

only could not have been so great as 84 tons; this weight probably included water in boiler and the tender with water and coal. "Roper" gives the weight of the heaviest locomotive on the Pennsylvania Railroad as 60 tons, and says it is the heaviest locomotive in the world. An engine of the "Consolidation" class, with cylinders 20x24 inches, weighs 96,000 lbs. A medium class passenger locomotive weighs, with water in boiler, from 65,000 to 70,000 lbs., and tender, with water and coal, 46,000 lbs.

(4) W. C. J. writes: I have been experimenting on a plan for a steam gauge; I find it works well and cannot get out of order. As an atmospheric pressure is 15 lbs. per square inch, twice that would be thirty, three times forty-five, and so on. Now, supposing a piston be so constructed that the pressure of the boiler will compress the air in a tight tube and thus show what the pressure on the boiler is. Also to have the cylinder so constructed that when the piston moves up to the required pressure it shall open a port and let the steam escape. Some time ago I wished to purchase a new steam gauge; I took seven gauges for trial, and connected them all to the same boiler at the same time, and no two were alike. Now, as some of them showed as high as 20 lbs. more than others, how could I determine which was right? A. We advise you not to waste your time and money upon your proposed manometer gauge; they have been tried and abandoned long since. Of course you can purchase a cheap (and poor) gauge, as you can a cheap and poor watch. Some spring gauges are like Pindar's razors, not made to use, but to sell.

(5) C. W. K. writes: I wish to ascertain if there is any rule for finding the quantity of canal coal consumed, with the following data: Size of cylinder 6 1/2 inches, stroke 8 inches, number of revolutions 120 per minute, at steam pressure of 80 lbs. A. Find the weight of steam used by your engine, in any unit of time, say one minute or one hour; allow canal coal to evaporate 7.4 lbs. weight of water per pound of coal; divide the weight of steam used by 7.4, result is coal consumed in same time.

(6) "Subscriber" asks if it be safe to use an engine with 80 lbs. steam, the cylinder being little less than 1/2 inch thick the thinnest part. It is 22 inches long, 10 1/2 diameter. A. Yes, so long as it receives no extra strain or shock; but do not allow water to work through the engine.

(7) C. F. writes: It is said that 2 inch pipe will not discharge any more water under the same head than as many 1/2 inch pipes, said 1/2 inch pipes holding the same amount of water. Give us the difference and the reason why. A. 2 inch pipe will discharge most; 16 pipes 1/2 inch equal in cross area one of 2 inches diameter. The frictional surface of one 2 inch pipe may be represented by 6, and the frictional surface of 16 pipes, 1/2 inch diameter, by 25—the resistance from friction will be 4 times as much in the latter as the former.

(8) D. K. E. asks: 1. Could a small steam engine (screw propeller) be put into an ordinary row boat 16x3 1/2 feet? A. Yes, if the screw is properly immersed. 2. What would the engine cost, and how much power would be required to run 4 or 5 miles per hour? A. An engine with 3 inch cylinder would suit. Cost, about \$350 with boiler and shafts.

(9) J. N. L. asks: Is a 1 1/2 steam pipe sufficient to run a 9 inch cylinder, 16 inches stroke, steam engine to full capacity; the steam ports are 5 inches long by 1/2 wide, steam pressure 100 lbs. per square inch? A. No; use at least a 2-inch pipe for usual velocity.

(10) E. J. C.—For information on artificial incubation see SCIENTIFIC AMERICAN SUPPLEMENT, No. 54.

(11) J. L. C. writes: I have a tank in my house supplied with water which communicates with a tank 101 feet off in a direct line by a pipe with 1 1/4 inch bore; the pipe goes down perpendicularly 3 3/4 feet from the house tank and up perpendicularly 5 3/4 feet into the outside tank; the open end of the pipe in the house is 2 feet higher than the open end of the pipe in the other tank. 1. How much, if any, will the flow of water be increased by lowering the outer end of the pipe, say 1, 2, 3, or 4 feet? A. If the difference in height of open end of pipes is now 2 feet, and you increase it to 4 feet, the flow will be increased about 40 per cent. 2. Will more water pass through an inch perpendicular pipe 10 feet long, than through an inch pipe 1 inch long? A. Yes, if upper ends are at the same level and both supplied from the same tank or reservoir.

