RECENTLY PATENTED INVENTIONS.

Engineering.

HEAT AND MECHANICAL ENERGY.—Hermann Mehner, Hackettstown, N. J. This invention is for a method of transforming heat into mechanical energy analogous to the theory of Sadi Carnot relative to a thermo-dynamical cycle of operations, in which a substance is finally brought to the same state in all respects as it had at the beginning. The method is stated to consist principally in changing the heat form of energy into a physico-chemical form and *vice versa*, the additional heat which may be stored in water in which saltpeter is dissolved being used to illustrate the application of the invention. "By exhausting hot steam into the hot salt a full condensation takes place without the help of any cool substance or body, no heat being carried off, and the entire amount being locked up in the molten mixture, to be transferred into a suitable boiler and transformed into steam at a somewhat higher temperature, whereby steam of higher pressure is made, and at the same time saltpeter in a dry state is again obtained and also the absorbed heat, heating being done with crystallizing salt, and the steam after doing its work being again condensed by the salt." The use of other solvents or volatile solutions and combinations of salts is provided for, admitting of a large number of modifications of the process in its practical application, the end being in each case to use mixtures by which the heat now lost in operating motors may be recovered and returned to the cycle of operations of the motor, proceeding in reverse order as regards the reactions by which the "heat binding" substances employed are affected. Twelve claims are embraced in this patent, and the final claim, which is very comprehensive, is for "a method for actuating a thermo-dynamical machine by first binding the waste heat of the machine by dissolving solid substances in the vapors or their products of condensation to form a liquid, and then desiccating the liquid at a high temperature to recover the solid substance and the vapor containing the waste heat and the additional new heat of a high temperature introduced by the desiccation to form power to drive the machine."

Railway Appliances.

CAR COUPLING.—Charles E. Seabury, Stony Brook, N. Y. This is an improvement on a former patented invention of the same inventor providing means for automatically coupling cars, the improvement specially providing means for holding the coupling link in a perfectly straight position, so that it will be sure to enter the drawhead of an opposing coupling. For this purpose the drawhead is made with a concave recess in the top, and attached to the link is an upwardly curved spring to fit the recess. The spring also allows the link to be moved to one side or the other or to be moved vertically, so that it may be made to enter a higher or lower drawhead.

CAR BODY.—John Turner, New York City. This invention covers a novel construction, especially adapted for horse, cable, and electric cars, and designed to give greater air space and more head room than is usual in the cars at present in use, while the car will not be higher, will be very strong, and can be built at the minimum cost. The construction also provides for the perfect ventilation of the car, and the arrangement is such that the ventilating apparatus may remain open in inclement weather without admitting rain or snow to the interior of the car.

SIGNALING DEVICE. — William Newcomb, Johnsonville, N. Y. A semaphore blade attachable at different points on a pivotally supported sectional hub has interior springs to counterbalance the weight of the blade, and is arranged for operation in connection with batteries and circuit wires and devices on a locomotive and at stations to set signals automatically by the action of electricity and gravity, to protect the moving train in front and rear. The mechanism is so constructed that a visual signal is exposed which may also be seen in the dark, thus protecting the train by night as well as in the daytime.

RAILWAY. — William S. Herrington, San Francisco, Cal. This invention provides for a construction especially designed for use in cities, in which the track is underground while the body of the car is above ground. A tunnel of uprights, bases, ties and braces, is constructed just below the pavement, and the casing of this tunnel is formed with a continuous central slot at the top, widened at curves, the trucks riding on their wheels on the tracks laid in the base of the casing, having each an upwardly extending hollow extension supporting a disk with a hub, on which the car body is swiveled. The roadbed will thus be formed independent of ordinary roughness of the surface, the track will not interfere with travel and cannot be obstructed by snow, and the danger from runover accidents is greatly reduced.

