

(23) W. F. asks (1) why an engine in making a curve will travel more on the high than on the low side. How do they do it when the wheels on both sides are making the same number of revolutions? A. The face of the tire is generally coned, and the outer wheel runs on a larger diameter; also, the inside wheel slips or slides to a certain extent, depending on the radius of the curve. 2. On what principle does an injector work? A. By the velocity and consequent momentum given the water by the effluent steam.

(24) V. V. G. asks: Will a locomotive without train, with a 4 1/2 foot wheel disconnected on one side, be equal to a 9 foot wheel? Will a locomotive run faster with one side disconnected? A. The locomotive will not travel faster than the wheel travels. Disconnecting one side makes no difference so long as the wheels have the same velocity.

(25) R. H. D. asks: What is the best way to irrigate a strawberry field, 1/2 acre, water to be taken from a lake, highest point 9 feet above low water; greatest distance 200 feet; time water is wanted, during the month of June? I can pump in a tank by hand and spread by gravity, or draw with team and self-filling tank attached under wagon. Is there a better or cheaper plan? A. Put up a windmill to pump into your tank, and spread by gravity.

(26) W. F. H. writes: We had a 40 horse power tubular boiler to test with water pressure; took the water from a pond covered with ice, boiler was out doors; thermometer about 23°, or 6° below freezing, cloudy day; gave it a pressure of 120 lb. in that condition. How much steam pressure would it be equal to? I claim it would be as hard on the boiler as 150 lb. steam or hot pressure. A. It would be harder on the boiler, because the water has no elasticity, while the actual pressure would be the same. The iron would also be more brittle at the low temperature.

(27) A. B. P. writes: I have a large cistern, and the pipe that feeds my boiler is constantly five feet under water. Would it be injurious to the boiler, or in any way objectionable, to let the exhaust from the engine into the cistern at the top of the water, if I use country tallow only in the cylinder? A. No, unless you use the tallow in large quantity.

(28) G. H. C. asks: 1. What was the depth of girders and what was the width from outside to outside of same across the track on the recently destroyed spans of the Tay bridge? A. Depth 27 feet, width between girders about 12 feet. It was a single track bridge. 2. Are hexagonal nuts ever used on bolts in fish plates in this country, or are they all square? A. They are almost invariably square. 3. Is a fish plate bolt screwed up tight as any other bolt in any piece of machinery, or is it left moderately loose to admit of expansion and contraction of rails? A. It is screwed up tight, but the fish plate has a little elasticity.

(29) A. O. K. writes: 1. I have charge of a boiler of the locomotive type. I have considerable trouble with leaks at the bottom of the water legs, caused by fractures in the cast iron "ring" surrounding the fire box. Calking does no good; I have also tried a cement of iron turnings, sal ammoniac, and sulphur, placing it on the cracks, but that also failed to stop the leaks. Bran does better, but does not stop them entirely. How can they be stopped effectually? A. First use coarse Indian meal on the inside, and when it has worked well into the cracks, fill above it with hydraulic cement 1 to 2 inches thick, being careful that the top of the cement is some distance below the top of grate bars. 2. I want to black small casting by dipping. Can you give a recipe for a paint for this purpose that will have a gloss after becoming dry? A. Use asphaltic black varnish.

(30) A. R. B. writes: Riding with a friend recently, he asserted that the wagon brake produced greater effect in retarding the vehicle when barely allowing the wheels to turn, than when it locked them entirely. I said he was mistaken, but could give him no satisfactory reason. Am I right, and if so, please explain why? A. Your friend is correct. It is true also of railroad brakes when the wheels are locked; the same surface is constantly presented for friction and soon becomes glazed; when allowed to turn, new surfaces are presented.

(31) C. E. B. asks: 1. Of what kind of metal is the rings in an engine cylinder composed of? A. Generally cast iron. 2. How can I run Babbit metal boxes for a saw mandrel or other shafts? A. Fit a mandrel the size of the shaft in the box and cast around it.

(32) J. H. W. asks for a recipe for a toilet lotion that will improve complexion of ladies, which contains nothing injurious. A. We do not recommend such lotions. Temperate living, plenty of out-of-door exercise, and frequent bathing impart a clear vigor to the skin attainable by no artificial means.

(33) J. F. P. writes: I have a well that is 20 feet deep, and I have a pump with 1 inch gas pipe; it is common iron piping. The water tastes a little of the iron. How can I keep it from tasting? A. Use wood tubing instead of the iron pipe.

