situated at a considerable distance, they appear inverted and much smaller.

The following is an interesting extract on this subject from Sir J. Emerson Tennent's recent work on Ceylon :—"A curious phenomenon, to which the name of 'Anthelia' has been given (and which may probably have suggested to the early painters the idea of the 'glory' surrounding the heads of beatified saints) is to be seen in singular beauty at early morning in Ceylon. When the light is intense, and the shadows proportionally dark—when the sun is near the horizon, and the shadow of a person walking is thrown on the dewy grass—each particle furnishes a double reflection from its concave and convex surfaces; and, to the spectator, his own figure (but more particularly the head) appears surrounded by a 'halo' as vivid as if radiated from diamonds. The Buddhists may have taken, from this beautiful object, their idea of the *agni* (an emblem of the sun) with which the head of Buddha is surmounted. But, unable to express a halo in sculpture, they concentrated it into a flame."

A NEW AREOMETER FOR DETERMINING THE REAL DENSITY OF LIQUIDS.

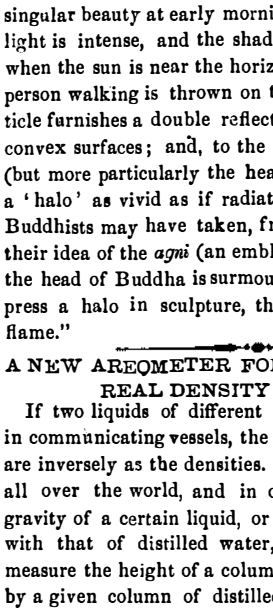
If two liquids of different density are in equilibrium in communicating vessels, the heights of the two columns are inversely as the densities. This rule is well known all over the world, and in order to find the specific gravity of a certain liquid, or its density, as compared with that of distilled water, it is only necessary to measure the height of a column of said liquid sustained by a given column of distilled water, and to calculate the relative proportion of the two.

In the first place, however, to measure the columns with the desired correctness requires certain precautions, and to charge a U-shaped tube with different liquids and discharge it again is coupled with such difficulties that the principles mentioned above, notwithstanding their simplicity. has never been turned to any account in practice.

The floating areometers which are in common use are subjected to the serious inconvenience of being very deficient in exactness, and it really is very rare that two instruments of this class correspond exactly with each other, neither do they give the real density nor the volume per pound.

The novel areometer of Mr. Jeannel is based on the equilibrium of two columns of liquid in a U-shaped tube, and notwithstanding this instrument is more difficult to handle than the floating areometers, it is preferable on account of its greater exactness, as it indicates the real density of the liquid, and it allows, at the same time, of making corrections necessary on account of the changing temperature. With alcoholic liquids only it becomes necessary to use tables for correction.

The instrument consists of the tubes A B and C D, which communicate by an intermediate column of mercury contained in the V-shaped vessel, M. The small tube, A B, of a diameter of about $\frac{1}{4}$ of an inch and about 22 inches long, connects with the vessel, M, being in reality a prolongation of the same, and both the upper part of the vessel and the small tube are filled with distilled water to a hight of 20 inches, which is marked 1000 on the scale. The other tube, C D, of a diameter of about $\frac{5}{8}$ of an inch and a length of about 25 inches, contains also a column of distilled water of the hight of 20 inches. This tube extends down into the mercury contained in the lower part of the vessel, M.



A siphon, S, serves to empty the tube, C D, and if this tube is emptied and filled with a liquid of greater density, it takes a column of less hight to cause the column of water in the tube, A B, to rise to a hight of 20 inches, and, on the other hand, if liquid of less density is filled into the tube, C D, a higher column is required to raise the distilled water in the tube, A B, to a hight of 20 inches. The hights of the two columns are inversely as the densities.

By proper scales on both tubes the density as well as the volume per pound of different liquids can be determined.

POLYTECHNIC ASSOCIATION OF THE AMERICAN INSTITUTE.

[Reported expressly for the Scientific American.]

On Thursday evening, the 15th inst., the usual weekly meeting of the Polytechnic Association was held at its room in the Cooper Institute, this city; the president, C. Mason, in the chair; John Johnson, secretary *pro tem.*

MISCELLANEOUS BUSINESS.

Heating by Steam.—Lewis M. Hills, of New Haven, read a paper presenting the usual arguments for warming buildings by steam. The paper was briefly remarked upon by the president and Messrs. Godwin, Garvey and Fisher. Mr. Fisher believed the largest building, or even a whole block, might be warmed by a single boiler; whereas, a single hot-air furnace would be altogether impracticable for such duty.