CAR AND BRAKE FOR LOGGING RAILWAYS.—John N. Valley, Jersey City, N. J. Two patents have been granted this inventor, in addition to one for a logging railway heretofore granted the same inventor, the construction of the road, carriages and brake being also applicable for general use in transporting passenger cars, freight, etc., in situations where a quickly made and inexpensive structure is called for. The railway structure is elevated, and consists of a longitudinal log stringer supported by laterally diverging posts hangers from the stringer supporting the track. The frame of the carriage is U-shape, its upwardly ranging sides or legs carrying the car wheels to ride on each side of the suspended track. From the bottom of the carriage depend hooks for supporting the load. The drawbar is bolted to the yokes forming the carriage frame, and extends beyond both ends, forming buffers, several cars being thus conveniently coupled together. The brake for this carriage is of novel form, and the brake shoes, instead of being applied to the wheels, are adapted to be brought to bear with great force against the sides and bottom of the track, giving a power of braking that is especially desirable in mountainous regions where steep grades are frequent. The brake is of simple and strong construction, and the brake lever is in convenient reach of the car or train operator.

Mechanical Appliances.

TOOTHED GEARING. — Matthew P. Campbell, Glasgow, Scotland. This invention provides a wheel having angular pivoted teeth with enlarged roots adapted to bear against each other, the teeth being free to oscillate on their pivots, the distance of the teeth from center to center being constant, while their inclination may be varied to accord with screws or worms of varying pitch. The pivot pins may be passed through a row of holes in a circle around the wheel rim, or two rows of staggered holes may be formed in the rim, alternate teeth being pivoted in the outer circle of holes and the others in the inner circle. This gearing is especially adapted for the transmission of great power, and is particularly designed for use on wormwheels and worms.

MACHINE WRENCH.—Marshall Martin, Walla Walla, Washington. This is a combination wrench and bolt holder, in which the cog die and its toothed driving gear and shaft are contained in a housing composed of separate plates hinged together, and united by a fastening adapted to admit of the housing being opened as required. The device is especially adapted for use on the rims of vehicle wheels, to hold and fasten the screw bolts and nuts which assist in securing the tires on the wheels, and for unscrewing the bolts when required to remove the tire.

SANDPAPERING MACHINE. — Herbert Spoor, Berlin, Wis. In this machine the sandpaper is secured about the face of a horizontal cylinder, and the material to be operated upon is fed over the cylinder by means of feeding rollers, the invention providing for the uniform adjustment of the cylinder and of the feed rollers, while a reciprocating as well as a rotating motion is imparted to the sandpaper cylinder. The construction of the machine is such as to facilitate the ready adjustment of its several parts to the work in hand, and insure the regular feed of the material operated upon.

AX HANDLE FASTENER. — Joseph M. Didero, Lorain, Ohio. The end of the handle adapted to enter the eye of the blade has a transverse central slot crossed by a longitudinal slot. A wedge having a head fits in the central slot, and side wedges are introduced into the longitudinal slot, one at each side of the central wedge, the side wedges having heads with one side rabbeted on the under surface to adapt them to fit over the head of the central wedge. As an additional security, each of the side wedges has an aperture adapted to register with corresponding apertures in the blade at each side of the eye, and when the handle and wedges are in proper position a screw or bolt is passed through the registering apertures and through the handle.

NIPPLE HOLDER.—Henry B. Spencer, Catskill, N. Y. This device consists of a hollow body having one end internally screw-threaded and a plug adjacent to the threaded portion through which extends a squared hole, there being mounted in the threaded portion of the body a tapering head with cutting edges and having a shank extending through the hole in the plug, while a screw mechanism moves the shank and head. This improvement forms a simple and convenient device to efficiently hold the nipple while a thread is being cut on it.

CHUCK JAW. — William J. C. Rowe, New York City. This invention relates to extension jaws for chucks, providing a simple, economical and durable device stepped to receive articles of different diameters and capable of being readily attached to the jaws of any chuck to increase its capacity. For this purpose reversible auxiliary jaws are employed, which, when turned upon one face, will receive large objects, and when turned upon the opposite face, will clamp small articles. The auxiliary jaw may be a casting or a forging with central opening to receive and neatly fit the chuck jaws forming a portion of the ordinary chuck, the slotted portion being flat and smooth and adapted to fit closely to the face of the chuck.

