described on p. 221, SCIENCE RECORD for 1876. Will both arrangements work, and which will be the better? A. The latter will have the least internal resistance, but will not be a very constant form. 5. Is there any alloy that expands when cooled, and contracts when heated? A. No; but a few of the metals or alloys, as those of antimony and bismuth, have the property of expanding considerably at the moment of solidification from fusion, owing to their tendency to crystalize.

(36) W. A., of Montreal, asks for the recipe for starch polish, or "concentrated starch," so-called? A. We do not know its exact composition, bnt think it is simply starch with a little grape sugar and paraffin.

(37) L. W. H. says: I want some method of preserving belts. I was told by an engineer to paint them with printer's black ink. Please let me know if this will damage belts that are in motion daily? A. A very little pure lard oil or neat's foot oil will preserve belts and prevent them from cracking. Castor oil is also used, but too much is worse than none. Daubing with printing ink is not recommended.

(38) R. B. G. says: I have a 12 x 24 inch engine, nearly new, runs 80 revolutions per minute, with which I wish to drive 2 pair 42 inch and 1 pair 30 inch burrs. My boiler is 42 inch x 26 feet, with two 16 inch flues. Is this boiler capacity sufficient? Give me the best plan to construct the furnace to give good draught and to economize fuel How much of the boiler shell should be exposed to the flames? What should be the size of an iron chimney, and how high? A. The boiler will be large enough in all probability. As to mode of setting, see p. 339, vol. 33.

(39) C. M. asks how to make a bichromate of potash battery? A. The carbon battery usually consists of a glass jar having within it a cup of porous, unglazed porcelain. The annular space between the sides of the vessels is filled with water slightly acidulated with oil of vitriol, and contains a sheet of zinc shaped so as to conform to the curve of the inner cup, which it nearly surrounds. A stick or prism of gas carbon is placed in the porous cup, and surrounded with a fluid made by adding strong sulphuric acid to a saturated solution of potassium dichromate until the red chromic acid just begins to separate in flakes, and then just enough water to redissolve the precipitate. The proportions of the several ingredients in this mixture should be about as follows: To 10 ozs. of potassium dichromate in a gallon of water, add 1 pint of strong oil of vitriol.

Please give me a recipe for polishing shells? A. See answer to H. C., p. 43, vol. 37.

(40) W. M. asks how to magnetize iron? A. Soft iron will not retain magnetism so as to become permanently magnetic. When a box of iron is surrounded by a coil of insulated wire (wrapped tight about it) through which a battery current is passing, the iron becomes a strong magnet. As soon, however, as the electric current is interrupted, the iron loses its magnetism and resumes its passive condition. You should consult some elementary treatise on electricity and magnetism or natural philosophy (physics). The best of these works may be consulted at the Astor Library.

(41) W. M. U., of Cork, Ireland, asks: 1. How is brown bronze on gas chandeliers and fittings done? A. Vinegar half a pint, copper sulphate 3 ozs.; hydrochloric acid 3 ozs., ammonium chloride 2 ozs., alum ½ oz. Dissolve the salts, reduced to a fine powder, in the vinegar and acids with the aid of heat, and apply to the brass warm. 2. Make a paste of 2 ozs. each of verdigris and vermilion, 5 ozs. each of alumand sal ammoniac (all in fine powder), and vinegar. Heat the paste, and spread it on the cleaned work previously warmed. The addition of a little sulphate of copper inclines the color to chestnut brown, and borax to yellowish brown. 3. Use the following bronze powder with an oil size: Copper filings 100 parts, carbonate of soda 60 parts; fuse, cool, powder, add 15 parts of copper filings, mix, heat to whiteness for 20 minutes, cool, powder, wash and dry. 2. How is black bronze done? A. Dip the work bright in nitric acid, quickly rinse with plenty of water, and place in the following mixture until it turns black: Hydrochloric acid 12 lbs., sulphate of iron 1 lb., pure white arsenic (arsenious acid) 1 lb. It is then taken out, rinsed with clean water, and dried in sawdust, and polished with black lead, and lacquered with a green lacquer made as follows: 1 gallon of wood naphtha (methylic spirit), 5 ozs. shellac, 4 ozs. gum sandarac, 1 oz. gum elimi; place in a tin flask and expose to a gentle heat for a day or two. Then strain off, add a half gallon of spirit, and treat as before. Finally dissolve in the liquor 6 ozs. of turmeric and 1 of gum gamboge. 3. Can brass before pouring be colored by placing anything on it so as to give it when turned in the lathe a rich color like straw? A. If we understand you, no. Yellow brass contains a larger proportion of zinc.

