a dollar of 1804? Also, how many dollars were coined in the year 1804? A. Address Superintendent of the Mint, Philadelphia, in regard to value and coinage.

(3991) G. M. W. says: 1. I want a metal that I can heat mercury or quicksilver in, to about 500° or 600° F., that the mercury will not injure or that will not injure the mercury. Will steel do? Or is there any way of preparing steel so it will do? A. Steel or wrought iron tubing is the best to hold mercury, requiring no preparation. There is no reaction by either metal on the other. 2. How much pressure would a flue about three-eighths inch inside and five-eighths inch outside stand before it would collapse? The flue to be made of steel or whatever other metal you advise using. I want one that will stand the greatest possible pressure. A. Three-eighths inch gas pipe, if properly welded, is good for pressures up to 3,000 pounds to the square inch, and three-eighths inch extra strong is good for 6,000 lb. per square inch. 3. How thick would I require the metal of a cylinder 6 inches diameter inside to be, to stand same pressure? A. Six inch wrought iron pipe should be equal to a working pressure of 1,500 lb., and extra strong 6 inch equal to 3,000 lb. For these working pressures, the pipe should be tested to 50 per cent higher pressure. 4. Please tell me how much mercury expands with heat. Say 100 cubic inches at 0° F. How much would there be at 300° F., also at 600° F.? A. One volume of mercury at zero becomes 1·0256 at 300° F. and 1·0313 at 600°.

(3992) B. E. W., Antonio, Kans., writes: I want to make for my own use a four or five inch astronomical telescope, with eyepiece for terrestrial use. Have had over four years' experience as a mechanic on fine and close bench work; have good eyesight and very delicate sense of touch. If you think it possible for me to grind and polish the lens, would ask as follows: 1. Where can I get the roughly ground glass castings for same, and at what price (for achromatic lens)? 2. Where can I get the material and gauges for grinding and polishing, and at what price? 3. Would it be better to buy eyepieces (celestial and terrestrial) already mounted in cell, or could I get separate ready ground lens and make them? 4. What standard work on the subject could I get that would aid me? A. There are large possibilities for amateurs with patience and perseverance. You can obtain the optical crown and flint glass from W. T. Gregg, optician, 122 Fulton Street, New York, cost about $2.50 per pound. You must make your own gauges and laps. You can buy eyepieces cheaper than to make them. You will find full instructions for grinding and polishing lenses, with the curves and kind of glass for telescope object glasses, illustrated in SCIENTIFIC AMERICAN SUPPLEMENT, Nos. 581, 582, 583. Also illustrations and construction of various eyepieces, in SCIENTIFIC AMERICAN SUPPLEMENT, No. 399, 10 cents each mailed. Byrne's "Hand Book for the Mechanic and Artisan" contains much information on grinding and polishing lenses. By mail, $5.

(3993) S. E. asks: 1. Can you inform me what the capacity is of the largest air pumps, not fans, in actual operation, and where, and about the size of their cylinders? A. The largest air pumps are the blowing engines of blast furnaces, with cylinders 6 to 8 feet diameter and 10 feet stroke, used in Pennsylvania. 2. Also have we any examples of suspension bridges whose suspending cables pass over more than two piers; if not, what is the first most serious objection (if any), or has this plan never been agitated? A. The suspension aqueduct at Pittsburg has seven spans. There are other suspension bridges of more than two suspending piers. We do not recall their names. There is no objection where it is necessary to have more than two piers, if proper trussing is used to prevent undulation.

(3994) A. M. says: Assuming that the wood is steamed and bent when green, and allowed time for the wood to be thoroughly seasoned and set in the bend, would it be inclined to lose the shape or curve if exposed to damp? If so, do you know of any process of rendering the wood damp-proof? A. Bent wood tends to resume its original shape when exposed to damp or becomes wet. The only way to prevent it is to finish and oil or varnish the bent wood, so as to prevent changes in its hygrometric condition.

