speed should be about 6 feet, more or less, to suit the model and allowed draught of the vessel. The pitch should also vary with the lines of the boat, longer for a sharp, fine-lined boat than for a boat of burden or a tugboat. A pitch of $1\frac{20}{100}$ to $1\frac{1}{2}$ times the diameter is about the range for different models and uses of steam vessels. For the speed of engine as stated, probably a pitch of 8 feet for a 6 foot wheel in a boat built for speed can be recommended. See an excellent work by Kunhardt on "Steam Yachts and Launches," $3 by mail. 2. Please give simplest method of determining and finding the pitch of a propeller wheel. A. There is no simple method of determining the size or pitch of a screw propeller. The resistance of the vessel, depth of draught, required speed, and power are all factors for size and pitch of screw propellers. 3. Where can I get the patent Bartlett wheel in America? A. We do not find that the Bartlett wheel is made under that name by makers of propeller wheels in this vicinity.

(5942) E. P. says: Will you kindly tell me how the carbon for arc lights is made and what is the material used? A. Clean pieces of coke are selected, p lverized, and passed through a fine sieve. It is then thoroughly mixed with from one-sixth to one-eighth its b lk of wheat flour, both being in a dry state. The mixture is moistened with water containing a small percentage of molasses. It should be allowed to stand for two or three hours in a closed vessel to prevent the evaporation of the water. At the end of this time the mixture may be pressed into moulds of any desired form, then removed from the moulds and dried, slowly at first, afterward rapidly, in an ordinary oven at a high temperature. When the rods or plates thus formed are thoroughly dried they are packed in an iron box, or, if they are small, in a crucible and completely surrounded by coke dust. The box or crucible must be closed by a non-comb stible cover. Then place in a fire and heat to a red heat for an hour or so, then allow the box to cool, remove the carbons, then boil for half hour in thin sirup or molasses water, then bake in an ordinary oven and recarbonize as already described.—From "Experimental Science." This same applies to battery plates.

(5943) J. T. T. asks: 1. For formula for making sealing compound suitable for dry batteries. A. Use resin 4 parts, gutta parcha 1 part, melted together with a little boiled oil. 2. For full directions for amalgamating zinc cup, such as used in dry batteries. A. Do not amalgamate it, as amalgamation renders zinc very brittle. If you must do so, wash the inner surface with a slightly acid solution of mercury nitrate. 3. In attempting to amalgamate a cup of zinc, sed dilute sulphuric acid (acid 1 part to 10 parts water) for cleanmg zinc and then applied few drops mercury on inside cup, rubbing it over surface by means of brush, but bottoms of cans would unsolder and drop out. On examination of zinc found it like rotten, being easily pulled in pieces. What caused this? A. You used too much mercury, but it will always make zinc brittle. 4. What amount of No. 32 cotton-covered magnet wire is necessary for making an electromagnet, having core ⅜ by 2 inches, using Norway iron? A. Wind it to a total diameter of ¾ inch.

(5944) H. M. writes: In mounting con- densers for magic lanterns, how close should they be placed together? A. Place them, if double, with convex sides inward and generally not more than a quarter of an inch apart. If there are three, you may determine the proper setting by trial.

(5945) J. C. M. asks for the best method of tempering the steel for the magnets used in the Bell telephone. A. Heat to a cherry red the ends only of the steel bars, plunge them in water to harden them, and draw the temper to a dark straw color or bronze bordering on purple.

(5946) R. F. W. asks: 1. In making dynamo described in SUPPLEMENT, No. 600, will not brass do just as well as bronze for the yokes? A. Brass will answer the purpose, but not as well as bronze. 2. Copper as well for the commutator as bronze? A. Yes, provided it is hard rolled. 3. If you have any paper giving full working drawings and complete description of the construction of a folding canvas canoe, will you please give the number? If you have no paper on a folding canoe, can you give me one on an ordinary canvas canoe? A. For an answer to this query we refer to SUPPLEMENT, No. 181, which contains a full description of a folding canvas canoe.

(5947) G. W. asks: 1. Can I obtain a sufficient spark to ignite the gaseous mixture in an oil engine by winding copper wire around a soft iron core? A. Yes. 2. If so, what size core and length of wire will be required? A. On a bundle of No. 18 soft iron wires ¾ of an inch in diameter and 8 inches long, wind No. 20 wire to the depth of 1¼ inches.

(5948) S. L. P. asks how dents are taken out of cornets and other brass horns. A. If the dents are inaccessible, so that tools cannot be applied to them on the inside of the horn, you can take them out after a fashion by oldering to the deepest part of the dent a wire and drawing the metal out, afterward unsoldering the wire and cleaning the surface of the brass. If the part of the horn containing the dents is of uniform diameter, you can draw through the horn a spherical metallic button that will fit the tube. If you desire a perfect job, it will be better for you to send the horn to an instrument maker.

(5949) J. asks whether fish oil is injuri- ous to rubber goods. Also what effect it would have when applied to rubber hose? A. Fish oil has a deteriorating effect on rubber. It tends to soften hose.

(5950) F. H. W. asks for a formula for a quick dry plate hardener, or something he can put on the plate that will dry rapidly by heat (without causing the film to run), in order to get a print shortly after development. A. The following is said to be a good gelatine hardener: The negative, after fixing and washing in the usual manner, is treated with a hardening solution composed of chloride of aluminum 5 to 12 grains, water 1 ounce. The stronger the aluminum solution, the greater the amount of heat the negative can stand without softening. The plate is immersed in the solution, and allowed to remain therein for a short time, and after immersion can be dried in sunlight or by artificial heat without danger of deterioration.

(5951) W. C. S. writes: 1. In the SCIEN- TIFIC AMERICAN for February 24, 1894, is given a discription of a magneto call bell for telephones. Could I make a cheaper call? A magneto bell is rather expensive. A. On page 162, current volume of SCIENTIFIC AMERICAN, under the head of "Telephone Experiments," you will find a description of a simple telephone call, which is effective for q iet places. 2. Will you give me a receipt for a stove polish? A. Mix 5 parts, by weight, of black lead (plumbago), 5 parts of boneblack, 10 parts of iron sulphate. Mix thoroughly and make into a paste with water.

(5952) Nick wants to make a sign hav- ing the letters smooth and clear, the balance of ground to be chipped or torn off and left rough. No particular pattern. A. Clean the glass thoro ghly, then apply a solution of good glue or of gelatine to the portions to be chipped. On drying, the glue or gelatine will contract and chip the glass.

(5953) Y. M. C. A. says: Would you kindly inform me, through your answer department of SCIENTIFIC AMERICAN, how to resilver a mirror? A. See page 183 of the issue of the SCIENTIFIC AMERICAN for March 24, 1894.

