charge leaves the gun. A. The kicking or recoil of a gun commences at the instant that the ball begins to move. The impulse lasts until the ball leaves the muzzle. The recoil continues after the ball leaves, from the momentum generated by the first impulse.

(26) J. inquires: 1. How to prepare a rust cement for iron? A. Wrought iron filings, 65 parts; sal ammoniac, 2½; sulphur (flowers), 1½; sulphuric acid, 1. The solid ingredients are mixed dry, sulphuric acid diluted with sufficient water being then added. This cement dries after two or three days, and unites with the iron, making a very resisting and solid mass. 2. Also an iron cement for high temperatures? A. (1.) Iron filings, 20 parts; lime powder, 45; borax, 5; common salt, 5; permanganate of potash, 10. The borax and the salts are dissolved in water, and are then mixed with the two first named ingredients as quickly as possible and used. This cement changes at a white heat to a glassy mass, which is perfectly airproof. (2.) Permanganate, 25 parts; zinc white, 25; borax, 5. These are treated with a solution of soluble glass, and used at once. This cement must be left to dry slowly, and then it will resist the highest temperatures.

(27) G. H. asks for the process of preparing a bichromate solution for a small electric light battery. A. M. Trouve in his improved electric battery takes 150 grammes of bichromate of potash powder to a like amount of water, and after slaking adds, drop by drop, 450 grammes of sulphuric acid. The liquid warms and the salt dissolves, while no crystals are formed on cooling, nor are chrome alum crystals deposited in the cell. The elements are arranged with two carbons to each zinc, the latter being so placed that it can be drawn from the solution. With 12 elements and the solution above described, it is stated that 10 incandescent lamps can be kept at work for five hours, each lamp giving 10 candles. There is thus 100 candle power for five hours.

(28) J. H. writes: Please inform me if there is a method known to ascertain whether there is any moisture left in kiln dried timber, or in other words to find out when timber used in carriage building or any equal mechanical branch is dry enough. Is there any cheap chemical test to detect the presence of water in timber, warm yet from the kiln? If so, what is the agent, and how is the test performed? Can timber like hickory or oak be dried too much, and if so, is the original tenacity lost for good, or will exposure to the atmosphere restore it again? A. There is a way of ascertaining the quantity of water left in timber after kiln drying, first by putting a known quantity by weight, as a sample, into an iron retort and subjecting it to a heat that will discharge all the water, and then weighing the remainder for ascertaining the amount discharged. The best and most reliable way of determining is by practice and experience, as to the heat of the kiln and time used in drying. You can dry the wood too much and make it brittle, or kill its toughness. Over dried wood works crisp under the tools. Exposure to moisture only partially restores it.

(29) R. R. C. asks: Will you inform me of the nature of the composition or the kind of metals used for the regulation of the heat, by reason of the expansion or contraction of the metal, in artificial hatching machines, hot houses, or for other purposes where a standard degree of heat is desired? A. Metallic regulators should be made of metals having the greatest difference of expansions if possible such as steel and zinc, combined in a spring. Iron and brass make good regulators by making the strips one or two feet long, soldering together, and coiling up like a clock spring.

(30) W. W. M. asks: 1. Will you inform me what will make hoof and horn material pliable, so that it will not get hard and brittle, and how may it be welded? A. Horn may be welded or joined by heating the edges until they are quite soft and pressing them together until they are cold. It may be softened, after sawing it into plates or sheets; by exposing it to powerful pressure between hot iron plates. Before pressing, the pitch must be removed, and the horn softened, first by soaking for some days and then boiling in water. 2. What will prevent sulphuric acid from destroying woody and fibrous materials? A. Nothing; sometimes a coat of varnish or paraffin may be applied with advantage, but it is very difficult to prevent the acid from getting through. 3. In making an electrical machine, as in SUPPLEMENT 161, could the electro magnets be made similar to an ordinary horseshoe magnet? A. Thema-chine may be made in the manner described. 3. Will the electrical force generated by one dynamo run another? Yes, but at considerable expense of power.