(12) J. L. R. asks: 1. Which will yield the greatest amount of heat: 1 lb. of best coal, or 1 lb. of alcohol when burned to best advantage? A. Coal, about 7 per cent more. 2. Why are not low pressure engines used in place of high pressure? Will they not give same power with far less fuel? A. They weigh more, cost more, occupy more room, and do not give much greater economy as the two classes are used in this country. 3. How many pounds will an ordinary horse pull on a straight pull? A. Necessarily indefinite; depends upon the weight of the horse, etc.

(13) S. C. C. asks: When a train of cars are rounding a curve, on which rail is the greater weight thrown, the inside or outside one? A. Outside one.

(14) J. A. H. asks: What can I use to prevent the forming of scales in a boiler? I am compelled to use water from a well which furnishes lime water. A. The mass of lime in your feed water should be separated in the heater; for removing lime scale already formed, use a small quantity of dissolved gum catechu daily, sent in through feed pump; watch carefully its effect, and increase or diminish the quantity as required. A small quantity of oak bark put in the boiler is said to be efficient.

(15) A. H. G. writes: You say in your issue of January 4th, 1879, in obtaining horse power of an engine, multiply area of piston, by pressure of steam, by length of stroke in feet, by double the number of revolutions. Do you not mean: "by revolutions per minute," instead of "double the number of revolutions?" A. No; double the number of revolutions equals number of strokes.

(16) J. H. R. asks: What is the number of threads to the inch in steam pipe? A.:

Inside diameter of pipe.	Threads per inch.
1/2	27
3/8	18
1/2	18
3/4	14
1	14
1 1/4	11 1/2
1 1/2	11 1/2
2	11 1/2
2 1/4	8
2 1/2	8
3	8
3 1/2	8
4	8

(17) S. B. & H. W. ask why rotary engines are not more used. A. It is very difficult to keep them tight under continuous use, and in most of them steam cannot be worked expansively, therefore they are not economical.

(18) J. C. asks (1) if there is any way of keeping a cylinder, while in motion, and heated by steam, free from condensation. A. Surround your cylinder with a steam jacket and introduce either live or superheated steam. 2. What kind of journal boxes or zht such a cylinder to have, that they may cause no trouble from heating? A. Probably phosphor bronze boxes will be best.

(19) A. M. U. asks for a correct method for laying out a cog or spur wheel. A. See SCIENTIFIC AMERICAN, vol. 38, pp. 36 and 149.

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

H. M. H.—The bead contains copper, lead, antimony, traces of bismuth, and silver. The crystals are anhedral calcium sulphate.—I. B. R.—It is galena—lead sulphide. It probably contains a small quantity of silver. The heavy mineral is barytes, or heavy spar—sulphate of barytes.—J. A. W.—It is a bituminous shale. It is impossible to make an analysis of any value on two ounces of water.—A. M.—It is a ferruginous quartz—not probably worth assaying. The dark fragment is an argillaceous shale.—The sample of clay in the Estabrook pen box (no name) contains much iron oxide and silica. It may be useful for manufacturing bricks and cheap pottery, tiles, drain pipe, etc.—J. N. W.—The potter's clay is of fair quality. It would be of more value if properly washed. The color is due to oxide of iron.—C.—The metal is lead—it contains a trace of silver. The mineral is muscovite.—C. D.—It is chiefly iron sulphide pyrite, of little value.—J. C.—The sample is the so-called millstone grit. It is too coarse to be of any practical value. Perhaps better stone may be found lower down.

COMMUNICATIONS RECEIVED.