CONCENTRATOR AND AMALGAMATOR.—Jacob Rodermond, New York City. Combined with a receiving pan having horizontal rotating arms and teeth on their lower faces, with perforated upright blades on their upper faces, a bottomless cup encircling their central portion, is a lower pan containing mercury, an apertured disk being in the pan and perforated plates attached to its upper face, while combined agitating and gathering devices are secured to its lower face. These devices consist of a horizontal body from which depends a spiral blade having its ends laterally curved in opposite directions, while there is a tubular connection between the upper portion of the upper pan and the lower portion of the lower pan, the improvement being designed to afford a simple and durable machine for treating ores, in which any number of pans may be employed.

Miscellaneous.

ANNUNCIATOR. — William C. Dillman, Brooklyn, N. Y. A swinging leaf carrying a mouth piece is arranged at the mouth of a speaking tube, a catch holding the leaf in raised position, while electrically operated means are employed for releasing the catch, and an electric bell is arranged in a circuit which is closed by the dropping of the leaf. When speaking tubes from several points all center at a common point, this improvement enables a speaker in a distant room to indicate positively at the central point the tube through which he is calling, as the leaf carrying its mouthpiece will be dropped and a bell rung by pressure on a push button, the bell continuing to ring until the leaf is again thrown up.

WASHING SUGAR.—Ramon F. Cordero, Rubio, Venezuela. This invention relates to the washing of sugar by alcohol, providing therefor a special form of apparatus whereby the same alcohol may be retained and used to wash successive charges. Combined with the sugar-receiving cone is an alcohol supply receptacle having a valved connection with the upper end of the cone, an outlet at the lower end of which has a glass section, below which and connected therewith is a boiler. There is an alcohol-condensing apparatus above the boiler, a trapped vapor pipe leading from the boiler to the condenser, and a valved pipe connecting the latter with the alcohol supply receptacle. The operation of washing the sugar and condensing the alcohol may be kept up in rapid succession, while one charge is being washed the alcohol of the preceding charge being separated from the molasses.

FABRIC TURFING TOOL. -- Vicente Fernandez, Guanajuato, Mexico. This is an embroidering implement that may be readily carried in the pocket and used on a great variety of work. Its handle carries a hollow sleeve, and a spring-pressed rod having one end formed into a sleeve is adapted to slide in the handle sleeve, the opposite end being slotted and bent to form a presser foot. A rod extends through the handle sleeve to one end of which a needle is attached so as to project through the presser foot, the position of which is regulated by a brake. The tool is easily threaded, and may be readily changed to carry a great variety of thread, and it may be conveniently operated by a single hand.

HORSE DETACHER AND BRAKE.—Annie H. Chilton, Baltimore, Md. Arranged to slip on the ends of the shafts are cuff-like sections, to which are connected the traces, the singletree, and locking arms to hold the traces in place, the arms being connected with a spring-actuated locking device, by operating which the cuff-like sections may be pulled off the shafts. The invention also provides effective means whereby, when the horse is released from the vehicle, the shafts will be held up from the ground and the vehicle will be braked, thus avoiding the danger of an upset or of the breaking of the shafts after the horse is released.

INCUBATOR.—Archer H. Burr, Omaha, Neb. A double-walled case holds the egg trays, above which are located double tanks with their upper compartments open, an outside double tank provided with means for heating being connected with the inside tanks. The invention is an improvement in that class of incubators adapted for automatically supplying the egg chamber with the right amount of moisture and air, maintaining an even temperature therein if sufficient heat is supplied to the heating tank.