(31) A. E. S. asks: 1. How can flowers be preserved in their natural form and color? A. Insert their stems in water in which 25 grains ammonium chloride (sal ammoniac) have been dissolved. Flowers can be preserved in this way for 15 to 30 days. To preserve them permanently for several months, dip them into perfectly limpid gum water and then allow them to drain. The gum forms a complete coating on the stems and petals, and preserves their shape and color long after they have become dry. 2. What is a cheap and effective disinfectant for outside use about house and barn, etc.? A. Carbolic acid or zinc sulphate, both of which are poisonous.

(32) A. S. writes: W. R. asks how to use charcoal in casting brass, in No. 14 of Notes and Queries, SCIENTIFIC AMERICAN of May 19, 1883. Tell him to make a flame of the outer bark of the birch tree and thoroughly smoke the mould in every part, and he will get a perfect casting.

(33) W. M. H. asks: 1. What process will enable me to letter or stencil letters and figures upon glass, such as glass signs for advertising purposes, that may be done cheaply and quickly? A. Etch with hydrofluoric acid. See SCIENTIFIC AMERICAN SUPPLEMENT, No. 313. 2. By what process can I drill holes in glass? A. Make a circle of clay or cement rather larger than the intended hole; and use a drill formed of a copper tube and supplied with emery and water.

(34) E. M.—The following method of etching on silvered glass is given by Leclere, of Paris. Glass which is thinly silvered is coated with a very thin coat of asphalt. A photographic cliche or a properly cut pattern of dark paper, pasteboard etc., is laid upon the asphalt coat when dry; and the whole then exposed to the rays of the sun, which will render the asphalt, whenever the latter is exposed, insoluble. The protected asphalt coating is then washed away with benzine, and the silver coating beneath it is etched with nitric acid, while the drawing or patterns will appear in silvered lines and figures upon the glues.

(35) A. C. F.—The following inks afford copies without a press:

1. (Black).

Nigrosine C. P. fine .... 10 ounces.
Glucose "A" .... 1⅛ ounces.
Hot water .... 1¾ pints.
Glycerine .... 1¼ ounces.

Dissolve the nigrosine by trituration in the hot water, then add the other ingredients and strain through a piece of silk. If too thick when cold, dilute to the proper consistence with water.

2. (Blue).

Cotton blue (aniline) C. B.. ... . 6 ounces.
Glucose "A" .... 1 ounce.
Glycerine .... ¼ ounce.
Hot water .. .. 2 pints.

Proceed as directed for black ink (above). In preparing these inks it is essential that the water should be kept quite hot while the operation of trituration is performed. The trituration should be continued until all of the dye has been taken up by the water. The straining must be performed hot, otherwise the filtering cloths quickly become clogged. In purchasing nigrosine and aniline blue, obtain if possible the purest quality. Cheap grades of these dyes are almost invariably heavily adulterated with dextrine.

(36) P. F. S.—The following varnish is recommended for coating the stalks of flowers for the preservation of their color and general character:

Isinglass .... 11 ounces.
Concentrated glycerine .... 9 "

The isinglass to be softened by first soaking it in cold water, and then dissolved in the glycerine by digestion and agitation with the latter heated to 212° Fah. over a water bath. When properly prepared this varnish is colorless, and when cold resembles rubber in all but color. Another varnish recommended for this purpose is prepared from:

Bleached gutta percha......... ...... 1 ounce.
Deodorized benzole........ ... .7 "

The gutta percha is cut into fine shreds and gradually added to and agitated with the solvent kept hot or (warm) over a sand bath—away from fire. The whole flower may be dipped into this varnish, shaken, and exposed to the air to dry. Another preparation suggested for this purpose is plain collodion diluted one-third and mixed with two per cent of camphor, also dissolved in a small quantity of ether and alcohol.