Leather from Whale Skin.—Mr. Howe read a paper prepared by D. H. Tetu, of Kamarousha, Canada, on the white whale of the St. Lawrence. The Canadians call the fish a porpoise, but works on natural history describe it as a whale; it is found for a distance of 200 miles between St. Roch (60 miles above Quebec) and Father Point; also found abundantly in rivers emptying into Hudson's Bay. Since the discovery of Canada, this fish has been an article of commerce; but the oil was not very good, and little use was found for the skin; lately, however, Mr. Tetu has succeeded in purifying the oil and tanning the skin. The oil is equal to the best sperm, and the leather has excellent qualities. The average price of the animal 10 years ago was $40, now it is $150; average weight, 2,500 lbs, and the largest, 5,000 lbs.—worth $200; average length 22 feet, and 15 feet in circumference. The ear is so small that only well-skilled naturalists can find it, yet the sense of hearing is more acute than in any other whale. Mr. Tetu catches the white whale in nets, near the river Saguenay.

In addition to the above, which is a condensation of the more important statements of the paper, Mr. Tetu, in answer to questions from various members, said that all kinds of leather are made from the skins; but it does not make good sole leather, for the reason that it is too pliable; ordinary tanning process employed, except that the limeing is omitted, and the tanning requires more time on account of the closeness of the fiber of the skin. The skin has hair (Dr. Stevens—All mammals have hair); the leather lasts five times longer than any other leather, yet costs the same; the skin of one whale is equal to the skins of 12 to 25 calves; the leather is chiefly used by the British army. Mr. Tetu may be seen at No. 77 Franklin-street, this city.

Specimens of leather were exhibited and passed among the members, and elicited general approval—especially for strength and pliability. The president and a reporter were unable, by pulling against each other, to break a strip a little larger than a shoe string.

Fry's Revolving Window Sash.—Mr. Garbanati exhibited a model of a window sash invented by Thomas P. Fry, of Brooklyn. The object of the invention is especially to encourage and facilitate the cleaning of the outside of the window. The sash is pivoted to guides which travel up and down in corresponding grooves of the casing. The window is thus easily turned, and the outside brought in, without detaching from the casing. The sash, also, when turned so as to be horizontal, allows as free ventilation as when the window is entirely removed.

The time allotted to miscellaneous business having expired, the president called up the regular subject—"Adulterated Food."

DISCUSSION.

Mr. Treadwell presented for chemical examination a sample of sugar which he had used in his family, but which he believed was not genuine; it contained matter which he thought was not so soluble as sugar.

Dr. Reuben—A gentleman in New Hampshire complained that he had found sand in maple sugar; but it was shown that the sand was a constituent of the sap, and that it was formed and precipitated in the same way as cream-of-tartar is found in wine.

A lively debate here ensued between Drs. Gould, Reuben and Mr. Latson, on the question whether salt should enter into the food of man; but nothing important was brought out, and as the subject was foreign to the purpose of the meeting, we make no report of it.

Professor Hendricks—Some of the gentlemen who have spoken here give their experience as dyspeptics, and advise us to adopt what they found which suited their cases. But dyspeptics' rules are not what healthy men should follow. It is safer to do precisely what dyspeptics forbid. (The professor made a stirring speech, and sat down amid applause and laughter.)

Mr. Seely presented four samples of carbonate of soda procured from respectable grocers, and sold under the name of saleratus or super-carbonate of soda. The powders were dissolved in separate vessels of water, and a solution of bi-chloride of mercury was added to each. The clear solutions immediately changed to a dark, dirty red, and a bulky precipitate soon settled. These tests showed that the super-carbonate of soda commonly sold is little better than common washing soda effloresced or dried. Had the articles been genuine, the precipitate made by the bi-chloride of mercury would have been white.

A gentleman (whose name our reporter did not learn) said:—I was once engaged in manufacturing saleratus, and sent to a baker a lot of genuine super-carbonate of soda. But the baker found that it made his bread yellow, and returned it to us. We then mixed it with 25 per cent of salt, and the baker found it of the best quality.

Mr. Seely—But the baker's bread might not have been any better. Almost any mineral matter makes pure bread whiter; alum was once commonly added to bread to whiten it. In Belgium it is said that sulphate of copper has been used; 1 part in 70,000 of flour answering the purpose. Liebig recommends lime, for the reason that lime is an essential element of the body.

The President—Pure wheat will not make white bread. Whiteness is not a desirable quality of bread; it is generally an evidence of fraud or ignorance.

