Correspondence.

The Editors are not responsible for the opinions expressed by their correspondents.

Adhesion, Cohesion, Gravitation.

MESSRS. EDITORS:—Natural philosophers make three divisions of the attraction of matter for matter, viz., adhesion, cohesion, and gravitation. If we seek for the basis of this classification, we find that it is merely the intensity of the attraction; that is, between adhesion, cohesion, and gravitation, there is only a difference in degree and not in kind. Ought we to admit that there are three "kinds" of attraction manifest in bulky matter, when we observe nothing more than the clinging of atoms together with unequal degrees of force? To do so is to violate that demand for simplicity everywhere made by science.

These different attractions depend on the proximity of the ultimate particles. Common facts prove this. Suspend two plates of glass near each other by long cords. They approach each other, illustrating gravitation. Bring their particles nearer together by pressing one upon the other and adhesion is manifest. How that a still closer approximation of atoms produces cohesion, may be thus shown. Break one of the plates in such a manner that cracks will radiate from a center, and spring apart the pieces of glass on each side of one of these cracks. The crack will be seen to advance a short space, but upon the pressure ceasing it will entirely disappear for the space it had advanced. No air or dust having entered, the particles were free to come very close together and thus to cohere. Where the glass was plainly broken for about an inch, it is now entire. This theory of the "kinds" of attraction depending on the distance between particles reduces all to one power or force, the peculiar energy of the atom, the basis of the correlation and conservation of force as taught by Faraday, Grove, and others, the energy more beautifully and definitely exhibited in the various forms of chemical attraction. F. T. GLOVER.

Providence Conf. Seminary, R. I.

[Our correspondent is mistaken in his premises as well as his conclusions. The distinctions which exist between the different kinds of attraction are marked. The attraction of gravitation acts upon bodies or particles of matter, however far they may be separated. The attractions of cohesion and adhesion act only at insensible distances. That there is a difference in kind as well as degree will also be manifest, when the distinction between adhesion and cohesion (evidently not comprehended by our correspondent) is considered. Cohesion only exists between particles of the same kind, adhesion only between particles of different kinds of matter, and does not exist at all in many instances. Mercury and glass are two bodies which are attracted toward each other, when distant from each other, by the universal law of gravitation, when brought near to each other they will not adhere in the slightest degree. Gaseous bodies also obey the law of gravitation but they are destitute of cohesion. The distinctions made between the different kinds of attraction were probably not made so hastily as the opinions of our correspondent, and were probably based upon a more complete knowledge of physical phenomena than he has yet obtained.—EDS.

The Velocipede Mania—An Improvement Wanted.

MESSRS. EDITORS:—I would beg to call your attention to a large field for American inventors, and if your journal would give my ideas a notice it would probably render a service. All France is crazy on the subject of velocipedes, and clubs are forming in every town and city. Velocipede races are more of an every day occurrence than horse races, and the manufacturers cannot supply half the demand. Those sold here are of two descriptions. In the one, the person is seated in a kind of chair, and works two pedals by the feet, and a lever with the right hand. The other and favorite description consists of two wheels, coupled together by an iron brace which serves for a seat. The forward wheel has projections for the feet, and the motion is obtained by a rolling movement of the leg. These last are tiresome, require some practice to learn, and a very nice balance not to fall over.

What is wanted is a system more simple, which one can learn at the first lesson; less fatiguing, and an equilibrium which will permit the velocipede to stand alone. For a patent in France that would conserve these requirements, I would give $2,000 in gold. If you think it worth while to notice this in your paper you would oblige me. C. R. G.

Paris, Aug. 31, 1868.

[The above comes from a responsible American gentleman, now carrying on an active business in Paris.—EDS.

Sun Power, Etc.