(5954) J. R. S. asks: 1. What is the re- ceipt for making laundry starch and mode of using same so as to produce a gloss when applied with a hand iron, such as used in families doing their own washing and ironing? A. One ounce each of g m arabic and borax are dissolved in 10 ounces of water; 1 ounce each of white wax and spermaceti are melted, and while liq id are rubbed with the solution of borax and 10 drops oil of cloves to make emulsion, mixing them thoroughly. A teaspoonful of this mixture in a pint of starch gives a fine polish. It may also be applied after starching by rubbing over the starch with a cloth and then polishing with the iron. The starch mentioned above is the ordinary dry starch made into a paste with hot water. 2. What is a formula for making black ink? A. Black Ink.—Gallnuts, coarsely powdered, 75 parts; sulphate of iron, 42½ parts; over this pour 2,000 parts of cold water. Digest from twenty-four to forty-eight hours. Strain through a cloth and add 24 parts gum arabic.

(5955) C. W. H. writes: I am going to lay 1,800 feet of piping to carry water from a pond to a well. The fall is about 10 feet in the 1,800, with about a 6 foot head, one turn at right angles. What I want to know is this: Which would convey the most water under above conditions—one pipe 4 inches in diameter the entire distance or begin with a 6 inch pipe 600 feet, then 4 inch pipe 600 feet, and then 3 inch pipe the remainder of the distance? Also, about how much water would flow through each of the above systems in 24 hours? A. With a continuous 4 inch pipe you will have a flow of 144,000 gallons per day of 24 hours. With sections of 6 inch, 4 inch, and 3 inch pipe in equal parts, you will have a flow of 129,000 gallons per day. If 1,200 feet of 4 inch, with 600 feet of 6 inch pipe at the pond end, you will have a flow of 180,000 gallons per day.

(5956) P. W. C. says: What is the formula for the combined toning and fixing solution for solio photographic prints, a solution which does not need mixing for use, but is always ready? A.

No. 1.

Sodium hyposulphite	10	ounces.
Alum potash	2½	ounces.
Potassium sulphate	1	ounce.
Sodium sulphate	5	ounces.
Water (distilled)	80	fluid ounces.

Dissolve the hypo. and the alum in the water; then add the sodium and potassium sulphate; allow it to stand for two or three hours.

No. 2.

Gold chloride	15	grains.
Lead acetate	6	grains.
Water (distilled)	8	ounces.

Mix in the proportion of 8 ounces of No. 1 to 1 ounce of No. 2. The mixture is stable and the bath is always ready for use.

(5957) P. O. M. writes: I have a piece of common window glass; by breathing on one side of same the outline of a person is produced as though it was drawn on with milk; but it evaporates with the dampness leaving the glass, and it is not visible again unless the glass is again moistened with the breath. A. The glass to which you refer has been slightly etched with hydrofluoric acid. The etching does not show when the glass is perfectly dry, but moisture develops the image, which disappears as soon as the glass becomes dry.

TO INVENTORS.

An experience of forty-four years, and the preparation of more than one hundred thousand applications for patents at home and abroad, enable us to understand the laws and practice on both continents, and to possess unequaled facilities for procuring patents everywhere. A synopsis of the patent laws of the United States and all foreign countries may be had on application, and persons contemplating the securing of patents, either at home or abroad, are invited to write to this office for prices which are low, in accordance with the times and our extensive facilities for conducting the business. Address MUNN & CO., office SCIENTIFIC AMERICAN, 361 Broadway, New York.

INDEX OF INVENTIONS

For which Letters Patent of the United States were Granted

April 3, 1894,

AND EACH BEARING THAT DATE.