TYPE WRITING MACHINE.—Eugene A. Ford, New York city. This typewriter is designed to print a large number of characters or letters without the necessity of multiplying keys, while the ink ribbon is automatically moved to unwind from the full reel and wind upon the empty one. The finger key is specially adapted to rapid work, being so formed as to allow the finger to readily slip from its edge after the key is depressed. A series of tubular type arms in the machine carry spindles having on their free ends heads with different type and different sides, and on the opposite ends segmental pinions engaged by a circular rack in any position in which they may be placed, a locking and releasing mechanism controlling the rack, which is moved by a double-acting key and a series of levers.

DOOR TRACK AND HANGER.—Charles O. Parsons, Milwaukee, Wis. The door track is, according to this invention, supported from the studding of a partition wall by end brackets, and intermediate brackets, there being preferably three of the latter, one at the center and one at each side of the doorway or frame. Adjusting screws are provided to elevate or lower either end of the track to compensate for any settling of the building, and cause the doors to hang plumb at all times, and this can be done without the aid of a mechanic, as the adjusting devices are within easy reach without removing parts of the door frame or partition. The improvement is specially designed for use in connection with division doors of living rooms.

TRUSS.—George V. House, Jr., New York City. This invention provides a truss having improved means for altering the size, form, and relative position of the pad, to adapt it for service in all varieties of hernia. This truss has a pad bulb, made of partly elastic material, such as India rubber, etc., adjustable by means of a pivotal shank, entering a carrier plate after passing through a slotted base plate, and engaged by a binding screw passing through one of a series of holes arranged in rows radiating from the pivot shank in a cap plate and in the truss band between the cap plate and base plate.

TRUSS PAD.—An additional patent has been granted the above inventor for an improvement, whereby the production is cheapened and a more convenient, lighter device is afforded. In such cheaper grades it is found that good results can be secured by using a rigid pad bulb and dispensing with the carrier plate, the bulb having on its inner face a nut in which works a threaded hub with fixed headed shank, the base plate having a slot enlarged at one end to permit the head to enter and admit the shank in the slot, the pad and base plate being adapted for disconnection without removing the hub shank, and the position of the pad being readily adjustable.

LAMP EXTINGUISHER.—John B. Greenhalgh, Blackstone, Mass. This is a simple attachment designed to be readily applied to any ordinary lamp burner, by which the flame of the wick may be extinguished, and which will operate automatically to put out the light when the lamp is overturned. Two hoods having depending shanks are pivoted on the wick tube, a spring-pressed lever having a cup at one end and engaging the shanks by its other end, normally holding the hoods closed, while a weight resting in the cup of the lever holds the hoods open.

PUZZLE.—Elmer E. Jenne, Ilion, N. Y. This device consists of a closed receptacle containing a series of circular spaced ribs provided with non-aligning apertures, the cover having an inlet opening over a space inclosed by one of the ribs, and a second opening showing solid portions of the ribs. The puzzle is for the player or operator to so manipulate the board or receptacle that concealed balls may be made to travel from the innermost to the outermost circular space and back to the starting point.

NOTE.—Copies of any of the above patents will be furnished by Munn & Co., for 25 cents each. Please send name of the patentee, title of invention, and date of this paper.

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 Written Information on matters of personal rather than general interest cannot be expected without remuneration.

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

Books referred to promptly supplied on receipt of price.

Minerals sent for examination should be distinctly marked or labeled.

(3229) F. & L. ask for some information in regard to staining cigar box lumber. A. Cigar box lumber is prepared by veneering. Whitewood is often used as the basis, veneered with Spanish cedar. On soaking a piece in water, the thin layer will come off.