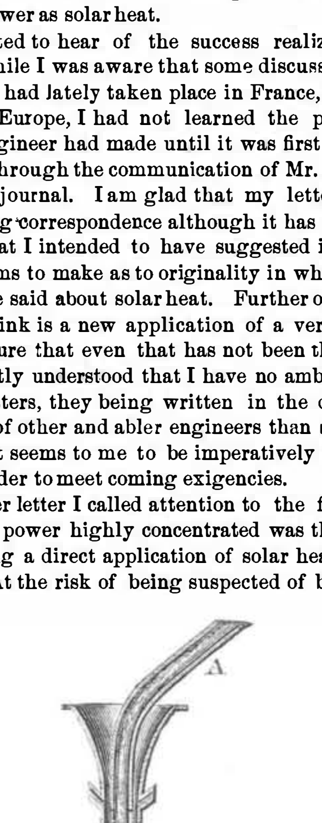
MESSRS. EDITORS:—In No. 11, current volume of the SCIENTIFIC AMERICAN, your correspondent "A" presents the idea of raising a vast weight up an incline (why not a perpendicular in level countries?) utilizing the expansion of metals by sun heat, and obtaining a small though irresistible motion of the mass on each successive day. Now I would suggest an endless chain with buckets of any required size to contain water (sand?); self-filling at the bottom, self-discharging at the top, thus "concentrating" the power in a reservoir for "transportation" through pipes to any point, for use, there to be transmitted to machinery through turbines. I suggest that the metal bars constitute the framework of the endless chain and supports, to have a mutual action and reaction upon each other, whereby the contractile as well as the expansive forces be utilized, and these forces, being equal, double the motion obtained. (Any good mechanic can supply details of construction). I suggest lenses, co-longitudinal with the bars to increase the heat if found expedient in practice. I suggest an automatic arrangement for multiplying the number of reciprocatory movements of the bars of force from one per day—as "A" has it—to any economical number desired, depending on the weather. This, by a self-acting shade to cut off the sun's rays when expansion maximates, and again expose to the sun when contraction maximates, thus obtaining as many motions per day as "A" would per season. By this plan there would be no trouble about gearing up or down to convert power into speed or lose it by friction of such gearing. I hope "A" can offer a better plan than the above, and if he does, then I also have one or two more left for his consideration. W. L. D.

Concentration, Transmission, and Transportation of Motive Power.

MESSRS. EDITORS:—In my former communication, published on page 163, current volume of the SCIENTIFIC AMERICAN, I remarked in substance, that it seemed strange that such an obvious source of power as solar heat should not have been heretofore made directly applicable to mechanical work. In your issue of 16th September, you publish a very interesting letter from the pen of C. H. Delamater, giving a statement of the progress which has been made by Capt. Ericsson, in his experiments with solar heat as a motor. Your correspondent states that I am mistaken in supposing due attention has not been paid to this subject. While I might call attention to the fact that very many periodicals devoted to mechanical engineering, as well as the transactions of learned societies, of which I have for years been a constant reader, contain, if anything at all, the most meager and general allusions to the direct mechanical application of this great source of power, it seems to me that the very fact that in this mechanical age no successful application of it has yet been made (if we except Capt. Ericsson's invention), is a sufficient evidence that due attention has not been paid to such an obvious and infinite power as solar heat.

I am delighted to hear of the success realized by Capt. Ericsson. While I was aware that some discussion in regard to this subject had lately taken place in France, as well as in other parts of Europe, I had not learned the progress that celebrated engineer had made until it was first published in this country, through the communication of Mr. Delamater to your valuable journal. I am glad that my letter called out that interesting correspondence although it has in a measure forestalled what I intended to have suggested in this letter. I have no claims to make as to originality in what I shall say, or what I have said about solar heat. Further on I shall suggest what I think is a new application of a very old device, yet I am not sure that even that has not been thought of. I wish it distinctly understood that I have no ambition to gratify in these letters, they being written in the desire to call the attention of other and abler engineers than myself, to the supply of what seems to me to be imperatively demanded at this time in order to meet coming exigencies.