- Fence. By G. T. B.
- On the Wagon Wheel Question. By G. S. W.
- On the Gary Motor. By C. H. H.

[OFFICIAL.]

INDEX OF INVENTIONS
FOR WHICH
Letters Patent of the United States were
Granted in the Week Ending
March 4, 1879,
AND EACH BEARING THAT DATE.
(Those marked (r) are reissued patents.)

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

Air brake relief valve, H. H. & T. C. Osgood.....	212,972
Amalgamator, P. Dickson.....	212,907
Animal trap, R. Spencer.....	212,999
Axle nut, vehicle, G. J. Dykes.....	212,842
Bale tie, J. M. Robertson.....	212,984
Bales, covering, for cotton, W. P. Groom.....	212,925
Baling press, S. Stucky.....	212,823
Baling press, J. M. Tichenor.....	213,010
Ball trap, T. M. Smith.....	212,996
Bed bottom, S. Hawker.....	212,930
Bed bottom, W. H. Leflinger.....	212,954
Bed bottom, W. J. Myers.....	212,816
Bedstead, cabinet, J. W. Stanton.....	213,001
Bee hive, J. P. Karr.....	212,949
Bee hive, N. Zink.....	212,828
Beer barrel, etc., air supplier, W. F. Class.....	212,898
Beer cooler, W. Klnefelner.....	212,951
Blackboard, F. G. Johnson.....	212,945
Bleaching compound, T. D. Brochockl.....	212,890
Blind fastener, A. F. Fuller.....	212,920
Blind slat adjuster, O. C. Peck.....	212,973
Bone grinding mill, T. O. Cutler.....	212,838
Book case, J. Danner.....	212,903
Book case, E. J. Smith.....	212,995
Boot and shoe counter or heel stiffeners, machine for shaping, R. Glover.....	212,923
Boot and shoe stay, A. Seaver (r).....	8,606
Boot and shoe trimming and burnishing machine, R. C. Lambert.....	212,853
Boots and shoes, machine for driving staples in lasting, S. Mower.....	212,861
Bottle washer, S. W. Dilln.....	212,841
Breastwork or shield, movable, M. J. Wellman.....	212,877
Brick pressing machine, W. L. Hippert.....	212,799
Bridge, P. Jarvis.....	212,941
Bridle bit, reversible, Holland & McKimm.....	212,935
Brooms, manufacture of, D. C. M. Barney.....	212,785
Brush, hair, F. A. Freeman.....	212,844
Brush, mucilage, J. B. Davids.....	212,904
Buckle clasp, F. D. Ballou.....	212,832
Buildings, construction of, H. R. Canine.....	212,894
Butter mould, M. T. Nesbitt.....	212,970
Candy machine, R. M. Marshall.....	212,811
Car coupling, N. F. Wynkoop.....	213,023
Car door, grain, Conrath & Knipper.....	212,901
Car door, grain, F. C. L. G. Susemihl.....	213,004
Car replacer, M. S. Shotwell.....	212,930
Car starter, R. Proctor.....	212,820
Car wheel, chilled, N. Washburn.....	212,825
Carbureter, H. S. Maxim.....	212,857
Carding engines to prevent their disintegration, treating rovings on, Haigh & Greenwood.....	212,928
Carriage curtain fastener, E. G. Grah.....	212,924
Cart body, F. H. Trenholm (r).....	8,610
Casting steel, mould for, G. Cowling.....	212,982
Check register, J. Casey.....	212,788
Chuck, drill, H. S. Pruyn.....	212,980
Clothes line support, P. Fischer.....	212,916
Clothes line support, extension, F. Fischlein.....	212,917
Clothes pounder, N. & J. Connoran.....	212,900
Coal slide or chute, G. A. Fall.....	212,915
Coffee pot, G. F. Hussey.....	212,801
Coin holder, L. H. Olmsted.....	212,867
