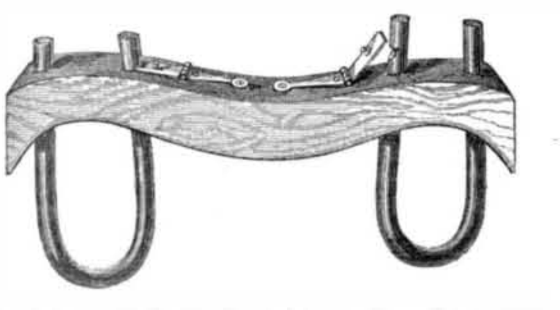
POST'S IMPROVEMENT IN OX YOKE BOWS.

The mortise through the bow of an ox yoke greatly weakens that part, and the key sometimes gets misplaced and lost, even though attached to the yoke by a leather thong; the thong may break, and just when the key is most needed it is *non est inventus*. To remedy this is the design of the improvement shown in the illustration, patented through the Scientific American Patent Agency Aug. 13, 1867. It is so simple as to be readily understood without extended explanation. Two hinged plates are secured to the top of the



yoke, as seen, the free ends engaging with notches cut in the bow and holding it securely in place until it is forcibly raised by hand. The object and construction of the device is easily understood from the foregoing. For particulars Charles H. Post may be addressed at Guilford, Conn.

Correspondence.

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

Pyrites as a Source of Sulphur.

MESSRS. EDITORS:—At present, when, in consequence of the general dullness of business, the price of sulphuric acid is extremely low, it is to be regretted that manufacturers persist in the use of costly, imported brimstone, to the neglect of the excellent and cheap pyrites so abundant in this country. Their case is similar to that of the British chemical manufacturers, who persistently ignored pyrites till compelled to adopt it by the brimstone monopoly attempted by the King of Sicily, but since they have adopted it, find the benefit resulting from its use so great, that every large producer of sulphuric acid in Britain now uses pyrites as the source of sulphur.

During my experience of fifteen years in England, I have used an average of one hundred tuns of pyrites weekly, and had at least twenty different varieties of the mineral to work, and have usually found that each kind required, to some extent, a special mode of treatment to ensure the best results. When pyrites was first adopted in England, this was not understood, and, in consequence, it was no uncommon thing to find from ten to fifteen, and even more, per cent of sulphur left in the burnt ore; but as the subject was studied, and improved modes of burning adopted, this was reduced, till from one to four per cent of sulphur became the range, with an average of two to three per cent in well conducted factories. This point was not reached till much time and money had been spent in experiments, and I regret to learn that one or two manufacturers near New York have lately attempted to burn pyrites with poor success, in my opinion, owing to the to the badly constructed kilns they employed. I have seen a good deal of American pyrites, and have no doubt that those acid manufacturers who first adopt its use will obtain a great advantage over competitors in trade who continue to use brimstone. The proper apparatus for burning pyrites is not very costly, while by using it sulphur may be obtained at from one fourth to one third the cost of sulphur derived from brimstone. The quality of the sulphuric acid produced from pyrites is as good as that from brimstone, provided proper precautions are adopted to separate the arsenic, which may be easily and cheaply done. In short, the numerous objections to pyrites at present urged here, are the same phantoms which formerly haunted British manufacturers, and have been so successfully laid by a closer acquaintance with the subject.

A. G. HUNTER.

Fair Haven, Conn.

Foreign Matter in Wood.

MESSRS. EDITORS:—I have noticed in your publications several interesting facts under the above head, and wish to add two which came to my notice. About sixteen years ago, three English bayonets were found in a tree on Staten Island. The tree was about two feet in diameter, and the bayonets were found nearly in the center, and about five feet below where the body of the tree was forked. About the same time, I saw a musket ball exposed in a pine board. The ball fitted perfectly close, the wood was solid around it, the fiber was not ruptured, neither was there the least sign of it before the board was planed, and it was evident to all who saw it that the ball could not have entered since the board had been cut from the log. The tree from which the board had been cut could not have been less than two and a half feet diameter, and the ball was about eight inches from the center.

J. NADER.

Sandy Hook.

Improvement Needed in Railroad Management.

MESSRS. EDITORS:—Can I say a word about railroads, or is the verdict of a coroner's jury all that can be allowed, however softly worded, against the management of our railroads? Why is it that with all our inventions and improvements looking to the safety of railroad travelers and the property of shippers, the directors of our lines choose to adhere to their old-time and obsolete notions rather than give our inventors and mechanics a chance to help themselves and benefit the public, railroad directors and stockholders included?

