The difference made in the Rich wheel is 13 per cent; in the Geyelin, 14 per cent; and in the Stevenson, 14 per cent—a remarkable coincidence of increase of power in the last tests. In the Geyelin wheel, it is explained as the result of changing the wheel from a vertical into a horizontal position; but in the Stevenson and Rich wheels, no such change was made; and yet there is claimed the same increase of 13 and 14 per cent. In the Parker wheel, 8 per cent is claimed to be gained by the same change; still leaving 10 per cent unexplained.

No cause was shown why any of the wheels should have more than one test (meaning by "one test" a consecutive series of trials, selecting the best as the result), except in the tests of the Collins and Littlepage wheels. The Collins wheel gave out 50 per cent only in November; his packing, where the shaft passed out of the draft pipe, was imperfect; and the Littlepage wheel was locked in its solid, unyielding bearings and in the bevel gearing. Collins had a test reported, under date of February 9, 1860, with an increase of nearly 27 per cent. Littlepage was refused another test; while some of the other wheels, without showing cause for a new trial, had continued tests during the term of six months.

Of the Kalbach wheel, Mr. Birkenbine states:—"It is remarkable for its simplicity; and, had it been constructed with the same amount of care and finish as that of some of the others, it is believed that the co-efficient of useful effect would not have been surpassed by any." To this should be added that this wheel, as also the Littlepage wheel (as before remarked), has the advantage over the Jonval wheels of using the same step for a short *race*, as for common daily work; while the Jonval wheels require immense large steps to support the wheel, gearing and water. Mr. Kalbach was no doubt convinced that the Littlepage wheel surpassed his in simplicity and easy construction, though fully as durable; from the similarity of the wheels, he must have expected them to be similar in their capacities; he therefore proposed to Littlepage, reciprocally, to make common cause in the sale of the wheel, as proving which was the best of the two. The report states that a letter was addressed to Mr. Kalbach, as well as to the other parties named; but his proposal is not stated. He would no doubt have furnished the required power for a much smaller sum than those named—probably for one-half the amount. His wheel is rejected for the following reasons, which the public are expected to receive as sound, scientific and conclusive, as they ought to be from the chief-engineer and associates of one of the largest cities in the Union:—

1st. The report says:—"Our minimum head and fall is but 8 feet. To produce a power of 125-horses, by two wheels, would require each of them to be 50 inches in diameter, and *they would occupy so large a proportion of the head and fall that the co-efficient of useful results would of necessity be low.*" Such an assertion, coming from the source it does, is really astounding. We understand it to mean that the actual useful fall of 8 feet would be reduced by 50 inches, leaving a fall of nearly 4 feet; when, in fact, with the draft pipes used, if the wheels were *ten* feet high, the full fall of 8 feet would be utilized, just the same as if only 10 inches high—the difference, *if any*, is caused *not by a reduction of fall*, but by a different mechanical arrangement.

2d. It is asserted that a wheel upon a vertical shaft gives out a better per-centage than two wheels upon a horizontal shaft. There may be a difference, but it is a small one. At all events, the data furnished by Mr. Birkenbine cannot be recorded as the difference of useful effect of identically similar wheels in the two positions named. In the Parker wheel, the difference is given at 8 per cent; and with the Geyelin wheel at 14 per cent. This does not agree by 6 per cent; whereas, had the wheels not been otherwise changed, the amount of difference in the two ought to be very nearly proportional. At the same time, it is very remarkable that this additional 14 per cent here added to the Geyelin wheel, ostensibly caused by the said change from a vertical motion of the wheel into a horizontal one, has also been arrived at with the Stevenson wheel without any such change—to wit: 14 per cent difference between the first and last test. The same applies to the Rich wheel, which also acquired 13 per cent by the second test, without any change in the direction of the shaft.

3d. The last objection to the Kalbach wheel is that "the velocity would be so great, and the reduction of the speed, by means of gearing, to the speed of the pumps would therefore involve much greater loss by friction than could, in possibility, be the result of the plan adopted for the gearing of the Jonval wheel as proposed." Please to compare the last objection with the one of the reasons given for adopting the Geyelin wheel, to wit: "and, as regards the bevel gearing or reducing the velocity for the proper speed of the pumps by two or four wheels, there is only an *apparent additional loss by friction, but none in reality, as a little reflection will demonstrate!*" Gearing down to a less speed in the Geyelin wheel is declared to be *no* loss of power; while the same thing in the Kalbach wheel *is* declared a loss of power!