In my former letter I called attention to the fact that the distribution of power highly concentrated was the chief difficulty in making a direct application of solar heat to moving machinery. At the risk of being suspected of borrowing an



idea from Mr. Delamater's letter, I will state that it was my intention to have suggested in my present letter the concentration of the solar heat itself, but he has spared me the necessity of saying much upon that point. The correctness of my own views is sustained by his account of the views and success of one of the greatest engineers of the age. I will therefore pass on to the discussion of the transmission and transportation of motive power. Both the transmission and transportation of motive power have, to a limited extent, been generally practiced for many years. The steam engine is an example of the former, the motive power being transmitted through pipes from the boiler to the cylinder, while the common soda water fountain is an example of the transportation of power, i. e., compressed gas. More extended applications of the method have been attempted, the objects being the propulsion of horse cars, etc.; but the results of all such attempts have, I think, convinced most engineers that anything like a general application of it to the driving of machinery is utterly out of the question. Not so with regard to transmission; and here I again find myself somewhat forestalled by your article, published on page 196, entitled "Transmission of Hydraulic Power, etc.," containing the suggestions of M. Leloup. I am confident that no engineer will read that article without being convinced that there is enough promise in this subject to repay investigation and experiment, although he may possibly object in some particulars, to the details of the apparatus proposed to effect the desired object. I am confident that no such complicated arrangement as that of M. Leloup would be necessary in most cases, and often a water wheel might even be dispensed with. On page 477 of "Ewbank's Hydraulics," is a description of an ancient machine called the *trombe*, or water bellows. I give herewith a drawing of one of these machines. The pipe, A, discharges water from the reservoir into the trumpet-shaped mouth of the vertical pipe, C. The end of the pipe, A, terminates in the pipe, C, at the bottom of the trumpet-shaped mouth. Opposite the lower end of A, are made a number of openings in the pipe, C, having short inclined tubes projecting from them, two of which are shown in the drawing. The lower end of C, enters the close vessel, D, and discharges its contents on a stone placed directly under it. As the water from A passes down into C, it draws air along with it through the top of the funnel, and also through the holes in the upper part of C. As the liquid dashes against the stone, the air separates and rises to the top of the vessel, whence it is forced under pressure through B, while the water accumulated at the bottom is drawn off by the regulating cock, E. This instrument, even in the rude form here presented, is capable of performing a good deal of work, and I feel sure that it can be improved so as to vastly increase its efficiency. A series of trombes might be made to supply compressed air from the falls of Niagara, through a system of pipes, at less cost than the gas works of that city, which would supply motive power for all its engines, elevators in warehouses, printing presses, etc. The cities of Troy and Albany might be supplied during a great portion of the year from Cohoes Falls. In many places it might be necessary to adopt some device like that suggested by M. Leloup, but where the trombe can be applied, it is doubtless the very simplest of all devices for obtaining a supply of compressed air.

With all the engineering and inventive talent possessed by the United States, I believe the honor of making initiatory experiments in this field should not be left to other lands, and whether or not the suggestions I have made shall prove to be of any direct value, if they awaken thought upon this important subject among your mechanical readers they will not be altogether worthless. A.

Index Plates for Gear Cutting.

MESSRS. EDITORS:—We have noticed the communications of your correspondent E. H. H. respecting index plates for gear-cutting machines, and herewith give the numbers for two sizes which we have been in the habit of using, thinking it would interest some of your readers. In a plate 24 inches in diameter we drill the following circles:

126	158	188	220
128	160	190	222
130	162	192	224
132	164	194	226
134	166	196	228
136	168	198	230
138	170	200	232
140	172	202	234
142	174	204	236
144	176	206	238
146	178	208	240
148	180	210	242
150	182	212	244
152	184	214	246
154	186	216	248
156		218	250

Number of circles, 63; number of holes, 11,844. Will divide all numbers to 125, and all even numbers to 250, or 187 different numbers. Diameter of inside circle, 7 inches. Distance from center to center of holes in inside circle, 0.175 inch; do. in outside circle, ·301 inch; do. between circles, ·135 inch.

