Hoboken, N. J.; John S. Newberry, professor of geology and paleontology at the Columbia College School of Mines, and late State geologist of Ohio, New York; Simon Newcomb, astronomer and superintendent of "Nautical Almanac," Washington, D. C.; Hubert A. Newton, mathematician and professor of mathematics at Yale University, New Haven, Conn.; General John Newton, late chief of the corps of engineers, U. S. army, and commissioner of public works, New York; James E. Oliver, professor of mathematics at Cornell University, Ithaca, N. Y.; Alpheus S. Packard, naturalist and professor of natural history at Brown University, Providence R. I.; Charles S. Pierce, late assistant and acting superintendent, United States Coast Survey, Washington, D. C.; Charles H. F. Peters, astronomer and director of the Litchfield Observatory, Clinton, N. Y.; Edward C. Pickering, astronomer and director of the Harvard Observatory, Cambridge, Mass.; Raphael Pumpelly, geologist, and has had charge of the Missouri State geological survey, and the transcontinental survey of the Northern Pacific Railway, Newport, R. I.; Frederick W. Putnam, ethnologist and curator of the Peabody Museum, Cambridge, Mass.; Ira Remsen, professor of chemistry at the Johns Hopkins University, Baltimore, Md.; Fairman Rogers, engineer, and formerly lecturer on mechanics at Franklin Institute, and professor of civil engineering at the University of Pennsylvania, Philadelphia, Pa.; William A. Rogers, Cambridge, Mass.; Ogden N. Rood, physicist and professor of physics at Columbia College, New York; Henry A. Rowland, professor of physics at the Johns Hopkins University, Baltimore, Md.; Lewis M. Rutherfurd, astronomer, New York; Charles A. Schott, connected with the United States Coast Survey, Washington, D. C.; Samuel H. Scudder, naturalist, and late editor of *Science*, Cambridge, Mass.; William Sellers, mining engineer, Philadelphia, Pa.; Sidney I. Smith, professor of comparative anatomy at Yale University, New Haven, Conn.; John Trowbridge, professor of physics at the Lawrence Scientific School of Harvard University, Cambridge, Mass.; William P. Trowbridge, professor of engineering at the Columbia College School of Mines, New York, N. Y.; James H. Trumbull, philologist and superintendent of the Watkinson Library, Hartford, Conn.; Addison E. Verrill, naturalist and professor of zoology at Yale University, New Haven, Conn.; Francis A. Walker, statistician, late superintendent of the census, and president of the Massachusetts Institute of Technology, Boston, Mass.; Dr. Horatio C. Wood, professor of materia medica, pharmacy, and general therapeutics, and clinical professor of nervous diseases of the University of Pennsylvania, Philadelphia, Pa.; A. H. Worthen, geologist, and in charge of the State Survey of Illinois, Springfield, Ill.; Arthur W. Wright, physicist and professor of molecular physics and chemistry at Yale University, New Haven, Conn.; Charles A. Young, astronomer and professor of that branch at the College of New Jersey, Princeton, N. J.

The foreign associates, limited to fifty members, include: John C. Adams, astronomer, discoverer of Neptune, Cambridge, England; Sir George B. Airy, astronomer royal of England, Greenwich, England; Arthur Auwers, astronomer, Berlin, Germany; Joseph L. F. Bertrand, mathematician, Paris, France; Pierre E. M. Bertholet, chemist, Paris, France; Jean B. J. D. Boussingault, chemist, Paris, France; Robert W. Bunsen, chemist, Heidelberg, Germany; Hermann Burmeister, naturalist, Buenos Ayres, S. A.; Arthur Cayley, mathematician, Cambridge, England; Michel E. Chevreul, chemist, Paris, France; Rudolph Clausius, physicist, Bonn, Germany; Alphonse De Candolle, botanist, Geneva, Switzerland; Baron Hermann v. Helmholtz, physicist, Berlin, Germany; Thomas H. Huxley, naturalist, London, England; Sir Joseph D. Hooker, botanist, Kew, England; Gustav R. Kirchhoff, physicist, Berlin, Germany; Rudolf Albert von Kolliker, physiologist, Wurzburg, Germany; Theodore von Oppolzer, astronomer, Vienna, Austria; Richard Owen, anatomist, London, England; Louis Pasteur, chemist, Paris, France; Ferdinand v. Richthofen, geologist, Berlin, Germany; George G. Stokes, mathematician, Cambridge, England; Otto N. von Struve, astronomer, St. Petersburg, Russia; James J. Sylvester, mathematician, Oxford, England; Sir William Thomson, Glasgow, Scotland; Rudolph von Virchow, anatomist, Berlin, Germany.

