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 passen ger 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 pisten 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, as high as 20 lbs. more than others, how could I determine which was right? A. We advise you not to waste 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
- (5) C. W. K. writes: I wish to ascertain if there is any rule for finding the quantity of cannel ceived from the following correspondents, and coal consumed, with the following data: Size of cylinder 6% inches, stroke 8 inches, number of revolutions 120 per minute, at steam pressure of 80 lbs. A. Find the weight 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% 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 may be represented by 6, and the frictional surface of lower down. 16 pipes, ½ inch diameter, by 25—so the resistance from friction will be 4 times as much in the latter as the
- (8) D. K. E. asks: 1. Could a small steam engine (screw propeller) be put into an ordinary row boat 16x31/2 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 \$450 with boiler and shafts.
- (9) J. N. L. asks: Is a 1½ 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 1/8 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.
- (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 11/4 inch | Air brake relief valve, H. H. & T. C. Osgood..... 212,972 bore; the pipe goes down perpendicularly 31/2 feet from the house tank and up perpendicularly 51/2 feet into the Sutside tank; the open end of the pipe in the house is 2 feet higher than the open end of the pipe in the other 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 as the two classes are u 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 a)ready 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 bouals number of strokes.

(16) J. H. R. asks: What is the number of

Inside diameter of pipe.	
½····	27
1/4 1/8	
78	
1	14
1	
11/4	111/4
11/2	
21/4	8
3	8
81/2	
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 and no two were alike. Now, as some of them showed cylinder with a steam jacket and introduce either live or superheated steam. 2. What kind of journal boxes o. 3ht such a cylinder to have, that they may cause no your time and money upon your proposed manometer 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 reexamined, with the results stated:

H. M. H.—The bead contains copper, lead, antimony, of steam used by your engine, in any unit of time, say traces of bismuth, and silver. The crystals are anhyone minute or one hour; allow cannel coal to evaporate | drite 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 most; 16 pipes 1/2 inch equal in cross area one of 2 is the so-called millstone grit. It is too coarse to be of inches diameter. The frictional surface of one 2 inch pipe | any practical value. Perhaps better stone may be found

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, L and remit to Munn & Co., 37 Park Row, New York city.

	Amalgamator, P. Dickson		
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From March 4 to March 7, inclusive. Bird cages, O. W. Taft, New York city. Chair, G. W. Archer, Washington, N. Y Carding engines, B. S. Roy, Worcester, Mass. Cop tubes and holders, G. W. Dyer, Washington, D.C. Drying apparatus, A. J. Reynolds, Chicago, Ill. Heating apparatus, J. S. Hull. Baltimore, Md. Hoof expander, C. H. Shepard, ———. Magneto-electric apparatus, W. W. Gary, Washington,

Metal bars, machine for shaping, J. J. Capewell, Cheshire, Conn. Sewing machine, J O'Neil, New York city. Shaft hangers, H. D. Cone, Stockbridge, Mass. Steam boilers, G. D. Daly, Flatbush, N. Y.