Insurance.

LIFE INSURANCE AS AN INVESTMENT.

The value of a man's life cannot well be expressed in dollars, but the value of his services to those dependent upon him can be estimated, that is to say, through life insurance every family can be positively assured of a sum on the death of a husband and father which will provide them a support such as his services gave during his life.

Life insurance in its simplest form contains only the element of indemnity, that is, a pecuniary provision based upon the contingency of the death of the insured. In the regular and substantial companies, the payments required are so adjusted that they continue equally through life, and are fixed at the age of entry These results are accomplished through the legal reserve which legitimate companies are required to keep--designed specially to cover the increased mortality at advanced ages. Reserves are the important element for securing permanency, which the co-operative or assessment companies do not provide.

During the past twenty years, another and a most attractive and desirable element has been connected with pure life insurance, which popularizes it with the insuring public. The element to which we refer is an investment feature, so largely represented in what are known as endowment policies. These cover the double object of protection to the family and a guarantee to the insured of support in old age. Thousands who were wise in the past are now reaping the results of their forethought and action by the payment to them of the amount of their matured endowment policies. Millions of dollars are annually paid to the holders of such contracts, the benefits of which are far reaching and inestimable.

Endowment policies are so made that no loss can be sustained by reason of a failure to pay the premiums, for the insured are guaranteed an equitable value in paid-up insurance in such an event. They are non-taxable, and, if properly made, are payable directly to the beneficiaries beyond the intervention of creditors.

Statistics show that only about two per cent of those who engage in business are continuously successful through life. Of every hundred business men, about ninety-eight do not succeed, and many of them die leaving their families to the tender mercies of "cold charity." The importance, therefore, of such a provision as life or endowment insurance affords is too apparent to require comment. It is the only means by which a family can be positively secured and, at the same time, the insured himself be guaranteed a support in advanced age. It stimulates thrift, encourages economy, and secures for the money paid greater satisfaction than any other form of investment.

In order to obtain the best results in life or endowment insurance, a company should be selected of established reputation for strength, economy, and fair dealing. The organization that conducts its business at the least expense, and receives upon its investments the largest rate of interest, can, for a series of years, give to its insurers the largest returns in reduction of premiums; that is to say, the cost of insurance in a company standing at the head in these important respects will be less than in a company of greater expenses and one having less remunerative investments.

Of the reports of the companies whose annu. statements are before the public, our attention has been attracted by that of the Ætna Life, of Hartford, not only as regards its financial strength, but also the peculiar attractiveness of its plans.

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.

Don't Read This

if you have a sufficiency of this world's goods, but if you have not, write to Hallett & Co., Portland, Maine, and receive free full particulars about work that you can do, and live at home, at a profit of from $5 to $25 per day and upward. All succeed; both sexes; all ages. All is new. Capital not required; Hallett & Co. will start you. Don't delay; investigate at once, and grand success will attend you.

"Steel Stamps," J. E. Mathewson, Springfield, Mass.

Wanted.—A good business man, with $10,000 to $15,000. to invest in and take active management of a lucrative manufacturing business, situated in the South. For further information address "H.," P. O. Box 773, New York city.

"Hail! Horrors, Hail!"

is an expression of Milton regarding the "infernal world." It is not too much to say that those who suffer from catarrh would thus express themselves about that disease. Torture and despair mark their daily existence. However, every case can be cured by Dr. Sage's Catarrh Remedy. Its proprietors have for years made a standing offer in all the newspapers of $500 for an incurable case. It speedily subdues all bad smells, is thoroughly cleansing, antiseptic, soothing, and healing in its effects.

Wanted.—A few first class workmen on mathematical, electrical, and philosophical instruments; good wages and steady work to competent men. Address, with reference, James W. Queen & Co., 924 Chestnut St., Philadelphia.

Tools, Hardware, and other specialties made under contract. American Machine Co., Philadelphia.

Guild & Garrison's Steam Pump Works, Brooklyn, N. Y. Pumps for liquids, air, and gases. New catalogue will be ready in March.

Catarrh, Catarrhal Deafness, and Hay Fever.