Mr. Birkenbine says:—"The department will adopt the Jonval turbine, arranged and geared similar to the one now in use at Fairmount."

We would suggest that, if the fly-wheel is placed on the shaft to which the crank of the pump is attached, as now in use, then the fly-wheel, if effectual, will require a weight of 200,000 lbs., with 44 feet circumference and 16 revolutions, for a power of 125 horses. Whereas, if the fly-wheel is placed on the shaft having the same velocity of the water wheel, to wit: 40 revolutions, then 32,000 lbs. will be as effectual as the 200,000 lbs. Had the two wheels upon a horizontal shaft been adopted with 80 revolutions, a fly-wheel of 8,000 lbs. upon the same shaft, or one of the same velocity, would be as effectual as the one of 200,000 lbs., as the latter is now applied; all having a circumference of 44 feet. The rule is to place the fly near the working point, when intended to accumulate force, as in this case. But rules have exceptions; and the more imperative rule ought to be adhered to in this case, to wit: a fly should always be made to move rapidly. This gives a difference, in favor of the horizontal shaft wheels, of 80 revolutions, in comparison with the Geyelin wheel, as arranged and now approved of at the Fairmount Waterworks; also, of 192,000 lbs. of metal saved in the fly-wheel, provided both be made to produce an equally smooth and even motion; and these 192,000 lbs., at 3 cents per lb., give the neat little sum of $5,760 in favor of the two wheels on a horizontal shaft. In addition, there would be no necessity for bevel gearing, nor for a step of which the surface is measured by the square foot, to sustain tuns of water. The bearings of the horizontal shaft wheels would only have to sustain the weight of the wheel *proper*, and they would be easy of access for lubrication.

LITTLEPAGE & CREUZBAUR.

Austin City, Texas, August 2, 1860.

REFORM IN WEIGHTS AND MEASURES.

MESSRS. EDITORS:—Having recently noticed that you were calling public attention to the propriety of using an extra degree of effort to bring the subject of a decimal system of weights and measures before the next Congress, and being much interested in that subject, I trust you will permit a British subject to offer a few remarks upon this very momentous question. I certainly must endorse your views as to the propriety and necessity of the measure; but may not a more comprehensive and direct course be adopted—a course that shall arouse attention not only in the United States of America, but in every civilized part of the world, or, at least, so far as the influence of American, English and French commerce extends? It may be asked, how can such a comprehensive measure be brought about? I reply that circumstances will sometimes transpire which will render the greatest difficulty apparently easy, and I consider this to be the case in the present instance. Now is the time, and the SCIENTIFIC AMERICAN is the instrument; and, in doing so, you will be accomplishing one of the greatest and most useful reforms of the age, not even excepting the Atlantic telegraph. I think this advocacy can be made a *paying* business, of itself, as it will undoubtedly extend the circulation of your very interesting journal. Being myself an Englishman, I candidly confess that, if the facilities which you possess existed in Canada, I should avail myself of that medium; but, as it does not, I deem it my duty, as a cosmopolitan, to communicate with you or any parties who will interest themselves in bringing about such a laudable measure. The time of action is the present season—the period of the visit of the Prince of Wales to this country.

The programme I suggest is as follows:—Let one number of the SCIENTIFIC AMERICAN be got-up in the best possible style, or in such a manner as will make it worthy of the subject and object; let its principal feature throughout be *union*; let its emblems be peace, commerce and literature; let the motto of this number be "Universality of Weights, Measures, Currency and Decimal-arithmetical Education for all Nations—or, at least, in France, Great Britain and the United States;" let those three great powers unite in the object, and become the theater of enterprise for the remainder of the world (for whatever they agree upon would be followed by the other nations, not only as a matter of choice, but of necessity); let there be a suitable (short) preface to the subject; let an address follow, proving the disadvantages of the present system and the advantages of the new one; let *fac-simile* representations be made of the several necessary silver coins, from a five-cent piece to a dollar—say 3, 5, 10, 20, 50 and 100-cent pieces. A page or two (or even more, if necessary), may be devoted to silver coins. The face side to contain the suitable insignia, with its proper mottoes, which can easily be obtained from any of the "coin manuals" of the day, with any improvement which may suggest itself; the reverse side, in all cases, to bear the value universally applied, as 3 cents, 5 cents and 10 cents, &c. Preceding this, however, should be printed a table of the values of various coins, unless it should be deemed expedient to put all the tables together; in either case, I recommend the American terms to be used, as now understood. Silver coins may be distinguished from gold by the face side having the *bare* head, as in the Canada silver coins of 1858. Gold coins of monarchies to be represented (as usual) by a crown or eagle. Most of the characters and inscriptions can be copied from a coin manual, or arranged in a somewhat similar manner. I apprehend that the circulating medium of the world, or all that is actually necessary, could be thus represented. The reverse sides of the coins of every nation would agree in the denomination according to the value of each coin, but the face sides would differ according to the latest insignia represented on their coins; pretty and interesting pictures would be thus produced, independent of utility.