(3230) E. C. A. writes: In our saw mill we are running a 54 inch circular saw at 700 revolutions per minute and another 34 inch saw at 1,200 revolutions per minute, which runs at a right angle with the big saw. The smaller saw is placed about 20 feet from the large one and about 8 feet to one side, and runs in the same direction. It has a ring of holes 9 inches from its center running all around the saw, and when in motion everything in the mill can be seen by looking through this ring of light as plain as looking through common window glass, and everything looks just as natural except the large circular saw, which appears to be revolving slowly backward, so slow that every tooth in the saw can be seen as plain as when standing still. When stopping the mill, the large saw appears to stop long before it really does. What is the cause of this strange delusion? A. The effect described is similar to that produced in the stroboscope or zoetrope. It is due to intermittent vision and the persistence of the retinal image. The rate of rotation of the small saw was related to that of the large saw in such a way as to permit of seeing the teeth of the latter only when the teeth were in certain positions, thus causing them to appear nearly stationary. The revolving saw viewed through an instantaneous photographic shutter would appear stationary. If viewed through a shutter opened and closed once during each revolution of the saw, the eye would receive a succession of images which would be retained by the persistence of vision and then blended into one continuous image. The small saw acted as a shutter in producing this effect. It is not necessary that the shutter should be limited to one exposure per revolution of the saw. There may be a number of exposures, but to make the saw appear stationary, the number should be an aliquot part of the number of teeth in the saw.

(3231) C. A. B. wishes the formula for the preparation of the platinum paper used by photographers. A. The sensitizing bath is made by dissolving dry ferric hydrate in a concentrated hot solution of oxalic acid. The acid is poured on to the ferric hydrate until it is just dissolved. Then 12 parts of sodium chloro-platinite are added to the hot solution. The whole is filtered and the solution thickened slightly by evaporation. The paper well sized is laid or floated

on the sensitizing bath for five minutes, is then hung up to dry, and should be kept dry or in a vessel containing chloride of calcium placed in a false bottom. In printing one-third longer time is required than with silver paper. The print, which is only slightly discernible, is next dexterously floated on hot oxalate bath heated from 120° to 140° Fah. The developing oxalate bath is made as follows:

Oxalic acid	25 parts.
Sodium chloro-platinite	2 "
Water	250 "

The picture quickly develops out according as it has been printed. It is then washed in dilute hydrochloric acid and water baths and dried. See also SCIENTIFIC AMERICAN SUPPLEMENT, No. 711, page 11360.

(3232) J. M. writes: Do you think from a sanitary standpoint it would be proper to discharge the sewage of a hotel into a dry well, twenty feet deep, the bottom of which is loose, porous sand? The well will be 300 feet from the building. And if there would be any danger of contaminating the water of a spring 1,600 feet from the well and which runs from the base of a hill opposite to the one on whose side the well will be located? It is the intention to use disinfectants and deodorizers in the well; and do you think quicklime sufficient? A. From a sanitary standpoint it would not be proper to discharge the sewage into the well. The better way would be to make a tight cistern of cement in the ground to receive the sewage, the contents of the cistern to be periodically removed and spread on the ground at a distance from habitations. The well, if used as a receiver of sewage as you propose, would be likely to contaminate the spring and other waters near or distant, below the level of the bottom of the well. Quicklime would be a poor disinfectant.

(3233) J. C. S. & Co. — The work on the specimen of etched glass received was done by means of hydrofluoric acid, either in the form of liquid or vapor. The entire glass, with the exception of the portion to be etched, is covered with a protective coating of varnish or wax. If liquid hydrofluoric acid is used, the glass is either dipped into it or a wax lip may be built up all around the plate and the acid poured on. The etching requires 5 or 6 minutes. After the acid is poured off, the glass must be thoroughly washed with water. According to another method, powdered fluorspar is placed in a lead trough and sulphuric acid is poured over it. The glass is laid over the trough face down, and the etching is effected by the vapors. Great care is required in the use of this acid to avoid inhaling the vapors or allowing it to touch the skin.

(3234) T. H. W. asks: Is there a colorless wash or varnish that can be applied to a bright metal surface that will not easily rub off and prevent rust? A. Mastic or very thin white copal varnish may be used for bright work.

(3235) J. M. S. says: 1. Will you please tell me how an amateur can take photographs in colors? I have tried a mirror back of the plate, without success. Also if plates are manufactured for photography in colors, if so, where can I buy them? A. The Lipmann process of photographing in colors is only an experiment and is confined to the solar spectrum. No practical process has been formulated. Try Cramer's isochromatic plates, which reproduce the color values to better advantage. 2. Please give me a formula for making blue print paper that will keep for a long while? A. For a blue printing formula see SCIENTIFIC AMERICAN SUPPLEMENT, No. 584.