(42) I. H. P. asks: What will remove the stain of sugar of lead from lime? A. Try a little soda water (carbonic acid water). If this does not answer use oil of vitriol diluted with about 50 parts of water.

Should imitation black walnut paper wainscot be sized before being varnished? If so, what is the preparation for sizing, and what is the best varnish? A. Yes; use a thin glue water, and when perfectly dried varnish with copal.

What can be done to cleanse for domestic use iron vessels in which sulphur has been melted? The sulphur seems to have combined with the iron by incrustation. A. Boil in the vessels for some time strong aqueous solutions of caustic soda or potassa; then wash with plenty of clean water and scour with sand.

(43) S. S. T. asks how to make the lightest gas possible from coal, such as would be most suitable to inflate a balloon? A. Use a hard coal and work the charge at a high temperature and longer than usual. The gas should be well washed and purified. Peat gives a lighter gas than coal.

(44) M. M. says, in answer to C. R., if he will so arrange his flue that the smoke from his boiler will pass vertically downward into a small chamber of 3 or 4 times the sectional area of his smoke flue, and from that chamber pass into the smoke flue, very few sparks will ever rise. If he will keep the floor of this receiving chamber flooded with water, neither sparks nor dirt can possibly pass up the smokestack. I have seen this tested and know it to be a perfect cure.

(45) B. R. T. asks how to make printer's rollers, and moulds for the same. A. The roller mould may be a brass, zinc, or tin tube of the size required. Oil it on the inside before pouring the composition into it. This is to prevent sticking. For the roller composition to use in summer take good glue, prepare as for gluing wood work, and add about twice the quantity of good molasses, and boil together for a short time, say an hour or two, then pour in the mould. If too soft when it gets cold, remelt and add more glue.

(46) J. E. asks for a recipe to make black ink, and is referred to reply to T. C. (54) p. 76, No. 5, present volume.

(47) J. A. H. is informed that we know nothing of the opportunities for his business in Japan. We doubt if employment could be secured there that would pay better than here.

(48) W. J. asks: Have any detailed drawings of the Brayton gas engine been published? A. In No. 20, vol. 34, and No. 2, vol. 36 of the SCIENTIFIC AMERICAN, and in Nos. 24 and 58 of the SCIENTIFIC AMERICAN SUPPLEMENT, you will find cuts and descriptions that will give you the information.

(49) H. K. asks: What is the best solution for tempering coalpicks? What is used for tempering dies and knives, and how is it done? Which is the best method to straighten a horse's hoof? A. Vol. 31 of the SCIENTIFIC AMERICAN contains about a dozen good articles on hardening and tempering to which reference is made. No two experts in hardening and tempering use precisely the same solutions or manipulate the tools to be tempered in the same manner. Each one would probably claim their process as the best. Conditions are such, as regards quality of steel, hardening, etc., that it is impossible to give the best solutions or the best methods. In reply to the last question our correspondent had better consult a farrier.