(34) J. C. S. asks: How can cattle hoofs or horns be melted so as to form a transparent composition? A. Horns are soaked in hot water until the bone is easily separated, when they are softened in hot water, slit up, and spread out between warm plates under pressure. From these plates the articles referred to are cut. Hoofs are usually cold pressed. Neither are melted as suggested.

(35) J. A. W. writes: Can you tell me the usual way of covering lead with powdered chromium for negative plates, and do you consider such plates equal to carbon? Do you know of an imitation or any substitute for hard rubber? A. The metallic chromium, according to Beasley, is pressed into the surface of the lead by passing between steel rolls. It compares favorably with carbon in some electrolytes. Celluloid can be made to closely resemble ebonite or vulcanite.

(36) J. S. writes: I wish to build a small steam launch of the following dimensions: Length over all 25 feet, beam 5 feet, depth 3 1/4 feet. Boiler 24 inches

diameter, 36 inches high, 90 or 100 one inch tubes. Engine, cylinder 5 inches by 6 inches stroke, working pressure 150 lb. The exhaust steam to be led through the bottom of the boat and along the keel to and around the stern, then forward and empty into a tank in the boat. The diameter of the exhaust pipe will be 1 1/4 inches, length about 30 feet under water. Will 30 feet of 1 1/4 inch pipe have enough surface to condense all the steam; if not, how long ought the pipe be? A. No; do not use less than 2 inch pipe.

(37) R. E. W. asks: By what process is condensed milk made? A. The fresh milk is pumped into large air tight vessels (vacuum pans) placed over a warm water bath and connected with air pumps, by which a partial vacuum is maintained within them. Under these circumstances the milk boils and parts with its water at a very low temperature. Where the milk so condensed is to be preserved for a very long time, it is mixed with a certain per cent of pure white sugar and put up in hermetically sealed cans.

(38) A. B. F. asks (1) for the dimensions of a scow that will carry about 40 tons of freight in addition to her engine, and not draw over 18 inches of water. A. About 75 or 80 feet long and 15 feet beam. 2. What would be the power of an engine to drive it at about 4 miles per hour with a stern wheel? A. Two engines, 6 inches cylinder and 2 feet stroke. A. Which is best for such a boat, an engine with one cylinder or one having two cylinders? A. Two engines.

(39) F. A. S. asks: 1. Is it true that Bessemer steel cannot be used for mould boards for plows, or bottoms of road scrapers. A. Yes. 2. Is it because such steel cannot be properly hardened? A. Yes. 3. If it cannot be made sufficiently hard, why is it? A. It contains too little carbon to be materially affected by the ordinary hardening processes.

(40) J. B. R. writes: I have a private telegraph line, two wires, 3/4 mile long. The line is annealed wire, such as tin men use in putting up stoves. The line has been in use three years. It has been broken several times and spliced. I use three cells Watsons battery to charge the line. It works good for three or four days, then it ceases to work until I cross the wires in the office for a few minutes, then it will work again as usual. Why will it not work all the time? The current is very strong when I cross the wires in the office. A. Without further data we cannot explain the action of your line. It is probable, however, that the resistance of your line is excessive. Use regular telegraph wire. If you require a small wire, use copper.

(41) F. H. L. asks if there is any composition of brass that can be melted in an ordinary coal stove that is of sufficient hardness to cast small models from and its composition. A. Common yellow brass may be readily melted in a coal stove, but it is doubtful if brass can be easily made in an ordinary stove, as the copper, which must be first melted, fuses at a much higher temperature than brass. A very good formula for yellow brass is copper 70 parts, zinc 30 parts.

(42) J. A. C. asks how are the teeth put in the small bracket saws not larger than 1-16 inch wide. A. A number of steel plates having the thickness of the saws are clamped together and placed in a milling machine, which cuts teeth in the edges of the whole series of plates simultaneously. The saws are then sheared from the edges of the plates, and the plates are again melted, and so on.

(43) G. D. R. writes: On page 69, current volume, SCIENTIFIC AMERICAN, I find an article by G. F. Barker, entitled "Crystallization in Canada Balsam." I have frequently observed the figures assumed by balsam or Damar varnish, when boiled between slips of glass; and they are like the cut in the article referred to. If the gum is thick enough and allowed to cool under pressure, the figures are permanent. I am not prepared to dispute or discuss anything; but unless I was sure the glass in question had not been exposed to a "prairie fire" or some other source of heat, I should say heat was the cause of the figures instead of crystallization, as a heat sufficient to boil balsam will not char wood, or if carefully applied, scorch varnish. My proposition can be easily demonstrated by any one with a drop of balsam and two small pieces of window glass.