Sufferers are not generally aware that these diseases are contagious, or that they are due to the presence of living parasites in the lining membrane of the nose and eustachian tubes. Microscopic research, however, has proved this to be a fact, and the result is that a simple remedy has been formulated whereby catarrh, catarrhal deafness, and hay fever are cured in from one to three simple applications made at home. A pamphlet explaining this new treatment is sent free on receipt of stamp by A. H. Dixon & Son, 305 King Street West, Toronto, Canada.—*Christian Standard.*

Modern M'ch. Tools a specialty. Abbe Bolt Forgers, Power Hammers, Lathes, Planers, Drills, and Shapers. Send for estimates. Forsaith M. Co., Manchester, N. H.

All Books and App. cheap. School Electricity, N. Y.

Wanted.—Mechanical drawing in connection with outdoor employment. Address "Howard," P. O. Box 773, New York.

Wm. Frech, Sensitive Drill Presses, Turret and Speed Lathes combined, Power Punching Presses, 68 W. Monroe Street, Chicago.

I want to buy 2 to 4 H. P. Engine and Boiler; must be cheap and good. Address Wm. Hausell, Nevada, Iowa.

Order our elegant Keyless Locks for your fine doors. Circular free. Lexington Mfg. Co., Lexington, Ky.

Nickel Plating.—Sole manufacturers cast nickel anodes, pure nickel salts, polishing compositions, etc. $100 "*Little Wonder.*" A perfect Electro Plating Machine. Sole manufacturers of the new Dip Lacquer Kristaline. Complete outfit for plating, etc. Hanson, Van Winkle & Co., Newark, N. J., and 92 and 94 Liberty St., New York.

Woodw'kg. Mch'y, Engines, and Boilers. Most complete stock in U. S. Prices to meet times. Send stamps for catalogues. Forsaith M. Co., Manchester, N. H.

Shafting, Couplings, Hangers, Pulleys. Edison Shafting Mfg. Co., 86 Goerck St., N.Y. Send for catalogue and prices.

The Knowles Steam Pump Works, 44 Washington St., Boston, and 93 Liberty St., New York, have just issued a new catalogue, in which are many new and improved forms of Pumping Machinery of the single and duplex, steam and power type. This catalogue will be mailed free of charge on application.

Haswell's Engineer's Pocket-Book. By Charles H. Haswell, Civil, Marine, and Mechanical Engineer. Giving Tables, Rules, and Formulas pertaining to Mechanics, Mathematics, and Physics, Architecture, Masonry, Steam Vessels, Mills, Limes, Mortars, Cements, etc. 900 pages, leather, pocket-book form, $4.00. For sale by Munn & Co., 361 Broadway, New York.

Machinery for Light Manufacturing, on hand and built to order. E. E. Garvin & Co., 139 Center St., N. Y.

Send for Monthly Machinery List
to the George Place Machinery Company,
121 Chambers and 103 Reade Streets, New York.

If an invention has not been patented in the United States for more than one year, it may still be patented in Canada. Cost for Canadian patent, $40. Various other foreign patents may also be obtained. For instructions address Munn & Co., SCIENTIFIC AMERICAN patent agency, 361 Broadway, New York.

Supplement Catalogue.—Persons in pursuit of information of any special engineering, mechanical, or scientific subject, can have catalogue of contents of the SCIENTIFIC AMERICAN SUPPLEMENT sent to them free. The SUPPLEMENT contains lengthy articles embracing the whole range of engineering, mechanics, and physical science. Address Munn & Co., Publishers, New York.

Presses & Dies. Ferracute Mach. Co., Bridgeton, N. J.

Wood Working Machinery. Full line. Williamsport Machine Co., "Limited," 110 W. 3d St., Williamsport, Pa.

Iron Planer, Lathe, Drill, and other machine tools of modern design. New Haven Mfg. Co., New Haven, Conn.

Curtis Pressure Regulator and Steam Trap. See p. 142.

Mineral Lands Prospected, Artesian Wells Bored, by Pa. Diamond Drill Co. Box 423, Pottsville, Pa. See p. 46.

Hercules Lacing and Superior Leather Belting made by Page Belting Co., Concord, N. H. See adv. page 46.

