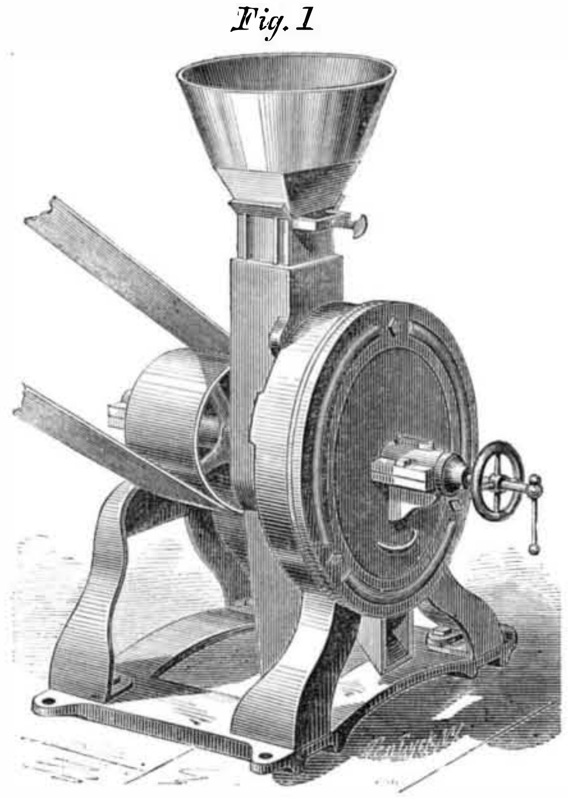
THE DIAMOND BONE MILL.

The great importance of the manufacture of bone fertilizers, the value of which is daily becoming better appreciated, and the great number of other purposes to which bones are applied in the arts, give interest to any device employed in their utilization. The reader will find on page 137, Vol. XX., of the SCIENTIFIC AMERICAN, an article on the "Value of Bones," and another on the "Utilization of Bones," on page 373, of the same volume, to which he is referred in this connection.

We illustrate herewith a machine for grinding bones,

Fig. 1



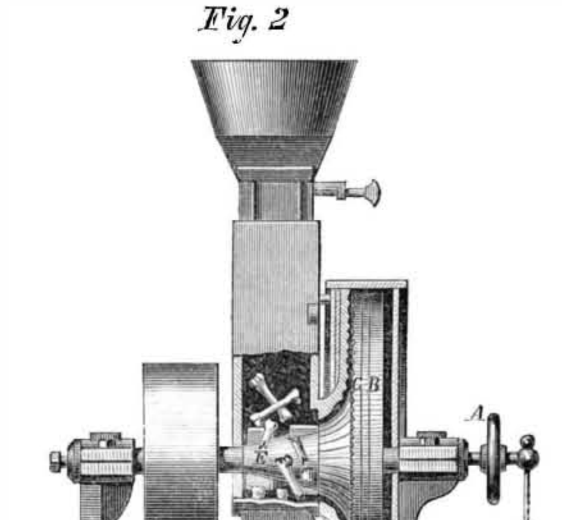
which has, although but recently introduced, attained an excellent reputation for its efficiency and other good qualities. An examination will satisfy all practical minds that the devices employed must secure good work.

Fig. 1 is an elevation of this mill, a vertical section of which is shown in Fig. 2. D is the hopper with a gate to adjust the feed. When in use the bones fall from this hopper down upon a powerful breaker or cracker at the bottom of the chute. From thence the crushed fragments pass in between the grinding plates, one of which is stationary and the other revolving. The revolving plate is made so as to conform to the shape of the stationary grinding plate, which latter has the form of the mouth of a trumpet. A screw, lever, and hand wheel, A, serve to adjust the revolving grinding plate, so that it will grind to any required fineness.

The revolving grinding plate is made of two metallic sections, an external one, B, and an internal one, C, which latter is the grinding plate proper. Between the sections, B and C, is a section of non-conducting packing, the object of which is to keep the mill from heating. The stationary grinding plate is also backed with similar packing for the same purpose. Fans are also attached to the periphery of the revolving grinding plate, by which, together with the non-conducting packing, the mill is essentially prevented from heating.