Other pages may contain tables of weights. This may be rendered very simple, especially if we use French terms for weights; and I prefer those for two reasons. One is, we have chosen the American terms for money; let us therefore, out of courtesy, take the French terms for weight. Now, as we have but one standard of weights, we can reduce them to the lowest possible fractisn, say a pound avoirdupois shall be the unit reduced to, or rather composed of, 10,000 parts; while terms of the smallest parts are in beautiful unison with the object they represent; hence, we should say 10 atoms make 1 Partical (French *particule*); 10 Particals, 1 Grain; 10 Grains, 1 Ounce; 10 Ounces, 1 Pound or 1 Livre (French); 10 Livres, 1 Stone; 10 Stones, 1 Quintal; 10 Quintals, 1 tun of 1,000 lbs. avoirdupois.

Of measures, there are some excellent delineations in the United States, which only want to be properly matured. For lineal measure, I would simply recommend a *commercial* Foot; this should govern cords, yards and fathoms, and be determined on by a committee or congress of nations, who should settle what species of measures should be adopted; but I may suggest, as a rule, say 10 Lines make 1 Mark; 10 Marks, 1 Inch; 10 Inches, 1 Foot; 10 Feet, 1 Rod, &c.

Let the opinions of the several Boards of Trade be previously obtained: and, if favorable, insert them in the "presentation copies" of the SCIENTIFIC AMERICAN; get (if possible) the co-operation of consuls and plenipotentiaries; and then, when your arrangements are all completed, present a splendid copy to the Prince of Wales when he visits your city; having first secured a patent or copyright for publishing it in the United States, France and Great Britain; and first sending a suitable number of magnificent copies to the Emperor of the French, the Queen of England, the President of the United States, the Governor-general of Canada, and such others as you may think would further the end in view. I am inclined to believe that if the price was not too high, there would be a greater demand for this one

number of the SCIENTIFIC AMERICAN than for a single number of any other periodical ever before printed in any language. RICHARD LEWIS.

Melbourne, C. E., August 15, 1860.

[We should be very much pleased to see the two nations unite in the great reform above-advocated by our correspondent; but we are opposed to this country waiting any longer for England. It is the effort to get up a great "world-combination" that has caused the measure to be delayed for the last 70 years, and which threatens to delay it forever. We do not believe that a better system than that of France will ever be devised; and that has the powerful recommendation of being already in operation by one of the leading nations. We therefore think it best for the people, both of England and the United States, to urge the adoption of the measure upon their respective governments as soon as possible, without waiting for each other. Already, one part of the system will have to be omitted here—the measure of land. Our government land-surveys have become so extensive that they had better be finished on the same plan. But all the rest of the French system of weights and measures may be adopted at once, and the sooner the better. When we get the beautiful, simple and convenient decimal system in operation, we shall wonder how we could have so long retained the present clumsy, complicated and barbarous method. Let some patriotic or ambitious member of Congress prepare a simple bill requiring that the French system of weights and measures, as at present in use, shall be adopted in our custom-houses and in all government transactions; and the great work will be done.—EDS.

INVENTIONS WANTED IN TEXAS.