(3236) R. P. P. writes: Please find inclosed sample of cement taken from a thermometer used by packers of canned goods and upon steam boilers, which stands heat and pressure of about 300 degrees. It is used to form a steam tight joint between the thermometer tube and the brass casing. Will you be kind enough to inform a yearly subscriber of your paper how to make and use this cement, also if it will stand brine? A. The cement appears to be composed of plaster of Paris mixed with a solution of silicate of soda or soluble glass. You can obtain the silicate through the drug trade. It may be plaster of Paris mixed with strong solution of alum, or oxide of zinc mixed with a solution of chloride of zinc 10 to 20 per cent. Either cement is applied like plaster of Paris, and will stand brine reasonably well, especially the latter.

(3237) R. H. W. writes: I herewith inclose you a box of matches, just as it was opened, except two matches taken out. Will you kindly explain, through the columns of your journal, how every match in the box could be charred in this way, the phosphorus all burned, and no greater combustion. The wood part of the match seems to be merely discolored. The box containing them shows no mark of violence, and is not burned. These matches were packed 1 dozen boxes in a paper which was sealed up nearly air tight. A. The composition on the end of the matches probably contained phosphorus mixed with some compound rich in oxygen. If the package was closely sealed, the combustion would for want of air be confined to the ends of the matches if these became ignited. Moisture, if present, would be of great effect in reducing the intensity of the combustion, and might by itself suffice to confine it to the tips. How the ignition occurred can only be a matter of surmise.

(3238) O. McK. writes: 1. I want to make a dynamo from which wires run to the motor which drives the machine. If you have a SUPPLEMENT telling how to make such a dynamo, please say what number it is. A. SUPPLEMENT No. 600 contains full information on the construction of an 8 light dynamo. 2. What is a laminated armature? A. A laminated armature is one in which the core is formed of thin iron plates separated by insulation. 3. What candle power lamp would this run? A. The dynamo above referred to runs eight 16 candle power lamps. 4. Does distance between dynamo and motor have any effect on the speed? A. The distance makes a great difference if not compensated for by an increased cross section of conductor. If the resistance is kept down, the distance is immaterial.

(3239) C. G. A. asks: Can you give me any preparation for softening the wings of butterflies and moths, after they have become brittle? Can you tell me of something that will take parasites off worms without killing them, and keep large beetles from becoming odorous? A. The wings of butterflies are softened by placing the insect on a piece of hot clean paper laid on wet sand contained in a jar. In the course of 2 to 5 hours the wings are sufficiently soft to permit of spreading the same. Parasites can be taken off caterpillars by means of a fine pair of pliers, but the results are usually not very satisfactory. Large beetles are best opened on the tail or belly and the inner organs removed to avoid rapid decay and smell. (See SUPPLEMENT catalogue.)

(3240) H. G. wants a formula for albumenizing and silvering paper for photographic printing, one that will make paper which will keep for some time if possible. A. You can purchase albumenized paper with less expense than will be required to make it. To sensitize albumenized paper that will keep for some time, prepare a nitrate of silver solution by dissolving sixty grains of silver to the ounce and do not let it get lower than 50 grains to the ounce, testing occasionally with the hydrometer. After solution of the silver, add citric acid drop by drop, until the slight precipitate of citrate of silver formed is just redissolved. Float the paper on the bath from three to five minutes, and on removing, place between sheets of clean blotting paper, which may be used over again. Paper thus prepared has been kept white and good for nine months and tones easily.

(3241) G. G. writes: I wish to ask if you know of any substance to cover large nickel plated wrought and cast iron work to stop corrosion during transmission to South American ports. From experience I know that brass instruments covered with lacquer, notwithstanding being carefully packed, turn black and have to be shipped in air tight tin boxes. A. A good protection for nickel plated goods for export is paraffin applied hot, and the goods then wrapped in paraffin or wax paper. Waxed paper bags make an excellent waterproof and air tight package.