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

Accordion, J. Galleazzi ... 517,648
Acid, purifying tannic, B. Reinus ... 517,626
Air compressor, hydraulic, Schutz & Henderson ... 517,628
Air, gas, etc., receptacle or tank for the storage of compressed, W. Timmis ... 517,777
Alarm. See Burglar alarm.
Amalgamator, N. L. Raber ... 517,767
Automatic switch, W. H. Southworth ... 517,595
Bagasse furnace, W. W. Sutcliffe ... 517,497
Band cutter and feeder, Lamm & Sicard ... 517,754
Banjo or violin tail piece, R. H. Small ... 517,493
Batteries, manufacturing active material for secondary electric, W. A. Boese ... 517,427
Bed rest, J. E. Plummer ... 517,623
Bed springs, device for tightening woven wire, E. M. Easting ... 517,818
Bedstead, G. E. Proctor ... 517,482
Berth, ship's, E. Lawson ... 517,462
Bicycle, T. B. Hyde ... 517,637
Bicycle frame, G. F. Washburn ... 517,501
Bicycle saddle, H. Bergfels ... 517,425, 517,538
Bicycles, variable driving gear, S. C. Eisenhart ... 517,739
Bill or account holder, J. F. Ridder ... 517,590
Billiard table, A. Woebs ... 517,715
Binder for leaves, G. H. Winslow ... 517,635
Bit for cutting rosettes, E. Gollins ... 517,691
Boat. See Life boat.
Boiler. See Steam boiler.
Boiler, H. W. Reynolds ... 517,826
Boiler cleaning compound, F. Berger ... 517,552
Boiler sput, W. S. Snipe ... 517,592
Bolt. See Door bolt.
Bottle, Friedman & Keller ... 517,800
Box. See Match box.
Brake. See Car brake. Elevator brake. Vacuum brake.
Bridge, draw, M. G. Schinke ... 517,809
Broom corn sizing machine, G. F. McCombs ... 517,761
Buckle, G. E. Adams ... 517,421
Buckle, self-clamping and locking trace, F. D. Clark ... 517,435
Bung, expansible, L. Wagner ... 517,781
Burglar alarm, electric, Frame & Morden ... 517,450
Burglar alarm spring, M. T. Gordon ... 517,547
Bustle, E. Case ... 517,434
Button attaching machine, F. A. Ryno ... 517,486
Button fastening machine, J. C. F. Dick ... 517,604
Button setting apparatus, W. B. Merritt ... 517,758
Button setting machine, I. G. Platt ... 517,622
Camera, H. Casler ... 517,539
Can discharge attachment, oil, W. Mathews ... 517,618
Can key, self-opening, E. Norton ... 517,657
Cans, key for opening metal, A. Kleinfeldt ... 517,523
Cans, manufacture of metallic preserving, A. W. Living ton ... 517,580
Cane carriers, apparatus for charging sugar, O. Carr ... 517,730
Cane juice, defecating, J. Koebig ... 517,820
Car brake, H. B. Cary ... 517,601
Car coupling, R. Dinsmore ... 517,448
Car coupling, E. J. Laban ... 517,753
Car coupling, L. H. Segrest ... 517,696
Car coupling, C. H. Taylor ... 517,670
Car coupling, B. M. Whitlock ... 517,504 to 517,506
Car fender, C. P. Anderson ... 517,638
Car fender and automatic br ke, W. L. Fitzhugh ... 517,798
Car, railway, O. Q. Cates, Jr ... 517,517
Car safety guard, freight, M. Fitzsimmons ... 517,519
Car, ventilated freight, W. T. Cottier ... 517,794
Cards, pictures, etc., support for, Dalsheimer & Greenleaf ... 517,444
Carriage, baby, M. L. Barr ... 517,598
Cartridge, practice, G. D. R. Aikin ... 517,719
Case or cabinet, J. F. Ohmer ... 517,477
Cask pitching apparatus, C. Bernreuther ... 517,515
Ceiling or wainscoting board, J. A. Hensel ... 517,521
Cell case blanks, machine for cutting out, F. D. Maltby ... 517,651
Cereals, preparing, W. Onderdonk ... 517,479
Chair. See Folding chair.
Chalking apparatus, line, C. E. Anderson ... 517,720
Chimney top and ventilator, J. T. Finch ... 517,797
Chopper. See Cotton chopper.
Churn, O. C. Byler ... 517,431
Churn, J. H. H. Duncan ... 517,817
Circuit maker, J. Weaver ... 517,502
Clamp. See Railway rail clamp.
Clay articles, glaze for, B. Frey ... 517,609
Clock, J. Smith ... 517,594
Clock synchronizer, electric, H. S. Prentiss ... 517,480
Cloth, paper, etc., machine for cutting, folding, and piling, F. Meisel ... 517,653
Clothes wringer, C. Wheeler, Jr ... 517,785
Clutch, pneumatic, J. F. Byers ... 517,679
Coal elevators, self-dumping mechanism for, A. Walker ... 517,782
Cock, gauge, G. Binder ... 517,426
Cock, train pipe stop, J. O'Leary ... 517,707
Coffee mill, O. Leinbrock ... 517,614
Compass, beam, W. B. Hunter ... 517,696
Continuous kiln, P. L. Youngren ... 517,637
Cooking food over lamp chimneys, utensil for, A. N. Ayres ... 517,561
Cooler. See Wine cooler.
Cot and wardrobe, combined, S. C. Hopkins ... 517,458
Cotton chopper, W. H. J. Goodwin ... 517,570
Coupling. See Car coupling. Shaft coupling.
Cover for frying pans, etc., M. E. Radick ... 517,708
Crate, berry, P. A. Wimbrow *et al* ... 517,713
Cremation furnace, S. W. Dixon ... 517,816
Crusher. See Rock crusher.
Culinary vessel, M. S. Tracy ... 517,673
Curtain fixture, C. E. Goodrich ... 517,453
Curtain stretcher, P. M. Hartpence ... 517,694
Cutter. See Band cutter. Stalk cutter.
Desk, adjustable, M. A. Wertheimer ... 517,633
Digger. See Potato digger.
Ditching machine, L. A. Stanford ... 517,774
Door bolt, A. Angus ... 517,512
Doubling webs of fabric longitudinally, machine for, S. G. Goss ... 517,693
Drawing frame, electric stop motion, E. Tweedale *et al* ... 517,778
Dresses for protecting bands of flowers, attachment for ladies', F. M. Fletcher ... 517,568
Drier. See Letter drier.
Drying kiln, A. & P. Kimball ... 517,700
Dye, blue, Nastvogel & Reingruber ... 517,473
Dyeing by the aid of paramidodiphenyl min, A. Weinberg ... 517,533
Dynamometer, J. A. Cross ... 517,439
Egg preserving apparatus, E. H. Layman ... 517,463
Electric lights, system for controlling, W. F. Bradner ... 517,812
Electric motor, W. J. Still ... 517,668, 517,669
Electric motor governor, J. F. Winter ... 517,714
Electric switch, R. Mackie ... 517,582
Electric switch, C. F. Speed *et al* ... 517,773
Electrical switch, E. Ruebel ... 517,664
Elevator, W. H. Rickabach ... 517,768
Elevator and dump, S. E. Kurtz ... 517,702
Elevator brake, self-acting, G. W. Ludovici ... 517,755
Elevator gate, C. Stocker, Jr ... 517,496
Ellipsograph, G. M. King ... 517,522
Enamel for coating sheet metal, etc., J. Henneman ... 517,454
Enameling paper or other fabrics, W. H. H. Childs ... 517,732
End gate, wagon, E. K. Hayes ... 517,649
Engine. See Gas engine. Rotary steam engine.
Engraving machine, H. A. Chase ... 517,680
Evaporating pan, S. A. Poche ... 517,765
Excavating or dredging machine, J. E. A. Braun ... 517,726
Eyeglasses, Bugbee & Reno ... 517,430
Fan, revolving, I. D. Boyer ... 517,428
Feedwater pipe heater, J. C. Shaw ... 517,771
Fence, J. E. Phillips ... 517,659
Fence, barbed wire, L. Herweyer ... 517,548
Fence, wire, Bennett & Chapman ... 517,423
Fender. See Car fender.
Fertilizer, S. B. Schenck ... 517,486
Fertilizer, phosphatic, N. B. Powter ... 517,661
Fertilizers, making, N. B. Powter ... 517,662
Filter, C. H. Schultz, Jr ... 517,488
Filtering or purification of liquids, L. Wagner *et al* ... 517,499
Fire extinguisher, Van Kalker & Bolt ... 517,780
Fir arms, detachable stock for hand, I. H. Reed ... 517,555
Fish, live box for shell, T. Mann ... 517,652
Flanger, T. W. Macfarlane ... 517,704
Flue, sa ety, C. E. Martin ... 517,471
Fluid discharging apparatus, W. T. Messinger ... 517,550
Flushing apparatus, G. D. Ackley ... 517,718
Folding chair, S. G. McCullough ... 517,806
Fork, W. L. Laffer ... 517,461
Fork cutter attachment, P. P. & J. Dustrud ... 517,796
Fruit cutting and pitting machine, J. F. Rehm ... 517,588
Fruit gatherer, J. K. Wo dward ... 517,786
Furnace. See Bagasse furnace. Cremation furnace. Smoke consuming furnace.
Furnace, E. B. Coxe ... 517,644, 517,645
Furnace, F. H. Richards ... 517,627
Furnace, fine fuel, C. Wegener ... 517,632
Gauge. See Liquid gauge. Water gauge.
Game apparatus, W. G. Burns ... 517,600
Game apparatus, C. C. Clawson ... 517,436
Garment and gusset therefor, bifurcated, S. B. & F. F. Lewis ... 517,579
Garment supporter, W. Ogden ... 517,658
Garter adjuster and fastener, W. L. Braddock ... 517,678
Gas engine, Labataille & Graff ... 517,821
Gas from crude oil, making fuel, C. F. A. Convert ... 517,681
Gate. See Elevator gate. End gate. Railway crossing gate.
Gazette holder, E. Adam ... 517,420
Generator. See Steam and gas generator.
Glass, apparatus for manufacturing plate, E. P. King ... 517,460
Glass melting tank oven, F. Wrede ... 517,675
Grader and amalgamator, J. A. Armbruster ... 517,721
Grading railways, etc., machine for, C. W. Arch ... 517,559