The 28-inch plate has the following circles:

152	182	212	242	272
154	184	214	244	274
156	186	216	246	276
158	188	218	248	278
160	190	220	250	280
162	192	222	252	282
164	194	224	254	284
166	196	226	256	286
168	198	228	258	288
170	200	230	260	290
172	202	232	262	292
174	204	234	264	294
176	206	236	266	296
178	208	238	268	298
180	210	240	270	300

Number of circles, 75; number of holes, 16,950. Will divide all numbers to 150, and all even numbers to 300, or 224 different numbers. Diameter of inside circle, 7 76 inches. Distance from center of holes in inside circle, ·160 inch; outside circle, ·293 inch; between circles, ·135 inch.

BROWN & SHARPE MANUFACTURING COMPANY.

Providence, R. I.

Poison of the Locust.

MESSRS. EDITORS:—An article in the SCIENTIFIC AMERICAN of Aug. 26, copied from the *Medical and Surgical Reporter* in relation to the poison of the locust, calls to my mind some observations made during their visit to this section in June last.

The locust said to be poisonous is not the insect resembling the grasshopper, but the red-eyed cicada, popularly known as the "Seventeen Years' Locust," and is different from that other member of the cicadæ family frequently called locust, but which are common among us every year.

The eggs of the red-eyed cicada are injurious to vegetation, and trees are frequently seen with their tops dead from the eggs deposited by locusts in the bark of the upper tender branches. The sting, so called, is the incision made by the ovipositor of the insect, in which incision, generally in the bark of trees, the eggs are deposited.

It was only in the latter part of the locust season that por sons were stung by them, and I think it may be accounted for as follows: Those insects which had not deposited until late in the season were, perhaps, delayed after their time was fully come, and, in obedience to Nature's law, were driven suddenly to relieve themselves, and hence their tenacity in maintaining themselves upon the human flesh until their object was accomplished. This theory is supported by the facts that the eggs are so injurious to vegetation when deposited in the bark of trees, and that it was during only the latter part of the season, when they were depositing their eggs, that instances were known of persons having been stung or poisoned. In several instances which came to my knowledge, the locust resisted attempts to brush or throw it off until the deposit had been effected. The treatment in the case of a child stung, was bathing in salt water to reduce the inflammation, which extended rapidly, and further, to remove the cause of the inflammation, viz., the eggs deposited in the wound. C. A. LEWIS.

Washington, D. C.

Submarine Engineering.

Among the many interesting things which the visitor to the rapidly-progressing railroad bridge will see, is the improved process by which men can work under water by a method which has taken the place of the former diving bell. So far as anything like a diving bell is concerned the operator carries it upon his head. The need for such labor is to level the rip rap rock which fills the spaces between the piles, and around them, just above the bottom of the river, to make a perfect sub-structure for the piers after the piles have been sawed off one or two feet above the bottom.

The contract for this work was taken by Mr. Perry, who has in his service for the under-water work, Mr. Quinn and Mr. King. We were at the place of one of the piers yesterday, and waited a few minutes to see Mr. Quinn come up after a four hours' submersion and hard work at the bottom of the river. On the edge of the flatboat stood Mr. King with a rope in one hand and an India rubber tube in the other, both extended out into the water and let out or drawn in to correspond with the motions of the man below, or to yield to, or counteract the strong current of the river, as rapid near the bottom as it was eighteen feet above at the surface. The rope was to communicate understood signals—the tube to convey a proper and uniform supply of air to the sub-aqueous man. Down stream large bubbles of air were almost constantly rising to the surface, air which Mr. Quinn no longer had any use for, or a surplus applied by a very ingeniously constructed air-pump by which three pistons were so adjusted upon a crooked revolving shaft that one of them was constantly and quickly forcing nearly a gallon of air within the sub-marine armor in which the operator was dressed.