(3995) J. H. G. asks what to use to wash brass or copper to give it a silver coating. I used to use a wash composed of quicksilver, sulphuric acid and rain water, but have forgotten the proportions. A. The process is to dissolve a small quantity of mercury in a solution of one part nitric acid to four parts water until it is saturated. Pour off the saturated solution, and to an ounce of the solution add a few drops of hydrochloric acid diluted with four parts water until a bright piece of copper is whitened by being dipped. Then dip any article, or rub the solution on it and wash.

(3996) D. R. C. says: I wish to paint the brick walls of a composing room, used for setting type, and also the rough hemlock joists under the roof with some white substance that will not scale off and fall into the type. Please state in the SCIENTIFIC AMERICAN what composition would be best for this purpose. Would like something not very expensive. A. We can recommend a whitewash made in the proportion of one-half a bushel of best lime slaked in hot water, eight quarts salt dissolved in hot water, 2½ lb. rice meal boiled to a paste, to which add one-half a pound white glue previously dissolved and one-half a pound clear whiting. Add the salt brine to the slaked lime and then the other ingredients. Keep it hot while using. Use a whitewash brush. Woodwork should be thoroughly cleaned from dust before applying this whitewash. It makes a bright surface like paint.

(3997) W. P. asks: How can I harden the tips or points of cog wheels, say to a depth of not more than one sixteenth of an inch? Said wheels are about 4 inches in diameter by half inch wide (or thick). The material is crucible cast steel. A. We suggest placing the gear on a revolving spindle at the proper heat, and to quickly bring a jet of water to bear upon the teeth. Speed should be about 600 revolutions per minute. Have the jet half an inch diameter, and under 20 or 30 lb. pressure. This will harden the teeth only. Steel should be as low in carbon as is compatible with hardening, to prevent cracking of the teeth.

(3998) Reader asks: 1. In what SUPPLEMENTS are the directions for making dynamos, motors, and telephones? A. We refer you to SUPPLEMENT, Nos. 161, 600, 720, 793, for dynamos; to Nos. 641, 759, 767, 783, for motors; and to Nos. 142, 163, 250, for telephones. 2. What are the formulas (chemical) for cutting copper and zinc? A. Use nitric acid for copper. Sulphuric, hydrochloric or nitric acid will dissolve zinc. 3. Is there any way I can get a catalogue from electrical firms without asking each one directly? A. You might make known your wants by advertising. 4. In wrapping an induction coil 3½ inch the primary layers are to the secondary as 3 : 10. What is the ratio for coils increasing an inch each time, using wire 18 and 32? A. The E.M.F. of the secondary is to that of the primary as the number of turns in the secondary is to the number of turns in the primary, while the amperage in the secondary is in inverse proportion to the E.M.F. For an answer to your medical query we advise you to consult a physician.

(3999) J. M. M. asks: How much does a bar of railroad track expand and contract in length, and how much space ought to be between the ends or joints? A. Rails vary in length by the extreme temperatures in the United States, about one-quarter of an inch in 20 feet, and for 30 feet rails about 7-16 of an inch, so that rails laid at time of mean temperature in the Northern States should have half the above spaces between the ends; in the Southern States, one-quarter. Rail laid in summer in the Southern States may have an allowance of 1-16 inch in 20 feet rails, and 3-16 inch in 30 feet rails.

(4000) M. C. A. C. asks: 1. How to keep linoleum bright. A. Wash with equal quantities of milk and water. Once in several months a little linseed oil or a weak solution of beeswax in spirits of turpentine may be used. 2. How are face powders perfumed? A. Use a few drops of some essential oil, as bergamot. Keep the powder in an air-tight jar.

(4001) F. E. W. asks: 1. Of what material are graphite bearings made, so that they require no oil? A. Graphite freed from grit. 2. Which kind of a wind engine (or mill) is the most serviceable—with or without cog gearing? A. Consult our advertising columns for a reply to this query.

(4002) M. R. asks: Will you please tell me if a common battery of blue vitriol and water, with a copper and zinc, will light a two, three, or four incandescent lamp, and how many cells would it take, and where could I get the lamps, or what kind of a battery does it take? A. A gravity battery is of no use in electric lighting. It is sometimes employed for charging secondary batteries, and the latter are used for operating lamps. The secondary battery is the best for lighting purposes.

