

would be about equally considered national airs. The music of the former is substantially the same, as that of "God Save the Queen," or "God Save the King," as it was first known. There is every reason to believe that the tune was composed in the time of James I., by Dr. John Bull, but it was not by him used for a national hymn. One Anthony Young, organist of All Hallows, Barking, adapted it to a "God Save the King," for James II., at the time when the Prince of Orange was hovering over the coast, but it was not so used until the time of George II. A letter from Victor to Garrick, October, 1745, mentions that it was sung at both theaters nightly amid great applause. It is a singular coincidence that Young's daughter was married to Arne, who composed "Rule Britannia." Mrs. Arne received a pension of £30 a year. In 1789 Mrs. Arne, who was grand-daughter of Mrs. Arne, received £100 from the government as "the accumulated amount of a yearly pension of £30 a year, awarded to Mrs. Arne as the eldest descendant of A. Young, the composer of 'God Save the King.'" The tune is almost a literal translation of a cantique sung by the Demoiselles de St. Cyr, when Louis XIV. attended morning prayer at that chapel. The words were by M. De Brion, and the music by the famous Sully. The "Star Spangled Banner" was first applied to the flag of the United States in a poem written by Francis S. Key, on the morning after the British attack on Fort M'Henry at Baltimore in 1812. The bombardment, which took place during the night, was witnessed by Mr. Key, who with some friends watched with intense anxiety for the return of day. At length the light came, and they saw the American flag still flying from the fort, the attack having failed. In the excitement of the moment he wrote the now famous song, the first verse of which so graphically describes the scenes of the night and morning. 2. Will a No. 3 pump, on a two inch pipe, throw water faster, than a No. 2 pump on same piping (well 20 feet deep)? If so, why? A. There are similar proportions in the steam and water pistons of most pumps. The water pressure would be nearly the same in No. 2 and No. 3 pump of the same make. The only gain a No. 3 pump would have is to throw more water with less speed. The piping should be of the assigned sizes due to the size of the pump for a proper proportion of work. 3. When a tree is felled, what force draws it in falling away from the stump? A. The manner in which a tree falls is largely due to the skill of the woodman, who takes advantage of the wind, the way the tree stands, etc.

(774) H. A. M.—Brick tiling on flat roofs cannot be made tight with cement. The tiles will absorb water. The cement will also open a little by the sudden shrinkage from the heat of the sun to the temperature of falling rain. We can only recommend a coat of coal tar, which allow to dry and then put on a thick coat of coal tar and asphalt, put on hot, and spread over with clean coarse sand, thick enough to keep the tar and asphalt from running by sun heat. See answer to Query 601, in our issue of April 13.

(775) B. V. G. asks (1) how a cable car rounds a curve. A. The cable is kept in place by flat-faced pulleys on vertical shafts, arranged around the curve, so as to just clear the grip in its passage around the curve. The grooved pulleys carry the cable just below the bottom of the grips, so that the cable in the grip is raised out of the pulley groove when passing. 2. Why the steamboats using electric headlights have the headlight glass cut in strips about 3/4 inch or 1 inch wide. A. The glass in the headlights is cut into strips to prevent breakage from the high heat of the arc.

Books or other publications referred to above can, in most cases, be promptly obtained through the SCIENTIFIC AMERICAN office, Munn & Co., 361 Broadway, New York.

NEW BOOKS AND PUBLICATIONS.

MAY TIME. A compilation, by Marcus Benjamin, of sundry poems. 84 pp. 25 cents. New York: De Witt Publishing House.

EXAMINATION OF WATER FOR SANITARY AND TECHNICAL PURPOSES. By Henry Leffmann, Ph.D., and William Beam, M.A. Philadelphia: P. Blakiston, Son & Co. 1889. Pp. 106. Price \$1.25.

This convenient little manual contains within small compass an excellent resume of methods of water analysis. The determinations of solid matter, of nitrogen in its various forms, of phosphates and oxygen required to oxidize organic matter are all treated. The all-important subject of interpretation of results has devoted to it a special chapter. A chapter giving analytical data and an index close a very useful work.