Cutting-off Saw and Gaining Machine, and Wood Working Machinery. C. B. Rogers & Co., Norwich, Conn.

Grimshaw.—Steam Engine Catechism.—A series of thoroughly Practical Questions and Answers arranged so as to give to a Young Engineer just the information required to fit him for properly running an engine. By Robert Grimshaw. 18mo, cloth, $1.00. For sale by Munn & Co., 361 Broadway, N. Y.

Dynamo Machines

for all purposes. Dynamo machines of highest efficiency, accurately calculated (as to capacity, etc.), and built to meet requirements in connection with all

Industrial Applications of Electricity,

including: Electric Lighting, Transmission of Power, Electro Mechanical Machinery, Electro Deposition of Metals, Electro Chemical Work, Telegraphy in place of Batteries, Electric Motors, of various horse power, to be run by Dynamo Currents. All dynamo and motor apparatus built to suit the work required and according to the best of known models for economy and efficiency.

J. H. Bunnell & Co.,
106 and 108 Liberty St., New York.

We are sole manufacturers of the Fibrous Asbestos Removable Pipe and Boiler Coverings. We make pure asbestos goods of all kinds. The Chalmers-Spence Co., 419 East 8th Street, New York.

The Crescent Boiler Compound has no equal. Crescent Mfg. Co., Cleveland, O.

Send for catalogue of Scientific Books for sale by Munn & Co., 361 Broadway, N. Y. Free on application.

Curtis Steam Trap for condensation of steam pipes, high or low pressure. Curtis Regulator Works, Boston, Mass.

Steam Hammers, Improved Hydraulic Jacks, and Tube Expanders. R. Dudgeon, 24 Columbia St., New York.

Emerson's Book of Saws free. Reduced prices for 1885. 50,000 Sawyers and Lumbermen. Address Emerson, Smith & Co., Limited, Beaver Falls, Pa.

Hoisting Engines, Friction Clutch Pulleys, Cut-off Couplings. D. Frisbie & Co., Philadelphia, Pa.

"How to Keep Boilers Clean." Send your address for free 88 page book. Jas. C. Hotchkiss, 86 John St., N. Y.

Barrel, Keg, Hogshead, Stave Mach'y. See adv. p. 76.

"Wrinkles in Electric Lighting," by V. Stephen; with illustrations. Price, $1.00. E. & F. N. Spon, New York.

Iron and Steel Wire, Wire Rope, Wire Rope Tramways. Trenton Iron Company, Trenton, N. J.

Brass and Iron Working Machinery, Die Sinkers, and Screw Machines. Warner & Swasey, Cleveland, O.

Split Pulleys at low prices, and of same strength and appearance as Whole Pulleys. Yocom & Son's Shafting Works. Drinker St., Philadelphia. Pa.

Chucks—over 100 different kinds and sizes in stock. Specials made to order. Cushman Chuck Co., Hartford, Ct.

Nystrom's Mechanics.—A pocket book of mechanics and engineering, containing a memorandum of facts and connection of practice and theory, by J. W. Nystrom, C.E., 18th edition, revised and greatly enlarged, *plates*, 12mo, roan tuck. Price, $3.50. For sale by Munn & Co., 361 Broadway, New York city.

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.

(1) W. H. D. of D. C.—You will find an engraving of Kunstadter combined screw and rudder in the SCIENTIFIC AMERICAN of May 18, 1878, and in issue of January 12, same year, an illustration of the process for the manufacture of mineral wool.

(2) W. G. R. writes: 1. Is it a fact that human hair has turned white in a night, or even in two or three days? A. It is generally so accepted, but the instances have been rare, and the proof is not very decided. 2. Is it a fact that octoroons do not have children? A. It is not. 3. What was the negro population of the United States in 1840, 1850, 1860, 1870, and 1880? A. 1840, 2,873,648; 1850, 3,638,808; 1860, 4,441,830; 1870, 4,880,009; 1880, 6,577,497.