The breaker, or cracker, is formed by strong studs projecting from the shaft of the revolving grinding plate playing

Fig. 2



between other studs, or teeth, projecting from the inside of the outer shell of the mill. This part is very distinctly shown in the engraving.

The peculiar "dress" of this mill consists of hollow diamond-shaped projections, radiating in lines from the center to the periphery of the plate. These grinding teeth are of hard iron from one eighth of an inch to three sixteenths of an inch in hight, thus making from one quarter to three eighths of an inch of hard iron on both plates, which will last a long time.

This structure of the grinding plates renders the teeth self-sharpening. When dulled by use after running the mill in one direction, they are sharpened for the other direction, so that all that is required is to reverse the motion of the mill. These surfaces are also made in segments so they can be easily removed for repairs, or, if necessary, replaced. Thus an important advantage is gained over the burr stone mill; namely, the obviation of all necessity for "dressing."

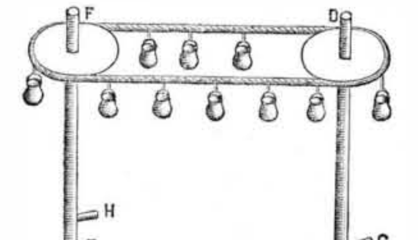
This principle has been successfully extended by the inventor to mills for nearly all grinding purposes.

A patent was obtained on this invention July 14th, 1868. A reissue was granted September 15th, 1868, and patents on other improvements are now pending.

For further information address Henry Shaw, agent, Diamond Mill Co., Cincinnati, Ohio.

A Very old Invention.

There is an old book, and a very scarce book now, bearing on its title page the following: "Mechanick Powers: or, the Mistery of Nature and Art Unvail'd. Showing what Great Things may be performed by Mechanick Engines, in removing and raising bodies of vast Weights with little strength, or force; and also the making of Machines, or Engines, for raising of Water, draining of Grounds, and several other Uses. Together with a Treatise of Circular Motion artificially fitted to Mechanick use, and the making of clock-work, and other Engins. A work pleasant and profitable to all sorts of Men from the highest to the lowest Degree; and never treated of in English but once before, and that but briefly. The whole comprised in Ten Books and illustrated with Copper Cuts. By Ven. Mandey and J. Moxon, Philomat. London: Printed for the Authors, and Sold by Ven. Mandey, next door to the Salmon, in Bloomsbury Market, and James Moxon, at the Atlas, in Warwick-lane, and R. Clavel, at the Peacock, in Fleet-street, 1696." This book is dedicated to his Grace, William Duke of Bedford, at that time Lord-Lieutenant of Middlesex, Cambridge, and Bedford, by his humble servants, Venterus Mandey and James Moxon, and contains much quaint matter. It claims to be the first treatise on mechanics written in English, with the exception of the work by one Bishop Wilkins, who wrote "but briefly, and rather historically than fundamentally." Among descriptions of "Engins moved by Smoak," of apparatus for indicating the distance traveled by a chariot or ship, of the effect of percussion or smiteing, we find the specification of a wire tramway, identical in principle with that of which we have lately heard



as a bran new invention, working successfully among the Leicestershire quarries:

"ENGIN VI.

TO REMOVE A MOUNTAIN, OR HEAP OF EARTH, FROM ONE PLACE TO ANOTHER EASILY AND QUICKLY.