Mr. Fisher—I found the bread in Florence yellowish, but excellent; better than I have found elsewhere. I do not know how bread is made here, but it is all bad.

Mr. Garbanati commended the French bread, which, he said, may be procured at various places in New York and Brooklyn.

Mr. Latson—The superiority of French bread is due rather to skillful manipulation than to any difference in ingredients used. A French baker will use precisely the same materials as other bakers, and yet invariably make a better bread. His skill consists chiefly in determining the point when the raised loaf should be put in the oven; he does not allow the fermentation to go as far as to make the bread sour or to give it a disagreeable flavor. He never works over his dough after it is once raised, as is evident from the fact that large cavities are always found in his bread.

Dr. Reuben—No substance whatever which is not an element of the body should be taken into the system. The effect of foreign matter constantly taken in is cumulative; and if it does not appear in a day, it surely will during the lifetime. It is only after a considerable time that painters feel the effects of lead.

Dr. Stevens—An impression has gone from this club that cattle are very much damaged by the transport from distant places; this I consider an error. Cattle are brought even from Texas, but they start in the Spring and do not reach here till Fall. On all railroads which carry cattle, there are stations at intervals of 200 or 250 miles where the cattle are taken out and receive every needful attention. If any of them are disabled by disease or accident, they are generally left behind and sold in the neighborhood. (The doctor here named the various railroads which transport cattle towards New York, with all resting stations.) It is my belief that in New York we have the best beef in the world; that no finer cattle can be found in any other market.

Mr. J. Lamb presented samples of pure ground spices prepared in Brooklyn. He said that the manufacturer had come from Europe, where he was engaged in the manufacture of certain kinds of sauce. When he attempted to make his sauce here, he found that he was producing a very different article. The black pepper he bought was largely adulterated with rottenstone and pummice stone. He was obliged, in order to carry on

his business successfully, to grind the spices himself. Some spices (especially pepper) should only be crushed, and the husks separated by a sieve. Cayenne pepper is adulterated and colored with red lead; he had known a case of lead colic produced by eating such pepper. Spices should not be put up in papers.

The President—Every article should be labeled with its proper name, quality and the name of its manufacturer. A law requiring this of all articles to which it would be practicable is perhaps the extent of useful legislation against adulterations.

The subject for the next meeting—"The Means of Conveyance to and from New York"—was then agreed upon, and the association adjourned.

AMERICAN NAVAL ARCHITECTURE.

[Reported expressly for the Scientific American.]

THE STEAMER "R. R. CUYLER."

The *R. R. Cuyler* has been completed only two or three weeks, and at the time of our writing has made but one trip to the port of her intended service; yet this limited trial, in which the many improvements introduced in her erection were thoroughly and properly tested, gave the greatest of satisfaction to all that were interested in her success. Full particulars relative to hull and machinery will be found annexed:—Length on deck, 235 feet 6 inches; breadth of beam (molded), 38 feet; depth of hold at beam, 17 feet 6 inches; depth of hold at spar deck, 23 feet 3 inches; draft of water at load line, 15 feet 6 inches; length of engine space, 66 feet 3 inches; area of immersed section at load draft, 548 square feet; tunnage, 1,600 tuns. Her frame is of white oak and chestnut, and square fastened with copper and treenails; distance apart at centers, 24 inches, and filled in solid for length of whole floor; secured by iron straps double and diagonally laid, 4 by ⅝ inches; cross floor (molded), 14 inches, and sided 10 and 12 inches.

The *R. R. Cuyler* is fitted with a vertical direct engine; diameter of cylinder, 70 inches; length of stroke of piston, 4 feet; diameter of propeller, 16 feet; length, 4 feet 9½ inches; pitch of same, 22 feet 6 inches, and has 4 blades.

She has two horizontal tubular boilers; length, 17 feet 5 inches; breath, 13 feet 6 inches; hight, exclusive of steam chests, 13 feet 9 inches. They have 6 furnaces, the breadth of which is 3 feet 11 inches; length of grate bars, 7 feet 8 inches. The number of tubes in these boilers is 288; internal diameter of same, 4½ inches; length, 14 feet 5 inches. Diameter of chimney, 4 feet 3 inches; hight of same above grates, 21 feet. The boilers possess a heating surface of 6,258 square feet; capacity of bunkers in tuns, 170. Average revolutions, 36; depth of keel, 12 inches; does not use blowers to furnaces; boilers located in hold; one smoke pipe; one independent steam, fire, and bilge pump; one bilge injection, and bottom valves or cocks to all openings in bottom; two masts, foretopsail schooner rig; has an independent rudder post.