(3) J. G. D.—The density of hydrogen compared to air is 0·0693; of ordinary illuminating gas, about 0·6; and of natural gas from Pennsylvania wells, from 0·51 to 0·61. The density of gas taken from the Fuel Gas Company's well, at Murraysville, Pa., which may be considered as a typical producer, is 0·56. Considerable variations exist in the density of the gas from either natural or artificial sources, but the mean results are very nearly alike. There would consequently be very little difference in the ascensional force of a balloon, whether filled with one or the other of the latter gases.

(4) T. S.—Steel untempered is the strongest metal in use for gun barrels, but aluminum bronze is claimed to be much stronger. Your barrel 2 inches diameter ½ inch bore would probably burst at 150,000 pounds pressure. You cannot burst it in a properly proportioned gun. It will sustain a safe working pressure of 50,000 pounds. We have seen a plugged gun of this description filled with powder and fired. The charge went out at the vent, burning it to three times its original diameter. These experiments are extremely dangerous.

(5) H. C. D. asks: What kind of valves are used in air pumps for steam engine condensers? A. India rubber, known in the trade as pure gum.

(6) H. F. S. asks: What should be added to starch to produce a good gloss on linen? A. Pour a pint of boiling water upon two ounces of gum arabic; cover it, and let it stand over night. A teaspoonful of this is added to the starch.

(7) E. H. asks what process Professor Checklie used in catching rats. He is supposed to have used some powerful odor and a dark lantern—the odor to entice them from their holes and stupefy them, and the light to attract them to a certain spot. A. Probably oil of rhodium. Rats and mice have a great liking for the oil.

(8) F. G. V. R. asks: 1. Which is the best brand of Portland cement, that is, which will become the hardest? A. Saylor's American Portland cement is one of the best. 2. What is the best ingredient to mix with Portland cement to get the hardest and finest cast? A. Use 1 part of cement with 3 of sand. 3. Can Portland cement be colored in casting, say black, blue, or red, and if so, what colors to use? A. It can be colored black by the addition of charcoal, blue by adding smalt, and red by adding iron oxide. 4. Can I polish a casting of Portland cement, and how? A. It will not take a polish if pure. See "Portland Cement: Its Manufacture and Uses," contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 386.

(9) N. W. N. asks: 1. What is the process of lettering in gold on leather or cloth as done by bookbinders? A. The place where the lettering is to appear is coated twice with albumen, and then covered with gold leaf. The title, locked up in a fillet, is then heated and pressed into the leather. Any superfluous gold leaf can be readily wiped away by using a soft rag. 2. Also the process and what materials used in sprinkling edges of books? A. Take an old toothbrush and dip it into a colored ink; shake off the superfluous ink, that the sparks formed may not be too large, and draw an old comb through it in such manner as to make the ink fly off in sparks over the edges of the book.

(10) E. R. asks how the black finish or enamel is put on sheet iron ware, such as toy shovels, fire shovels, etc. A. Use black japan varnish, put it on with a brush or by dipping; thin the varnish with turpentine to a suitable consistency for your work. Bake the article in an oven heated to 250° Fah. See full process described in SCIENTIFIC AMERICAN SUPPLEMENT, No. 310. You can get a copy of the *Official Gazette* from the Patent Office.

(11) J. L. P. sends us the old question about cutting figures out of paper, so that if cut in one way the actual surface will be greater than if cut another way. The figure he sends cut in paper is not correct. The pieces do not fit, as can be plainly seen. There is no problem in this. There is a form of cutting the pieces so that they will fit exactly both ways. Then their surfaces are alike in both forms.

(12) S. B. H. desires instructions for transferring decalcomania, or transfer pictures, on satin, silk, or any material. I find mucilage does not do. A. Use a varnish consisting of equal parts of pale Canada balsam and rectified oil of turpentine. This mixture is sometimes called crystal varnish.

(13) E. J. W. asks: 1. What is the fertilizing value of the shell marl found in tidewater Virginia? A. As a fertilizer, its action is both mechanical and chemical. Being granular, it improves the textnre of stiff soils by loosening them, thus rendering them pervious to the air and moisture. It furnishes the inorganic elements of materials for plant food. The most important of these elements are phosphoric acid and potash. 2. How should it be made or applied so as to get the best results? A. It requires no preparation to fit it for use as a top dressing for the soil. It is hauled directly from the pit and spread upon the land.