(4003) F. V. C. asks: 1. Is there any cheap substitute for the porous cups that come in batteries? A. Nothing very efficient. Try flower pots with the holes corked up. 2. What kind of battery is best for a motor? What for a storage battery? A. Storage battery for motors, and gravity batteries for charging the storage batteries. 3. Tell how to make the principal parts of a storage battery, and its dimensions, when used for lighting. A. For this information see SCIENTIFIC AMERICAN, vol. lxi., page 22. 4. Describe a small compressed air motor run by a power of 30 lb. per square inch from a small water pipe. A. A small compressed air motor is substantially the same as a steam engine. 5. What acid is used to reduce soft wood to pulp? Can it then be brought back to a hard substance? A. Nitric and sulphuric. By proper treatment the wood is converted into cellulose, which is explosive. It can be dissolved in a mixture of alcohol and ether, and will solidify on drying.

(4004) W. T. says: Can you inform me about what per cent of heat contained in anthracite coal, burned in a stove made for heating only, can be liberated into a room, or can you tell me whether there is necessarily a loss of 50 per cent or over, under the most favorable conditions? A. The loss of heat in common stoves may be as great as 50 per cent, but with the best stoves, provided with large absorbing and radiating surface, the loss should not be greater than 25 per cent, and much of this might be saved by extending the stovepipe, so as to utilize all the heat, save enough to create draught. Much of the heat is also lost by opening stove doors for ventilation.

(4005) W. L. J. asks: Would a 500 lb. ball, say, fired from a gun in a perpendicular position, with a charge of powder sufficient to throw it vertically say five miles, return to the earth with the same velocity with which it started? A. It would not. The friction of the air materially retards its velocity, due to gravity.

(4006) H. H. S. says: 1. I have a 2 inch pipe, 1 foot under ground, 75 yards in length, which drains a creamer; am bothered with it becoming filled with something that obstructs the flow of water. Give me a solution to clean it. A. If the pipe is foul from the drainage matter, use a strong solution of caustic potash, not soda, in boiling hot water. If necessary, stop the end of the pipe while the hot lye is running, fill the pipe, and let it remain over night. 2. I want to know the proper side to run a leather belt, in regard to the splices, that is, ought the end of the splice or lap butt the face of the pulley? A. The belt ends should be butted together and laced to make a smooth surface. If put together with hooks, the butts should turn out. 3. Can a cell of Burnley dry battery receive a new life from a dynamo? A. A dry battery cannot be charged by a dynamo.

Replies to Enquiries.

The following replies relate to enquiries recently published in SCIENTIFIC AMERICAN, and to the number therein given:

(3842) Referring to SCIENTIFIC AMERICAN of January 9, 1892, question 3842, C. B. can clean his brass rifle or shot shells by immersing them in strong cider vinegar, and heat to a boil. Then rinse them thoroughly in clear cold water, and wipe dry with woolen cloth. If the vinegar is good, the shells will be clean and will remain so.—G. E. K.

M. T. D. asks how to pickle beef, tongues, etc.—A. P. S. asks how to make invisible or sympathetic ink.—C. A. W. asks for a corn salve.—W. H. E. asks for a harness grease.—E. S. S. asks for a shoe blacking or polish.—R. W. S. asks how to make a hektograph or copying pad.—E. R. T. asks how to tin iron.—J. A. B. asks (1) for a receipt for making a cement which will stick leather to metal. 2. How to estimate horse power of an engine.—J. H. S. asks how to remove tattooing.—H. F. C. asks how to make birdlime.—Y. M. C. A. asks (1) how to etch glass, (2) names of all known elements and metals.

Answers to all of the above queries will be found in the "Scientific American Cyclopedia of Receipts, Notes and Queries," to which our correspondents are referred. The advertisement of this book is printed in another column. A new circular is now ready.

INDEX OF INVENTIONS

For which Letters Patent of the United States were Granted

January 26, 1892,

AND EACH BEARING THAT DATE.