Grain meter, rotating, J. M. Finch ... 517,608
Grain meter, rotating, E. K. Hayes ... 517,650
Grate, automatic water circulating fire, Ferris & Wheeler ... 517,567
Grinding machine, D. H. Church ... 517,643
Grooving machine, H. W. Morgan ... 517,705
Gun, cane, R. F. Cook ... 517,438
Gun carriages, anchor for field, Noble & Brankston ... 517,476
Gun sight, C. Bechis ... 517,514
Gymnastic appliance for school desks, T. Bessing ... 517,788
Hammock, T. B. Thomas ... 517,667
Hanger. See Shade hanger.
Harp, W. W. Batchelder, Jr ... 517,723
Harrow disks, machine for sharpening, J. L. Shaw ... 517,810
Harrow, spring tooth, M. J. Todd ... 517,672
Harvester, W. McCloskey ... 517,654, 517,655
Harvester, cotton, L. R. Turner ... 517,596
Harvester finger, cotton, A. Levedahl ... 517,578
Hasp lock, J. A. Dixon ... 517,685
Hat forming mould, J. Marshall ... 517,470
Heater. See Feedwater pipe heater. Water heater.
Heating and ventilating rooms, device for, C. Mills ... 517,759
Heating systems, heater for hot water, F. E. Dack ... 517,683
Hooks for stretching curtains, m chine for making, F. Steinmann ... 517,775
Horse rake, C. S. Sharp ... 517,490, 517,491
Hose reel, W. N. Casson ... 517,731
Hosiery, Sills & Wood ... 517,593
Hosiery cutting apparatus, I. Mossop ... 517,706
Ice cream freezer, J. M. Skipper ... 517,492
Ice machines, pneumatic can hoist for, C. A. MacDonald ... 517,468
Injector, air, J. G. Stamp ... 517,629
Insulating compound, A. Gentzsch ... 517,452
Insulating tube, M. Robinson ... 517,591
Insulator, L. McCarthy ... 517,621
Insulator pin, G. H. Winslow ... 517,634
Jack. See Lifting jack.
Jar fastening, R. S. Carr ... 517,433
Journal box, oil drawer, J. H. Surtin ... 517,776
Key. See Can key.
Kiln. See Continuous kiln. Drying kiln.
Kitchen cabinet and churn, combined, Hodges & Dickson ... 517,457
Label holder, W. G. Duckett ... 517,545
Lacing hooks, machine for setting, J. Keith ... 517,823
Lamp collar, L. J. Atwood ... 517,676
Lamp, incandescent, A. C. Carey ... 517,432
Lamp, miner's safety, Graham & Chapman ... 517,520
Lamps, adjustable desk bracket for electric, Garlock & Marshall ... 517,569
Last, F. E. Benton ... 517,424
Lathe centering device, R. L. Levin ... 517,466
Lawn sprinkler, J. Dickens ... 517,544
Leather skiving machine, A. J. Tewksbury ... 517,631
Letter drier, D. D. Howard ... 517,703
Life-boat, C. Baswitz ... 517,558
Lifting jack, B. F. Lewis ... 517,465
Line fastener, W. S. Twitty ... 517,597
Liquid gauge, A. R. Welch ... 517,710
Lock. See Hasp lock. Switch lock. Sash lock.
Lock, D. J. Cable ... 517,729
Lubricating device, H. P. Humphrey ... 517,748
Lubricator, J. Longinus ... 517,467
Lubricator, W. O. Nelson ... 517,553
Lumber or composition material, artificial, G. S. Mayhew ... 517,822
Magnetic separators, feeding mechanism for, G. Conkling ... 517,734
Mail transporting apparatus, R. A. Morgan, Jr ... 517,619
Match box and cigar tip cutter, combined, T. W. Foster ... 517,546
Measuring machine, cloth, G. P. Conant ... 517,437
Metal shaper, combination, H. J. Hendey ... 517,613
Metal shaper, suspension, H. J. Hendey ... 517,612
Meter. See Grain meter.
Microphone, W. Deckert ... 517,564
Milk purifier, R. H. Casswell ... 517,814
Mill. See Coffee mill. Rolling mill. Windmill.
Moulding apparatus, J. Shaaber ... 517,489
Moulding machine, W. Edgar ... 517,737
Mole trap, M. E. Parham ... 517,824
Mortising machine, veneer, H. C. Ward ... 517,558
Motor. See Electric motor. Water motor.
Motor, A. E. Whitaker ... 517,712
Musical instrument, mechanical, G. B. Kelly ... 517,805
Necktie, G. Selowsky ... 517,769
Nut lock, J. H. Burrows ... 517,728
Nut lock, S. W. Wright ... 517,534
Nut making machine, A. Urban ... 517,779
Ordnance, sighting and indicating apparatus for, H. H. Grenfell ... 517,746
Ore separator and classifier, J. P. Foley *et al* ... 517,750
Packing for rock drilling engines, G. M. Githens ... 517,690
Packing, piston rod, A. H. Clark ... 517,563
Pan. See Evaporating pan.
Paper bags, making, W. A. Lorenz ... 517,617
Paper feeding mechanism, E. Dummer ... 517,518
Pasting device for sheets, flies, strips, etc., A. Day ... 517,684
Pasting table, folding, L. Maurer ... 517,756
Peeling table, fruit, F. M. Anderson ... 517,511
Pen rack, W. S. Mendenhall ... 517,757
Pencil sharpener, A. Werner ... 517,784
Perforating machine, G. B. Kelly ... 517,752
Photographic camera multiplying attachment, D. S. Cole ... 517,733
Pin. See Insulator pin. Scarf pin.
Pipe, clip for use in making joints in cast iron, E. H. Gowing ... 517,611
Pipes in situ, man facture of monolithic, E. L. Ransome ... 517,808
Pitchers, etc., shield for, M. L. Buckley ... 517,789
Planter, hand corn, P. Schendzelos ... 517,487
Potato digger, J. A. Buck ... 517,516
Pressure, apparatus for indicating and regulating fluid, J. H. Gartrell ... 517,451
Pr nting machine, C. P. Cottrell ... 517,382
Projectile, F. M. Ashley ... 517,560
Pulley, expansible differential, W. Roney ... 517,532
Pump, centrifugal, G. W. Price ... 517,629
Pumping machinery, M. Foster ... 517,449
Rack. See Pen rack.
Railway, conduit electric, H. A. Goreham ... 517,692
Railway, conduit electric, W. F. Jenkins ... 517,804
Railway, conduit electric, W. C. Keithly ... 517,549
Railway crossing gate, G. C. & T. A. Corbin ... 517,792
Railway, induction electric, C. E. Roehl ... 517,531
Railway rail and joint, combination, W. H. McCormick ... 517,551
Railway rail clamp, D. B. Ruffner ... 517,665
Railway rail girder joint, J. M. Price ... 517,660
Railway signal, C. C. Kahne *et al* ... 517,751
Railway switch, F. Brown ... 517,727
Railway switch, electrically-operated, W. S. Gavey ... 517,743
Railway tie, R. Dinsmore ... 517,447
Railway tie, J. Neafie ... 517,585
Railway, underground conduit, W. F. Jenkins ... 517,749
Railways, system of elevated and surface, C. H. Barrows ... 517,585
Rake. See Horse r ke
Razor blades, etc., machine for hollowing, J. Leresche ... 517,464
Reel. See Hose reel.
Respiration, device for producing, J. M. Pressey ... 517,481
Rheostat, A. J. Shaw ... 517,770
Rock breaker, subaqueous, P. S. Ross ... 517,556
Rock crusher, C. E. Wyman ... 517,717
Rock drilling and boring machine, I. N. Day ... 517,815
Rock drilling and splitting, G. M. Githens ... 517,689
Rolling mill, R. G. Wood ... 517,716
Rolling roll, metal, W. E. Harris ... 517,747
Rolls for side bearing suspension rails, P. Eckel ... 517,687
Roof or floor, fireproof, T. A. Lee ... 517,576
Rotary steam engine, W. M. Barnes ... 517,513
Rotary steam engine, W. M. Byrd ... 517,790
Sash balance, W. K. Morgan ... 517,760
Sash fastener, P. C. Dolliver ... 517,605
Sash holder, C. E. Hell ... 517,695
Sash holder, C. S. Lee ... 517,577
Sash lock and support, J. S. Henry ... 517,456
Scale, druggist's weighing, E. Kelly ... 517,698
Scarf pin, H. Bornstein ... 517,725
Screen. See Window screen.
Screen, L. G. Beers ... 517,724
Secondary cell or battery, G. B. Henry ... 517,455
Separator. See Ore separator. Soot separator.
Separator bowl, centrifugal, D. J. Davis ... 517,603
Shade hanger, extensible, J. Joseph ... 517,750
Shaft coupling, clip, T. L. Baumgarten ... 517,787
Shelf, book, G. Wenker ... 517,503
Shingle machine, T. C. Davis ... 517,795
Sifter, ash, L. Youngquist *et al* ... 517,636
Signal. See Railway signal.
Skating rink, Mead & Clemens ... 517,823
Smoke consuming furnace, J. F. Chazotte ... 517,540
Soap server, toilet, H. B. Potter ... 517,624
Soot separator, M. A. Lutzner ... 517,581
Speed varying mechanism, H. H. Cummings ... 517,443
Spindle step protector, E. Jagger ... 517,573
Spinning machinery spindle, Smith & Howson ... 517,772
Spooling machine stop mechanism, Lever & Grundy ... 517,615
Spooling machines, automatic tension regulator for, W. H. St. George ... 517,495
Spring. See Burglar alarm spring. Watchcase spring.
Spring catch, A. Ludwig ... 517,703
Sprinkler. See Lawn sprinkler.
Stalk cutter and rake, combined, J. Priestley ... 517,766
Stamp attaching machine, postage, O. J. Moe ... 517,472
Stamp sticking device, C. A. Sprague ... 517,494
Stamps to envelopes, machine for attaching postage, C. Elliot ... 517,740
Stapling and cutting machine, Parks & Mollart, 517,586, 517,587
Steam and gas generator and engine, combined, N. Eaton ... 517,606
Steam boiler, J. E. Green ... 517,745
Steam trap, F. M. Ashley ... 517,422
Stone, artificial, A. Wallenber ... 517,811