(14) P. P. B. asks (1) how many pounds 1,000 cubic feet of pure hydrogen gas will lift. A. 70 pounds. 3. What would be the difference in the elevating power of pure hydrogen, say 1,000 cubic feet, and the same bulk of coal gas? A. The latter would lift 38 pounds less. 3. A good size or varnish for balloons? A. India rubber varnish. 4. What materials are used besides silk for the construction of gas balloons? A. Finest cambric and paper.

(15) G. W. D. writes: At what height will it be necessary to place a tank, with a 6 inch main running from it 2,500 feet long, with one elbow in same, to secure force enough to attach three 2 inch hose to same, and with 1¼ inch nozzles, and throw a stream of water 40 feet high? A. Make the bottom of reservoir not less than 90 feet above the hydrants, and of sufficient size to sustain a flow of at least one cubic foot per second during any possible requirement; say 3,600 cubic feet for one hour. You will also do well to attach your pump to the 6 inch pipe near the mill, with an ample air chamber, to prevent water ram. Pump may be driven by steam or water power.

(16) G. B. B. desires a recipe to make non-freezable liquid wash blue. A. The addition of glycerine will probably accomplish your purpose. This substance does not freeze in winter, nor evaporate in summer. A very small proportion of glycerine is used in water meters.

(17) To W. J. M., T. P. P., and many others, who have asked for inks that would be of a specified character, and then fade out after a longer or shorter period, to be regulated as desired, we would say that there are substances which will make a fair ink, and soon fade out on exposure to the air. But to make public the directions for making such an ink would afford to ill disposed persons facilities for easily perpetrating various frauds, and we therefore conceive it to be against public policy to reply to such questions in these columns.

(18) J. P. asks (1) how mineral wool or everlasting wicks are made. A. The wicks used in the perpetual lamps (see "Science in Antiquity," SCIENTIFIC AMERICAN SUPPLEMENT, No. 409) are said to have consisted of asbestos or gold wire, but we are advised by dealers in asbestos that wicks cannot be made from asbestos or mineral wool. Nor do we know of any means of making wicks fireproof. Asbestos was tried for this purpose some three or four years ago, but they soon became non-porons. 2. Are there any chemicals that can be put in coal oil to improve its burning powers? A. No.

(19) Moss desires to know the process generally used for curing, cleaning, and curling the moss usually found hanging from trees in the swamps and marshes throughout the Southern States. A. It is soaked in water to remove the bark, then ginned and sent to market, the curling being natural.

(20) O. & D. ask how to test the candle power of lamps. A. Probably, the most perfect arrangement for testing the intensity of light yet devised, either for lamps, gas, or other purposes, is an electrical method described on page 261 of vol. 52 of the SCIENTIFIC AMERICAN. For further information on other measurements, see SCIENTIFIC AMERICAN SUPPLEMENT, No. 225.

(21) "Dayton" writes: In your instructions on wax engraving (as per issue for January 2), will not the electro plate formed on the engravings, impressions, etc., adhere to the smooth copper plate upon which the thin wax is poured? Will the blacklead with which it is rubbed prevent it? If not, what can be used? A. The blacklead with which both the wax and surface of the copper exposed in the lines are covered will prevent the electro plate from "sticking."

(22) P. G. G. writes: Can you tell me about how many people in the United States are afflicted with cancer, and whether the disease is on the increase or not? Is there any known way of removing cancer without the aid of knives? A. We think there are no means of ascertaining the number of cases of cancer. Even the number of deaths from it cannot be accurately traced, since in the reports they are associated with other forms of tumors. There is no reason to suppose that the disease is relatively on the increase. By "removing cancer" we suppose you mean drawing them out, as is constantly advertised by "cancer doctors." Such claims are impostures and nothing else.

(23) J. B.—We think your proposed plan of freeing sidewalks from snow and ice by running steam pipes thereunder to melt such accumulations would ordinarily cost far more than other methods of removal.