A signal was given to ask if all was "right." Responsive twitches of the rope meant "all right." Soon after the signal was given for "dinner time." Then slowly crawled Mr. Quinn to a ladder suspended from the boat to the bottom of the river. The bubbles are seen further up stream—the rope and tube are gradually pulled in—the top of the ladder trembles and he is coming up slowly with his armor-dress of more than a hundred pounds heavier than the weight of his body. Out of the turbid water emerges a frightful head with a great square eye as large as a hand, in front, and a similar one on either side, but without hair, or mouth, or eyes, or any resemblance to the "human face divine." Human hands are seen on the ladder—an unwieldy outline of a human body is seen beneath the great head, nearly two feet in diameter. His assistants thumb a few screws and take on the copper helmet, revealing the good-looking English face of Mr. Quinn. Relieved of sixty pounds weight on his breast and back, and shoes with leaden soles of thirty pounds each, which, being removed, his canvass-rubber clothing is removed, and there he sits, or stands, a proper sized man in dry, ordinary clothing, only his naked hands having been wet.

So strong is the current of the river these sub-water men can scarcely stand against the force of the current, though borne down by armor and weights to the amount of 275 pounds. This weight is partly requisite on account of the amount of air inclosed, for breathing purposes, within the encasing armor. Except a slightly painful sensation from the pressure of condensed atmosphere in the ears, on the first practice of under-water work, they say that no other inconvenience arises from a temporary residence in Neptune's dominions, or, as we live on fresh water shore, we should say the realms of the Nymphs, Naids, or Potamids.

The sub-river men occasionally place a hand upon a fish, which naturally leaves that neighborhood, instanter, but whither he goes the diver cannot tell, for in the dark water of this river, at that depth, he cannot even distinguish the rope or the white air-tube more than six inches from his face, All this work of leveling and adjusting square rods of loose rock must be done by the sense of feeling, battling with the current upon his hands and knees.

Such are among the wonderful matters of science and skill going on within a mile or two of our city, and yet not one in a hundred knows the tenth part of the interesting things connected with the work of the great railroad bridge which is soon to span the river, and be as great a benefit to Dubuque as it is an honor to those who projected and to those who are building it.—*Dubuque Times.*

Brick Making by Machinery—The Gard Machine.

It is pleasant to say a good word for a really good thing, and such, we are convinced, is the brick machine invented by E. R. Gard, of Chicago, Ill., descriptions of which may be found on page 238, Vol. XIV., and page 132, Vol. XVI., SCIENTIFIC AMERICAN. These descriptions, however, of a machine not then perfected, do not convey a proper idea of the machine we saw in operation a few days ago, which turned out seventy perfect bricks per minute from raw clay, bricks so perfect that they could be "hacked" nine high from the machine without crumbling, defacement, or the necessity of previous drying. Fully equal to hand made, in other respects, these bricks present an edge face as smooth as that of the famous Philadelphia bricks, while their side faces are excellently well adapted to holding and retaining the mortar. The machine uses the clay just from the bank, nothing ever being required to be added but water, and that rarely, and turns out the perfected bricks at a rate only limited by the capacity of the workmen to remove them.

The confidence of the inventor in the superiority of his machine is evinced by his challenge to the owners of all other machines in the country, of a competitive trial on the fairest terms, the proceeds of the trial to be given to charitable objects. A full size working machine may be seen in operation in the rear of 59 Ann street, New York, from 9 A.M. to 3 P.M., and we suggest to our builders and others a visit. For descriptive pamphlet address E. R. Gard, New York City.

BARR'S IMPROVEMENT IN CENTRIFUGAL MACHINES.

The Weston Centrifugal Machine, becoming quite commonly known—over one hundred being now in use in sugar refineries—is a great improvement on the common machine by being self-balancing, a result obtained by suspending the rotating cylinder, allowing it to gyrate in accordance with the varying distribution of the load, thus greatly reducing the power necessary to drive the machine. This gyration is sometimes excessive and the object of the improvement illustrated in the engravings is to prevent this excess of movement without interfering with the productive results of the machine.