Relative Cost of Water and Steam Power.

A subscriber at Portland, Ore., writes to the *Lumber Trade Journal*, and wants to know "whether it is cheaper to run a saw mill by water or steam power." He further says: "I am about to engage in a large enterprise at a point in Washington Territory where there is abundant water power, but sometimes the river falls low, and is not available for a steady manufacturing business. Had I better rely upon steam power or water power; which, in the end, is the cheapest?"

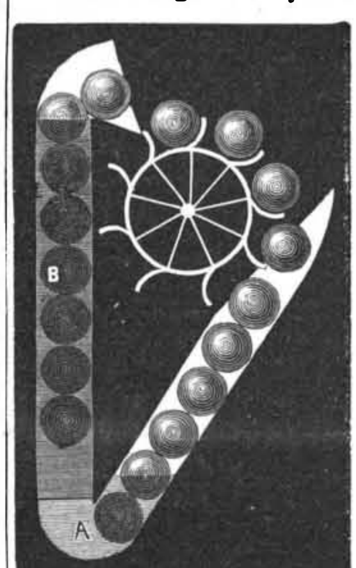
In reply, the editor says that the water equipment at Lowell, Mass., was for canals and dams $100, and for wheels, etc., another $100 per horse power. But this as a first experiment was more costly than a similar experiment need be. At Saco, Me., the expense incurred was $165 per horse power; but at a later period, for turbines with high heads, the expense would be less. A construction and equipment, solidly carried out, with the latest improvement in wheels, would not cost over $200 per horse power (probably less) under favorable circumstances. If we remember correctly, an estimate at Penobscot, Me., was for $112.50 per horse power. If the construction be with wooden dams, and the equipment with lower grade wheels, then the cost would be less than $50 per horse power; and although the construction would be less permanent than the more solid, it would outlast any steam apparatus. On the other hand, Fall River (Mass.) estimates of steam equipment, exclusive of foundations and engine houses, run from $100 to $115 per horse power. A Boston authority gives $110 for nominal 300 horse power and upward, inclusive of foundations and masonry. Similarly a Portland (Me) authority places it at $100 per horse power for nominal 300 horse power.

A PERPETUAL MOTION MACHINE—WILL IT WORK?

I herewith send you my thoughts on a perpetual motion arrangement that I have never noticed in print. It is very simple, and I would very much like to see it illustrated and commented upon by you.

I use a tubular tank, in which the balls to be used just fit. The power wheel is arranged to catch these balls, and the turning of the wheel by the weight of the balls is the power produced.

The tube is filled one side with water and the other side with enough mercury to force the water up to the top of column. In the figure, A is mercury, and B the water. The balls to be used are made of iron, with an air tight chamber filled with gas to make them float in water.



The machine is supposed to operate in this way: The balls are started on mercury side. Several will be needed to force the first ball through the mercury, but the moment it has passed the center it will rise to the top of column of water. The next coming balls will force it out until it rolls off on to the proper place on the power wheel. Here the balls exert their weight, turn the wheel, and then drop back into starting channel to force the ones ahead of it through the mercury back into the water again.

If each ball weighs say ten pounds, it seems as if there would be enough weight to force it through the mercury into the water, and then it would at once rise up higher than from where it started.

The difference of power seems to be the *weight* of the ball on one side and the *buoyancy* of the same ball on the other, *but I am afraid that the mercury is so dense that the amount of weight needed to force the first ball through the mercury will just balance the weight of the column of water.* If we take two tubes, partly fill the one with water, and the other partly fill with just enough mercury to balance each other. Now, if we take iron balls that will float, and place the balls one over the other in each tube, which one will require the greatest number of balls to force the first ball to the bottom? Can this be determined by science, or must it be found out by experiment?

New Albany, Ind. HENRY A. GOETZ.

[The writer of the above communication outlines pretty clearly the fallacy. With regard to the question at the end of the letter, we reply: The same number of balls will be required to force the first ball to the bottom, whether through mercury on one side or through mercury and water on the other side. The amount of weight required to force the first ball through the mercury will just balance the increased pressure due to displacement of the water or additional raising of the height of its column.—ED.]

Telegraph Wires in New Orleans.