(See note at end of list about copies of these patents.)

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Marvin, H. N., Syracuse, N. Y., electric drill 467,510
Matlock, D. B., Jan Jose, Cal., fruit gatherer 467,687
Matson, D. B., Buffalo, N. Y., electric lamp hanger 467,511
Mauger, Philip J., Danvers, Ill., gate 467,771
Mayson, T. W., Ossonby, N. Z., optical inst 467,895
McAdams, J., New York, hydraulic elevators 467,705
McArthur, Neil, & M. Lutz, Detroit, Mich., raising sunken vessels 467,515
McCabe, J. D., Coraopolis, Pa., drawing board 467,825
McClellan, Edward J., New York, screw machine 467,568
McCullers, W. H., Clayton, N. C., cultivator 467,963
McDonald, E., & P. McHugh, Cin'ti, O., flushing water closets 467,516
McDonald, James S., Chicago, manifold book 467,582
McGee, J. T., & R. W. Ca , Bryan, Tex., poison distributer 467,619
McGrain, John, Clev., Ohio, crutch 467,675
McQueen, J., & W. Moores, Manchester, Eng., driving belt 467,765
Menefee, J. F., Warrensburg, Mo., display rack 467,628
Mercer, Andrew, Brooklyn, N. Y., steam boiler 467,704
Merrick, Clinton, Forest City, Iowa, disk harrows 467,862
Metz, J. D., Dubuque, Iowa, blankbook cover 467,821
Michel, P., Stapleton, N. Y., window shade 467,567
Miller, Daniel K., Phila., Pa., rolling metals 467,512
Mishler, H., Mogadore, Ohio, potter's tool 467,609
Mohn, F. W., Hoboken, N. J., stage appliance 467,754
Montz, W. H., Packerton, Pa., sliding doors 467,822
Moore, E. Y., Milwaukee, Wis., pulley block 467,513
Morley, J. C., & D. C., Hudson, Mich., wrench 467,688
Morrell, R., Summit, N. J., rail fastening 467,548
Moses, F., Toronto, Can., hot air furnace 467,755
Mosher, J. A., Abilene, Kans., rheostat 467,611
Mosher, J. A., Abilene, Kans., electric arc lamp 467,610
Muller, A., Christianstadt, Ger., pumps 467,823
Mullin, D. J., Chicago, Ill., railway joint 467,674
Munsell, W. W., Dodge City, Kans., railway coach 467,514
Myers, C. & E., & J. Davies, Manchester, Eng., screw propeller 467,824
Myers, F. I., New York, signaling app 467,581
Myers, Henry, Alton, Ill., lubricator 467,595
Naumann, C., Schlettau, Ger., manure distributer 467,517
Nelson, J. A., Nebraska City, Nebr., gate 467,556
Nelson, W. C., Santa Rosa, Cal., dish washer 467,620
Neu, G. S., New York, electric wire tapper 467,891
Nichols, E. I., San Francisco, hydraulic motor 467,612
Normann, O. A., St. Olof, Minn., sleigh 467,826
Nushawg, G. W., Farmersville, Ohio, school desk 467,557
Nutting, A., Quincy, Mass., railway track jack 467,706
Oakes, H., Silver City, N. Mex. Ter., & B. Oakes, Chicago, Ill., thread cutter 467,689
Ogden, G. H., Clev., O., blankbook 467,892
Ogg, H. W., Orrick, Mo., weather strip 467,621
Olin, Erick, Grant, Nebr., fire escape 467,630
Oliver, F., Economy, Pa., steam engine 467,766
Oswald, W. C., Rock Island, Ill., vehicle tongue 467,622
Page, C. D., Tacoma, Wash., dump car 467,772
Palm, J. M., & J. H. Akin, Arkansas City, Kans., bench vise 467,781
Palmer, J. F., Chicago, pneumatic tire 467,642
Parker, G. J., & C. B. Walker, Trinidad, Colo., ore concentrator 467,569
Parry, A. N., Amesbury, Mass., carriage 467,518
Patten, Enos, Lynn, Mass., lasting machine 467,877