"Let the mountain, or hill, or heap of stones be A, to be removed to the place B; to save time in going and returning from one place to the other, as also that the motion whereby the earth or stones is transferred from A to B may be swift, we may make use of the following industry: Erect at the foot of the mountain, or in its middle, a great and solid wooden column, or piece of timber, C D, and erect such another in B, namely, E F, affix at the top of each piece or column, the wheels, D and F, and make hollow each wheel in the circumference; and put about them a great strong rope, extended parallel to the horizon; but if the distance from A to B be great, least the rope should be too much stretched or bent, raise other such like pieces, or columns, in the middle with their wheels made hollow as aforesaid, to sustain the rope parallel to the horizon; on the rope thus doubled, here and there hang baskets, which must be so far distant from each other, that they hinder not one another; and the ends of the pieces must be so placed, that the power applied to the leavers, G and H, may be turned about their centers; for so the whole rope, with the baskets hanging on it, will be turned about successively; wherefore, if men keep filling the baskets in A, and others unload them in B, the whole hill will be easily transferred from A to B.

"Where note, that the greater the wheels D and F are, the swifter the rope and baskets will be turned about, which momotion about the axis or piece of timber being easie, may be accomplisht by means of short leavers, and so the motion of the baskets may be greater than the motion of the power about the piece of the timber. Besides the saving of labour, and the gaining of time, which is effected by this engin, it hath likewise this conveniency, that if between the two places, A and B, there should be a river, or stream, or such like inaccessible, as if the earth were to be transferred from a mound, or hill, to the next adjoining field, and there were a large deep mote or ditch before them, you could scarcely obtain your desire any other way."

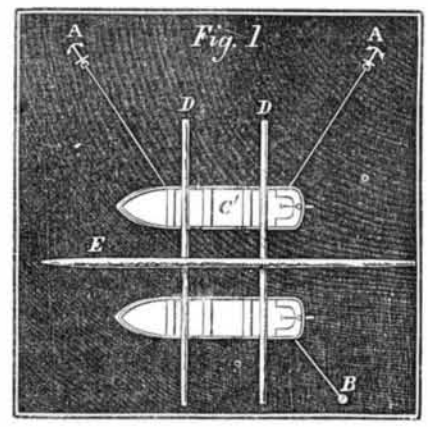
Venterus Mandey and James Moxon, Philomat, were thus nearly two hundred years in advance of the recent inventor of the wire tramway.—*Engineering.*

(For the Scientific American.)

THE SHAD FISHERIES OF THE HUDSON.

The American shad, *Alosa præstabilis* of naturalists, one of the most esteemed fishes which frequent our waters, gives profitable employment to a large number of fishermen both on the New York and New Jersey sides of the Hudson river, and constitutes a much more important branch of piscatorial industry than is generally supposed.

These fish, leaving the ocean every spring, in vast numbers, penetrate most of the North American rivers which flow into



the Atlantic, for the sole purpose of breeding and spawning in fresh water, after which they return, thin and poor, to recuperate their strength in the briny deep. The further South we go, the earlier in the season are they found to make their appearance.

The period of the first arrival of shad in the Hudson river, varies somewhat according to seasons, or as old fishermen believe, with the state of the moon.

The very first fish, which always sell at fancy prices, are generally caught during the month of April. By the end of June the last of the stragglers has found its way back to its salt water home.

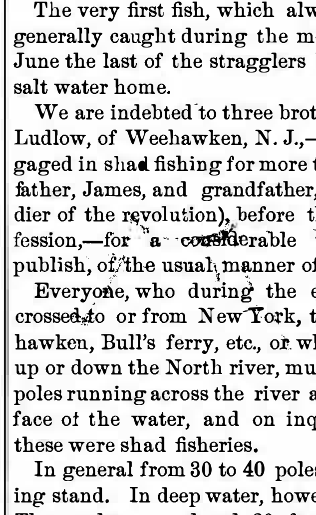
We are indebted to three brothers, James, Samuel, and John Ludlow, of Weehawken, N. J.,—who have been regularly engaged in shad fishing for more than thirty years, and whose father, James, and grandfather, Anthony Ludlow (an old soldier of the revolution), before them, followed the same profession,—for a considerable portion of the account we publish, of the usual manner of catching this excellent fish.

Everyone, who during the early months of the year, has crossed to or from New York, to Jersey City, Hoboken, Weehawken, Bull's ferry, etc., or who has had occasion to travel up or down the North river, must have noticed long lines of poles running across the river and projecting above the surface of the water, and on inquiry will have learned that these were shad fisheries.

