

(2) W. H. W. writes: You recently gave an interesting account of the manufacture of walking canes. Will you be kind enough to state in your next issue the mode of polishing, or rather the receipt for varnishing the canes? A. Use the following: gum shellac, 3 oz.; gumastic, 1 oz.; gum sandarac, 3 oz.; alcohol, 40 oz. Dissolve the last two in the alcohol, then dissolve the shellac, and pour off the clear varnish.

(3) J. C. L. asks if there is any cheap way of making Prussian blue, and which is the best way? A. The following method is given in 'Spons' Encyclopedia': (a) A solution of two parts of alum and one part of iron sulphate is made in water; a solution of potassium ferrocyanide is then acidulated with sulphuric acid, and some of the first solution is dropped in till the precipitate falls slowly; the latter is well washed in a filter and dried. (b) Mix a solution of ferrous sulphate with one of potassium ferri-cyanide; wash and dry.

(4) A. F. asks: 1. What are the ingredients, and their exact proportions, for the silvering of glass, new process? 2. How can I successfully silver small sheets of glass by that process? 3. How are glass balls and other similar articles silvered by the same process? A. 1, 2, 3. We presume reference is made to the following process, recently published by Prof. Palmieri: When into an ammoniacal solution of silver nitrate is poured, first, a little potassium hydroxide and then a few drops of glycerine, the reduction of the silver begins at once. This action is accelerated if either or alcohol be added to the mixture. A moderate heat and darkness are said to increase the brilliancy of the precipitate, and darkness also favors the adhesion to the mirror of the deposit. 4. Is heat necessary by the more simple process of the silvering of above named objects? A. Heat produces a better result, and the operation takes place more quickly.

(5) J. McD.—Chloride of lime is made in England chiefly by the alkali or soda ash manufacturers. The chlorine gas obtained as a by-product is used to saturate the lime. In this way they are able to produce it much less expensively than would be possible in this country, where a special plant would be necessary. The manufacture of tobacco is described in SUPPLEMENT, 196.

(6) W. C. W. asks: 1. How much space does one cubic foot of air fill when under pressure of one additional atmosphere—when under two? A. One-half cubic foot; one-third cubic foot; space occupied inversely as the pressure. 2. What per cent of water is wasted when using a hydraulic ram? A. From two-thirds to eleven-twelfths of the water will be lost, according to the height the water has to be raised.

(7) G. S. G. writes: How can I prevent a water tank situated in the tower of a wind mill from freezing? I notice that some of the Western manufacturers of mills give instructions in their catalogues for frost proofing. What is their process? A. You may protect your water tank from freezing by placing a tight cover over the top with an extra siding part of the way down from the top. Lay on the cover straw, hay, or felt, anything to keep the air from circulating at the surface of the water. If the inlet and outlet pipe is at the bottom the water stratifies in cold weather, the cold water remaining at the top while the feed and discharge is constantly going on at the bottom. Hence the top freezes first. If two pipes are used, the inlet pipe should be carried to the top of the tank, which will force a mixing of the water and lessen the liability to freeze. If ice cold water is pumped, as from rivers or creeks in winter, then the whole tank must be covered in as close as a country cellar to prevent freezing.

(8) M. F. asks if there is any leather pulp made from leather waste, how it is made, and whether anything like leather would mix with it to make grinding or polishing wheels? A. The waste from tanneries and currying shops, in the shape of fleshings from the hide, and trimmings and skivings from partly tanned leather, are used to some extent in this way in the making of what is known as "leather board," a cheap rolled and pressed substitute for sole leather in the cheapest grades of boots and shoes, but the fiber when made into a pulp has no cohesive force to fit it for the purpose suggested. It makes rather a gelatinous tissue. The thick hide of the walrus is especially tanned and largely used for polishing wheels.