It would seem that it would be the part of policy to have such an oversight of a track as to keep the road bed and rails in good condition; and that it would be better to use *good* iron and steel rails in preference to poor ones, even if the former did cost more at first. Do not our railroad companies lose by using heavy locomotives and cars and by drawing almost incalculable loads over their insufficient roads? I think it would be better to employ locomotives of from eight to twelve tuns, with cars corresponding in weight, and smaller trains, rather than to crush the rails with the enormous weight now put upon them.

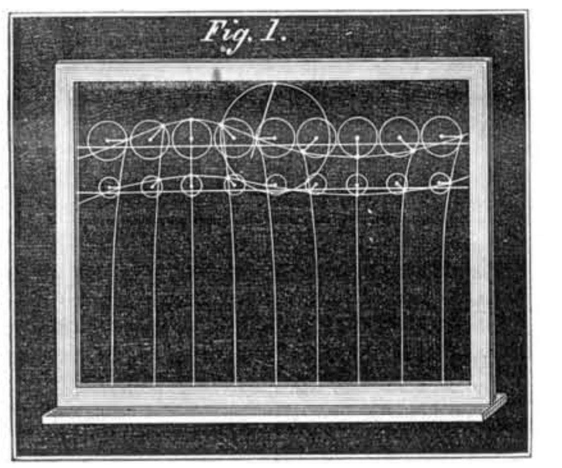
"The times are out of joint." A reform is demanded, or we must all stay at home.

D. P.

The Wave Theory.

MESSRS. EDITORS:—In the *American Journal of Science and Arts* for May, there is a description of a new wave apparatus, invented by Prof. Lyman, to illustrate the modern wave theory, viz., "that in wave motion all the particles of a liquid are revolving synchronously in vertical circles." The author of the article alluded to, states that, "in teaching this theory, however, it is often difficult to make pupils understand how the infinitude of simultaneous revolutions, which it supposes, can take place without mutual interference, and in such a way as to produce the observed phenomena." Now, Messrs. Editors, when I read the last quotation I was glad, for I myself have had difficulty in comprehending the new theory, and I was really beginning to depreciate my own mental capabilities, when this timely paragraph set my mind at rest. There are others who are "at sea" upon this wave theory as well as myself, and I should certainly find some in a New England University who find its comprehension difficult. It is not, then, because I read my *Silliman's Journal* in a shop, or exercise my muscles at the work bench rather than in rowing or at football, that I find difficulty in comprehending the modern wave theory. There seems to be something in the theory itself which *is* difficult to comprehend, and that necessitates the invention of special apparatus.

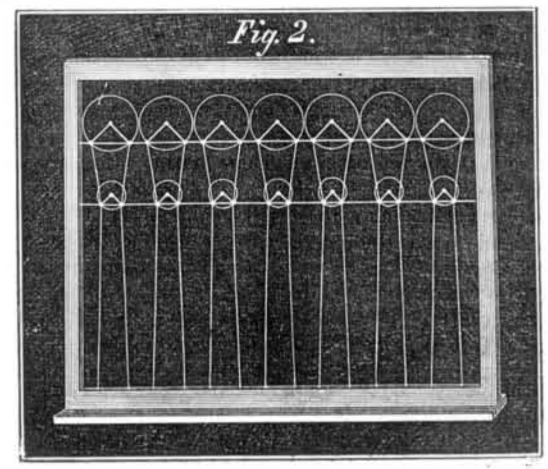
If you will kindly grant me space, I will here transcribe the cut and description of the apparatus from the journal referred to, and afterward explain to you the difficulties which my friends at Yale and Harvard no doubt, in common with myself, find in comprehending it. I am well aware that in your estimation an opinion, provided it be based upon sound logic, is as valuable propounded by a man in his shirt-sleeves, as though he wore a professor's gown. The mechanics esteem you as the champion of practical ideas in America, and no



doubt the *Journal of Science* is the leader of theoretical science on this continent, and we respect it and bow to it as such; but in this case I have found a conflict between the theory and the facts (at least I am so convinced), and my experience has taught me in such conflicts to always stick to the facts.

"In front of a plane surface are two series of revolving arms or cranks, the length of the lower ones being half that of the upper. Two elastic wires connect the crank-pins of each series; upright wires also connect each pair of cranks, and pass down through a plate into the base. The cranks all revolve synchronously; they thus keep their relative position, and come into any given position successively, each in its turn. The relative position of the cranks of each horizontal series is such, that the directions of any two, in regular order, differ by the same fraction of a whole revolution, that the distance between their axes is of a whole wave length. Thus, in the apparatus, the wave length is supposed to be divided into eight equal parts, and hence the common difference between the directions of adjacent crank arms is one-eighth of a circle, as shown in the figure. The cranks in each vertical set have their positions always alike. The number of cranks, whether taken horizontally or vertically, is arbitrary—a matter of convenience in construction. The synchronous revolution of the cranks is effected by means of any suitable mechanism, such as equal toothed wheels on the several axes, with alternate idle wheels connecting them; or, equal rag-wheels, with endless chain, or metallic ribbon; or, equal cranks, with a rigid connecting frame, or plate. The first method is used in the original machine, the third in the model for the patent office, the second and third in the larger and smaller sizes, respectively, for the market.