In general from 30 to 40 poles in a row constitute one fishing stand. In deep water, however they are less numerous. These poles are placed 30 feet apart. Their length varies from 20 to 90 and even 100 feet, this great hight being obtained by firmly splicing several pieces together; their lower ends are often from 12 to 18 inches in diameter, and 15 feet of the bottom end are tapered off to a point, so as to enable them to readily penetrate into the river bed. They are made of hickory or white oak, and when of large size do not cost less when set, than twenty dollars apiece.

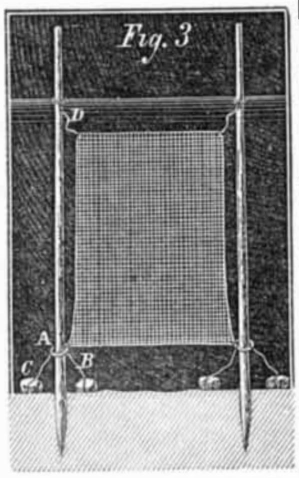
The mode of driving in the poles is illustrated in the following diagram, Fig. 1.

Two boats C and C' are placed parallel to each other. One of them, C, is made fast by means of a guy line B, to a post, or fixture of some kind, the second boat, C' is held in its place by means of two anchors, A A, as shown in the figure. Two poles, D and D, are then placed crosswise over the top of the boats and the pole, E, destined to be sunk in the river, is laid across them. This last pole is now tilted up, so that its sharp pointed heavy lower end will sink in the water at the bow end of the boats. When it touches bottom, it is hauled up and down, a certain number of times, by main force, so as to make it take a firm hold, after which a cross beam called a "riding stick," Fig. 2, is firmly attached to it. On this riding stick, four men now stand up and by repeated measured jumps, drive the pole into the silt as far as it will go, often causing it to penetrate to a depth of 25 feet below the bed of the river. This firm attachment is indispensable in order to preclude the possibility of passing vessels drawing out the poles. As soon as one pole is in its place, the guy line of the boat, C, is attached to it, the boat, C', again anchored out at a short distance, and another



pole sunk in the same manner as was the first. The same operation is repeated until the whole row is "planted."

The nets which are spread between each pair of poles are from 20 to 25 feet in depth and their upper portion is generally situated at a depth of from 15 to 20 feet below the water surface, so as to avoid being caught by propellers, ships' rudders, etc.



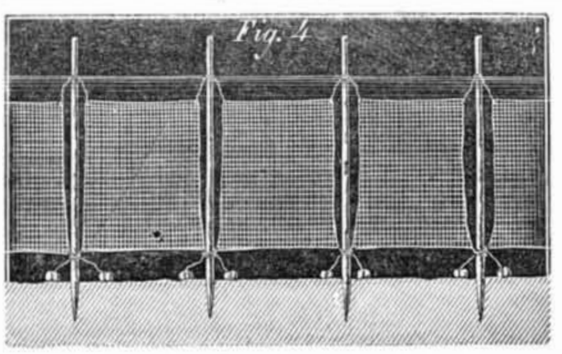
Over each pole is slipped a hoop, A, Fig. 3, to the bottom of which, by means of a fifteen fathom line called the "foot rope," B, is attached a heavy stone, C. The net is attached by one corner to the hoop and above to an "arm line," D, 15 fathoms in length. This arrangement as will be seen, allows of the passage of fish both above and below, as well as on the sides of the nets, when they are bagged by the tide. The following diagram gives an idea of this arrangement.

The planting of the poles, as well as all repairs to the nets, is made at low water slack. The meshes in shad nets vary from 4, or even less, to 5½ inches. The best fishermen employ only these last, and derive a larger profit through the sale of fewer but larger fish, than could be realized from a greater number of small and inferior ones. The nets are hauled up at every high water slack.

Shad is a very tender fish, which in warm weather is generally dead before being taken out of the net, but in cold weather it is much longer lived.

