he insists that "the crystallization in iron or any other metal *can never take place in a cold state.* To form crystals at all, the metal must be highly heated, or nearly in a molten state."

The opinion is quite prevalent among engineers and men devoted to science, that tough metals in a cold condition do become crystalline and very brittle, when subjected a considerable period of time to tension and vibrations. The breaking of the axles of railroad cars, the piston rods of engines, and the iron stringers of bridges, is oftentimes attributed to the metal becoming crystalline. But, while Mr. Roebling is a disbeliever in the crystalline theory of vibrations, he admits that tension and vibrations impair the strength of iron while it retains its fibrous cha acter. This, he considers, is due to a separation of the threads of the pure iron, and the *cinder* with which it is combined, by the vibrations, thus destroying the cohesion of the particles. This is a most interesting question, and the opinion of Mr. Roebling is of great weight in the matter. He asserts that the cables of the Niagara bridge are made of a superior quality of metal; that they possess an abundance of strength; are free from vibration; that they are well-preserved, and may be safely trusted for a long series of years. As iron, in large structures, has been applied only in very recent years, long experience on a large scale has not yet been obtained; but, so far as that experience goes, Mr. Roebling is of opinion that "good iron, not overtaxed by tension and vib ation, and otherwise preserved, will prove one of the most durable building materials at our disposal."

CREOSOTING RAILROAD TIMBER

The facility with which timber can be worked into almost every variety of form, the fibrous and elastic character which it possesses, combined with great strength in proportion to its weight, renders it unrivaled as a material for many purposes. With its many good qualities, however, it has a number of inherent defects, such as combustibility when exposed to high temperatures, and proneness to early decay when exposed to moisture and the atmosphere. In bridges, ships, and other structures, it commences to decay from the very moment it is exposed. When placed in dry situations it endures for quite a long period, but when situated, like railroad timbers, partly above and partly under ground, exposed to air, heat and rain, its life is of very brief duration. The vast expenditures incurred for railroad timber—the sleepers of which have to be renewed every few years—have naturally drawn much attention towards the discovery of some process to render it more enduring. The Kyanizing, Payenizing and Burnettizing processes, for infusing the chlorides of zinc and mercury and the sulphate of copper into the pores of wood, so as to coagulate its sap and render it insoluble, have all been tried with more or less success, but recent experiments in England with creosote seem to give it the palm as a preservative agent over all other substances which have been heretofore used. On the Buckinghamshire Railway about ninety thousand sleepers that had been treated by the above-named three processes, and about thirty thousand prepared with creosote were laid down, and it was found that thelatter were far more durable than the others. Timber which had absorbed about eight pounds of liquid creosote to the cubic foot was apparently as sound at the end of five years as when first treated. It has also been stated that this peculiar substance not only prevents the decay of timber that has been treated when in a sound condition, but it also arrests decay after it has commenced in timber. This is a most valuable condition, and its reliability has been tested on quite a large scale on the Great Northern and the Lancashire and Yorkshire Railroads (England), on which roads creosoted timbers, that have been down for ten years, appear to be as good as when first laid.

This is an important question for our railroad companies; they may have their timbers creosoted on the very spots where the trees are cut down in the forests. Creosote is a product of the distillation of wood in retorts, and it receives its name from its well-known power to preserve animal substances by coagulating the albumen. It is a liquid which may be made from the refuse or useless parts of the very trees that are chosen to make railroad timbers. It can be kept in wooden tanks into which the timbers may be placed and sunk by weights so as to steep them for several days under the liquor. Creosote has a pungent odor, but this is not very objectionable; it is the same as that which flavors smoked ham, and to many persons it is far from being disagreeable. All timbers for bridges, the sills of buildings, and the sleepers of railroad tracks should be treated with this substance or some other equally as good, if there is any. The refuse creosotic compounds of coal oil—those which are obtained from distilled coal as well as from the natural oil wells—may be as powertully antiseptic in their nature as creosote distilled from wood. Experiments should be made to determine this, because such products are now thrown away as waste, whereas they may be usefully applied to render exposed timber ten times more enduring than it now is, and thus save millions of dollars to our country annually.

CONTRACT FOR A STEAM FIRE ENGINE.

We take the following common-sense, practical suggestions from the New York *Times*. There is one very great and unquestionable advantage of free institutions and a free press; they furnish the government with the whole combined knowledge and wisdom of the community:—

To the Editor of the New York Times:

I see by your paper of last Friday that there was no bid for the building of a steam fire engine for Hose Company No. 5. I believe the reasons are, that the advertisement was not conspicuous, being mixed up with street contracts; that the time was too short, and that, so far as one builder is concerned, the specification of a cylinder not less than 6¾ inches bore by 8½ inches stroke, deterred him from bidding, his engine being rotary. I know one establishment that was disposed to bid for the contract, but had only five days notice, which was not sufficient to make an estimate, unless the design had been already made. A month would be but a moderate time for a shop not already in the business, to propose a plan and estimate upon it; and I respectfully suggest that the authorities should allow this time, and more, if they can spare more.

I further suggest that the printed forms should be sent to all the fire engine builders and to the principal machinists, and that the proposal should be advertised and also noticed in the SCIENTIFIC AMERICAN, and other papers that go to machine shops. I do not believe that two out of twelve or more shops that build steam fire engines knew that this matter was open to them, or could have been able to make their bids in time. The reference to a particular New York engine, as to size and style, would make it necessary to see that engine in order to estimate properly.

I would further suggest that the specification should be revised, the work to be done fully stated, and no reference should be made to the engines now in use, to render a journey to New York necessary as a condition of being able to make an intelligent estimate.

Yours, respectfully,

AN ENGINEER.

THE FAIRS OF 1860.