(9) M. L. D., Saratoga, asks for the process of making Russia leather, and where the materials can be obtained? A. Russia leather is made in this country substantially the same as any cowhide, calfskin, or sheep leather, allowing for the different way of finishing, but using birch bark tar to give the peculiar aroma. The process was long considered a trade secret, until about ten years ago, when Mr. Jewell, our Minister to St. Petersburg, and himself a tanner, looked into the business, and sent over the first lot of several barrels of birch bark tar to our largest sheepskin tanning firm. Since that time we have made a great deal of what is really only imitation Russia leather, for while it has the peculiar smell, it is very rare that any such leather is made here equal to the sterling quality of that which the Russians take so long a time and use so much care in making. The birch bark tar can probably be had of some of our importers trading with Russia, or possibly of one of the large sheepskin firms making the imitation Russia leather.

(10) N. J. H. says: Please state whether the bridge that spans the river Tay, in Scotland, has not given way since being finished, and let a train of cars into the river? A. A section of the original Tay bridge, 3,000 feet long, fell on the evening of Dec. 28, 1879, carrying down with it a train of passenger cars. A violent gale was blowing at the time. All on board the train were lost.

(11) W. B. M. asks: 1. What are the black crystals formed on the carbons of the Grenet battery, using solution of potassium bichromate? A. Chrome alum. 2. About what is the ratio of power between the Grenet and Grove cup battery? A. Measured in volts the Grove is 1,956, and the Grenet 1,095. The latter has been somewhat augmented lately by improvements in the bichromate solution. 3. Would that insulating substance known as "hard gelatinized fiber," in sheets one thirty-second inch thick, be suitable for insulating layers of secondary wire in an induction coil? A. It

would answer, but a good quality of sheet hard rubber would probably be better. 4. In a medical induction coil, the magnetic induction of the core, as I understand it, is shut off by a tube of brass, fitted to slide over the core. How is it that the vibrator, which is operated by the magnetized core, is not also stopped? A. The tube diminishes the current induced in the secondary wire, but produces no effect on the magnetic core of the coil. 5. In a small induction coil I am able to get a shock with one of the secondary poles (I do not know which) and either of the primary poles. Where is the circuit? It seems impossible that there can be a circuit through the coil, it is so thoroughly insulated. A. There may be no metallic circuit. You can get a shock from a section of the wires without touching the other. It is the discharge of static electricity accumulated at the extremities of the secondary wire.

(12) E. F. M. writes: I have in my dwelling an iron tank and iron pipes to convey water through my house. I find iron scales constantly flowing and getting in the valves and water cocks, which causes them to leak. Please suggest a remedy. A. You do not say that your tank is painted. It should have been thoroughly painted before being used. The only way now is to clean it thoroughly and free it from scale on the inside; have it well dried. Then paint the inside with red oxide of iron (Prince's metallic paint) and boiled linseed oil only; no turpentine or other mixtures. Mix so that the paint spreads easily. Let the first coat dry well before putting the second coat on. This may take several days, unless you can open the tank to the sun and air.

(13) W. C. R. asks: 1. If Portland cement will take a polish, and if impervious to water, no oil or varnish to be used in the polishing? A. The Portland cement will not take a polish without varnish or resinous filling. 2. Also, if that imitation of wood which I saw described in your paper some months ago will take a polish with water the same as stone, no oil to be applied? A. You will have to give the date or name of article in relation to imitation of wood.

(14) A. M. B. asks how the hoops of wooden pails, tubs, etc., are painted; whether they are done after putting in place or not? A. The hoops on wooden pails are painted by means of a roller charged with paint. The tubs and pails are revolved.

(15) S. P. C. asks for a simple method to prevent the reverberation of sound in a school room? A. Rough finished walls and ceiling are better than hard smooth finish. Paper hangings with dead finish or flock surface or flock figures will sometimes break the sharpness of the reverberation. Curtains hung upon the walls or windows, they can be of muslin or cheese cloth tastefully hung. Sometimes on only one side, opposite the speaker, will accomplish the purpose. In a school room large maps hung between the windows illustrating the daily teaching are both instructive and very useful as anti-reverberators. They are on sale by the school book publishers of New York and probably St. Louis.