The deplorable fact is but too manifest to-day, that the shad fisheries of the Hudson river, through unpardonable legislative negligence, are rapidly declining, so much so indeed, that unless some energetic measures be resorted to without delay in order to protect both fish and spawning grounds, not many years will elapse before this fine fish will have entirely disappeared from our river. Less than fifty years ago, shad were so abundant in the North River that they sold regularly at seven dollars per hundred: this year they brought from 30 to 40 dollars, and averaged 30 dollars.

Thirty years ago the great porgie, the striped bass, and many other fine fish were caught in abundance a long way up this river, but at present they have entirely disappeared from it, as have also the sharks which in the olden time were a terror to the bathers of the metropolis. The shad, if not looked after will in less than twenty years be "a thing of the past." Not one half of the number of shad that went up the river twenty-five years ago do so at present, but the



greatest falling off has taken place during the last five years. This is attributed not so much to the continually increasing steam navigation of the river which scares the timid creatures, as to the license allowed the kerosene refineries and gas works to poison the water with their residues, as is clearly proved by the fact that some years back fish could be kept alive for our markets for weeks at a time in tanks filled with the river water, whereas to-day they die within a very few hours after being put into it.

The next reason for the rapid decrease in the number of shad is due to the fact, that this fishery in the Hudson is perfectly free and uncontrolled, that no regulations of any kind exist in regard to it, and that no laws have been passed protecting the future interests of the community from the thoughless cupidity of present fishermen.*

We earnestly commend this subject to our representatives. Regulations should be passed strictly forbidding the catching or vending of shad before the first of March, or after the 25th of May, and also prohibiting the use of nets whose meshes are less than 5½ inches. A fine of $500 for each violation of the law, with $100 of it for the informer, would soon replenish our stock of shad, and all would eventually be gainers by it.

The genuine fishermen of the North river, will, we know, be the first to sustain our views, and none but hungry poachers off the National domains will be found to oppose them.

* The laws existing in regard to our North River fisheries have become a dead letter to the fishermen, who are ignorant of their very existance, and unless the States of New York and New Jersey act jointly in the matter of new regulations, not much good will be done, even while stocking the River through the process of artificial incubation, as commissioner Green is at present attempting to do, near Coeyman's, some 150 miles up the Hudson.

GOOD strong tea, cooled with ice and flavored with lemon, with the addition of a very little sugar, is an excellent drink for hot weather.

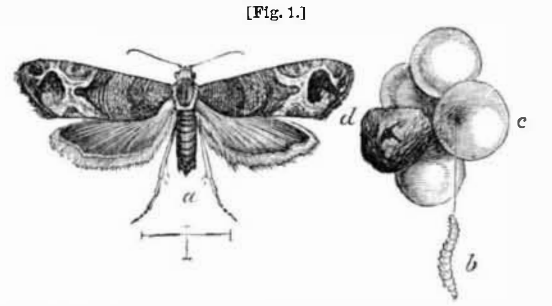
The Grape-Berry Moth.

(*Penthina vitivorana*, Packard.)

Scarcely a year passes but some new insect foe suddenly makes its appearance amongst us; and were it not for the fact that the ravages of others are at the same time abating, the destruction which they unitedly would cause would be intolerable.

The insect which forms the subject of this article may be cited as an illustration of such a sudden appearance in many different parts of the country, for until last year no account of it had ever been published, and it was entirely unknown to

[Fig. 1.]



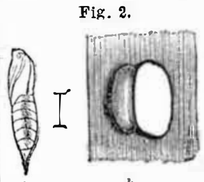
Colors—(*a*) deep brown, pale buff and slaty; (*b*) olive-green or brownish.

science. It had, however, been observed in Ohio, for three or four years, and in Missouri and South Illinois. It has gradually been on the increase, and was never so numerous as last year. We found it universal in the vineyards along the Pacific and Iron Mountain railroads, in Missouri. It was equally common around Alton, in Illinois, and we were informed by Dr. Hull, of that place, that it ruined fifty per cent of the grapes around Cleveland, Ohio. It also occurs in Pennsylvania.