(24) S. W. F. asks what a diabetic should eat. Everything containing starch and sugar has long since been prohibited. Meats and eggs contain both albumen and carbon, and milk to some extent. Will you please state just what food is meant by "albuminoid and hydrocarbonized food"? A. There must be a mistake somewhere. All our animal foods, with the single exception of the "fats," are included in the class of "albuminoids." The fats, both animal and vegetable, are hydrocarbons, while all the starch and sugar foods are carbohydrates, and the term "hydrocarbonized food" must naturally include both these latter forms. Such abstinence as is prescribed in the article quoted would certainly end the diabetes, for it would end the patient.

(25) J. D. G. asks: 1. Could I get a flowing well in about the center of the State of Kansas? A. It is extremely improbable that you will obtain a flowing well in central Kansas, except on low grounds. 2. How can I bore through or manage the quicksand which we find at a depth of 20 feet? A. You may put a drive well through the quicksand. 3. What pressure of air is indicated by column of mercury in glass tube of gas filter pipe proving gauge? A. If the mercury gauge is a siphon, each inch rise indicates a pound pressure nearly. If the gauge rises from a cistern, it requires nearly 2 inches rise to indicate a pound.

(26) W. B. asks when the Winnecke comet will return, the name of the next comet to return, and if Biela's comet or part of it will ever return, and when. A. The Winnecke comet was last seen in 1875. It has a five and half year orbit. Its second return should occur the coming spring. It is supposed that Biela's comet was dissipated in a meteoric shower occurring in November, 1872. Last seen as a comet in 1852.

(27) W. S. writes: A brass spring, after being heated, loses its power. How or by what process is the lost power restored to the spring? A. The hardness of brass is due solely to the compacting of the mass by compression, as in rolling or hammering. In heating brass, the original and natural condition is restored, and only a repetition of the process of rolling or hammering will again harden it.

(28) A. B. W. asks the best material to use to prevent water from freezing in iron pipes above ground. A. Cover the pipes with hair or plaster felt, or make a box around the pipes and fill it with sawdust, shavings, or wool.

(29) T. H. K. writes: I am going to make a half dozen No. 14 plate iron barrels about 25 inches diameter and 28 inches high, made out of Philadelphia R. G. iron. These barrels are required to be tinned inside with pure tin, the same as tinning sheet copper. How shall I proceed? A. The sheet iron should be thoroughly cleaned from scale, in a bath of 1 part hydrochloric acid, 4 parts of water. The side to be tinned well scrubbed with sand, then laid on an inclined bench and brushed over with muriate of zinc and sal ammoniac (tinner's acid); pour the melted tin over the surface, allowing it to run down and back into the melting pot, the process being a repetition of that used in tinning sheet copper. When the barrels are made up, the joints can be tinned with a soldering copper.

(30) W. G. writes: In a steam cylinder where the piston rings are steam packed, does the steam enter the follower on both ends of the cylinder or on only one? A. There is a small leakage into the piston at both ends, depending entirely upon the closeness of fit of the rings. It should be no more at one end than the other, provided the bolts that hold the follower make a perfect joint under their heads.

(31) W. H. S.—A steam pleasure boat of less than 5 tons register needs no license. Over 5 tons, the license fee is $5.00 to a United States inspector. Your 3 horse power engine will do for about 6 to 7 miles an hour. All boats have to pay lockage where such regulations are in force.

(32) W. T. W. A.—The hay stack could take fire by spontaneous combustion from the heat generated by fermentation. We cannot recommend anything for ingrowing nails, except more constant care.

(33) D. B. G. asks: 1. Of what advantage is a slack between the cars in starting a heavy loaded freight train? Does it aid the engine in starting? A. The slack connections between freight cars aid the engine in starting a heavy and long train by giving motion to the cars successively. 2. Is it simply because of annoyance to passengers that it is not used on passenger trains? A. Slack connection exists on passenger trains to some extent, but controlled by a spring in the coupler and a spring buffer, which lessens the shock. Cost of construction is the probable reason that spring buffers and couplings are not used on freight cars.

(34) H. D. J. desires a pure fruit acid as substitute for tartaric acid, at about one-third the cost, to use in the manufacture of jellies. A. There is an acid sulphite of lime, better known as the bisulphite of lime, which is used for the purpose mentioned. An excellent quality of this compound is known as Horsford's sulphite.