(16) A. R. B.—Your spy glass with a level mounted above will have it no means of adjustment. You must have level arranged so that you can vary its position with the axis of the spy glass. The horizontal line is necessary, and must be placed across the field in the focus of the eye glass. As you will have no means of reversing the spy glass with accuracy for ascertaining the coincidence of alignment between the level and the glass, you will have to adjust by some observed level with another instrument. You can make a fair spirit level with a small long bottle nearly filled with alcohol and corked tightly, leaving just enough air in for a bubble; fasten it in a socket with plaster of Paris. A common carpenter's level is a very good instrument for leveling, by sighting across the top for ordinary ditches and drains.

(17) J. B. C. asks whether malleable iron can be cut with a sheet iron saw, run with a great degree of speed, and what causes it—the expansion of the saw or the friction of the air? Iron can be cut without touching the saw when still. And, also, what velocity would an 8 inch saw have to be run at? A. A wrought iron saw under high speed cuts iron or steel cold by the friction of the saw. An 8 inch saw would do very little work on iron, and would have to run 3,000 turns per minute; 24 to 36 inch saws are used for such work running from 2,000 to 3,000 turns per minute.

(18) H. G. asks: What ought to be the diameter of smoke stack, also height, for 3 boilers, 52 in. in diameter and 23 ft. long, with 5 fires in each boiler four-tenths in. and one-fifteenth in. in each? A. Forty-two to 44 in. square and 68 to 70 ft. in height, if any high buildings surround the chimney, increase the height, to 80 ft.

(19) J. A. C. asks: 1. What is the best speed to run a main line machine shop shaft, so as to use pulleys with plenty of belt surface? A. About 130 revolutions per minute. 2. Also, what is the best speed to run a main line mill shaft for sawing cord wood, plank, and trees, so as to use pulleys with plenty of belt surface? A. About 200 or 250 revolutions per minute. 3. How many revolutions per minute should a 26 in. circular saw be run, also what size belt to use for sawing oak cord wood plank? A. Fifteen hundred to 1,600 revolutions per minute. We think a 5/4 in. belt would suit. 4. Also what size boiler will it take to run an engine 8 x 12 100 revolutions per minute, whether vertical or horizontal? A. A boiler with 180 ft. surface if vertical tubular or 145 ft. surface if horizontal tubular.

(20) J. H. B. asks: 1. Does the weight of a loaded wagon bear equally on the entire length of the spindles of the axles? A. Yes. 2. If the wheels of a loaded wagon with tires two inches wide be taken off and wheels with tires four inches wide substituted, will the friction or traction be increased on a hard road? A. Your question is very indefinite. If the wagon be a road engine, the traction will be increased.

(21) M. H. asks: What changes would be necessary for us to make in our furnace to use natural gas to generate steam? We have been using soft coal. Is natural gas used anywhere as fuel to generate steam? If so, how are the jets arranged under the boiler? A. There are a number of devices in use for burning gas under boilers, most of which are patented. The general principles are those of a Bunsen burner, in which a

central jet is placed in a short tube so arranged that a strong blast from the central tube will draw in through small holes the gas or air from another source and force a mixture at the point of the nozzle. In some, the center blast is air under high pressure, drawing the gas around it after the manner of an injector. In others, the gas is under a pressure, as the central blast drawing air in by suction. Again, steam from the boiler is used for the center jet, drawing both gas and air by suction. These jets are multiplied to suit the conditions and requirements of the boiler, from one to six jets being used when applied through the doors with large pressure. In some the entire grate is removed and a nest of Bunsen burners put in its place, all being united in a common feed pipe with gas under five to ten pounds pressure issuing through the center tubes.

(22) M. G. writes: We think one of our refineries is mixing glucose with sugar. We wish to know how to detect glucose in a sugar mixture? A. Cane sugar has no effect on Fehling's solution, while a liquid containing glucose will throw down a red to yellowish precipitate of copper oxide in this reagent.

