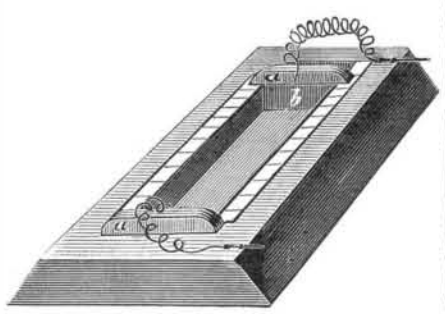
(27) H. G. A. asks: Can you give me a rule by which I can calculate the velocity of steam at different pressures through pipes of different sizes, and how much to deduct for friction on straight pipes and angles of 90°? A. A formula for the flow of steam and gases, which is generally accepted as correct, is still wanted. You can find rules and formulæ in Clark's Manual for Engineers," page 893 and onward.

(28) H. von S. asks: 1. Where and by whom are steam engines manufactured to burn petroleum oils in place of coal or wood? A. We know of no one who makes boilers specially for petroleum, though there are many boilers in the oil regions in which oil is used as a substitute for other fuel. 2. What would be a suitable size of such engine to give a boat, 30 feet long by 8 feet beam, a speed of 10miles an hour? A. The engine for such a boat should be about 6 inch cylinder by 8 inches stroke, with tubular boiler about 40 inches diameter by 5 feet high.

(29) W. R. J writes: There is a blast furnace located about 1,200 feet from a water power. It has been proposed to convey the power by wire ropes to the blowing machinery located at the furnace. I suggest that the machinery be located at the power and the air conveyed to the furnace. The furnace will require about 1,300 cubic feet of air per minute, at an average pressure of 2½ lb. per square inch. I propose to use a 15 inch pipe. Which plan do you think best, and what would be the loss in friction through the pipe? A. Locate your blast machinery near the power, and convey the air in a large pipe; the pipe, if large, will be a substitute for a receiver or reservoir.

(30) W W. S. asks (1) if it is necessary that the "air chamber" (that is, any part of it) in a force pump should be higher than the discharge snout. A. Yes, to prevent the air passing away with the water. 2. When an air chamber is used, does any of the water pass into it and by so doing compress the air? A. Yes, sufficient to compress the air to the pressure required for delivery of the water. 3. Should an air chamber be perfectly air tight? A. Yes. 4. What are the advantages to be derived from using an air chamber? A. More uniform delivery of water and relief to the valves

(31) G. M. asks how to determine the conducting power of liquids. A. To measure the resistance of liquids make a wooden trough, 4 or 5 inches long and cement it with sealing wax. In this trough place two



movable blocks, *a a*, the edges of which, extending over the sides, will serve as indices to the scale. To each of these blocks is attached a platina plate, soldered to a spiral copper wire, the ends of which are fastened to the trough. The liquid is placed in the trough, and the plates placed at any convenient distance from each other. After observing the galvanometer placed in the same circuit with this apparatus, a rheostat is substituted for the liquid and adjusted until the same deflection is produced. Since Ohm's law holds good for liquids as well as solids, the resistance of a stratum of liquid can be calculated from the length, breadth, and thickness when the resistance for the unit of section and length is known.

(32) B. H. L. asks: 1. Is civil engineering a good, profitable, and healthy business? A. Yes, in ordinary times. 2. How and where is the preparation best obtained? A. At educational institutions where it is especially taught. 3. Is civil engineering as good a business as mechanical engineering, and where do you get the best preparation for a mechanical engineer? A. The difference will depend entirely on circumstances. For mechanical engineering, in a technical school and workshop.

(33) M. A. D. writes: Suppose I have a furnace and boiler for making steam to run a large air pump. I have this pump to force air into a large iron drum. I then use this compressed air to run an engine. What per cent of the steam power can I get out of the air engine? A. Probably from 30 to 55 per cent of the power expended, and by an exceptionally good arrangement, perhaps somewhat more.

(34) W. C. B. asks: Would a circular steam boiler, 10 inches in diameter by 12 inches long, with wrought iron sides 3-32 of an inch thick, and cast iron heads 5-16 of an inch thick, with 5 one inch flues, be perfectly safe at 50 lb. pressure? A. Yes, with the exception of the heads; if they are to be cast iron, make them ⅝ inch thick at least.

(35) G. H. B. asks: What will be the mean velocity of a stream of water running through a pipe 2½ feet diam , 1 mile long, grade of 1½ inch to 100 feet, and a mean head of 2 feet? A. Formulas given differ very much, but the average result is about 3·8 feet per second.

(36) G T asks if there is such a place on the American coast, north, south, east, or west, as Eddystone Lighthouse, or North and South Edisto, or Edisto Island? A. Edisto Island, in the southern part of South Carolina, is at the mouth of the Edisto River, and is formed by two tidal streams called North Edisto River and South Edisto River. Edisto Island post village is on Edisto Island.

(37) W. M. B. asks if a locomotive engine, same cylinder and same pressure of steam, is as effective as a stationary engine, and if not, why not? A. No, because the valve arrangement will not permit the working of the steam expansively to the same degree of efficiency.