(3242) T. B. asks for a formula for toning wood prints black, or the color of prints on albumen paper. A. Tone with a bath made of—

Chloride of gold	1 gr.
Pulverized borax	60 "
Water	4 oz.

See page 225 of SCIENTIFIC AMERICAN, April 13, 1889.

(3243) J. A. R. says: Please give me a good formula for making a preparation which will kill the bed bug and destroy its eggs. A. Use corrosive sublimate, to be had at drug stores. Druggist will tell you how to use it.

(3244) T. D. McC. writes: In your answer to query No. 3180, I notice what looks like a slight error. You say, "If you divide the voltage by the number of watts, you will have the current in amperes required." As W = C E, dividing the number of watts by the voltage will give the required current, which is 0·845 ampere. The resistance of motor should be 130 ohms.

(3245) D. McC. S. S. writes: 1. I notice in this week's issue of your valuable paper, you state in answer to query 3152, "What is the difference between a square foot and a foot square? A. There is no difference in area or quantity of surface, but there may be a great difference in shape," etc. Now it seems to me that though this answer is, when applied to one square foot, perfectly correct, it would be liable to be misleading when applied to more than one. Thus, for instance two feet square would be equal to $2^2 = 4$ square feet, and I therefore think that the number of square feet in a given area of feet square would be best expressed by the formula x F. sq. $= x^2$ sq. F. Please inform me whether this is not correct. A. This is right as far as it goes, but your formula only applies to squares, and does not take rectangular figures within its scope. 2. Also, could you inform me what is the value of ordinary carrier pigeons in this country, and would these be capable of carrying small packages of say 4 to 8 oz., or can they only carry very light letters? A. Carrier pigeons can only carry light letters. Their price varies with their age, breeding, and proved abilities. 3. Also what is the world's total output per annum of platinum, and what is the present and what the average price of such? A. We have no very recent figures. In 1887, the production of platinum in Russia was placed at 113,724 troy ounces; 2,000 or 3,000 ounces additional were produced elsewhere.

(3246) B. M. I. asks: 1. How is wood made into pulp, and how is wood pulp converted into paper? etc. A. For wood pulp we refer you to our SUPPLEMENT, Nos. 293, 299, 311, and 570. 2. What is "Frankford black" and how is it made? A. It is a kind of black, said to be made by burning grapevine twigs or cuttings, used in printer's ink.

(3247) H. H. W. asks: 1. What is the chemical formula for aurate of ammonium? A. It is of indefinite composition. A typical formula would be $Au_3O_4(NH_4)_2.3H_2O$. 2. How is it manufactured? A. By precipitating a solution of gold with ammonium hydrate and boiling in an excess of the same; or by digesting auric hydrate in a solution of ammonium sulphate. 3. What is its explosive power compared to nitroglycerine? A. Probably ⅛ that of nitroglycerine. 4. What is the highest explosive known? A. Of the commercial explosives, nitroglycerine. 5. Can fulminate of silver or mercury be exploded without drying or removing from the liquids from which it is produced? A. Safety is secured by keeping them immersed in water, yet explosion while so immersed is at least a possibility. 6. Will nitric acid and glycerine produce enough heat on uniting to explode itself? A. No.

(3248) L. M. asks: 1. I have some specimens of satin spar that have been cut into gems for setting. They are beautiful, but are very soft. Is there any way of hardening them, also can they be colored, and how? A. They cannot be hardened nor satisfactorily dyed. 2. What way is there of preserving natural colors, in dried and pressed flowers, etc.? A. Only by avoiding exposure to light. 3. I have specimens of quartz, clear and white crystals, etc., that have been naturally stained red and yellow by sulphur, iron and alum. What chemicals or receipt can I use that will clean them and remove the stains without injuring the specimens? A. You can boil in strong hydrochloric or sulphuric acid without effect on the quartz. 4. Where can I buy agate and jasper in the rough, in vicinity, and price per lb., also Mexican onyx that is used in New York, and any other semi-precious stones for ornamental and fancy work, in rough and polished? A. Address Tiffany & Co., or Eimer & Amend, of this city.