MESSRS. EDITORS:—The great want of Texas is sufficient water. The only means of obtaining it in this section of the State is by making cisterns and by boring wells with an auger. The bored wells are about 5 inches in diameter and from 100 to 300 feet deep. The water rises in the well from 50 to 80 feet of the surface. To draw the water we use a tin tube, 5 or 6 feet long, with a valve in the lower end. Now these tubes are easily broken and frequently leak, and this leaking from the bucket keeps the water muddy. I wish to know if you cannot suggest some better method of raising the water. Are there any pumps, simple and durable, that will pump the water from a depth of 100 feet? What we want is a pump that is simple and will not get out of fix; for we have no shops to take them to if they need repairs. The price of boring these wells is 40 cents per foot for the first 100 feet, and 75 cents for the next 100 feet, and so on. So, if any of your readers have an improved apparatus for boring, they might do well with it here. And you may tell your inventors that this is the field for their steam plows and windmills. There is a million of dollars lying waiting here for the first man who will bring us a steam plow that will turn over our prairies cheaper than our oxen; and another million to the man who can furnish us with a windmill, strong, durable and controllable, that will do our grinding and threshing cheaper than steam. I know there are many professing to do this, but give us one that will stand the test of actual experiment.

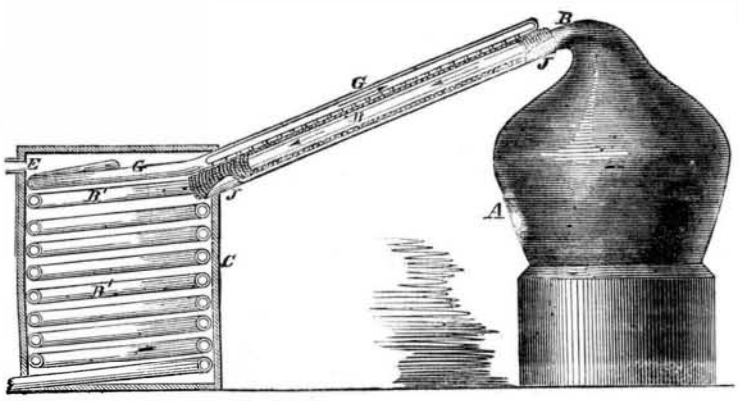
I have been taking your paper for ten years; its chief excellence, in my opinion, is its perfect *reliability* and the total absence of *clap-trap* and *humbug*. I do not believe that you can be bribed to say of somebody's fly-trap that it will catch more flies and bigger flies than anybody else's fly-trap. A. H. S.

Springfield, Texas, Aug. 7, 1860.

LUM'S POWER-ACCUMULATING WINDMILL.—We would respectfully inform *Le Génie Industriel* that its description of Lum's "Power-accumulating Windmill" betrays, on the part of the translator, an entire misapprehension of the nature of the invention. The machinery is driven by just the force of the weight, neither more nor less, as well when the weight is ascending as when it is descending.

IMPROVED CONDENSER.

The invention which we here illustrate is designed to take advantage of the great power of evaporation in condensing vapors in distillation. It is well known that it takes about 1,000 degrees of heat to evaporate water; that is to say, 1,000 degrees of heat passed into water will convert it into vapor of the same temperature as the water. If a hot liquid is used for evaporating the water, these 1,000 degrees of heat are extracted from the liquid, which is consequently very rapidly cooled. In the ordinary still, the vapor is condensed by winding the pipe which conducts it from the boiler spirally in a tub through which a constant flow of cold water is maintained. The improvement represented in the annexed cut consists in covering that portion of the pipe which leads from the boiler to the worm with cloth or other soft substance, and keeping the cloth constantly wet with cold water, which, by its evaporation, cools the contained vapor.



BROWN'S IMPROVED CONDENSER.

A represents the boiler and B the conducting pipe, which is wound with yarn throughout its whole length. The feed pipe, G, which supplies the cold water to the worm-tub is laid directly over the pipe, B, and is perforated with numerous small holes through which the water escapes upon the yarn or cloth covering the pipe, B. The surplus water escapes from the end of the pipe, G, and is caught by the trough, J, and conducted to the worm-tub, C, being the only source of supply to the tub. A waste pipe, E, carries off the excess of water and prevents the tub from overflowing. The pipe, G, after it enters the worm-tub, is carried once around or partly around the tub, and the supply of water is either forced through it with a pump, or drawn from a reservoir at a greater altitude.

The inventor of this improvement is Abram C. Brown, to whom the patent was granted, through the Scientific American Patent Agency, on the 10th of July, 1860. Further information in relation to this invention may be had by addressing Abram C. Brown, at the corner of Eighth-street and Buttonwood, Philadelphia, Pa., or his agent, Charles Bradfield, at No. 16 Exchange-place, Jersey City, N. J.