(23) J. M. D. asks: How is it possible that coffee becomes burned in the making, the kernels being kept constantly in circulation by the boiling of the water? A. It is the extract of the coffee that is in contact with the overheated tin that at first becomes baked to the tin and then burns, and makes the disagreeable flavor called burned coffee. This occurs often when coffee pots are not kept perfectly clean, or coffee is allowed to stand in the pot when not in use. A scum deposits upon the bottom which easily burns when the pot is placed on a very hot fire.

(24) C. F. P. asks: Can a "cut" of type metal be cast in a mould of plaster of Paris, so as to distinctly show the hair lines when printed, and if so, please describe process? A. The ordinary stereotype process will afford a fair copy of a cut, but an electrotype is to be preferred. You can take a stereotype mould from your cut by very carefully oiling the cut and then pouring over it a thin batter of very fine plaster of Paris. When it hardens it should be removed and dried in an oven or other equally warm place. When dry it should be lowered face up in a kettle of melted type metal and allowed to remain below the metal until bubbling ceases, when it may be carefully drawn up and allowed to cool. To secure the necessary thickness of metal the mould is surrounded by a metal frame.

(25) S. H.—Tungsten or wolfram is worth 60 to 80 cents per pound in Liverpool, and is subject to 20 per cent *ad valorem* duty. Sells here for \$1 per pound. Used in making musket steel, the hardest steel made.

(26) H. W. asks: How is the gilt label or title on the back of a book made? Theoretically, I know how it is done—burned into the leather, etc.; but what I want to get at is—what is used in the work, and what is the process? There is no bindery in our neighborhood, so I turn to you for help. A. Gilding on leather, cloth, and other book binding material is similar to sign gilding, except that heat is applied. A size is used, the ordinary gold leaf is applied thereto, the type or engraved metal is heated and pressed against the gold leaf upon the book cover, and the gold remains in the letters or where the pressure was made. The surplus gold leaf is then brushed away.

(27) E. H. R. asks: What is the difference between coke and charcoal tin, and how are they manufactured? A. The difference is in the quality of the iron—charcoal iron making the best tin—it is tougher and easier worked. The tinning is done by dipping the sheets in melted tin.

(28) Mrs. J. L. H. asks: 1. For a recipe for making sirups to use in medicines, as sirup of rhubarb? A. Sirup of rhubarb may be prepared by macerating 6 ounces bruised rhubarb in 4 ounces dilute alcohol; press and filter, and evaporate to 2 pints. Mix 10 fluid ounces of this tincture with 28 fluid ounces simple sirup. For further details consult the U. S. Dispensatory. 2. Would like information of silk culture from cocoons? A. Some information on this subject is given on page 1707, of SCIENTIFIC AMERICAN SUPPLEMENT, 107, and further in great detail in SCIENTIFIC AMERICAN SUPPLEMENTS, 174 and 175.

(29) J. M. O'M. writes: I have a very valuable meerscham pipe which I have failed to color by smoking; please let me know through the medium of your valuable paper of an artificial or other way to color it. A. Ordinarily the pipe is boiled for coloring in a preparation of wax which is absorbed, and a thin coating of wax is held on the surface of the pipe, and made to take a high polish. Under the wax is retained the oil of tobacco, which is absorbed by the pipe, and its hue grows darker in proportion to the tobacco used. A meerscham pipe at first should be smoked very slowly, and before a second bowlful is lighted the pipe should cool off. This is to keep the wax as far upon the bowl as possible, and rapid smoking will overheat, driving the wax off and leaving the pipe dry and raw. A new pipe should never be smoked out doors in extremely cold weather.

(30) W. T. B. asks: Where is the largest steam engine in existence? A. We think it is the Pilgrim's engine, 110 in. cylinder, 14 ft. stroke, the largest, single cylinder engine; but the double engines of the large Atlantic steamers have more power.