INDEX OF PUBLICATIONS ON METHODS OF COMMUNICATION IN THE FIELD AND ON TORPEDO WARFARE. By R. Von Fischer-Treuenfeld. London: Alabaster Gatehouse & Co.; New York: D. Van Nostrand. Pp. v, 71.

The title of this book tells its story. From military telegraphy, through signaling, both audible and visible, ballooning, carrier pigeons, dogs and velocipedes, torpedo service, electric light apparatus, and many other subjects, down to cryptography, the literature is indexed in twenty-nine divisions. This gives the titles of the papers and publications. An index of authors' names, referring back to the main work, completes it, giving an excellent presentation of the subject.

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INDEX OF INVENTIONS

For which Letters Patent of the United States were Granted

April 16, 1889,

AND EACH BEARING THAT DATE.

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

Table listing inventions with names and patent numbers. Includes items like Acid, alizarine green sulpho, R. Bohn; Air brakes, flexible piping, D. M. Legat; Alarm, C. Agerskov; Alizarine-blue green, R. Bohn; Anchor, folding, T. S. Laughlin; Armature, dynamo, C. O. C. Billberg; Atomizer, G. Kneuper; Axle oiling device, locomotive, T. J. Rogers; Bag, See Paper bag; Baling presses, power mechanism, G. Ertel; Barrel cover, G. W. Lindsey; Barrels, etc., apparatus for shaving, Gibson & Ray; Basin or bath waste and overflow, W. H. Newell; Baskets, machine for making, I. J. W. Adams; Batteries, automatic cut-out for secondary, S. C. C. Currie; Batteries, therapeutic attachment for galvanic, C. V. Osborn; Battery, See Secondary battery; Battery zincs, making, H. G. Farr; Beer engines, construction of, J. A. Bigelow; Bell, pneumatic, R. P. Garsed; Belting, R. Dick; Belts, making flat, R. Dick; Bicycle, R. H. Fletcher; Bicycle gearing, W. J. Fitzpatrick; Blacking, shoe, C. D. St. Pierre; Blast furnace, E. Walsh, Jr.; Blast furnaces, charging apparatus for, E. Walsh, Jr.; Block, See Flooring block. Paving block. Snatch block; Board, See Trimming board; Boiler, See Steam boiler; Boiler, E. W. Poorman; Boilers, low water indicator for steam, P. J. Grau; Bolts, machine for cutting the screw threads on, J. M. Simpson; Bonbons, making soluble, L. Oberhaeuser; Books, carbon paper attachment for receipt or note, H. C. Seely; Bottle washing and brushing machine, C. B. Inman; Box, See Cock box. Dredge box. Miter box; Box cover, W. Sharnweber; Brace, G. T. Sutterley; Bracket, See Scaffold bracket; Brake beam, W. A. Pungs; Buggies, stop plate for, Stewart & Chambers; Burner, See Gas burner. Hydrocarbon burner. Vapor burner; Buttonhole strip, H. W. Lyon; Button setting machine, J. H. Vinton; Calculating machine, E. M. Rosenthal; Calendar, S. W. Balch; Can, See Oil can; Candlestick, A. Roelofs; Car berths, ladder and guard for sleeping, Cullen & Brown; Car, combined sleeping and day, H. M. Jones; Car coupling, J. O. Bryant; Car coupling, Case & Preston; Car coupling, D. U. Graveline; Car coupling, A. W. McKenzie; Car door fastening, P. H. Murphy; Car, electric alarm advance, H. Riesenbergh; Car for live stock, H. Baines; Car frame, railway, M. A. Zurcher; Car, hand, F. A. Staser; Car, railway, M. A. Zurcher; Car, railway, E. Wenigmann; Car, sleeping, T. W. Moore; Car starter and brake, combined, S. B. Fyler; Car wheel, H. W. Libbey; Cars, ticket box for street railway, S. H. Caughy; Carbazol yellow, R. Bohn; Carbon filaments, manufacture of, E. P. Thompson; Carbon filaments, manufacture of incandescing, E. P. Thompson; Carriage