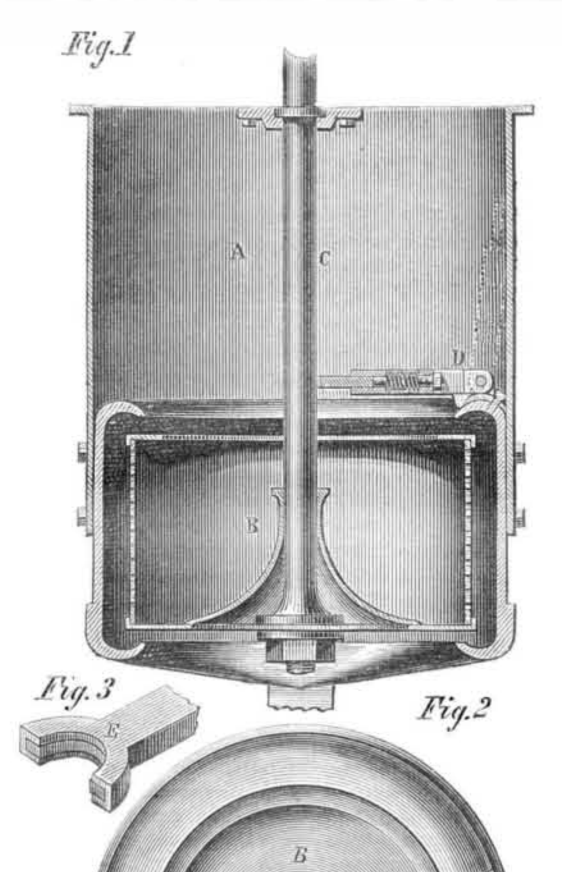


Fig. 1 is a vertical section showing the improvement; Fig. 2 is a plan or top view; and Fig. 3, a perspective view of the device itself, the clutch.

A is a stationary cylindrical case, suspended from timber or the ceiling of the room, and B is the revolving cylindrical vessel for receiving the sugar or other material to be operated upon, and having perforated sides. C is a vertical shaft by which this vessel is suspended. The improvement consists in a hinged frame, D, for guiding the shaft, and a clutch, E, working in the frame.

The frame, D, is hinged to the outer case, A, so that it and the clutch may be raised. When the clutch is in contact with the shaft, C, the frame and clutch are prevented from passing below a level by lugs on the side of the case near the pivot by which the frame and clutch are supported. The shank of the clutch is encircled by a spiral spring intended to yield sufficiently to the swing of the rotating cylinder, but also to check it to prevent it from gyrating beyond a certain limit. The tension of this spring and its consequent bearing against the shaft, C, is regulated by a nut on the end of the clutch shank.

The inventor of this improvement claims that by its use the expense of an attendant is avoided; the forked bar or clutch preventing the violent shocks and vibrations, which occur when the cylinder is unevenly loaded, and an unyielding bearing is employed. During the time of charging the machine the shaft is most liable to gyrate, and the forked rod is most needed, and the latter being of inconsiderable width and occupying but a small proportional space, does not interfere with the operation of charging.

Patented by Robert J. Barr, August 4, 1868. Letters may be addressed to him at 618 S. Delaware Ave., Philadelphia, Pa,

Inproved Method of Preserving Wood.

Patented April 14, 1868, by Theodore William Heinemann, New York city.