(37) C. W. N. K. writes: Would you kindly inform me through your paper the size screw it would take to run a boat 12 feet long by 3⅞ feet beam, and whether it would be better to have a two blade or a three, supposing it revolves at the rate of 375 a minute? A. The diameter will depend somewhat on the draught of water. We think 15 inches or 16 inches diameter, two blades, best.

(38) G. B. asks: Can you inform me how mosaics are made? A. The enamel used is a kind of glass, colored with metallic oxides, and it is so fusible that it can be drawn out into threads, small rods, or oblong sticks of varying degrees of fineness, slightly resembling the type used by compositors. These polychromatic rods are kept in drawers properly numbered, so that the artist always knows to which case to repair when he requires a fresh supply of a particular tint or tints. When the picture is commenced the first step is to place on the easel a slab of marble, copper, or slate, of the size fixed upon; and this slab is hollowed out to a depth of about three and a half inches, leaving a flat border all round which will be on a level with the completed mosaic. The excavated slab is intersected by transverse grooves or channels, so as to hold more tenaciously the cement in which the mounts of enamel will be embedded. Then the hollowed slab is filled with "gesso," or plaster of Paris, on which the proposed design is traced in outline, and usually in pen and ink. The artist then proceeds to scoop out a small portion of the plaster with a little sharp tool. He fills up the cavity thus made with wet cement or "mastic," and into this mastic he successively thrusts the "spiculæ," or the "tesseræ," as the case may be, according to the pattern at his side. In the broad folds of drapery or in the even shadows of a background, or a clear sky, his morsels of enamel may be as large as one of a pair of dice; in the details of lips, or eyes, or hair, or foliage, or flowers, the bits of glass may be no larger than pins' heads. The cement, or mastic, is made of slaked lime, finely-powdered Tiburtine marble, and linseed oil and when thoroughly dry is as hard as flint. Sometimes the mastic which fills the cavity is smoothed and painted in fresco with an exact replica of the pattern, and into this the bits of glass are driven, according to tint, by means of a small wooden mallet. If the effect produced wounds the artist's eye, he can easily amend the defect by withdrawing the offending piece of enamel and driving in another while the cement is still wet; and, by observing proper precautions, it can be kept damp for more than a fortnight. When the work is completed any tiny crevices which may remain are carefully plugged with pounded marble, or with enamel mixed with wax, and the entire surface of the picture is then ground down to a perfect plane, and finally polished with putty and oil.

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

F. A.—The specimen is simply mica in clay, of no value at all.

COMMUNICATIONS RECEIVED.

On a New Electrical Condenser. By N.
On the Orbits of Planets. By C. W. H.
On the Theory of the Turbine. By S. W. R.
On Electricity in Printing Offices. By T. H. B.

INDEX OF INVENTIONS

For which Letters Patent of the United States were Granted

May 15, 1883,

AND EACH BEARING THAT DATE.