Convertible chair, J. Lee (r).....	8,604
Cork extractor, L. C. Mumford.....	212,863
Corn stalk cutter, W. Barnes (r).....	8,608
Cradle, A. S. Reisor.....	212,882
Curtain roller and bracket, Buckley & Sawyer (r).....	8,603
Cut-off rain water or other, J. A. Lyons.....	212,958
Dental chair, H. Woodbury.....	213,021
Desk and seat, school, G. Munger (r).....	8,606
Distillation of oils, H. B. Everest.....	212,914
Drawers, E. Levi.....	212,810
Drum, heating, N. J. Engler.....	212,913
Electric light, Du Motay & Stern.....	212,860
Electric light, P. O. Jenkins.....	212,851
Electric signaling apparatus, E. N. Dickerson, Jr.....	212,792
Electrical signaling apparatus, T. N. Vall.....	212,873
End gate, wagon, J. H. Sifers.....	212,991
Enemas, syringes, etc., of india-rubber, manufacture of, J. G. Ingram.....	212,933
Engraving machine, J. C. & G. M. Guerrant.....	212,927
Exercising machine, F. G. Johnson.....	212,946
Fare register, R. Gornall.....	212,798
Farm gate, T. Alton.....	212,781
Feather renovator, Lull & Brainerd.....	212,809
Feed water heater, E. Huber.....	212,936
Feed water heater, G. W. Storey.....	213,009
Fence post, G. D. Baily.....	212,784
Fence post, H. S. Palmer.....	212,868
Fence wire barbed, H. M. Vaughan.....	212,874
File, bill, M. Posz.....	212,979
Fire alarm box, automatic, Pond & Tenney.....	212,818
Fire alarm box, non-interfering, C. H. Pond.....	212,869
Flue roller and expander, J. H. McGraw.....	212,964
Fluting bed and roller, M. A. Perrigo.....	212,976
Garter, T. J. Carroll.....	212,837
Gas apparatus, illuminating, E. J. Jerzmanowski.....	212,943
Gas generating apparatus, E. J. Jerzmanowski.....	212,942
Gas retorts, head and lid of, C. W. Isbell.....	212,940
Glassware, shaper for tubular, A. H. Helsey.....	212,932
Grain, etc., cooler and drier, F. A. Luckenbach.....	212,955
Grate bar, J. B. Miller.....	212,966
Harrow, J. F. Wilcox.....	213,020
Harrow, J. H. Yager.....	213,024
Harvester elevator, C. Ainsworth.....	212,879
Hat, J. Thomas.....	213,008
Hat forming machine, R. Eickemeyer.....	212,910
Hat sweat band, C. O. Kanouse.....	212,948
Heating furnace, J. H. Merrill.....	212,965
Reel cutting die, H. Turner.....	213,013
Hog trap, R. D. Loudon.....	212,807
Hoisting apparatus, G. Sanford.....	212,989
Horse power, R. S. Leggett.....	212,854
Horse power tread, H. Smith.....	212,993
Horse tail protector, J. Briggle.....	212,836
Hose pipe supporter, W. P. Silvernail.....	212,992
Hose support, A. M. Waterworth.....	212,876
Hub, vehicle wheel, A. V. Holcomb.....	212,934
Hydrocarbon from substances which have been treated therewith, removing, W. Adamson.....	212,873
Indicator, F. N. Chase.....	212,789
Injector for beer kegs, salt, J. C. G. Hupfel.....	212,800
Insecticide, J. C. Benton.....	212,835
Iron, galvanizing and tinning, Wahl & Eltonhead.....	213,015
Ironing table, S. W. Kibbourne.....	212,905
Jewelry, sprig work for, L. Heckmann.....	212,848
Knob, sheet metal, H. A. Matthews.....	212,962
Lamp chimneys, etc., machine for flaring and crimping, R. Hemingray.....	212,850