I first boil the wood in a weak solution of carbonate of soda or any other alkali, or muriatic acid (pure, crude, or waste materials will answer equally well, but of the pure, one part in fifty to two hundred of water is strong enough), until the liquor ceases to abstract color from the wood, which then is free of nitrogenous matter, and consequently no longer subject to spontaneous decay, and after drying in the usual way, if intended for use where it will not be exposed to the inroads of water, insects, etc., needs no other treatment. But if it be intended for railway sleepers, or purposes where it may be much exposed, or come in contact with nitrogenous or fermenting substances, I subject it to a second treatment in a close boiler, of suitable size and shape, strong enough to bear a very high pressure, conveniently fitted with an air-tight door, also with horizontal cross bars, which serve as braces to strengthen the boiler, and at the same time keep the wood from floating, with a safety valve, discharge cock, pressure-gage, and thermometer.

Into this boiler I put the wood, and with it enough rosin, when liquefied, to cover it, and sufficient water to fill, when converted into steam, the whole of the remaining space in the boiler. I then close the door tightly, and heat the boiler gradually until the thermometer shows the contents to be at about 306° Fah., when the rosin is as liquid and penetrating as boiling water, and the steam, being of a very high pressure, forces the rosin through all the pores of the wood. I keep the same temperature up just long enough to have the wood evenly heated all the way through, the time varying according to the thickness of the pieces treated. After that I lessen the heat gradually, until the thermometer shows the mass inside the boiler to have cooled down to about 200° Fah., when I suddenly raise the temperature again, and as soon as the rosin has become sufficiently liquid, I open the discharge-cock and allow it to drain off. The wood may then be taken out, and on cooling will be found very compact, hard, elastic, impervious to water, even if left in it for a long time, not subject to shrinking, warping, or the attacks of insects, and indestructible except by fire.

If it be desirable, however, to make the wood effectually resist even the power of the last-mentioned agent of destruction, I substitute soda or potash water-glass instead of the rosin, in the process last described, and after thoroughly impregnating it, dry it and allow it to lie for some time in muriatic acid or some concentrated solution of a metallic salt, which will make an insoluble silicate.

New Bridge at Niagara Falls.

They are building a new suspension bridge at Niagara close to the Falls, for carriages and foot passengers. On the American side the towers are within a few hundred feet of Falls, and the cables are already swung across to corresponding towers close to the Clifton House. In some respects this bridge is more remarkable than the other. In length it exceeds it 450 feet, being 1,250 feet in the span. The towers are 105 feet high, and are built 13½ feet apart. Unlike the heavy stone columns of the lower bridge, they are light wooded trestles, twenty-eight feet square at the base and tapering to the top. When finished they will be roofed and weatherboarded.

The bridge will be sustained by two cables, which were swung last winter when the ice filled the river below the Falls. The lower bridge is sustained by four cables. Those of the new bridge are composed of seven strands of twisted steel wire, each mustering two and three-eighths inches in diameter, which form a cable about nine inches thick. The ends are fastened by the new shackles invented by Mr. Hewlett, of Niagara, in a manner very different from that formerly adopted. The strands of the cable are untwisted at the ends, and hang separately from the tops of the towers. Each is secured to a separate shackle, which looks something like a pulley with a fixed wheel. These are grooved so as to hold the cable by means of friction, independent of the fastening at the ends, if necessary. The shackles are of various lengths, so as to divide the strain as much as possible, and are secured to a base firmly planted in beds of masonry eighteen feet square. This will probably hold the weight of the bridge against any ordinary pressure; and unless the slight towers are racked and weakened by the lateral motion caused by the high winds of the winter season, it will probably last as long as the other. The inside measurement of the bridge will be ten feet in the clear. As this will barely enable carriages to pass each other, it is a wonder that an additional two feet were not added when the cables were swung.

Novel Application of Asphalte.

The repellent property of asphalte bitumen with regard to water, which is so characteristic that samples of natural asphalte, though they contain much mineral matter, scarcely ever yield any moisture to analysis, has already led to its use for lining water tanks and cisterns which are not required to hold boiling water. Now, however, it is proposed to use it for canals as an economical and very desirable substitute for the ordinary puddling. But we need scarcely observe, it is only the best description of Seyssel asphalte that would answer the purpose in a satisfactory manner, and remain water