© 1894 SCIENTIFIC AMERICAN, INC.

Stone working machine, Field & Pratt..... 517,742
Straw stacker, pneumatic, J. W. Nethery..... 517,475
Straw stackers, centrifugal discharger for, F. F. Landis..... 517,524
Straw stackers, centrifugal discharger for pneumatic, F. F. Landis..... 517,525
Straw stacking machine, M. T. Reeves..... 517,590
Street sweeper, J. B. Tilton..... 517,709
Stuffing box, H. G. Williams..... 517,509
Surgical ligature holder, H. A. Kaysan..... 517,754
Surgical table, O. Grasemann..... 517,861
Switch. See Automatic switch. Electric switch. Electrical switch. Railway switch.
Switch attachment, Warren & Casey..... 517,783
Switch lock, S. E. Barlett..... 517,722
Swivel bracket for rods, T. Morris..... 517,620
Table. See Billiard table. Pasting table. Peeling table. Surgical table.
Table and bed, combined folding, R. Ettinger..... 517,607
Telephone, S. D. McKelvey..... 517,762
Telephone, magneto, S. D. McKelvey..... 517,763, 517,764
Telephones, coin-controlled and coin-return lock for, J. M. Dashiell, Jr..... 517,445
Tenoning machine, W. H. Bennett..... 517,599
Thermometer, magnifying, S. G. Denton..... 517,446
Tile machine, J. Adamson..... 517,510
Tin boxes, machine for expanding, Edgar & Williams..... 517,736
Tire, pneumatic, G. N. Monro, Jr..... 517,584
Tire tightener, I. L. Carman..... 517,813
Tires, etc., hand pump for inflating, J. Dickens..... 517,736
Tobacco ordering apparatus, moistening chamber for, G. A. & C. A. Peple..... 517,825
Toe weight, E. G. Miles..... 517,583
Toothpick cutting machine, J. Powers..... 517,625
Toy, E. Lindner..... 517,616
Toy parachute, C. G. Tiefel..... 517,671
Track clearer, J. Olson..... 517,478
Train lighting and braking system, electric, G. W. Swartz..... 517,498
Trap. See Mole trap. Steam trap.
Tray, invalid, A. Bender..... 517,677
Tray, smoker's, W. H. O'Dwyer..... 517,598
Tricycle, S. F. Estell..... 517,741
Truck, T. R. Campbell..... 517,642
Truck, car, E. G. Gibson..... 517,688, 517,744
Truck, car, J. L. Hardie..... 517,571
Truck, motor car, Lutton & Pfetch..... 517,565
Truck, piano, F. E. Davis..... 517,543
Trunk, W. H. S. Westlake..... 517,711
Trunk fastener, W. Bruen..... 517,429
Truss, Brickner & Herr..... 517,639
Tube. See Insulating tube.
Tubs or boilers, fender for metallic, Roberts & Burroughs..... 517,827
Twine holder and take-up, E. Nelson..... 517,474
Type distributing apparatus, C. F. Hilder..... 517,802
Typewriting machine, W. P. Quentell..... 517,663
Typewriting machines, numeral adding or subtracting attachment for, J. D. Daugherty..... 517,735
Vacuum brake, W. L. Fitzhugh..... 517,819
Valve, Knapp & Chamberlin..... 517,575
Valve device, J. Reichmann..... 517,589
Valve gear, gas engine, B. H. Coffey..... 517,541
Valve operating mechanism, J. J. Moore..... 517,807
Vehicle seat, J. M. McHenry..... 517,526
Vehicle wheel, metallic, C. S. Cannon..... 517,791
Vehicles, means for connecting draught animals to, T. H. Brigg..... 517,640, 517,641
Ventilator, W. T. Cottler..... 517,793
Vessels, apparatus for raising sunken, J. & C. Taylor..... 517,630
Vine fastening, grape, Ryckman & Tucker..... 517,484
Vine stripper, M. Maples..... 517,469
Wagon body, Wagner & Habermann..... 517,500
Walls or ceilings, finishing joint in wooden, G. Knower..... 517,701
Washing machine, J. Beltzer..... 517,537
Washing machine, L. Kelly..... 517,699
Washing machine reversing gearing, J. G. Crawford..... 517,646
Watchcase spring, C. Nobs..... 517,554
Watchcases, tool for ornamenting, F. Ecaubert..... 517,686
Watch movement box, E. C. Fitch..... 517,647
Water gauge, J. C. Rummel..... 517,483
Water heater, E. Hayes..... 517,572
Water motor, J. W. Shipley..... 517,667
Water purifying apparatus, J. H. McDonald..... 517,552
Well drilling apparatus, bit for, S. A. Horton..... 517,459
Wells, etc., removing articles from, L. Maish..... 517,806
Wheel. See Vehicle wheel.
Wheel rims, joint for metal, J. Friedenstein..... 517,610
Windmill, T. D. Cook..... 517,542
Windmill, C. E. Williamson..... 517,674
Wine cooler, T. R. Wickham..... 517,507
Window screen, W. W. Cole..... 517,602
Wire, apparatus for hardening and tempering steel, E. Oddy *et al*..... 517,527
Wire fabric machine, F. A. Williams..... 517,508
Wool washing machine, Eyre & Hopkins..... 517,566
Wrapping machine, L. C. Crowell..... 517,440
Wrapping machine, newspaper, L. C. Crowell, 517,441, 517,442
Wringer. See Clothes wringer.