"The crank pins represent as many liquid particles; the circles on the background their orbits. The transverse wires represent continuous lines of particles, which at rest would be horizontal, and be represented by the lines on the background drawn just below the centers of the orbits; the upper one of these being the surface line, the lower a line of particles one-ninth of a wave's length down. The upright wires represent lines of particles which at rest would be vertical. Every point in these moving lines describes its own distinct orbit. The apparatus is constructed to a scale, and so, represents a wave of given length, hight, and period; but equally, represents, also, a wave of any other length and proportionate hight, though of period proper to its length, according to the law of that relation, as stated further on. In the original instrument, for example, the wave length is 36 inches; hight from trough to crest, 4 inches; and period for that length, 0s 76; but it equally represents a wave whose length is 36 feet, and hight 4 feet, with period 2s 63; and similarly for other proportional dimensions."

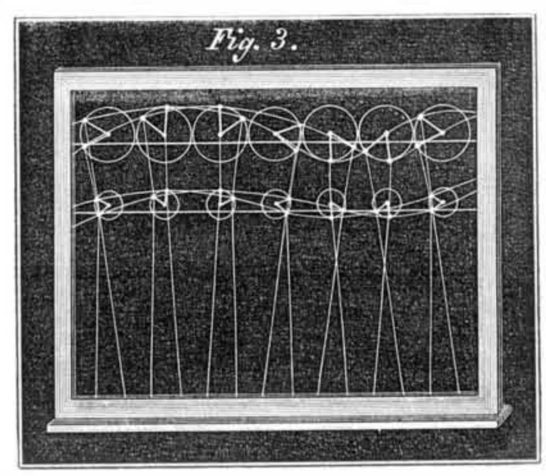


I felt that it was presumptuous in me to entertain a doubt that this apparatus was all that was claimed for it, and that it illustrated so many characteristics of wave motion; but a habit of overlooking authority and thinking for myself (a habit, by the way, which has injured my reputation among the good orthodox people who are my neighbors) led me to examine it, and my examination led to doubts, which my experiments made with a similar apparatus, extemporized for the occasion, confirmed. I give a drawing of the apparatus which I constructed.

Conceiving that the apparatus constructed by Prof. Lyman was deficient, in that it showed only one horizontal and one vertical line of particles traversing the orbits of the particles represented by the crank pins, I made my apparatus with two cranks for each orbit, and connected them with strips of india rubber. I was not surprised when, upon attempting to arrange these cranks as in Prof. Lyman's apparatus, so as to represent the form of a wave, I found the result indicated in Fig. 3.

Clearly a case of interference; one which I could not reconcile with the modern wave theory.

After all, thought I, what is the use of such apparatus, when I can have the "real thing?" If I could only dig a vast pit by the ocean, and erect a shore of transparent glass and look through it at the motion of the water, I might see what the real motion is, and thereupon I set to work to construct an ocean with glass shores. It is eighteen feet in length and 12 inches from shore to shore, and its depth sixteen inches. It was a little more difficult to make a gale of wind; however by the aid of an old blacksmith's bellows, I contrived to simulate all the phases of wind, from the



"zephyr softly breathing" to the steady breeze and the hyperborean blast. In order to enable myself to see the internal mysteries of my ocean, I sought for some fine particles which the eye could easily distinguish, and distributed them pretty uniformly through the water.

Experiment 1.—Steady and continuous but moderate breeze in a direction nearly horizontal upon the surface. Result—A surface current in the same direction as the wind, with undertow in the opposite direction. Current well defined.

Experiment 2.—Steady and continuous but very strong blast, in the same direction. Result—As in first experiment, except that the current was more rapid, and involved more of the mass of the fluid.

Experiment 3.—Sudden gusts at regular intervals. Result—Distinctly marked waves of apparently equal length, except at the extremity opposite the bellows, where the waves were changed into well-marked breakers, upon the vertical end of the tank. Seen through the sides of the tank the particles floating in the water gave no sign of revolution, but danced up and down with the undulations of the surface, the motion growing less toward the bottom, where there was comparatively little motion.

Experiment 4.—Sudden gusts at irregular intervals and of different degrees of force. Result—The waves no longer of equal length, but interfering with and crossing each other, in