She possesses two decks for freight, above which is the large and comfortable cabin, capable of accommodating in the best manner 220 passengers, with berths and state rooms. Above this cabin is situated the spacious dining saloon, the ladies' saloon, various pantries, and officers' quarters. The upper saloons are paneled in oak, and the lower cabin is beautifully furnished; the entire woodwork being polished white and gilt. Broad flights of stairs connect the two saloons.

This steamer cost about $142,000, and composes, with three other vessels, the line running between New York City and Savannah, belonging to H. Cromwell & Co. The hull was built by Samuel Sneden, of Greenpoint, of the best material and in the most substantial manner. Builder of engines and boilers, the Allaire Works, this city.

STEAM FERRY-BOAT "PACIFIC."

Within a few weeks the Union Ferry Company have added another splendid boat to their many others, and it is now running on the East river, between Whitehall-street, this city, and Atlantic-street, Brooklyn. Below will be found some of the particulars of hull and machinery:—Length on deck, 180 feet; breadth of beam (molded), 33 feet; depth of hold to spar deck, 14 feet; draft of water at load line, 6 feet 3 inches; tunnage, 650 tuns. Her frame is of white oak, chestnut, &c., properly and securely fastened with rivets and treenails. Built in 1859; has one independent steam, fire, and bilge pump; one bilge injection; does not use blowers to furnaces; one smoke pipe, ; water bottom to boiler. Is fitted with condensing engine and drop; flue boiler; built by Neptune Iron Works, this city.

She is protected from communicating fire by having felt on boiler, space above same, and iron around chimney. Her bows are sheathed; has water wheel guards, fore and aft. Splendid saloon cabins on side · one anchor and two life-boats.

THE STEAMER "PERUANA."

This steamer, a fine and complete specimen of naval architecture, has just reached completion, and is now making her first trip to the ports of her intended service, on the coast of Peru. Subjoined will be found minute particulars of hull, engine, and boilers:—Length on deck, 180 feet; breadth of beam (molded), 29 feet 6 inches; depth of hold, 11 feet 3 inches; depth of hold to spar deck, 7 feet 3 inches; length of engine and boiler space, 65 feet; area of immersed section at load draft of 6 feet, 169 square feet; tunnage, 560 tuns.

Her frame is made of white oak, chestnut, and hacmetac, and square fastened with copper and treenails; the frames are filled in solid, distance apart, 31 inches; cross floors (molded), 12 inches, sided, 7½ inches, and these are secured by double laid and diagonal iron straps, 4½ by ⅝ inches.

The *Peruana* is fitted with a vertical direct-acting engine; diameter of cylinder, 44 inches; length of stroke of piston, 11 feet; diameter of waterwheels (over boards), 27 feet; length of boards, 7 feet; depth of same, 22 inches; number of blades, 24.

She has two return flue boilers; length, 24 feet, 6 inches; breadth, 8 feet 6 inches; hight, exclusive of steam drum, 8 feet 3 inches; number of furnaces, 2 in each boiler; length of grate bars, 6 feet, 9 inches; have 10 flues in each boiler, whose internal diameters are 15, 16 and 12 inches; length of flues, 20 and 14 feet. The smoke pipe extends 32 feet above grates; bunkers, made of wood; capacity of same, 120 tuns, and the daily consumption of coal is expected not to exceed 12 tuns.

Her maximum pressure of steam is 25 lbs.; maximum revolutions at this pressure, 18; the boilers are located in the hold; does not use blowers to furnaces; she has 3 water-tight bulkheads, and a large and pleasant cabin on deck; water wheel guards fore and aft.

In addition to these she is fitted with one independent steam, fire, and bilge pump, one bilge injection, and has bottom valves or cocks to all openings in her bottom; and is protected from communicating fire from the boilers by felt and sheet iron. Builders of hull, J. Westervelt & Sons; builders of machinery, Morgan Iron Works. The vessel is owned by Charles A. Dimon and others.

IRON AND WOODEN SHIPS.

MESSRS. EDITORS:—On page 131, of the present volume of the SCIENTIFIC AMERICAN, you propose to enlighten your readers on on the subject of naval architecture—a most praiseworthy purpose—but, alas! they are doomed to disappointment, unless the editors change their course, and give their readers something more than the opinions of "eminent ship builders," as quoted on page 180.