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

Adding machine, A. Stettner, Jr. 277,627
Alarm. See Burglar alarm.
Album clasp, T. M. Hass 277,722
Anvil, punching and riveting, J. C. Rothbarth 277,511
Ash depositer, J. H. Hart 277,718
Axle, car, H. C. Atkinson 277,825
Axle skein, R. Lane 277,579
Axle skein, A. H. Southworth 277,624
Back strap attachment, G. M. Bowen 277,669
Bag holder, N. Adams 277,651
Bag holder, E. E. Alderman 277,654
Bag holder, H. W. Nelson 277,772
Bag lock, D. S. Hammond 277,714
Bag or satchel, C. Vehring 277,812
Baking pan, G. E. Clark 277,679
Baling press, A. H. Ballagh 277,439
Baling press packing attachment, J. R. Shepherd 277,619
Base balls, manufacture of, T. P. Taylor 277,809
Battery. See Secondary battery.
Bed attachment, W. T. Fuson 277,563
Bed bottom, spring, J. & R. Ainslie 277,652
Bed slat fastening, C. D. C. Bowers 277,541
Bed, sofa, A. Häsler 277,721
Bed, spring, G. Wenzell 277,639
Bed, wardrobe, H. S. Hale 277,566
Bedstead, G. W. Ellis 277,470
Bedstead and table, interconvertible, A. L. & C. A. Warner 277,637
Bedstead, folding, V. A. Menuez 277,501
Bell, call, A. H. Jones 277,741
Belt and bucket elevator, P. Okell 277,774
Belt, driving, C. C. Campbell 277,678
Bench plate socket, J. H. Buckley 277,675
Betanaphthol, production of sulpho-acid compound of, H. Endemann 277,864
Bird cage, A. B. Hendryx 277,724
Blacksmiths' fullers, die for making, J. F. Duffy 277,468
Blast furnaces, water bosh for, A. F. Wendt 277,638
Blowers, etc., friction lock for lever fan, J. W. Hiemenz 277,487
Book binding, T. J. Cagney 277,456
Boot or shoe, button, E. Lanthier 277,580
Boot or shoe heel stiffener, T. Joyce 277,571
Boot or shoe sole stamp, W. C. Hoar 277,727
Boots, shoes, or stockings, machine for manufacturing felt, J. Brandy 277,450
Bosom board neckband shaper, C. A. Gilbert 277,705
Bottle stopper, I. Neef 277,847
Bottle stoppering, Macvay & Sykes 277,758
Bottle washing machine, F. B. Seiberlich (r) 10,327
Box. See Letter box. Packing box. Show box.
Box and package filler, Bolton, Strieby & Rankin. 277,540
Bracelet and necklet fastening, J. M. Banks 277,537
Bracket. See Lamp bracket.
Braiding machine, Veerkamp, Leopold & Darker. 277,523
Brake. See Car brake. Sled brake.
Brake shoe, W. White 277,647
Bretzel machine, T. H. & M. S. Keller & C. W. Meyers 277,573
Bronzing machine, H. R. Sillman 277,621
Brush holder, J. & R. Engel 277,471
Burglar alarm, ringing, T. E. James 277,738
Button hole cutter, J. H. Osborne 277,602
Butter package, J. F. Ellis 277,696
Button stay, D. J. Kelley 277,574
Camera stand, W. R. Wright 277,650
Canister, C. M. Symonds 277,630
Car brake, P. R. Frey 277,476
Car brake, J. Lytle 277,587
Car coupling, N. Barr 277,828
Car coupling, E. R. Brown 277,674
Car coupling, T. F. Byron 277,677
Car coupling, L. Davis, Jr. 277,466
Car coupling, W. E. Drew 277,690
Car coupling, W. W. Fitch 277,698
Car coupling, J. C. Fowler 277,701
Car coupling, A. Fulton 277,837
Car coupling, Heffner & Kelly 277,723
Car coupling, T. B. Nutting 277,773
Car coupling, W. R. Wallace 277,635
Car coupling, N. R. Zimmerman 277,823
Car guard, street, R. J. Good 277,564
Car heater, R. Steel 277,626
Car heater and ventilator, safety, W. F. Condon. 277,546
Car, railway, T. L. Wilson 277,819
Car starter and brake, C. T. Brown 277,863
Car, suspension railway, D. Query 277,783
Car unloader, grain, J. H. Chase 277,460
Car wheel guard, railway, J. Jacobs 277,490