Lantern, J. H. Irwin (r).....	8,611
Last maker's guide, J. Kimball.....	212,852
Lasting machine, S. E. Mower.....	212,815
Lasting machine, H. G. Thompson.....	212,824
Latch, W. I. Ludlow.....	212,956
Lead fumes, collecting waste, G. T. Lewis.....	212,855
Leather work, machine for opening and pressing seams in, G. W. Emerson et al.....	212,843
Lifting handle, chest or box, W. Bachtengkirch.....	212,881
Lock, J. J. Dinnan.....	212,908
Lock, W. I. Ludlow.....	212,957
Lock, W. H. Taylor.....	213,006
Mask, smoke excluding, G. Neally.....	212,969
Measuring lumber, device for, E. Neary.....	212,817
Mechanical medium, H. J. Steln.....	212,870
Middlings purifier, E. S. Bartholomew.....	212,834
Milk cooler, L. B. Austin.....	212,830
Motor, J. Plattenburg.....	212,977
Music leaf turner, O. H. Goodwin.....	212,846
Oil cloth, metallic binding strip for, C. E. Marshall.....	212,961
Oil press mat, Perkins & Baker.....	212,974
Packing, refrigerator door, H. W. Cass.....	212,896
Padlock, H. Budd.....	212,892
Paintings on panels and other surfaces, reproducing oil, H. Bokaerts.....	212,887
Paper, M. Newton.....	212,866
Paper folding machine, W. Spalckhaver.....	212,998
Paper folders, pasting mechanism for, S. D. Tucker.....	212,872
Paper pulp from wood, S. M. Allen.....	212,782
Pegging machine, A. W. Moore.....	212,814
Photographing objects in motion, method and apparatus for, E. J. Muybridge.....	212,864
Piano, pedal, W. J. Becker.....	212,885
Pinchers for attaching seam protectors, paper fasteners, etc., Rutz & Weiser.....	212,938
Pipe and nut wrench, D. Fisher.....	212,735
Plane, bench, L. C. Rodler.....	212,986
Plant digger, A. Kreider.....	212,953
Planter, corn, J. W. Bruner.....	212,787
Planter, corn, J. P. R. Mann.....	212,959
Planter, hand corn, A. M. Haswell.....	212,929
Planter, seed, Ide & Post.....	212,938
Plow, reversible gang, J. Chapman.....	212,897
Polisher for varnished surfaces, H. S. Bartholomew.....	212,833
Pressing machine and sheet tie, J. W. Jones.....	212,947
Printing machine, Anthony & Taylor.....	212,880
Printing press, E. L. Gilman.....	212,922
Printing press, A. Godfrey.....	212,737
Pulmonic fountain, C. S. Lockwood.....	212,856
Pump, R. A. McCauley.....	212,858
Pump, J. W. Robertson.....	212,885
Pump, T. B. Swan.....	213,005
Pump and syringe, breast, M. Von Beust.....	213,014
Pumping and cooling system, Molera & Cebrían.....	212,967
Pumping, forcing, and blowing, machinery for, R. Johnson.....	212,944
Quartz mill, D. H. Anderson.....	212,829
Rag engine, E. D. G. Jones (r).....	8,609
Railway system, flexible, O. C. Woolson.....	212,827
Refrigerator, J. R. Ludlow.....	212,808
Road engine, H. H. Bridenthal, Jr.....	212,889
Road engine, F. E. Culver.....	212,839
Road chair spring, H. Gerrish.....	212,845
Safety pin, H. H. Thayer.....	213,007
Sash fastener, Ross & Fortmann.....	212,967
Saw, circular, J. A. Miller.....	212,813
Saw mill dog, E. H. Stearns.....	212,903
Scissors and shears, A. Clarke.....	212,790
Scoop, coal, J. Balmore.....	212,883
Scoop, weighing, J. Birks.....	212,786
Seed cleaner, blue grass, I. B. Sandusky.....	212,821