Every reader of your journal knows that you are favorable to iron ships, and that you give them the preference over those built of wood; but who has ever found in your journal one single reason why iron ships should have the preference in this country? The "eminent shipbuilder" to whom you refer has an object in view, beyond his country's good. If you will permit him to come to the witness-box it will be shown through the SCIENTIFIC AMERICAN that it is *not* for the best interests of the United States that her merchants shonld go into iron shipbuilding, except for river navigation, where the lightest draft of water is demanded. Is it not because ships are not remunerative that our shipyards are idle? If a wooden steamship of a given size, costing $200,000, will not pay, will she pay if built of iron, of the same size and capacity, and costing $250,000? Does the increased cost make her more profitable? Again, we are told that they are stronger than wooden ships; does the increasing list of shipwrecks of iron-built ships prove it? Does it not rather prove the converse to be true? That iron may be more fully represented in the construction of this noble fabric, we fully admit, but deny that it is the best material of which to build the external of the hull; and we think the editors will agree with us, if they will give the subject a fair amount of investigation. Why does England build iron ships? Is it not in conformity with her best interests to export her iron in a manufactured state, and would she not build her ships of wood if she could get it without importing it? Undoubtedly she would? It has always been her policy (and should be *ours*) to sell more than she buys, and, when one of her staple products has become exhausted, to substitute something else, so that her commercial policy may be maintained. And when the people of the United States shall have learned that the perfection and manufacture of wooden ships is one of the most profitable of all our exported fabrics, then we shall discover whose interests the "eminent shipbuilders" and iron-workers are advocating when they talk of iron ships. May we not hope that you will allow this subject to be ventilated through the columns of your journal? Although your humble servant may lay no claim to "eminence" as a shipbuilder, yet he will pledge himself to show that either *ignorance* or *avarice* forms the basis of all projects for substituting iron for wood in the outer shell of our ships. If the "eminent shipbuilders" will labor as assiduously to improve the models of American ships, as they have to favor British policy and British interests, we should find even England herself willing to admit that *not Britannia but Columbia* rules the waves.

JOHN W. GRIFFITHS.

Navy Yard, Philadelphia, Pa., March 17, 1870.

[An answer to the above will be found on page 217. We are positive that the last clause of the above is an unwarranted insinuation against the patriotism of our shipbuilders. We are confident that the charge of any one of them having labored assiduously to favor British policy and interests cannot be sustained.—EDS.

ENGLISH LOCOMOTIVES ON A "BENDER."

An amusing case recently came before the Court of Queens Bench at Westminister; we find it reported in full in the London *Times*:—The plaintiff in the action, James Washington Myers, was by birth an American, and had acquired considerable celebrity, in England by his equestrian performances. His services were in great request, and for some time he served under the auspices of Messrs. Hawes & Cushing, at the weekly wages of 45 shillings. In the Spring of last year these gentlemen offered to increase his weekly allowance if he would continue with them; but having the "Young America" spirit in him, he declined the offer and started a company on his own account, with which he traveled from place to place, giving performances. When about to "go the circuit" the plaintiff's attention was attracted by an advertisement of "Bray's Patent Traction Engine," designed for draw-carriages &c., upon the common road by steam power, instead of the ordinary means of locomotion by horse-flesh. It occured to him that if he could get one of these engines to answer his purpose, it would both save the expense of horses in carrying his "Pavilion" round the country, and would at the same time "astonish the natives," and act as a grand advertisement of his exhibition. Accordingly, he applied to the defendants' company, and on the 16th of June, Mr. Hanson, the secretary, wrote him a letter saying that he thought it could be be arranged to let him have an engine, but as the directors had two other proposals before them, he must decide by the next day. He accordingly attended the board the next day, and told the directors what he wanted the engine for; and that if it would not go at the rate of seven or eight, or six miles an hour, it would be of no use. They said it would go seven or eight miles an hour with great ease, and would carry 20 tuns at seven miles an hour, though they would not like it to go at that speed, but it would go five miles an hour well. The plaintiff told them he did not want to go more than five miles an hour. The next day the draught agreement was sent to him, but it contained a stipulation that the plaintiff was not to work the engine more than three miles an hour, and as that speed would be of no use, he altered the "3" to "5," and with that alteration the company executed the agreement under their seal. The agreement was dated June 21, 1859, and by it the defendants agreed to let the plaintiff their traction engine "No. 1" for three months from July 11, 1859, at the monthly payment of £65, to include engine-driver's and steerer's wages. As the engine was to be made an advertisement, the plaintiff gave directions that it should be painted with all the colors of the rainbow, and he