Its natural history may be given as follows: About the 1st of July, the grapes that are attacked by the worm begin to show a discolored spot at the point where the worm entered. Upon opening such a grape, the inmate, which is at this time very small and white, with a cinnamon colored head, will be found at the end of a winding channel. It continues to feed on the pulp of the fruit, and upon reaching the seeds, generally eats out their interior. As it matures it becomes darker, being either of an olive-green or dark brown color, with a honey-yellow head, and if one grape is not sufficient, it fastens the already ruined grape to an adjoining one, by means of silken threads, and proceeds to burrow in it as it did in the first. When full grown it presents the appearance of (Fig .1) *b*, and is exceedingly active. As soon as the grape is touched the worm will wriggle out of it, and rapidly let itself to the ground, by means of its ever-ready silken thread, unless care be taken to prevent its so doing. The cocoon is often formed on the leaves of the vine, in a manner essentially characteristic. After covering a given spot with silk, the worm cuts out a clean oval flap, leaving it hinged on one side, and, rolling this flap over, fastens it to the leaf, and thus forms for itself a cozy little house.

One of these cocoons is represented at Fig. 2, *b*, and though the cut is sometimes less regular than shown in the figure, it is undoubtedly the normal habit of the insect to make just such a cocoon as represented. Sometimes, however, it cuts two crescent-shaped slits, and, rolling up the two pieces, fastens them up in the middle as shown at Fig. 3. And frequently it rolls over a piece of the edge of the leaf in the manner commonly adopted by leaf-rolling larvæ, while we have had them spin up in a silk handkerchief, where they made no cut at all.

Fig. 2.



Color—(*a*) honeyyellow.

In two days after completing the cocoon, the worm changes to a chrysalis. In this state (Fig 2, *a*), it measures about one fifth of an inch, and is quite variable in color, being generally of a honey-yellow, with a green shade on the abdomen. In about ten days after this last change takes place, the chrysalis works itself almost entirely out of the cocoon, and the little moth represented at Fig. 1, *a*, makes its escape.

Fig. 3.

The first moths appear in Southern Illinois and Central Missouri about the 1st of August, and as the worms are found in the grapes during the months of August and September, or even later, and there is every reason to believe that a second brood of worms is generated from these moths, and that this second brood of worms, as in the case of the Codling moth of the apple, passes the winter in the cocoon, and produces the moth the following spring, in time to lay the eggs on the grapes while they are forming.

THE REMEDY.

This worm is found in greatest numbers on such grapes as the Herbemont, or those varieties which have tender skins, and close, compact bunches; though it has also been known to occur on almost every variety grown.

As already stated, there can be little doubt that the greater part of the second brood of worms passes the winter in the cocoon on the fallen leaves; and, in such an event, many of them may be destroyed by raking up and burning the leaves at any time during the winter. The berries attacked by the worm may easily be detected, providing there is no "grape rot" in the vineyard, either by a discolored spot or by the entire discoloration and shrinking of the berry, as shown at Fig. 1, *d*. When the vineyard is attacked by the "rot," the wormy berries are not so easily distinguished, as they bear a close resemblance to the rotting ones.

Many wine makers are in the habit of picking up all fallen berries, and of converting them into wine. The wine made from such berries is but third rate, it is true; but we strongly recommend the practice, as upon racking off the juice obtained from them, countless numbers of these worms are found in the sediment, while unseen hosts of them are also, most likely, crushed with the husks. Those who do not make wine should pick up and destroy all fallen berries.—*Entomologist.*

ADVERSE REPORT ON THE EAST RIVER BRIDGE.