We take the following full list of the agricultural and mechanics' fairs of this Fall from *The Country Gentleman*, omitting those which have already been held:

NATIONAL.

American Institute.....New York, opens Sept. 27.

STATE.

Alabama.....Montgomery, Oct. 29, Nov. 2.
Canada, Upper.....Hamilton, Sept. —
Connecticut.....No exhibition on account of cattle disease.
Georgia.....Atlanta, Oct. 23, 26.
Georgia, Planter's.....Macon, Dec. 3, 59.
Georgia, Lower.....Savannah, Nov. 22.
Indiana.....Indianapolis, Oct. 15, 20.
Iowa.....Iowa City, Oct. 2, 5.
Kentucky.....Bowling Green, Sept. 18, 22.
Kentucky, North Eastern.....Ashland, Sept. 18, 20.
Maine.....Portland, Sept. 25, 28.
Maryland.....Baltimore, Oct. 30, Nov. 3.
Michigan.....Detroit, Oct. 2, 5.
Minnesota.....Fort Snelling, Sept. 27, 29.
Mississippi.....Holly Springs, Oct. 16, 20.
Nebraska.....Omaha, Sept. 19, 21.
New Hampshire.....Manchester, Oct. 3, 6.
New York.....Elmira, Oct. 2, 5.
North Carolina.....Raleigh, Oct. 16, 19.
Ohio.....Dayton, Sept. 25, 28.
Oregon.....Oct. 2.
Pennsylvania.....Wilkesbarre, Sept. 24, 27.
St. Louis Ag. and Mech. Association.....St. Louis, Sept. 24, 30.
South Carolina.....Columbia, Nov. 12, 10.
Tennessee, Mid. Div.....Franklin, Sept. 24, 28.
Virginia.....Richmond, Oct. 22, 28.
Wisconsin.....Madison, Sept. 24, 29.

HERMETICAL MASTIC OF GRAPHITE.—The preparation of this cement is very simple. A mixture is made of 6 pounds of plumbago, 3 pounds of fine chalk, 8 pounds of the sulphate of baryta, and 3 pounds of linseed oil, well boiled. The black lead, chalk and baryta must be reduced to a very fine powder, and well-mixed with the oil. A cement is thus obtained which, as shown by experiments, is much superior to that made with red lead, and which may be employed with great advantage in luting the joints of steam boilers, water pipes, gas pipes, &c.—*Journal de L'Eclairage au Gaz.*

APPLICATION FOR THE EXTENSION OF A PATENT.

Improvement in Drawing Frames.—Eliza Pray, administratrix of Joseph Pray, deceased, and Christopher Stafford, of Plainfield, Conn., has applied for the extension of a patent granted to the said Joseph Pray and C. Stafford on the 12th of November, 1846, for an improvement in the above-named class of inventions. The testimony will close on the 20th of October next; and the petition will be heard at the Patent Office on the 12th of November, 1860.

DR. BRADLEY'S IMPROVEMENTS IN TELEGRAPHING.—On page 274 of Vol. I. (new series), SCIENTIFIC AMERICAN, we noticed an improvement in telegraphing, invented by Dr. L. Bradley, now of this city, by which from 10,000 to 15,000 words per hour could be transmitted, in place of 1,500 or 2,000, which had been the previous limit. On applying this apparatus to long circuits, however, Dr. B. found a limit to the rapidity in the action of the relay magnet, and he has since been engaged in improving this part of telegraphic apparatus. He has now a relay which will enable him to transmit 10,000 words per hour. He has also connected this relay with an improved sounding apparatus which enables him to dispense with the local circuits for those who read by sounds. A full illustration of this great invention will appear in our next issue.

MACHINE SHOP ARCHITECTURE.—The illustrated article, published in another part of this paper, on Iron Works—their arrangement, location and construction, will be found worthy of the attention of such of our readers as take an interest in the subject. It is written with intelligence and ability, and will commend itself to a large class of our readers, as the subject is an important one, and has never before been presented in any journal so far as we know. The article, with accompanying plans, will be completed in our next number.

MCCORMICK AND THE PRESS.—In our issue of the 25th ult., we noticed the peculiar manner in which the famous inventor of the reaper, Mr. McCormick, became connected with the newspaper press of Chicago. It seems acording to the *Times* and *Herald* of that city, that Mr. McCormick did not get the control of the *Times* by the summary process of enforcing certain claims which he is alleged to have purchased against it. The transaction, as it is detailed, shows, that he acted all the while like a straight-forward man.

RECENT AMERICAN INVENTIONS

The following inventions are among the most useful improvements patented this week. For the claims to these inventions the reader is referred to the official list on another page:—

MAGNETO-ELECTRIC MACHINES.

These improvements are for the most part applicable to either of the two common forms of magneto-electric machines heretofore constructed, namely, that which consists of one or more series of helices composed of covered copper wire coiled round cores of soft iron, applied to rotate between or near the poles of a series of stationary permanent magnets, and that which is composed of one or more series of permanent magnets, applied to rotate near one or more series of stationary helices, but all the improvements are applicable to machines of the first-mentioned form. The first improvement consists in the employment of a number of helices in each wheel or circular series proportioned to the number of magnetic poles in each circular series of magnets as three to two, for the purpose of making the attractive force of the magnets always counterbalance the retarding or holding back force. A second improvement consists in the arrangement of the helices of two or more wheels or circular series in a spiral relation to each other, that is to say, so that in a machine having two wheels or circular series of helices each helix of either wheel or circular series is in a line midway between the lines of the two helices of the other wheel, and that in a machine, having more than two wheels or series of helices, the helices of the several wheels are arranged in regular succession at a distance in advance of each other equal to the distance between those of each wheel or series divided by the number of wheels or series in the machine, the object of such arrangement being to bring the helices of the several series alternat-