DESIGNS.

Brooder, E. Barney..... 23,168
Hammer, Z. Duchemin..... 23,169
Musical instrument key, A. Newell..... 23,166
Preserving vault, W. Walker..... 23,167
Spoon, fork, etc., S. Smith..... 23,163
Type, font of printing, H. Ihlenburg..... 23,164
Pattern for textile fabrics, C. Schlaepfer..... 23,165

TRADE MARKS.

Agate beads and buttons, F. Bapterosses & Cie..... 24,438
Beer, lager, Firm of Isaac Leisy..... 24,449
Biscuit, celery, S. B. Clark..... 24,455
Blacking, dressing, and rubber and leather cement for boots and shoes, Laing, Son & Harrar..... 24,477
Blood purifier and liver and kidney regulator, I. E. Zimmerman..... 24,466
Boots and shoes, W. H. Fearey..... 24,441, 24,442
Building, paving, and insulating composition, A. P. McKean..... 24,478
Butterine, Wilkins & Company..... 24,462
Canned and hermetically sealed goods, M. J. Boyer..... 24,461
Canned lobster, Burnham & Morrill Company..... 24,459
Cigars, all-tobacco cigarettes, cheroots, smoking, chewing, and leaf tobacco, and snuff, S. Hernsheim Brothers & Company..... 24,447, 24,448
Clasp for securing underclothing, metal, F. G. Davis..... 24,437
Coffee, Woolson Spice Company..... 24,451
Confections, sugar and licorice, M. Michaelis & Sons..... 24,563
Corset waists, E. Pohl & Company..... 24,440
Cough drops, J. F. Beane..... 24,470
Fish and meat packed in tin cans, J. O. Hauthorn & Company..... 24,460
Flour, oatmeal, parched wheat, and other cereal foods, J. B. A. Kern & Sons..... 24,456
Gold cure for opium, whisky, and tobacco habits and nervous diseases, Leslie E. Keeley Company..... 24,464
Hog and beef products, including lard and tallow, Anglo-American Provision Company..... 24,457, 24,458
Insecticides, O. H. Jadwin..... 24,475
Liniments, E. F. Watkins..... 24,474
Liniments, ointments, and remedies for dyspepsia, chills, and lung troubles, F. W. Peck & Company..... 24,472
Liniments, worm powders and elixirs for diarrhea, Carter & Jones..... 24,471
Meat softener in the form of a powder, A. E. Baird..... 24,463
Medicine for the cure of neuralgia, grip, and fever, Pheno-Bromate Chemical Company..... 24,468
Mineral water, natural, J. P. C. Schmit..... 24,450
Noodles, egg, C. F. Mueller & Company..... 24,454
Oil, castor, M. Calm & Brother..... 24,473
Oranges, E. Van Ness *et al*..... 24,452
Paper and envelopes, writing, Z. & W. M. Crane..... 24,444
Perfume for toilet uses in liquids, powders, pastes, and soaps, G. E. Lorenz..... 24,445
Remedies for catarrh, la grippe, and diseases of the throat and lungs, L. Mabee..... 24,469
Remedy for certain named diseases, J. W. Lundgren..... 24,465
Remedy for certain named diseases, J. H. McLeod 24,467
Remedy for chicken cholera, E. M. Hawkins..... 24,476
Rivets, Hoopes & Townsend..... 24,439
Soap, shaving, J. B. Williams Company..... 24,446
Velvets, Giron Freres..... 24,443
Watchcases, Illinois Watch Case Company..... 24,436
Windmills, Fairbanks, Morse & Company..... 24,479, 24,480

A printed copy of the specification and drawing of any patent in the foregoing list, or any patent in print issued since 1863, will be furnished from this office for 25 cents. In ordering please state the name and number of the patent desired, and remit to Munn & Co., 361 Broadway New York.

Canadian patents may now be obtained by the inventors for any of the inventions named in the foregoing list, provided they are simple, at a cost of $40 each. If complicated the cost will be a little more. For full instructions address Munn & Co., 361 Broadway, New York. Other foreign patents may also be obtained.

Advertisements.

ORDINARY RATES.
Inside Page, each insertion - - 75 cents a line
Back Page, each insertion - - - - $1.00 a line
☞ *For some classes of Advertisements, Special and Higher rates are required.*

The above are charges per agate line—about eight words per line. This notice shows the width of the line, and is set in agate type. Engravings may head advertisements at the same rate per agate line, by measurement, as the letter press. Advertisements must be received at Publication Office as early as Thursday morning to appear in the following week's issue.

"Star" Foot Lathe Swings 9x25 in.
LATHE
Screw Cutting Automatic Cross Feed, etc.
Scroll Saws, Circular Saws, Lathes Mortisers.
Catalogue Free of all our Machinery.
Seneca Falls Mfg. Co. 695 Water St., Seneca Falls, N.Y.

LATHES, Shapers, Planers, Drills, Machine Shop Outfits, Foot Lathes, Tools and Supplies. Catalogue Free. SEBASTIAN LATHE CO., 120 CULVERT ST., CINCINNATI, O.

AIR COMPRESSORS, ROCK DRILLS, COAL CUTTERS, Stone Channeling Machines.
THE INGERSOLL-SERGEANT DRILL CO.
RAVEMEYER BUILDING, 26 CORTLANDT ST. New York.