curtain fastener, S. P. Scott; Carrier, See Cash carrier. Egg carrier; Cart, hand, A. Schubert; Cash carrier, D. Lippy; Cash indicator and register, W. W. Wythe; Center of attraction in polarized bodies, determining the, A. Gipperich; Chair, See Iron chair; Chairs, spring attachment for rocking, W. I. Bunker; Check spreader, overdraw, S. E. Harsh; Cigar bundling machine, A. E. Pye; Cigar making machine, W. M. Steine; Clamp, See Wood working clamp; Clasp, See Corset clasp; Clasp, F. B. Spooner; Clip, See Wagon clip; Clock, A. Jungmans; Clothes pounder, L. N. Martin; Cock box, stop, P. H. Gundermann; Cock or faucet, F. B. Ray; Coffin fastener, W. A. Sparks; Coin assorter, J. Roggy; Colter attachment for plows, W. J. Edwards; Commode, J. A. Bell; Concrete pavement and floor, P. M. Bruner; Cooking apparatus, H. H. Boggs; Copying writings, apparatus for, F. A. C. Zabel; Corkscrew, Alvord & Brown; Corn cob pipes, manufacturing, A. Ruth; Corpse dressing table, C. Green; Corset clasp, J. H. Haviland; Coupling, See Car coupling. Tube coupling; Coupling pin, F. L. Remington; Crane, traveling, J. Walker; Cultivator, J. Shoolbred; Cultivator, H. Staggs; Cultivator, cotton, J. Marion; Curtain pole socket, H. Reubel; Cutter, See Feed cutter. Pipe cutter; Dampers for fireplaces, etc., device for operating, A. V. Bay; Dental vulcanizers, regulating valve for, I. Stuck; Desk, drawing board and easel, combined writing, H. L. Keith; Dial, timepiece, M. V. B. Ethridge; Display rack, R. Kaufmann; Door check, M. H. Bassett; Door check, W. S. Barlow; Dredge box, J. W. Ivory; Dredging bucket, R. Hosford; Drill, See Ratchet drill; Drilling tool, A. E. Brown; Drum and gripper, combined, H. Fletcher; Duplex engine, direct-acting, C. C. Worthington; Dust collector, Leduc & Weeks; Dye, crimson, T. Diehl; Easel and sheet music cabinet, combined, O. Stoddard; Egg carrier, C. F. A. Eddy; Electric currents, distribution of, E. Thomson; Electric lighting, system of, T. A. Edison; Electric lighting, wiring structures for, Johnson & Greenfield; Electric locomotion, system of, F. Wheeler; Electric machine, dynamo, E. Weston; Electric wire nail, C. A. Gildemeyer; Electro-magnetic motors, operating, N. Tesla; Electrotypes, forming curved, Benedict & Furlong; Elevator, W. H. Milliken; Engine, See Duplex engine. Gas engine. Motor engine. Steam engine; Envelope machine, A. A. Rheutan; Envelope machine, F. H. Richards; Fan, suspension fly, W. C. Whitner; Farm gate, C. M. Gitt; Feculent matter receiver, O. D. McClellan; Feed cutter and cornhusker, combined, A. Rosenthal; Fence, wire, J. N. & N. Lehman; Fence, wire, W. H. Mitchell; Filter, oil, A. C. Darragh; Fire escape, S. H. Sprague; Fire escape ladder and truck, A. Frederick; Fires in passenger cars, device for extinguishing, S. H. Harrington; Flooring block, W. Boelling; Flushing device for urinals, Murphy & Atkinson; Flushing device for water closets, etc., Murphy & Atkinson; Frame, See Car frame. Umbrella frame; Fuel, artificial, A. E. & C. M. Murray; Funnel apparatus, jar holding, M. Ellis; Furnace, See Blast furnace; Furnace, M. A. Foster; Furnaces, indicating device for charging, E. Walsh, Jr.; Gauge, See Water gauge; Gas, apparatus for the manufacture of, C. M. Gearing; Gas, apparatus for the manufacture of, T. S. C. Lowe; Gas burner for heating purposes, P. Lesser; Gas engine, L. H. Nash; Gas engines, fuel mixing device for, L. H. Nash; Gas governor, H. J. Bell; Gate, See Farm gate. Tilting gate. Water gate; Grain binder, Eastman & Potter; Grain clipping machine, R. W. Welch; Guard, See