(35) J. M. asks: What chemical ingredient can I mix with water to prevent it from freezing? A. Glycerine is used to prevent water freezing in gas meters.

(36) Q. T. S. asks: 1. What preparations are more commonly used in waterproofing paper and pasteboard? A. See articles on this subject in SCIENTIFIC AMERICAN SUPPLEMENT, Nos. 39, 96, and 267. 2. What is the chemical composition of the so-called "liquid glass," and about how expensive is it in large quantities? A. It is either a silicate of potassium or sodium. See "Water Glass," in SCIENTIFIC AMERICAN SUPPLEMENT, No. 307. The liquid is worth 5 cents per pound.

(37) E. R. R. asks how to mark or ornament polished steel tool, such as we see on saw plates, etc. A. Take 4 parts by measure of pyroligneous acid, alcohol 1 part. Mix, and add 1 part nitric acid (sp. grav. 1·28). This constitutes the etching fluid. The steel is coated with wax and the design made by means of a needle, and then the liquid is used to eat the metal away.

(38) C. F. B. asks how to make a liquid extract of beef that will keep six months or longer. A. Cut the lean of fresh killed meat very small, put it into eight times its weight of cold water, and heat it gradually to the boiling point. When it has boiled for a few minutes, strain it through a cloth and evaporate the liquor gently by water bath to a soft mass. Two pounds meat yield 1 ounce extract. Fat must be carefully excluded, or it will not keep.

(39) J. M. asks (1) for a recipe for a cheap solution, to make Manila or Sisal fiber fireproof, at the same time preserving it without staining. A. The following mixture, consisting of boric acid 6 pounds, ammonium chloride 15 pounds, pure borax 3 pounds, and water 100 pounds, is applied by immersing the articles therein. 2. Proportion of alum and soap to gallon of water for a good size that will not peel. A. Spon says simply, "Apply a solution of soap to the wrong side of the cloth; when dry, go over again with a solution of alum." Under such circumstances, use only sufficient water to dissolve the alum.

(40) J. W. Q. asks the carrying capacity in pounds of a scow 42 feet long and 11½ feet beam. A. 2424 pounds to 1 inch in depth, if the above dimensions are on the water line. As the scow settles in loading, the capacity will slightly increase per inch. Say about 15 tons for an additional draught of 1 foot.

(41) H. B. S. writes: Having a boiler with twelve square feet fire surface, a 1½x3 inch engine, with oscillating cylinder, and a boat 12 feet long by 2 feet 6 inches beam, what size and pitch of propeller is required, and what speed can be realized in still water? Boiler, engine, and boat weigh 175 pounds. A. Propeller 12 inches diameter, 30 inches pitch, will give you a speed of 4 to 5 miles per hour, with 60 pounds steam pressure.

(42) O. P. F.—A "water bath" is used instead of a "sand bath" for heating glass alembics or other glass vessels used for distilling or evaporating. It may consist of any vessel of hot water in which another vessel may be placed for heating. There is little saved by oiling or even painting a floor that wears fast by use. Floors of dwellings or rooms that are kept clean and not much used may have their appearance improved by oiling with boiled linseed oil or painting.

(43) W. F.—The motions of barometer and thermometer are mostly in opposite directions during storm periods, occasionally otherwise—the direction of the storm winds varying their relations to considerable extent. The fair weather ranges of both instruments are very tantalizing, unless considered in connection with the direction of the wind, cloudiness, and humidity. A series of simultaneous meteorological curved lines made to a scale (in our possession) shows the most fantastic relations imaginable. The steel indices in a registering thermometer are held by capillary attraction of wetted surfaces when drawn down the scale by the alcohol; they are pushed up the scale before the mercury by resistance to capillary contact, the index being held to the glass by the adhesion of contact.—Objects do not lose their power of gravitation in a vacuum.

(44) C. S.—Bessemer steel is made in the United States equal to that made in England.

(45) M. E. E. asks a way in which lead can be made tougher and more durable, without becoming harder, or much harder. A. Alloy with tin. 2. A cheap substitute for India rubber. A. We know of nothing cheaper that is as durable and retains the main qualities.

