly dry with powdered pumice stone and water.

(74) A. W. B.—You can put your push button, your bells, and battery all in one circuit, if you do not object to both bells ringing at the same time. If you want to ring the bells independently, you must divide your circuit just below the lower bell and run two wires to the top floor and place a push button on each. Both push buttons may be connected with the same return wire. Cost of bells, from $1.50 upward. Push buttons, 35 cents and upward. Battery, $1.25 to $1.50 per cell.

(75) J. D asks: 1. Is there any means of restoring the oxygen to worn out prisms of the Leclanche battery? A. No. 2. By making and breaking the line circuit of a telephone you hear a faint click in it; is that produced by atmospheric electricity accumulated on the line? A. Earth currents and atmospheric electricity. 3. The objects in my nickel bath sometimes turn black, what is the trouble? A. Possibly your current is too strong. 4. Can I gain time by warming my nickel bath? A. Yes. 5. In a high speed engine, the piston, piston rod, and part of connecting rod come so many more times from their state of rest to a higher velocity, and again to rest, than a low speed engine. Is there not a loss of energy on account of the inertia of piston and connections, and consequently a low speed or rotary engine more economical than an ordinary high speed engine? A. The inertia is counteracted by lead or cushion. There is no very marked difference in economy. The present tendency among engineers is to high pressure and high speed.

(76) A. K. asks: What preparation they put on silver leaf that makes it look like gold, such as that on cheap mouldings? A. You can purchase a gold lacquer from large paint houses that will accomplish your purpose. A pale gold lacquer of 1 gallon of methylated alcohol, 10 oz. of seed lac bruised, and half ounce of red saunders dissolved and strained is often used.

(77) J. G. W. asks for a recipe for red-edging or gilt-edging books? A. The book is very firmly clamped between the arms of a press, so that none of the coloring materials shall penetrate among the sheets. The edges are then coated by means of a camel's hair brush with a mixture of carmine and a suitable shade of aniline red with sufficient gum arabic to thicken the solution. The ingredients vary according to the shade desired. In the case of gilt-edging the leaves are first coated with a solution of white of egg, gold leaf is then put on, and finally burnished with a tool tipped with agate.

(78) C. G. D.—The usual process of nickel plating is described in the SCIENTIFIC AMERICAN SUPPLEMENT, No. 310, under the title of Electro-metallurgy. It is necessary to polish the plating, and for this purpose rouge and buffers are generally employed. We would recommend you to read some of the works on the subject, such as Wahl's "Galvanoplastic Manipulations," recently published. See page 109 of SCIENTIFIC AMERICAN, current volume.

(79) C. E. P.—Your general conjecture about the minerals is correct. As regards tin, from a rough qualitative test, traces of it appeared present. We would suggest that a larger quantity of the mineral be forwarded and sufficient money ($5.00) be included, so that an assay could be made, by means of which the working amount of the metal could be determined.

(80) C. H. L. asks: Can you give me any information of Cooper Institute, and the conditions on which students are admitted? And is it so fixed that a student can earn his board and clothes? A. There is no bar to any student of good character entering the classes of the Cooper Union. Only ladies can enter the classes in engraving. They can earn the value of their work for themselves. There is no other means of earning anything within the Union. You may obtain a situation at any employment in the city, and attend the evening classes.

(81) S. W. R. writes: 1. What is the matter with my plating bath? I prepared it by dissolving 4½ oz. of nickel ammonium sulphate in 3 pints of water, according to SCIENTIFIC AMERICAN SUPPLEMENT No. 310. It plates dark, and when polished looks like lead. It seems to take a good deal more battery power than does the silver bath, is very hard to polish at all, and I understand should look nearly like silver. A. You are probably using too much current. Try a weak battery. 2. What will an induction coil 2 x 1¼ do? A. It depends upon the construction of the coil and the amount of battery employed.

(82) F. K. asks: 1. What is the best conductor of heat, that is, what material will retain the most heat the longest? A. The best conductor of heat according to Despretz is gold, and according to Wiedemann and Franz, silver. 2. What is the best non-conductor of heat, or just the opposite of the other? A. The best non-conductors are asbestos, mineral wool, paper, soapstone, and animal wool and hair. 3. Will an electric machine, if made in the lightest practical form and material, lift more than its own weight, and if so, how many times its own weight would it lift? A. An electro motor will lift almost any weight by means of a windlass or equivalent device. Time is an element which you do not consider. A light dynamo should sustain several times its own weight when used in connection with a suitable electromagnet. Your query is hardly clear enough to enable us to give you a definite reply.