The city of New Orleans is about to adopt a system of Colonel Flad for overhead wires. This consists in erecting tall towers at the street corners, which will carry the wires over the roofs. The system will be under the supervision of the Commissioner of Public Works, and the older method of running the wires, telegraphic, telephonic, and electric lighting, on poles will be abolished. The towers will be classified for the different classes of wire; and the wires are not to be less than 10 ft. above the roofs. The Star Iron Tower Company, of Fort Wayne, has received an order for 224 towers.

Correspondence.

Casting Steel Ships.

To the Editor of the Scientific American:

Being greatly interested in our coast defenses, I would like to make a suggestion, after reading Sir Henry Bessemer's proposal to cast *in situ* the whole face of a fort. Why not cast the hulls of our new war vessels? There are no insurmountable obstacles in the way, and the plant once established could be used for a hundred or more vessels, which, when cast, could be cleared and floated away to be finished, the moulds replaced and another cast in the same moulds. R. GLEASON.

Egan, Dakota.

Singular Upheavals.

To the Editor of the Scientific American:

About three years ago, a company was constructing a wharf at Pyramid Harbor, Chilcat Inlet. The bottom was covered with silt to the depth of about 10 feet, lying on a bed of cement or gravel from 8 to 12 inches thick. Under it is a bed of clay or blue mud.

The piler, on being driven through the cement, would be thrown up with great violence. She was thrown on top of the wharf (that part finished), over 20 feet above the water, it being at low tide, and the rise and fall is about 16 feet. Another time, a pile was driven, and in the gin, with the monkey on it. It was thrown out with such force as to raise the monkey to the top, a distance of 60 feet. The weight of the monkey was 1,500 pounds.

To me it was such an uncommon occurrence, and can be so easily substantiated by respectable parties, the contractor, and the members of the corporation for whom the wharf was constructed, I consider it worthy of notice. W. H. WOODCOCK.

Fort Wrangel, Alaska, April, 1887.

VIOLIN TUNING PEG.

The barrel of this peg may be turned to take up any undue amount of slack that there is in the string connected to the peg, after which the necessary fine adjustment may be obtained by turning the barrel, through the medium of a worm gear. On a tapered wooden core formed at one end with a head or thumbpiece is placed a metallic sleeve formed with an annular flange, against which fits a plate formed with a number of apertured ears, through which pass screws connecting the peg with the instrument. Against the face of the plate is placed a gear, engaging with which is a worm carried by a short vertical shaft supported in bearings extending outward from the plate. The gear is formed with an internal ratchet, Fig. 2, engaged by a pawl mounted in a transverse recess formed in the core and pushed into engagement with the teeth by a spring. In order that the pawl may be withdrawn from the teeth, it is formed with an aperture, which is entered by an eccentric projection formed upon a bar fitted within the core, Fig. 3, and held in position by a pin entering a groove formed in the bar. The end of the string, in connection with which the peg is employed, is passed through an aperture in the core and sleeve, and the slack is taken up by turning the key, the pawl being pressed inward against the tension of its spring. When a tension approaching that required for a proper tuning of the instrument has been imparted to the string, the required accurate tension is obtained by turning the vertical shaft. If the string should break, it may be stripped from the peg by turning the bar so that its eccentric projection will force the pawl against the tension of its spring; and when the pawl has been forced out of engagement with the ratchet, the string may be grasped and pulled from the barrel of the peg, the parts being then free to turn in either direction required.

This invention has been patented by Mr. James H. Gardner, of Elkhart, Indiana.

Another Remarkable Torpedo Boat.

In our paper for April 23 last we gave an account of a new torpedo boat built in London for the Italian government, 140 feet long, 1,400 h. p., 100 tons displacement, which runs 25 knots or 28 miles an hour—the fastest boat ever produced.

Another torpedo boat for the Imperial Chinese navy, by Messrs. Yarrow & Co., had her official trial on March 31, and attained the remarkable speed of nearly 24 knots per hour, as a mean of six runs over the measured mile in the Lower Hope, three with and three against tide. To be exact, the speed was 23·882 knots; and a subsequent run of two hours' duration gave a mean speed of 22·94 knots, with the engines running easy. She had on board her torpedo armament complete and ballast to represent four torpedoes, also a fair quantity of coal and twenty-four persons. This boat is 128 feet long, and constructed on Messrs. Yarrow & Co.'s rapid-steering principle, which enabled her afterward to make circles to both sides, having diameters of about 230 feet.