THE POWER OF THE HEART.—Let any one, while sitting down, place the left leg over the knee of the right one, and permit it to hang freely, abandoning all muscular control over it. Speedily it may be observed to sway forward and back through a limited space at regular intervals. Counting the number of these motions for any given time, they will be found to agree exactly with the beatings of the pulse. Every one knows that, at a fire, when the water from the engine is forced through bent hose, the tendency is to straighten the hose: and if the bend be a sharp one, considerable force is necessary to overcome the tendency. Just so it is in the case of the human body. The arteries are but a system of hose through which the blood is forced by the heart. When the leg is bent, all the arteries within it are bent too, and every time the heart contracts, the blood rushing through the arteries tends to straighten them; and it is the effort which produces the motion of the leg alluded to. Without such ocular demonstration, it is difficult to conceive the power exerted by that exquisite mechanism, the normol pulsations of which are never perceived by him whose very life they are.—*Jos. W. Sprague.*

THE trotting stallion "George M. Patchen" has been bought by Mr. Waltermire, of this city, for $25,000.

THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.

Variable Stars.—Professor Gould read a paper on this topic. He stated that careful observations had revealed the fact that the number of variable stars is now about eighty. Scientific men in this country and Europe had turned their attention to this subject, and important results might be expected. The generally received opinion is, that every star under the third magaitude is variable. He mentioned a number of the variable stars; one of them had a few years ago apparently disappeared altogether, but about a year ago it re-appeared suddenly, with more effulgence than ever.

Roosevelt's Paradoxes.—Mr. Clinton Roosevelt, of New York, presented a paper on the Paradoxes of the Atomic Theory of Chemistry. He said that we rely much on common-sense, but there is only one thing on which all sentient beings have agreed, and that is that happiness is the chief good of existence. From this point all sects and parties separate and come in collision, so that in philosophy, as well as in religion, and morals, and politics, it was necessary to determine the higher law, as well as the rule of faith in evidence. He considered that all matter is ethereal, and that all atoms are evolved from *something*, and this certainly established the higher physical law. He proposed to set up a new system of chemistry and upset all established notions generally. This paper, from its great profundity, drew forth the *silent* applause of the whole association.

Spontaneous Combustion.—Professor Horsford read a paper on the burning of Berdan's Mechanical Bakery, in Boston, supposed to be the work of an incendiary, but which he showed might have resulted from spontaneous combustion in the boxes of sawdust used to catch the drippings of the oil. It is well-known that some oils, when spread over a surface, and exposed to air, absorb oxygen with such great rapidity as to heat considerably and to ignite if there is small opportunity of cooling. The sawdust absorbs the surplus oil, and where remaining in piles, spontaneously takes fire. Professor Horsford described an apparatus for testing the comparative avidity with which different oils absorb oxygen, or, in other words, there safety. It exposes equal surfaces of the oils to the action of the air, and measures the quantity of oxygen absorbed by each, all being compared with pure sperm oil, which is known to be safe.

Lighting Mines with Gas.—To prevent fire-damp explosions in collieries, by lighting with coal gas, was the subject of a paper by Capt. E. B. Hunt. He proposes to avert the dangers of coal mines by lighting them with coal gas, supplied with air from the surface, not allowing the atmosphere of the mine to come in contact with the same.

Professor Rogers thought the plan would be impracticable, from the fact that the progress of the work required that the workmen should be supplied with a movable lamp. It was certainly a great desideratum that some means should be devised to prevent the frequent casualities in our coal mines.

The Oil Wells.—Professor Newberry read a paper on this subject. The oil is found in Pennsylvania, western Virginia, Ohio, New York, Canada and other places. The wells yield, by pumping, from ten to twenty-five barrels per day of the crude oil. The yield of the refined article of the Pennsylvania oil is about 85 per cent of the whole. He saw a well which gave ten barrels a day of pure oil, and it was barreled and sent to market as it came out of the ground. The owner was not satisfied and deepened his well, and in eighteen hours 110 barrels were collected from it—but this proved to be very impure. The crude oil burns dimly, and is a very good lubricator, and when refined has less smoke and less odor than any other oil, and is not explosive, while its illuminating power is equal to the best coal oil.

In Illinois the oils occur in a limestone, and the loss by distillation is about one half. These oils everywhere occur, for the most part, about one geological level. The oil seems to have distilled from the carbonaceous deposit below, and it may be the product of animal as well as vegetable remains.

Professor Pugh confirmed the statement as to the practical value of the petroleum; it is used with great success by the students in the institution to which he