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

S. M. S.—The scale consists principally of carbonate and sulphate of lime, some carbonate of iron, and a little alumina and silica. There is nothing in it of a poisonous nature. The mineral matter forming the scale is most readily precipitated from the water by boiling. Allow the water to settle and siphon off from the sediment.—W. P. C.—It is flint.—M. C.—It is an earth or soil containing a large quantity of carbonaceous matter apparently of animal origin. Earth of a similar nature is often found in the caves of guano districts. The percentage of ammoniacal salts is very small, but it contains enough of the phosphates to be of some value as a fertilizer.—T. W.—It is not plumbago, but a shale of little value. It may pay you to look deeper.—B. F. G.—Nos. 1 and 4 are not trap rock, but a limestone containing garnets and idocrase—a compound of lime, iron, alumina, and silica. Nos. 2 and 3 contain copper.—H. W. K.—We cannot find your box of minerals.

COMMUNICATIONS RECEIVED.

The Editor of the SCIENTIFIC AMERICAN acknowledges, with much pleasure, the receipt of original papers and contributions upon the following subjects:

On Darwin and Others on Creation. By Dr. H. D. T.

On Determining the Proportions of Gear Teeth. By O. E. M.

On Hydraulic Cements, Stone, etc. By ——.

On Geometrical Problem and Instrument. By W. G. B.

Also inquiries and answers from the following:

D. L. H.—H. W. K.—J. S. A. B.—G. R. C.—W. C. L.—J. M.

HINTS TO CORRESPONDENTS.

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

Correspondents whose inquries fail to appear should repeat them. If not then published, they may conclude that, for good reasons, the Editor declines them. The address of the writer should always be given.

Inquiries relating to patents, or to the patentability of inventions, assignments, etc., will not be published here. All such questions, when initials only are given, are thrown into the waste basket, as it would fill half of our paper to print them all; but we generally take pleasure in answering briefly by mail, if the writer's address is given.

Hundreds of inquiries analogous to the following are are sent: "Who publishes books on steam boilers? Who publishes a book on construction and running of steam engines?" All such personal inquiries are printed, as will be observed, in the column of "Business and Personal," which is specially set apart for that purpose, subject to the charge mentioned at the head of that column. Almost any desired information can in this way be expeditiously obtained.

OFFICIAL.

INDEX OF INVENTIONS

FOR WHICH

Letters Patent of the United States were Granted in the Week Ending

July 3, 1877,

AND EACH BEARING THAT DATE.

[Those marked (r) are reissued patents.]

A complete copy of any patent in the annexed list, including both the specifications and drawings, will be furnished from this office for one dollar. In ordering, please state the number and date of the patent desired, and remit to Munn & Co., 37 Park Row, New York city.

Adhesive substance, Long & Drake 192,773
Advertising seat, etc., Lacomme, Marville, & Giron 192,770
Animal stocks, Bowman & Irving 192,672
Animal trap, F. Cowan 192,569
Aquarium, Paen & Sexton 192,595
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DESIGNS PATENTED.

10,079.—PENDENT GAS FIXTURES.—C. Baker, Philadelphia, Pa.

10,080 and 10,081.—GASALIERS.—R. C. Baker, Philadelphia, Pa.

10,082.—CASSIMERES.—F. S. Bosworth, Providence, R. I.

10,083.—EMBROIDERY PATTERN.—E. Crisand, New Haven, Conn.

10,084.—HEATING STOVES.—J. A. Lawson, Troy, N. Y.

10,085.—LIQUOR FLASKS.—E. R. Lilienthal, San Francisco, Cal.

10,086.—MATCH SAFES.—W. H. Matthai, Baltimore, Md.

10,087.—CASSIMERES.—W. B. Weeden, Providence, R. I.

10,088.—MONUMENT.—A. M. Buchanan, Moberly, Mo.

10,089.—CASSIMERES.—O. F. Chase, Thompson, Conn.

10,090.—OIL STOVES.—W. Hailes and J. Gray, Albany, N. Y.

[A copy of anyone of the above patents maybe had by remitting one dollar to MUNN & Co., 37 Park Row, New York city.]