TECHNICAL SCHOOLS: THEIR PURpose and its Accomplishment.—By Prof. R. H. Thurston. A paper discussing the importance to the people and to the nation of the introduction and perfection of technical education in the United States, and its development as a part of a state and national system. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, Nos. **934** and **935**. Price 10 cents each. To be had at this office and from all newsdealers.

CATALOGUES FREE TO ANY ADDRESS
GEARS AND PARTS OF MODELS
GOODNOW & WIGHTMAN BOSTON

IF YOU HAVE ANY SMALL ARTICLES in Brass or Iron that you want manufactured in quantities, write to THE JONES BROS. ELECTRIC CO., 28-30-32 West Court St., Cin'ti, O.

INSTRUCTION BY MAIL

In Architecture.
Architectural Drawing.
Plumbing, Heating and Ventilation,
Bridge Engineering,
Railroad Engineering,
Surveying and Mapping,
Mechanics,
Mechanical Drawing,
Mining,
English Branches, and
ELECTRICITY.

Diplomas awarded. To begin students need only know how to read and write. Send for FREE Circular of information stating the subject you think of studying to The Correspondence School of Mechanics and Industrial Sciences, Scranton, Pa.

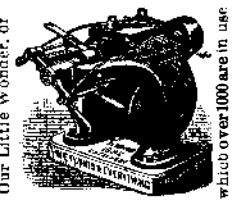
4000 STUDENTS.

HYPNOTISM: Its Uses and Abuses. The science easily acquired. Illustrated book, $1. Prof. Anderson, S.A. 4, Masonic Tem'le, Chicago

CARBORUNDUM
HARDEST ABRASIVE KNOWN. EMERY AND DIAMOND POWDER SUBSTITUTE. IN FLOUR, POWDER, CRYSTAL, WHEEL, SLAB & HONE FORM.
CARBORUNDUM CO. MONONGAHELA CITY, PA. U.S.A.

Fertilizers are Unprofitable

Unless they contain sufficient Potash. Complete fertilizers should contain at least 6 per cent. of Potash. Fertilizers for Potatoes, Tobacco, Fruits and Vegetables should contain from 10 to 15 per cent. of Potash. To obtain best results use fertilizers containing enough Potash or apply Potash salts, such as Muriate of Potash, Sulphate of Potash and Kainit. Instructive pamphlets and information free. Address,
GERMAN KALI WORKS,
BENNETT BUILDING, NEW YORK CITY.


Improvement on Our Little Wonder, of which over 1000 are in use.

NICKEL AND **ELECTRO-PLATING** Apparatus and Material.
THE Hanson & VanWinkle Co. Newark, N. J.
81 LIBERTY ST., N. Y.
23 S. CANAL STREET, CHICAGO.

The distribution of your power is as important as its application. I know a good deal about the economical distribution of power. Perhaps I could give you a few pointers. Inquiries answered free catalogues sent free.
Catalogues: A, woodworking mach'y; B, mach'y for brass, ivory, horn, etc.; C, shaft'g, pulleys, hangers, etc.
P. PRYIBIL, 488-500 W. 41st St., NEW YORK.

12" DRILLS D'AMOUR & LITTLEDALE, 204-206 E. 43d Street, NEW YORK. Correct in Design, Workmanship, and Price.

ROCK DRILLS AIR COMPRESSORS & GENERAL MACHINERY FOR MINING, TUNNELING, QUARRY & RAILROAD WORK.
RAND DRILL Co 23 PARK PLACE NEW YORK

BUY TELEPHONES

That are good—not "cheap things." The difference in cost is little. We guarantee our apparatus and guarantee our customers against loss by patent suits. Our guarantee and instruments are **BOTH GOOD.**
WESTERN TELEPHONE CONSTRUCTION CO., 440 Monadnock Block, CHICAGO.
Largest Manufacturers of Telephones in the United States.

If you want the best CHUCKS, buy Westcott's

Little Giant Double Grip Drill Chucks, Little Giant Drill Chucks, Improved Oneida Drill Chucks, Cutting-off Chucks, Scroll Combination Lathe Chucks, Geared Combination Lathe Chucks, Plain Universal Lathe Chucks, Independent Lathe Chucks. Made by Westcott Chuck Co., Oneida, N. Y., U. S. A. *Ask for catalogue in English, French, Spanish, or German.* FIRST PRIZE AT COLUMBIAN EXPOSITION, 1893.

OIL FUEL FOR BOILERS. — DEscription of the assemblage of the water tube, oil-fired boilers, which supplied the motive power for the Chicago Exposition, and which were the greatest in number and operating power ever before collected in one locality. With 2 illustrations. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **937.** Price 10 cents. To be had at this office and from all newsdealers.

CROWN SMELTING COMPANY, CHESTER, PA. FOUNDERS AND SMELTERS. CROWN BRONZE, PHOSPHOR BRONZE, MANGANESE BRONZE, GUN METAL AND BRASS. HEAVY CASTINGS A SPECIALTY. MAKERS OF WHITE BRASS & LINING METALS.

NEPERA PAPER.

NEPERA CHEMICAL COMPANY TRADE MARK

A New Printing-Out Ready Sensitized Paper.

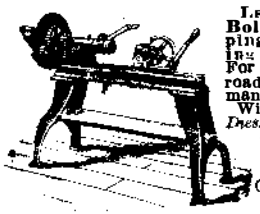
PERMANENT PRINTS, Better Results, Easier Obtained. **No Ice, No Hot Water Treatment, No Lead Salts, No Alum** or other hardeners endangering the durability of the image. Extreme simplicity of all operations. Printed, toned, and mounted in less time and with less trouble than any other paper. Does not bronze and does not fix out. *A paper for all climates and all seasons. Will stand a hot water test of 100° F. and will behave just as well in ice cold water.* Has none of the defects of its rivals. ☞ Write for free sample sheets. ☞ *Ask for prices of our Special Bromide Paper.*
For sale by All Dealers. **Nepera Chemical Co., Nepera Park, N. Y.**

Parsons Horological Institute.
Learn the Watch Trade
Engraving and Jewelry Work.
PARSONS, IDE & CO. ☞ *Circular free.*
302 Bradley Ave., PEORIA, ILL.

GASOLINE ENGINES.

Stationary & Portable
ALL SIZES.
Dwarfs in size and Giants in Strength.
Costs only 10 cents a Day per H. P. to run them, & scarcely any attention.
EVERY ENGINE GUARANTEED
Write for particulars and testimonials.
THE VANDUZEN GAS & GASOLINE ENGINE CO. CINCINNATI, O.
Mention this paper when you write.

DISPOSAL OF THE GARBAGE AND Waste of Cities.—By W. F. Morse. A statement of what, during the last two years, has been added to our knowledge on the subject of the disposal of city garbage and refuse; with special reference to the disposal by fire of the organic waste and garbage of the Chicago Fair. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **938.** Price 10 cents. To be had at this office and from all newsdealers.



Large Variety of Fine Bolt Cutting, Nut Tapping, and Pipe Threading Machines. For Machine Shops, Railroads, Carriage Makers, and manufacturers in general. With or without *Opening Dies.* For Hand and Power.
WILEY & RUSSELL MFG. CO., Greenfield, Mass., U.S.A.
Send for new Catalogue.