Snow and ice guard; Hair holder, J. L. Hackett; Hammer, drop, F. M. Leavitt; Hand motor, C. E. Bromwell; Handle, See Tool handle; Handle, L. M. Devore; Hanger, See Spring hanger; Harvesting machine, corn, J. F. Steward; Harvester reel, J. F. Steward; Hay rake and loader, J. E. Shinn; Heater, See Tank heater. Water heater; Heating apparatus, H. Helm; Heating system, W. W. Canfield; Heeling machines, top lift carrier for, H. W. Winter; Heeling machines, top lift holder for, H. W. Winter; Hoes and shovels, machine for making, H. E. Marchand; Hoisting and loading machine, D. S. White; Holder, See Hair holder. Lamp holder. Pen holder. Refrigerator ice holder; Hook, C. O. Buell; Hub and axle, vehicle, J. R. Cole; Hydrant, J. Kaiser; Hydrocarbon burner for furnaces, Griffith & Miller; Indicator, See Cash indicator; Inhaling apparatus, E. Krull; Injector, steam, A. Lambert; Iron, See Waffle iron; Iron chair, A. M. Gjestvang; Iron ore, treating magnetic, G. Conkling; Knife, See Surgeon's knife; Knife for printer's use, L. J. Dus; Jack, See Lifting jack; Jetty, W. M. Douglas; Ladder, fire, L. Harris; Ladder, fire truck, C. Albert; Lamp, D. W. Parker; Lamp bulbs, exhausting electric, J. W. Packard; Lamp holder for vehicles, C. L. Ellicott; Lamp, incandescent, Lemp & Wightman; Lamp, incandescent electric, T. A. Edison; Lamp shade or reflector and guard, combined, C. A. Cooley; Lamp suspension device, Hammond & Merriam; Lamp with annular burner, oil, A. Cautius; Lamps, cut-out for incandescent electric, E. R. Whitney; Lamps, etc., extension fixture for, L. F. Griswold; Lamps, heating attachment for, J. W. Zinn; Lantern, electric, Cox & Van Dyke; Lantern, tubular, E. C. Glazier; Latch and lock combined, J. A. Campbell; Lath turret, C. I. King; Lathing, machine for forming sheet metal, J. Weichart; Lead, making white, J. Baldwin; Ledger or similar account book, J. W. Horne; Leg, artificial, C. A. Frees; Levers, foot for sand, C. Vezie; Lifting jack, W. M. Piper; Lifting jack, A. A. Strom; Liquids, apparatus for delivering, J. Jenkins; Liquids, device for agitating, R. S. Williams; Loom lease rod, Hobbs & Whelan; Looms for weaving fabrics having end borders, shuttle box pattern mechanism for, F. Hebden; Lumber piles, device for launching, H. Rich; Magnetic separator, G. Conkling; Marker, land, W. H. Boggs; Match, F. Leiss; Measurement apparatus, electrical, A. C. White; Measuring siphon, J. M. Clark; Mechanical movement, F. H. Richards; Medical compound, F. Kruger; Metal wheel, A. Keith; Mill appliance, H. Aiken; Miter box, W. H. Englehard; Motor, See Hand motor; Motor engine, Newall & Blyth; Mower, lawn, F. Enos, Jr.; Musical instruments, picking thimble for, N. E. Barnes; Nail, See Electric wire nail; Neckscarf, L. Cole; Necktie fastener, W. H. Glines; Net, fisherman's, J. F. Marsters; Nipple, nursing, R. Lockwood; Oil can, H. Muller; Ore concentrator, J. H. Pemberton; Ore separator, magnetic, C. C. Coats; Organ, O. C. Whitney; Oven for vapor or gas stoves, J. Stubbers; Oven, portable, J. Middleby; Padlock, G. Brambel; Panel raising machine, J. Green; Paper bag, E. E. Clausen; Paper folding machine, W. Downing; Pavement, laying artificial, J. W. MacKnight; Paving block, G. M. Graham; Paving block, W. & J. W. McReynolds; Pen holder, L. M. Hopkins; Photo-engraving, translucent film for use in the art of, C. A. Muller; Photographing instrument, G. A. Cooke; Pianofortes, sheet music support for, E. J. Snow; Pin, See Coupling pin; Pipe cutter, V. B. Stevens; Pipes, leak detector