Car windows, sash holder for street, I. N. W. Sherman 277,793
Carbon black, machine for the manufacture of, W. Falconer 277,472
Card grinder, C. B. & O. B. Parker 277,604
Cards and samples, device for exhibiting, H. Cole 277,681
Carpet lining, Chinnock & Stephens 277,832
Carriage step pads, die for forming, D. F. Southwick 277,853
Carrier. See Parcel carrier.
Case. See Watch case.
Caster, S. Vanstone 277,522
Casting attachment for open hearth steel melting furnaces, C. M. Ryder 277,850
Casting building blocks, mold for, J. J. Schillinger 277,791
Ceiling, fire proof, J. E. Ware 277,814
Celluloid, etc., nozzle for making rods and tubes from, J. B. Edson 277,694
Chain units, machine for making roller, Field & Halkyard (r) 10,326
Chair, T. G. Maguire 277,759
Chair seat, P. E. Chappell 277,544
Check rower, A. W. Thompson 277,856
Check rower attachment, F. L. Brewer 277,673
Cheese hoop, G. W. Hey 277,838
Cheese press, G. W. Hey 277,839
Chipping machine, J. Boyer 277,448
Chopper. See Cotton chopper.
Churn, G. Bull 277,830
Churn, E. B. Lewis 277,752
Cigar wrappers, machine for cutting out, J. Brandt 277,452
Circuit controlling device, E. Weston 277,640
Cisterns, cleaning, W. S. Henson 277,486
Clasp. See Album clasp. Corset clasp. Garment clasp.
Clay, apparatus for preparing, C. Chambers, Jr. 277,459
Clock alarm mechanism, J. Ganss 277,702
Clog or shoe, J. Cassidy 277,458
Clothes drier, A. Iske 277,736
Coach window, sliding, J. C. Goold 277,565
Coal, machine for separating impurities from, C. W. Ziegler 277,530
Coffee pot, L. W. Walker 277,813
Collar fastening, dog, J. M. Riley 277,785
Collar, horse, W. Cosbie 277,463
Collar, horse, J. F. Trautmann 277,857
Color, J. Urban 277,633
Condenser, steam, H. A. Campbell 277,457
Condenser tubes, gland for surface, J. F. Tolmer. 277,551
Cooler. See Liquid cooler.
Cooling apparatus, H. Stollwerck 277,804
Corkscrew, W. Bennit 277,442
Corset clasp, M. P. Bray 277,671
Cotton chopper and cultivator, F. A. Pettitt 277,777
Countersink for bits, R. J. Welles 277,859
Coupling. See Car coupling. Whip coupling.
Cradle motor, T. Logan 277,758
Crupper, harness, J. Shaffer 277,516
Crusher. See Ore crusher. Rotary crusher.
Cuff holder, E. A. Robbins 277,612
Cup. See Oil cup.
Curtain fixture, F. B. Mallory 277,760
Cuspidor, P. S. Dusenbury 277,692
Cutter. See Button hole cutter.
Dental plate, J. W. Shults 277,796
Desk, school, H. J. Colburn 277,545
Dial, sun, D. L. Smith 277,799
Digger. See Potato digger.
Door check, R. Wright 277,828
Door hanger, C. W. Bullard 277,542
Door lock, W. Rowe 277,616
Drawing frame and drawing and doubling slivers, J. E. Prest 277,606
Drier. See Clothes drier. Fruit drier.
Drill. See Seed drill.
Drying substances in sheets, frame for, J. B. Edson, 277,693
Electric cable support, A. Wright 277,528
Electric lock, M. Sullivan 277,628
Electric machine, dynamo, E. Weston 277,644
Electric wires, laying underground, J. Marks 277,588
Electro-magnetic engine, G. W. Foster 277,475
Elevator. See Belt and bucket elevator.
Embroidery patterns, producing transferable, M. E. Bingaman 277,665
Emery wheel, A. Ball 277,659
End gate, wagon, E. Prescott 277,779
Engine. See Electro-magnetic engine. Gas engine. Traction engine.
Evaporating or drying apparatus, A. Gilain 277,704
Evaporating pan, F. P. Taber 277,855
Excavating and moving dirt, etc., device for, W. Burket 277,455
Extension table, J. H. King 277,576
Extractor. See Stump extractor.
Fence, J. Yeiter 277,821
Fence, earthen, A. Delffs 277,687