Sewer pipes and deodorizing the foul air therefrom, ventilating, A. W. Rand.....	212,981
Sewer and embroiderer, L. C. Mumford.....	212,862
Sewing machine, J. H. Applegate.....	212,783
Sewing machine feeder, N. Durkopp.....	212,793
Shaft, flexible, N. Stow (r).....	8,607
Shawl strap and head rest, H. H. McLane.....	212,812
Shirt, dress, H. F. Elias.....	212,911
Shoe, J. F. Emerson.....	212,794
Shoe sole trimmer, W. D. Orcutt.....	212,971
Shovel, W. Wharton, Jr.....	213,019
Snap hook, E. Kemphall.....	212,950
Sofa and chair back, J. H. Travis.....	213,012
Spinning machine spindle band holder, C. E. Herrick.....	212,833
Spools tension device for thread, R. O. Burgess.....	212,883
Spring shaper, S. A. Case.....	212,895
Stand for decanters, bottles, and jars, G. W. W. & J. Betjemann.....	212,886
Stand pipe and ladder, Tidball & Spencer.....	212,871
Steam boiler, G. W. Doolittle.....	212,909
Steam boiler, A. H. Fowler.....	212,918
Stencil plate, Krier & Irvin.....	212,952
Stereotype cast, M. J. Hughes.....	212,937
Storage tank, portable, T. B. Riter.....	212,953
Stove, heating, McCaw & Brown.....	212,963
Stove pipe safe and register, H. B. Morrison.....	212,969
Sun dial, L. Taunstoun.....	213,009
Surveying instrument, H. S. S. Watkin.....	213,018
Swing, W. W. Elliott.....	212,912
Syringe, Perkins & Davol.....	212,975
Telegraph, fire alarm, C. H. Pond.....	212,819
Textile and other fabrics cutter for, A. Warth.....	213,017
Ticket case, A. W. Sperry.....	213,000
Tobacco cutter, L. E. Heaton.....	212,931
Tobacco cutter, T. B. McIntosh.....	212,859
Toy motor, H. Groth.....	212,926
Toy pistol, H. M. Weaver.....	212,926
Truck cover supporter, J. G. A. Walker.....	213,016
Truck, plow and farm, B. Franklin.....	212,919
Tugs or traces, draught, W. M. Cuttbert.....	212,840
Turnstile register, F. O. Deschamps.....	212,900
Tuyere, G. M. Smith.....	212,994
Twist drills, making, C. Jacobson.....	212,982
Umbrella handles, ribbon retainer for, J. Wright.....	213,021
Umbrella notch ring, O. M. Smith.....	212,997
Valve, C. C. Walworth.....	212,875
Valve, slide, J. J. Tonkin.....	213,011
Vegetable assorter, J. H. & H. J. Heinz.....	212,849
Vegetable cutter, C. J. Gardner.....	212,921
Vehicle brake lever, J. Yenne.....	213,025
Vehicle spring, J. J. Cobb.....	212,791
Vehicle spring, A. L. & L. A. Davis.....	212,906
Velocipede, H. W. Baltz, Sr.....	212,884
Wagon jack, J. B. Gillaspie.....	212,796
Wagon jack, G. & L. N. Lakin.....	212,866
Wall paper exhibitor, H. M. Collins.....	212,909
Watch, calendar, B. Baillet.....	212,882
Water elevator, steam, E. C. Plumer.....	212,978
Water wheel, C. E. Marshall.....	212,940
Wave power for propelling vessels, J. B. Greene.....	212,847
Wells, sucker rod socket for oil, J. H. Bair.....	212,831
Whiffletree plate, H. Keyes.....	212,803
Whip rolling machine, O. Bryant.....	212,891
Wind wheel, C. V. Stevens.....	212,822
Yarn winder, J. T. A. Boyd.....	212,888
Yoke strap, neck, H. Keyes.....	212,804

TRADE MARKS.

Ales, W. A. Miles & Co.....	7,069
Baking powder, J. H. Knauss.....	7,056