(3249) J. R. N. asks: What is the metal gallium? Where found? What are its uses? And how long has it been known? A. Gallium is an exceedingly rare metal, and hitherto only a chemical curiosity. It is found in zinc blende from the Pyrenees and other localities. It was found in 1875, by Boisbaudran.

(3250) G. A. D. asks: 1. What is an alum cell? What is an iodine cell, and how can I construct them? The above are mentioned in "Experimental Science," on page 189, under radiometer. A. An alum cell is a tank with plate glass sides filled with a strong solution of alum. It stops most of the heat rays while allowing the light rays to pass. For use in an ordinary lantern, the cell should be ¾ inch thick. An iodine cell may be made with glass sides, but rock salt is used when perfect results are required. The cell should be 2 inches thick. The solution is made by dissolving iodine in bisulphide of carbon. The solution should be a saturated one. This cell stops the light rays and allows the heat to pass. 2. Also a selenium cell, and how can it be made? A. Selenium is rubbed on a heated brass grating; the heat melts the selenium, and some of it enters the spaces in the grating. When the selenium has cooled and crystallized, the cell is ready for use. You will find a full description of the photophone in "The Telephone," by G. B. Prescott. 3. Is it possible to reduce the resistance in a vacuum tube for the passage of the electric current to an equivalent of, let us say, the resistance of dilute sulphuric acid? A. It would be impossible to reduce the resistance to that extent. The resistance of an ordinary vacuum tube is about as small as it can be. 4. How much are five degrees Fahrenheit expressed in heat units? A. A heat unit is the amount required to raise the temperature of one pound of cold water one degree Centigrade. The Centigrade scale can be converted into Fahrenheit according to the following formula:

$$\frac{\text{Centigrade} \times 9}{5} + 32 = \text{Fahrenheit.}$$

5. Where could I buy an air pump (piston pump) of good reliable make which would not be too expensive? A. You can buy air pumps from any of the dealers who advertise in our columns.

(3251) C. A. H. asks: In rewinding a small electric motor, say about one-eighth horse power, to adapt it to Edison 110 volt circuit, what should the resistance be in the fields and armature, and the best way to connect up shunt or series? A. The resistance of the machine should be such as to use the amount of current required for the power needed. An electrical horse power is 746 watts. A watt is one ampere multiplied into a volt. If you require one-eighth horse power, you will need about 93 watts. Your E. M. F. is 110 volts; therefore, if you divide the number of watts by the voltage, you will have the current in amperes required, which is 0·84 ampere. Now, to arrive at the total resistance of the machine, you will divide the voltage by the amperage, which will give you 130 ohms. Of this amount, if the machine is series wound, the resistance of the field magnet should be about one-half that of the armature, while if it is shunt wound, the resistance of the field magnet should be about fourteen times that of the armature.

(3252) F. H. B. writes: I have been rewinding a small motor for 110 volts, and about the same time you answer question number (3180) C. A. H. I have been questioning its correctness in my own mind and would like to ask you if am not correct and your answer is wrong; 746 watts divided by ⅛ gives 93 watts required. Now, you say divide the voltage by the number of watts and gives 1·18 amperes; but I think to divide the watts by the voltage is correct, which gives 0·84+ ampere. Now divide the voltage by amperes, and it gives 130·6+ ohms resistance of wire, instead of 92 ohms. I think this way is correct, because watt is voltage multiplied by amperes. Now, having the watts and voltage, the ampere must be the number of times the voltage is into the watts, instead of watts into voltage, as you state in that answer. A. You are correct in your conclusions in regard to determining the amperage and resistance of the motor. The reply referred to was erroneous, the same is corrected in this number of the paper.

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August 4, 1891,

AND EACH BEARING THAT DATE.

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