Fence post, Arthur, Spaulding & Davison .. 277,657, 277,658
Fence post, C. J. Gorla 277,708
Fence post, Likes, Hedge & Baker 277,493
Fire engine boilers and heaters, vacuum relief for, C. Bresnahan 277,862
Fire escape, Newhouse & Mooers 277,600
Fire extinguisher, automatic, R. W. & F. Grinnell 277,481
Fish egg hatching trough, L. Stone 277,805
Flax, etc., machinery for breaking and scutching, Shinn & Fuller 277,517
Flour bolts, etc., conveyer for, C. B. Slater 277,622
Flour packer, J. B. Martin 277,845
Fluting and ironing machine, J. V. Smith 277,520
Folding machine, L. C. Crowell 277,549
Food, producing farinaceous, J. Schweitzer 277,792
Fountain. See Ink fountain.
Fountain, M. M. Murray 277,598
Fruit drier, W. C. Crozier 277,685
Furnace grate, C. H. Baush 277,538
Furnace grate, T. Kirkwood 277,491
Gag runner, R. G. Hanford, Jr. 277,715, 277,716
Gage. See Pressure gage.
Garment clasp, C. W. Foster 277,700
Gas and vapor from liquid hydrocarbons, apparatus for generating, H. F. Hayden 277,567
Gas engine, C. Shelburne 277,618
Gas generating apparatus, H. C. Shields 277,852
Gas lighting, electric, T. H. Rhodes 277,610
Gate. See End gate.
Gear wheel, Stanley & Cornelius 277,802
Generator. See Steam generator.
Glass silvering apparatus, J. Starr 277,803
Gloves, lacing, W. F. Foster 277,558, 277,559
Glycerine from the mother liquor of soap factories, production of, J. K. Kessler 277,575
Governor for steam engines, automatic, T. A. Grist 277,710
Grain, apparatus for the reduction of, H. F. Saint Requier 277,790
Grain binder, automatic, G. F. Green 277,709
Grain binding machines, cord tyer for, N. Jewett. 277,739
Grain drills, force feed fertilizer attachment for, S. B. Hart 277,719
Grain drying and cooling shelf, H. Cutler 277,686
Grate, T. H. Lucas 277,754
Grate, fire, B. S. Wash 277,526
Guard. See Car guard. Car wheel guard. Saw guard.
Hame, J. A. Wilson 277,818
Hammock, Blascow & Fichtner 277,829
Handle. See Saw handle.
Hanger. See Door hanger.
Harvester, corn, C. Baltzell 277,660
Hat bodies and other fabrics of carded and disintegrated fibers, method of and apparatus for making, J. T. Waring 277,636
Hat lining, A. Hoen 277,729
Hat tips, machine for stretching, J. H. Gesner 277,703
Hay derrick, horse power, L. Hoblit 277,728
Hay loader, J. M. Snodgrass 277,800
Head light for locomotives, etc., electric, F. Ball, Jr. 277,536
Heater. See Car heater.
Hinge, lock, J. K. Clark 277,680
Holder. See Bag holder. Brush holder. Cuff holder. Photographic plate holder. Rein holder. Type holder.
Hoop. See Cheese hoop.
Horse power, J. H. Elward 277,835
Horseshoe nails, machine for assorting, J. B. Husted 277,488
Hygrometer, G. A. Ayers 277,533
Ice, apparatus for handling, R. B. Thomas 277,811
Inclined plane and sled therefor, R. Steel 277,625
Index tab, Flammger & Sobinski 277,836
Ink fountain, C. A. Lieb 277,582
Insulating wire for electric purposes, J. J. C. Smith 277,519
Iron. See Laundry iron. Soldering iron.
Joint. See Locked joint.
Jug, non heat conducting, M. P. Bousser 277,447
Keys, machine for making split, R. T. King 277,577
Knitted goods, machine for napping and brushing, G. Jackson 277,489
Knitting machine, circular, J. H. Osborne 277,603
Ladder, flexible, P. Brendel 277,672
Lamp and holder, electric, E. Weston 277,646
Lamp and holder therefor, electric, E. Weston 277,645
Lamp bracket, electric incandescent, E. Weston 277,641, 277,642
Lampburners, extinguishing device for, W. Goldie 277,477