(46) O. S.—The value of mica, according to its size and quality, is from 25 cents to $5.00 per pound. The average price during 1885 was $2.50 per pound. To be marketable, the mica must be clear and transparent and sufficiently large to be used for stoves, etc. Its fire-resisting properties are usually tested.

(47) G. W. K. writes: Using one pound coal for evaporating seven pounds water or fluid, feeding the boilers at 200 degrees, how many pounds of coal will be required to evaporate 700,000 pounds of water or a fluid evaporating at 220 degrees? This question refers to evaporation of brine, which boils at about 220 degrees. A. At the rate named, it will require about 107,000 pounds to evaporate 700,000 pounds of water as salt brine. One pound of coal to evaporate 7 pounds of water is not in accordance with modern practice; 1 pound to 10 or 11 is an ordinary result, and with any kind of regenerating system, 1 pound of coal to 13 or 14 pounds water, or 1 pound of coal to 10 lb. of brine, is possible and feasible.

(48) C. R. R.—For your safety valve: Divide the weight of the ball in pounds by the area of the safety valve, which quotient will be the pressure per square inch in pounds, if the ball were set upon the pin of the valve. Divide the required pressure per square inch by the distance of the center of the pin from the fulcrum in inches. This quotient, multiplied by the first quotient, will give the length from fulcrum to center of ball, in inches. You do not give enough particulars to calculate exact horse power; about 500 probably.

(49) B. C. writes: I have a meerschaum pipe broken at the elbow. What kind of cement shall I use to fasten it together? A. Use quicklime mixed to a thick cream with the white of an egg.

(50) C. E. W. asks: 1. An explanation and diagrams of construction of the polyopticon for throwing enlarged pictures on white screen from solid objects or prints, as the magic lanterns do from transparent slides? A. The polyopticon is in every particular like a magic lantern with the condensing lens left out and the light placed in front of the picture on one side of the optical cone, and shaded, so that the direct light shall not pass through the lenses. You may inspect them at the optical stores in your city. 2. A rule or formula for draughting from any given diameter of spheres a covering to be in two pieces, shaped something like the figure eight, such as is used generally for covering base balls? A. Make the diameters of each circular half of cover equal to half the circumference of the ball plus the thickness of the cover. If elastic, allow for its stretching. McKenzie's "weather cycle" was a theory that has not been verified.

(51) A. G. L. desires (1) a receipt for baking powder. A. Take of:

Powdered cream tartar	30 ounces.
Sodium bicarbonate	15 "
Flour	5 "

All well dried; mix thoroughly, and keep dry. 2. Egg powder (such as is used to make pancakes, etc., without eggs). A. By the addition of about ½ drachm turmeric powder to each pound of baking powder, it is converted into egg powder. 3. Linen gloss (I mean the powder gloss, something that can be used in cold starch (raw starch) for giving a fine gloss to shirt collars, cuffs, etc.). A. White wax 1 ounce, spermaceti 2 ounces; melt them together at a gentle heat. When you have prepared a sufficient amount of starch in the usual way, for a dozen pieces, put into it a piece of the polish about the size of a large pea. 4. Dry soap, or what is sometimes called extract of soap. A. We presume you refer to the essence of soap, which consists of 4 ounces Castile soap in shavings, 1 pint proof spirit; dissolve, and add a little perfume.

(52) C. M. W. asks: Will common black powder explode in a vacuum? A. Frick says, "Gunpowder burns without explosion in a vacuum," and also powder may be set on fire by means of a lens within an exhausted receiver; but it will be found to burn away slowly without explosion." These statements are substantiated by experimental data given in the memoir on the "Explosiveness of Niter," by Robert Hare, and published by the Smithsonian Institution in 1849.

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

F. F.—Of the specimens sent, No. 1 appears to be a piece of slaty rock; No. 2, a weathered slate; No. 3, a shale; No. 4, a slate; and No. 5, limestone. There is nothing in their appearance to determine their geological age, nor do they at all indicate the presence of coal. As to further prospecting, we are unable to advise.—J. W. B.—The earth is without value in New York. It lacks body, and is too gritty to be useful as a pigment. If carefully sorted, ground, and mixed with oil, a local mineral paint might be made from it.—A. W. C.—The specimen sent has no economic value.

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