(83) B. H. writes: If a perpendicular pipe one inch square surface be connected with a horizontal pipe of the same size, at right angles, both filled with water, and the perpendicular pipe be brought under pressure of ten pounds, the pressure in the horizontal pipe will be the same, viz., ten pounds. If ten pipes of the same size should be similarly connected with the horizontal pipe, and the water in each pipe brought under a pressure of ten pounds, would the pressure in the horizontal pipe be 10 × 10 = 100 pounds, or only 10 pounds? A. If the ends of the pipes are closed the pressure in the horizontal pipe will also be ten pounds plus the hydrostatic pressure caused by the height of water in the upright tubes; which adds one pound for every twenty-seven inches in height. The number of pipes does not affect the question.

MINERALS, ETC.—Specimens have been received from the following correspondents, and examined, with the results stated:

J. H. G.—The specimen is pyrite or iron sulphide, in a coaly slate or shale. It is not likely to be of any value.—R. T. B.—The mineral sent is magnetite, or magnetic oxide of iron. It is one of the most valuable iron ores that is found.

INDEX OF INVENTIONS

For which Letters Patent of the United States were Granted

March 25, 1884,

AND EACH BEARING THAT DATE.

[See note at end of list about copies of these patents.]

Advertising articles to cards, attaching, S. P. Mount 295,665
Air compressor, hydraulic, C. Pfanne 295,800
Alarm. See Fire alarm.
Animal trap, C. Hall 295,634
Antiseptic solution, J. F. Kennedy 295,876
Asphalt, machine for mixing, G. Winding 295,707
Bag. See Mail bag.
Bait, spoon, C. B. Hibbard 295,753
Baling press, J. D. Page 295,672
Ballot box, J. Klinger 295,560
Battery. See Galvanic battery.
Bee hive, J. Vanzandt 295,693
Bee hives, moth trap for, J. T. McElfresh 295,786
Belt stud, O. S, Turner 295,599
Blacking box, A. V. Sauford 295,677
Blasting barrel, G. A. Ingram 295,556
Block. See Saw mill head block.
Blotter, A. H. Frederick 295,625
Body protector, W. Gray 295,543
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Bolting chest, Kohnle & Hamilton 265 561
Boot or shoe toe cap, F. H. Kennedy 295,877
Borer, hand, W. E. Clough 295,523
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Button fastener, M. H. McNair 295,575
Button fastener, W. H. Wood 295,709
Button fastener staples, implement for setting, J. H. Goodfellow 295,539
Button hook or fastening, F. A. Smith, Jr. 295,823
Button machine, G. R. Williams 295,705
Buttons, etc., attaching, J. F. Thayer 295,593
Cabinet maker's clamp, W. E. Sheldon, Jr. 295,589
Camera. See Photographic camera. Solar camera.
Can. See Fruit, vegetable, and meat can.
Cane and cigar case, combined, D. Lee, Jr. 295,654
Capstan bars, etc., rack for holding, Foster & Hanford 295,746
Car coupling, F. K. Adams 295,609
Car coupling, N. P. Cowell 295,618
Car coupling, Duffy & McIvor 295,860
Car coupling, Huber & Barnhart 295,763
Car coupling, S. D. Lee 295,773
Car coupling, J. Shanaman 295,588
Car coupling, L. E. Sloan 295,684
Car coupling, G. W. Smith 295,829
Car coupling, W. H. Ward 295,697
Car coupling, H. B. Williams 295,706
Car, safety railway, E. Henn 295,637
Car warmer, chemical, C. Mitchell 295,576
Car wheel, Melvin & Clute 295,790
Car window curtains, device for holding, F. Furness 295,535
Cars from one track to another, mechanism for guiding, J. A. Heyl 295,640
Carpet stretcher, W. A. Skinner 295,824
Carrier. See Cash carrier.
Cash carrier for stores, C. M. Johnson 295,645
Caster, E. T. Thomas 295,689
Caster, W. Zimmer 295,850
Chain link, ornamental, S. L. Lederer 295,772
Chain tip, watch, H. M. Herring 295,869
Chandelier, extension slide, J. P. Bonner 295,519
Chimney cowl, E. R. Stasch 295,687
Chuck, lathe, J. S. Gilmore 295,623
Churn, W. H. Dyer 295,862
Churn, A. Jackson 295,766
Churn motor, H. C. Sadler 295,587
Clamp. See Cabinet maker's clamp.
Clasp. See Rope or line clasp.
Claw bar, W. H. Lyman 295,571
Clay crushing machine, F. E. Frey 295,533
Cleaning textile fabrics, wooden and metallic surfaces, etc., composition for, F. S. Monroe 295,382
Clock, alarm, J. Ganss 295,627
Clocks, electric alarm for spring, E. Jungerman 295,873
Clover huller cylinder, Land & Campbell 295,771