(44) B. T. F. writes: In SCIENTIFIC AMERICAN, February 7, 1880, page 91, article 4, C. M. K. asks: What will drive away or destroy fleas? I reply: Persian insect powder. I tried it and got rid of the terrible pest.

(45) G. H. writes: Having discovered traces of silver in several places upon large tracks of land we own in this region, we should like to have some simple method of testing or assaying specimens of the rock. From tests made in the East of several different specimens, we are led to believe the stuff will yield from \$35 to \$40 a ton, but wish to try this ourselves. Can you tell us of any simple apparatus? A. Charge into a 6-ounce crucible (a Battersea F answers very well) 1 ounce each of the ore and dry bicarbonate of soda, 2 ounces of litharge (free from silver), 1/2 ounce of argal, and cover with 1/4 inch of dry salt. Heat the crucible until the contents are in a quiet state of fusion, remove from the fire, cool, break, and clean the lead button by pounding on an anvil. If the button weighs more than, say, half an ounce, scorch it down in a scorching dish in an open muffle. Heat 1 1/2 inch bone ash cupel in the muffle, drop into it the button, and keep up the temperature of the muffle to a bright red heat until all the lead has been scorched off and absorbed by the cupel, and the small bead of gold or silver (if the ore contains any) becomes well rounded and clear. The ore must be finely powdered, and the whole of it passed through an eighty-mesh sieve.

(46) E. B. L. asks: How to cut up and work into shape retort carbon. It is very hard, and will turn the edge of everything I have tried. A. It is worked in the same manner as glass or stone. To saw it, use a revolving disk of thin sheet iron or copper supplied plentifully with emery and water. To shape it, use an iron lap supplied with sharp sand or emery and water.

(47) G. W. H. asks how can I drill

through stone or earthenware vases holes, 1/4 in. say, to 1/2 in. diameter? The vases are about 1/4 in. thick. A. Use a copper tube for a drill, and supply it with emery and oil.

(48) W. H. P. asks: Who was the first man who had knowledge of the existence of the American continent? A. Seeing that the most ancient vestiges of man thus far discovered have been found on this continent in formations antedating a portion, if not the whole, of the Glacial Period, history may be pardoned for not recording the first comer's name. The first white man certainly known to have visited our continent was Leif Ericsson, in the year 1001. There are traditions of earlier voyages of Europeans to America, but the historical evidence of such visits is insufficient.

[OFFICIAL.]

INDEX OF INVENTIONS

FOR WHICH

Letters Patent of the United States were

Granted in the Week Ending

January 20, 1880,

AND EACH HEARING THAT DATE.

[Those marked (r) are reissued patents.]

A complete copy of any patent in the annexed list, including both the specifications and drawings, or any patent issued since 1867, 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.

Table listing various inventions and their patent numbers, including items like 'Air, apparatus for separating the water of condensation from compressed, S. B. Hunt', 'Air, pneumatic apparatus for economizing compressed, S. B. Hunt', 'Album clasp, S. Posen', etc.

Table listing various inventions and their patent numbers, including items like 'Measuring machine, cloth, O. W. Dodson', 'Milk cooler, D. Van Hovenberg', 'Mill for reducing, levigating, etc., L. Smith', etc.

DESIGNS.

Table listing designs and their numbers, including 'Carpet, A. Heald', 'Carpet, D. McNair', 'Carpet, T. J. Stearns', etc.

TRADE MARKS.

Table listing trade marks and their numbers, including 'Cotton fabrics, unbleached, bleached, and colored, woven, Hill Manufacturing Company', 'Flour, wheat, Empire Mill Company', etc.

English Patents Issued to Americans.

Table listing English patents issued to Americans, including 'Car starters, J. Hill, Williamsport, Pa.', 'Elevator, hydraulic, C. W. Baldwin, Brooklyn, N. Y.', etc.

PRINCIPLES OF HORSE SHOEING.

By Geo. Fleming, V.S. A paper describing the proper method of shoeing horses so that the animal's feet may be kept always healthy and sound. How much the walls of the hoof should be reduced, and how the operation should be performed; the kind of shoes that should be selected; how they should be fitted; the number and size of nails that should be used, and how the face of the hoof should be treated. Followed by a description of a modified form of the "Charlier" method as successfully followed by the author for many years. Continued in SCIENTIFIC AMERICAN SUPPLEMENT, No. 2405. Price 10 cents. To be had at this office and from all newsdealers.