Perfect Newspaper File

The Koch Patent File, for preserving Newspapers, Magazines, and Pamphlets, has been recently improved and price reduced. Subscribers to the SCIENTIFIC AMERICAN and SCIENTIFIC AMERICAN SUPPLEMENT can be supplied for the low price of $1.50 by mail, or $1.25 at the office of this paper. Heavy board sides; inscription "SCIENTIFIC AMERICAN" in gilt. Necessary for every one who wishes to preserve the paper. Address
MUNN & CO., Publishers SCIENTIFIC AMERICAN

CALDWELL IMPROVED CHARTER GAS ENGINES.
2 TO 50 ACTUAL H. P.
USING GASOLINE, NATURAL GAS OR PRODUCER GAS.
DOES NOT INCREASE INSURANCE. SAFE. RELIABLE. ECONOMICAL. SIMPLE.
TAKES GASOLINE FROM NO DUPLICATE PARTS.
TANK LOWER THAN ENGINE AND OUTSIDE OF BUILDING IF DESIRED.
H. W. CALDWELL & SON, SOLE MFRS. WASHINGTON & UNION ST., CHICAGO, ILLS.

MATCH MACHINERY.

Latest improved. Complete plants furnished. JOS. C. DONNELLY, 1209 Buttonwood Street, Philadelphia, Pa.

THE "CLIMAX"
Stereotyper and Moulding Press

combined, for making perfect **Celluloid Stereotypes** to be used in place of metal stereotypes. Also for making **Rubber Stamps.** Should be in use in every printing office.
See SCI. AM., Dec. 30, 1893. Send for circular to
THE J. F. W. DORMAN CO.
217 E. German St., Baltimore, Md.
Manufacturers of Rubber Stamps, Vulcanizers, Stereotype Machinery and Supplies.

THE COPYING PAD.—HOW TO MAKE and how to use; with an engraving. Practical directions how to prepare the gelatine pad, and also the aniline ink by which the copies are made, how to apply the written letter to the pad, how to take off copies of the letter. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **438.** Price 10 cents. For sale at this office and by all newsdealers in all parts of the country.

MY WIFE CAN NOT SEE HOW YOU DO IT AND PAY FREIGHT.

$14 Buys our 3 drawer walnut, or oak Improved High Arm Singer sewing machine finely finished, nickel plated, adapted to light and heavy work; guaranteed for **10 Years;** with Automatic Bobbin Winder, Self-Threading Cylinder Shuttle, Self-Setting Needle and a complete set of Steel Attachments, shipped any where on **30 Day's Trial.** No money required in advance. 75,000 now in use. World's Fair Medal awarded machine and attachments. Buy from factor and save dealer's and agent's profits. **FREE** Cut This Out and send to-day for machine or large free catalogue, testimonials and Glimpses of the World's Fair.
OXFORD MFG. CO. 342 Wabash Ave. CHICAGO, ILL.

PERFORATED SHEET METALS
For Cotton, Oil & Rice Mills, Sugar Houses, Distilleries, Phosphate & Fertilizer Wks. Mining, Gas & Water Wks., Threshers & all kinds of Grain Cleaning Mach'y, Steel & Iron Plates & Cylinders for Screening Ore, Coal & Stone. For Filters, Strainers, Ventilators, Oil, Gas & Vapor Stoves & all special purposes Perforated Tin & Brass.
THE HARRINGTON & KING PERFORATING CO. CHICAGO

THE

☞ **ESTABLISHED 1845.**

The Most Popular Scientific Paper in the World

Only $3.00 a Year. Including Postage.
Weekly—52 Numbers a Year.

This widely circulated and splendidly illustrated paper is published weekly. Every number contains sixteen pages of useful information and a large number of original engravings of new inventions and discoveries, representing Engineering Works, Steam Machinery, New Inventions, Novelties in Mechanics, Manufactures, Chemistry, Electricity Telegraphy, Photography, Architecture, Agriculture, Horticulture, Natural History, etc. Complete list of patents each week.

Terms of Subscription.—One copy of the SCIENTIFIC AMERICAN will be sent for *one year*—52 numbers—postage prepaid, to any subscriber in the United States, Canada, or Mexico, on receipt of **three dollars** by the publishers; six months, $1.50; three months, $1.00.

Clubs.—Special rates for several names, and to Post Masters. Write for particulars.

The safest way to remit is by Postal Order, Draft, or Express Money Order. Money carefully placed inside of envelopes, securely sealed, and correctly addressed, seldom goes astray, but is at the sender's risk. Address all letters and make all orders, drafts, etc., payable to
MUNN & CO., 361 Broadway, New York.

THE

Scientific American Supplement

This is a separate and distinct publication from THE SCIENTIFIC AMERICAN, but is uniform therewith in size, every number containing sixteen large pages full of engravings, many of which are taken from foreign papers and accompanied with translated descriptions. THE SCIENTIFIC AMERICAN SUPPLEMENT is published weekly, and includes a very wide range of contents. It presents the most recent papers by eminent writers in all the principal departments of Science and the Useful Arts, embracing Biology, Geology, Mineralogy, Natural History, Geography, Archæology, Astronomy Chemistry, Electricity, Light, Heat, Mechanical Engineering, Steam and Railway Engineering, Mining, Ship Building, Marine Engineering, Photography, Technology, Manufacturing Industries, Sanitary Engineering, Agriculture, Horticulture, Domestic Economy, Biography, Medicine, etc. A vast amount of fresh and valuable information obtainable in no other publication.

The most important Engineering Works, Mechanisms, and Manufactures at home and abroad are illustrated and described in the SUPPLEMENT.

Price for the SUPPLEMENT for the United States, Canada, and Mexico, $5.00 a year; or one copy of the SCIENTIFIC AMERICAN and one copy of the SUPPLEMENT, both mailed for one year to one address for $7.00. Single copies, 10 cents. Address and remit by postal order, express money order, or check.
MUNN & CO., 361 Broadway, New York.

Building Edition.

THE SCIENTIFIC AMERICAN ARCHITECTS' AND BUILDERS' EDITION is issued monthly. $2.50 a year. Single copies, 25 cents. Thirty-two large quarto pages, forming a large and splendid Magazine of Architecture, richly adorned with *elegant plates in colors,* and with other fine engravings; illustrating the most interesting examples of modern architectural construction and allied subjects.

A special feature is the presentation in each number of a variety of the latest and best plans for private residences, city and country including those of very moderate cost as well as the more expensive. Drawings in perspective and in color are given, together with Plans, Descriptions, Locations, Estimated Cost, etc.

The elegance and cheapness of this magnificent work have won for it the **Largest Circulation** of any Architectural publication in the world. Sold by all newsdealers. $2.50 a year. Remit to
MUNN & CO., Publishers,
361 Broadway, New York.

© 1894 SCIENTIFIC AMERICAN, INC.