for, A. H. Brown; Plane, bench, F. M. Bailey; Planing machine feeding device, Welch & Auterlieth; Planing machine, wood, Wetherell & Jones; Planing machines, belt tightener for, E. F. Auterlieth; Plate, name and letter drop, W. Graham; Plow, S. Kauble; Plow, J. W. Webster; Pole or tower, J. W. Davy; Portraits, mounting, P. G. Kramer, Jr.; Press, See Printing press. Tobacco press. Press for bundle wrapping, self-locking, E. E. Porter; Printing machine, hand, W. O. Nelson; Printing machines, stop mechanism for cylinder, S. D. Tucker; Printing press, A. B. Carty; Printing presses, ink fountain for, A. B. Carty; Propeller and governor, chimney or stack, J. A. Robb; Propeller for vessels, current, E. Lotze; Pulley, H. J. Gilbert; Pulley changing device, Burbank & Church; Pulley, split, J. M. Pollard; Pulp board bending machine, wood, C. B. Jameson; Pump gearing, E. H. C. Oehlmann; Pump, mercury air, J. W. Packard; Punch, shears, and saw gummer, combined, J. Schofield; Rack, See Display rack; Rail spiking machine, Roberts & Caldwell; Rails, cast metal brace chair for girder, W. M. Brown; Railway alarm apparatus, automatic, W. Rymer; Railway spikes, finishing, H. Greer; Railway, street, L. M. Hosea; Railway switch, E. Gordon; Railway switch stand, C. Alkins; Railway switches, interlocking signal apparatus for, F. H. Treacy; Railway systems, electric heating apparatus for, M. W. Dewey; Railway track alarm, electric, T. Taylor; Railway track instrument, G. C. Steenbergh; Railway vehicles, brake apparatus for, Cowburn & Tentschert; Railways, pneumatic alarm for, T. Taylor; Railways, underground conduit for electrical, F. H. Reed; Rake, See Hay rake; Ratchet drill, H. M. Glines; Ratchet drill, Rogers & Jones; Ratchet drill, T. N. Scott; Reapers and mowers, cutter bar for, J. I. Murray; Record, H. C. Seely; Reel, See Harvester reel; Refrigerator car, W. H. H. Sisum; Refrigerator ice holder and water escape, U. Reiffer; Register, H. S. Ross; Rheostat, N. Benardos; Riveting machine, H. S. Maxim; Rod, See Loom lease rod; Rolling bulb webbed slot rails, rolls for, F. Colley; Rolling machine, tire, J. Munton; Rolling three-flanged slot rails, rolls for, F. Colley; Rolling Z-shaped slot rails, rolls for, F. Colley; Ruler, N. Vermehren; Sail, ship's, J. Roberts; Sash fastener, R. A. Reisse; Scaffold bracket, E. A. Brace; Scaffold, safety, J. Carmichael; Scraper, E. L. Lefebvre; Scraper, road, H. C. Langebartels; Scraper, wheeled, F. A. Rathbun; Screw cutting machine, J. H. Sternbergh; Screw cutting machine, Sternbergh & Pemberton; Secondary battery, J. S. Sellon; Seeder, hand, T. R. Parry; Separator, See Magnetic separator. Ore separator; Separator, C. Hallett; Sewage purifier, J. J. Powers; Sewing machine thread cutting mechanism, C. F. Wilcox; Shaft, flexible power, O. J. Brown; Shaft support, E. Clark; Shafts, adjustable box for, E. H. Bridgman; Shaping irregular forms, self-feeding machine for, W. & G. M. Reid; Sheet metal vessels, mechanism for forming and sizing, A. Slaysman; Ships, machine for bending ribs or frames of, J. S. Mitchell; Shirt, H. W. Messer; Shirt, fannel, F. D. Renshaw; Shoe, C. H. Pearsall; Sifter, J. C. Fredericks; Slates, etc., composition of matter for the production of artificial school, H. Gallinowsky; Snatch block, B. H. Naves; Snow and cleaning streets, machine for melting, A. Hentschel; Snow and ice guard, S. R. Hawthorne; Soda, making, F. H. Gossage; Sole for rubber foot wear, protective, T. Regan; Spectacles, electro-therapeutic, C. Brust; Spinning frames, etc., guide tube for, S. Henderson.