(38) F. L. writes, I am troubled with salt in my boilers coming from the lower levels of the mine. I understand in ocean steamship practice, zinc is put in the boilers. What action has it on the salt? Is it used as a plain metal or a compound, and how, and in what quantity? A. Zinc is more electropositive than iron, and in virtue of this property it in a measure protects the boiler plates from corrosion. It is usually employed in the form of plates or scrap (spelter) in quantities of 5 or 10 lbs.

(39) F. R. R. asks: 1. Will the power or polarity of a permanent magnet be affected by constant use on an electro-magnet, to be attracted and repelled, and liable to be left in either position for a length of time? A. If the electro-magnet is strong, and the like poles of the two magnets are in contact with or near each other for a time, the polarity of the permanent magnet would be neutralized or reversed. 2. If an electro-magnet is more than twice as strong, as a permanent magnet, or *vice versa*, would not the attraction of the strong magnet for the metal of the other overcome the repelling force of its corresponding pole and attract instead of repel it? A. Yes. 3. Would it not be the same if both were permanent magnets, or both electro-magnets? A. Yes.

(40) W. A. A. writes: 1. I want to make an engine, 3½ inches stroke and 3½ inches diameter, how large should the ports and exhaust be? A. Steam ports ¾ inch x 2¾ inch. 2. How large a boiler and of what size copper should it be made of, so that it would stand 150 lb? A. Exhaust ports ⅝ inch x 2¾ inch. The size of the boiler about 30 square feet heating surface, but will depend upon the speed of the engine and thickness of metal upon the design of the boiler. 3. How large a boat would be best adapted for this engine? A It would probably drive a good model boat, 21 feet in length, at a fair speed.

(41) W. H. G. asks: 1. If two or more small cubes of Indiarubber are clamped together in a certain machine, would the pressure cause all of the pieces of rubber to be equally reduced in the direction of the pressure, or would some of the pieces yield more than the others? A. As we understand you, if the cubes were taken from the same piece of rubber the elasticity would be about the same in all of the pieces. 2 How long would the elastic nature of rubber continue if subjected to such pressure at intervals, and where the degree of force applied sometimes varied? A. Your question will not admit of a definite reply; from one to five years, depending upon the conditions of strain, wear, and exposure. 3. In what way can rubber be made to resist the hurtful effect of linseed and other oils? A. If the rubber is to be subjected to varying compression, we know of no practical means of protecting it.

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

C. P. T —No. 1 (quartzose), gold, 1 3-10 dwt.; silver, 255-100 oz; value $4.13 per ton. No. 2, gold, 1 3-5 dwt.; silver, 6 68-100 oz.; value per ton, $8.97. The others contain nothing.—J. S. R.—1. Pyrrhotine (magnetic pyrites, iron sulphide). 2. Zincite (red oxide of zinc). 3 and 4. Magnetite (magnetic iron ore).—R. H.—Quartz and magnetite an excellent iron ore.—J. W C.—It is mica scales, of little value.—W. E. K.—Fossiliferous limestone.—J. D. M.—Chrysolite (olivine) in basalt.—H. W. T.—Lime carbonate. We do not exchange specimens.—N. P. W.—They are impure hematites (iron ores). No. 1 contains much sulphur, and No. 2 manganese and probably titanium.—W. S. H.—Iron pyrite (sulphide of iron) —G. P.—It is graphite (plumbago). If found in sufficient quantities, of some value.—L. L. R. & B.—Fragments of quartz, valueless.

COMMUNICATIONS RECEIVED.

On Ellipses; also, on Preserving Cider. By A. C.
On the Magnetic Needle. By G. W. M.
On Boiler Explosions. By J. P. H.
Death in What We Eat. By T. B. M.

[OFFICIAL.]

INDEX OF INVENTIONS

FOR WHICH

Letters Patent of the United States were Granted in the Week Ending

September 9, 1879,

AND EACH BEARING THAT DATE.

[Those marked (r) are reissued patents.]

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From August 9 to September 2, inclusive.

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Buckles, W. J. Carnes, Gonzales, Texas.
Compound for protecting goods, D. W. Lamb, N. Y. city.
Grain elevator, J. B Stoner, Toledo, Ohio.
Guns, W. B. Farwell *et al.*, Brooklyn, N. Y.
Horseshoe machinery, J. R. Williams *et al.*, Johnstown, Pa.
Knitting machine, B. F. Shaw, Lowell, Mass.
Machine guns, D. C. Farrington, Lowell, Mass.
Mills for grinding corn, etc., A. L. & E. Lister, Newark, N. J.
Mowing machine, P. Mast *et al.*, Springfield, Ohio.
Puddling furnace, J. Luhens, Conshohocken, Pa.
Pressure regulator, G. Ross. Troy, N. Y.
Railway signaling apparatus, W. Robinson, Boston, Mass.
Sewing machines, Wilson Sewing Machine Company, Chicago, Ill.
Spinning machinery, J. Abbott, Philadelphia, Pa.
Telephone, S. H. Short, Franklin Co., Ohio.
Water supplying apparatus, N. W. Green, Springfield, Mass.
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