(31) J. A. H. asks: Can you inform me of a method of marking a steel tape with acids so that the figure so marked will show bright against the dark steel? A. Melt ordinary beeswax and tallow equal parts, or better beeswax 2 parts and Venice turpentine 1 part, and coat the steel with it where you wish the letters to appear, using it as a paint with a camel's hair brush to form the letters. Immerse the steel in a bath of sulphuric acid 1 part, nitric acid 1 part, water 2 parts by measure, for ten minutes or even less. The progress may be noted by taking from the bath and immersing in clear water.

(32) N. S. H. asks: 1. For the composition used for impression paper? A. Impression paper is prepared by mixing lamplack with cold lard to the consistency of thick cream, and applied to the paper with a rag. Then take a flannel rag and rub until all the color ceases coming off. 2. The receipt for the composition that is put on illuminating watch boxes? A.

For the preparation of a luminous paint see SCIENTIFIC AMERICAN SUPPLEMENT No. 249. 3. Also a receipt for making liquid glue? A. See back numbers of SCIENTIFIC AMERICAN.

(33) M. N. W.—The method of making cast iron malleable is briefly as follows: "White" or brittle iron is used for the castings. When the castings are cleaned from the moulding sand, they are packed in cast iron boxes with sides and bottoms three-quarters of an inch thick, with powdered sal ammoniac and forge scales, put in an oven, and kept at a red heat from six to eight days, according to the size of the castings. They must cool gradually.

(34) E. A. J. asks: If corn meal will cause a locomotive boiler to foam? A. If put in in any quantity it will cause foaming for a time, but gradually wear off.

(35) C. E. McC. asks for a receipt for painting or staining a checker board on marble top table. Something that will not spread or wash out. A. In staining marble it is necessary to heat it hot, but not so hot as to injure it, the proper heat being that at which the colors nearly boil. Blue is produced with an alkaline indigo dye. Red by dragon's blood in alcohol. Yellow by gamboge in alcohol. Gold color with (sal ammoniac) ammonium chloride, zinc sulphate, and verdigris, equal parts. Green, sappreen in alcoholic potassium hydroxide. Brown, tincture of logwood. Crimson by a solution of alkanet root in turpentine. Black spots may be produced with silver nitrate. As a general rule, however, we believe these tables are made by inlaying rather than by staining.

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

R. C. P.—The specimen is ordinary clay. It would have no value in New York on account of the iron it contains, but you might find some local demand for it. —D. M. D.—No. 1 consists of decomposed or oxidized sulphides of iron; the taste is due to the sulphur. No. 2 is an iron ore consisting of oxides and sulphides. No. 3 is the magnetic oxide of iron, or magnetite. No. 4 is a sample of clay too gritty for polishing purposes.—M. S.—It is impossible to form any opinion in regard to No. 1 unless it is chemically examined, the expense of which would be \$5.00. No. 2 is a decomposed shale rock of no use or value.

INDEX OF INVENTIONS

For which Letters Patent of the United States were Granted

February 26, 1884,

AND EACH BEARING THAT DATE.

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

Table listing various inventions with patent numbers, including: Air pressure apparatus for beer kegs, Alarm, Alcohol process of, Annunciator, Automatic lubricator, Axle carriage, Back band hook, Back stay fastener, Bag fastener, Bag lock, Balance spring, Barrel cover, Bathing apparatus, Battery, Bed, sofa, Beef cutter, Beer cooler, Bell, Blast furnaces, Blind and awning window, Blind stiles, Boats, Book case, Books, Boot and shoe last, Boot and shoe lasting device, Boot or shoe, Bottle for containing aerated or gaseous liquids, Bracelet, Brick kiln, Brooch pin, Buckle, tugs, Burning machine, Button fastener, Button hook, Buttoner, Cables, Caissons, Can ending and seaming machine, Car brake, Car coupling, Car coupling, Grounds & Gibson, Car coupling, H. Pidcock, Car door, Car replacer, Car sleeping, Car ventilator, Car wheel, Carriage wheel, Cartridge implement, Cartridge shell, Cartridge shells, Cartridge shells machine for drawing metallic, Case, Cement, Chain lock, Chair, Chuck, drill, C. Gage.