The writer of the following report is the projector of a number of extensive and important public improvements which have attracted much attention, one of which, the Broadway Arcade Railway, is well known to our readers. According to Mr. Nowlan's figuring the proposed East River Suspension Bridge, although the plans are indorsed, either tacitly or expressly by nearly all our leading engineers, will be a dead failure. He thinks it cannot be made to hold together except for a short time, and that with the hight of towers proposed the bridge will almost touch the surface of the water at high tide. Mr. Nowlan's report contains several interesting statements, and we have no doubt will call out suitable replies. It is, we believe, the first adverse report upon the project that has been made public:

Report on the construction of suspension bridges over the East River as proposed by a company incorporated by the Legislature of the State of New York, made before the Commissioners appointed under an order of the Senate of the United States, to meet at the city of New York, to hear such objections and recommendations upon the subject of such bridges as may be made by competent persons, professional or otherwise, such commission consisting of Gen. Newton, Gen. Wright, and Major King, all of the United States Army.

REPORT OF SAMUEL BARNES B. NOWLAN, C. E.

Gentlemen: In reply to your request, I submit the following report, based upon an experience of many years in practical engineering, and the attendant scientific investigation of details, particularly as applied to engineering manipulations in the construction of military works in connection with submarine engineering.

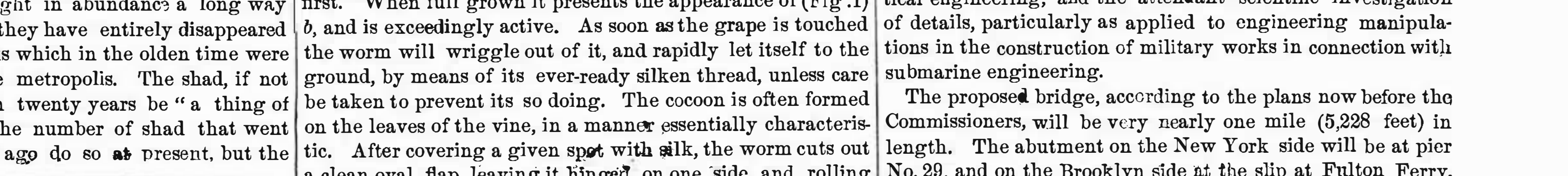
The proposed bridge, according to the plans now before the Commissioners, will be very nearly one mile (5,228 feet) in length. The abutment on the New York side will be at pier No. 29, and on the Brooklyn side at the slip at Fulton Ferry. The grade on the approach from the New York terminus at the City Hall Park to the level of the bridge will be 3½ feet in every 100 feet, while the grade on the Brooklyn side, from its terminus near the junction of Sands and Fulton streets, will be less.

The hight of the bridge is to be 135 feet, as fixed by the State charter.

The center span will be 1,600 feet. It is very doubtful if 135 feet of hight would be sufficient to allow the passage of vessels of a large tunnage, and it seems impracticable to increase the hight of the bridge by reason of the steeper grade, which would render it too great for the convenience of travel. In slippery weather wagons would find it impracticable to ascend to the elevation of even 135 feet, and passengers would prefer the ferry boat.

As to the proposition of any bridge on the suspension plan by wire cables or iron chains, I desire particularly to give the causes and practicable results in cases of failure under similar circumstances.

Referring to the diagram, I would remark that the distance spanned will range about 1,600 feet. A B represents the chord, A C B the catenary curve with the line C D. Now, as the natural sag of the suspended chain should be in proportion as 1 is to 16, and the towers being as represented, 135 feet at the point of hight for the chord, the catenary curve being 1 in 16 would produce in the distance of 1,600 feet a sag of 100 feet, leaving only 35 feet for water way.



Should an unnatural strain or taut be brought to bear upon the suspended chain it would not allow for the deflection and variations of temperature, which from extraordinary changes may vary from 120° Fah. to 20° below zero.

When the catenary curve is obtained, a natural curve is obtained which will meet all deviations of temperature. But if not, the overstrain or taut will cause the snapping under the vibration, as in the case of the Menai Suspension Bridge.

The cause of the falling of that bridge was from the oscillating motion to which it was subjected, there being no strands employed on that bridge as now used by the projectors of the Niagara Suspension Bridge. If those strands were not used that bridge would not last half its time. At present the deflection is over 9 inches at noon under a temperature of 85°. At the time it was first built it gave only 5 inches on the catenary curve.