Science and Art.

Beams and Girders.

MESSRS. EDITORS—I have just read the conclusion of Mr. D. H. Morrison's papers on beams, &c., as published in the SCIENTIFIC AMERICAN. I am pleased with the kindly manner in which he has alluded to what I have said on the same subject; and I trust I shall not be thought wanting in courtesy in coming direct to the question, and confining my remarks strictly to it.

First, let me furnish a very simple rule for estimating the strains in beams and similar structures—one that is known to be true. When the load is uniformly distributed, then suppose one-half of it to be placed on the middle of the beam, multiply this half load by one-quarter of the span, and divide the product by the depth of the beam, and the quotient will give the horizontal strain in the upper and lower parts of the beam. When the load is concentrated on the middle, then proceed with it as with the half of a uniform load.

Now apply this rule to Mr. Morrison's theory, and it will be found that he has made an error of just one-half in the first part, in assuming that the intensity of the horizontal strains are represented by the lengths of the horizontal lines, *g a* and *a i*; and it will also be found that he has committed a similar error in the last part. The horizontal thrust or strain is five tuns where he makes it ten. Now, as all his calculations as to the forms of beams and curves of equilibrium seem to rest on this assumption, his conclusions cannot be reliable.

In answer to his suggestion that the curve of equilibrium may be elliptical, because this form is supposed to be best for the upper side of a beam of uniform breadth, I will only say that such form was meant for such beams only. And I will add that the forms he suggests for rectangular beams are not practical, at least, not for solid ones, for they cannot be rolled; and if they should be cast in such forms, they would be greatly strained, if they did not break, in cooling.

To show that there is no neutral point in the center of a beam, any more than a neutral axis, let us suppose this point to be one inch, two inches, or three inches in diameter, and make a hole of this size through the center of the beam. Now it is quite clear that there can then be no strain within this opening, whether it be large or small, for there is no material within it to be strained; and this would be equally true of a similar opening in any other part of the beam. But retain the material of the hole in its place, and remove all the material above and below this part, then the strain will be wholly concentrated in this part or point, and will increase in intensity as the size of this part is reduced. This may be carried to an infinite extent, so that when this point has no magnitude, the beam will have no strength. Hence the theory of a neutral point is of no more practical importance than that of a neutral axis. We may, it is true, find a point or line that is midway between the positive and negative forces in beams; but it will depend altogether on the form and construction of the beam whether these points or lines will be strained or not. But to seek for such points first, and then base all our calculations as to strains on the distance these points may be from the centers of the opposing forces, seems to be about as sensible as it would be to seek first for a similar central point between a fulcrum and weight, or power, to determine the power or capacity of a simple lever. Indeed, a beam may very properly be considered a lever, regarding the vertical pressure on the bearings under its ends as the power acting upward, and considering the depth of the beam as the distance between the fulcrum and the weight or resistance, and half the length of the beam as the distance between the fulcrum and the power, that is, when the load is concentrated on the middle; but when the load is uniformly diffused over the beam, then the distance from the end to the center of gravity, or one-quarter of the span, will be considered as the distance between the fulcrum and the power. This rule agrees with the first, and both agree with the results of actual trials. The power may always be known to be exactly equal to one-half of the whole load, and one-half of the weight of the beam.

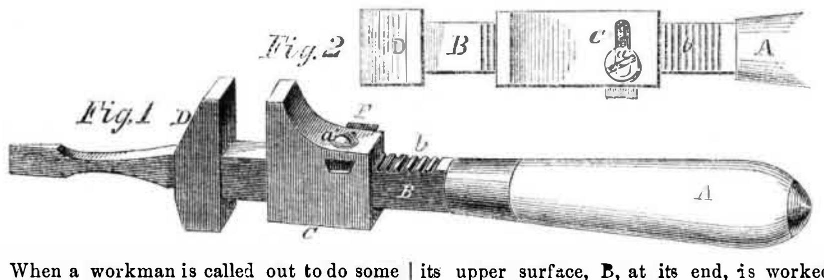
BENJ. SEVERSON.

N. B.—I also refer to "Haupt on Bridge Construction" (page 115), regarding strains in the chords. B. S.

Baltimore, February, 1859.

[Much attention has been attracted to, and a great deal of interesting information published on, this subject; but we are unable to devote any more space at present to its consideration.—EDS.

McKENZIE'S WRENCH AND SCREW-DRIVER.



When a workman is called out to do some work, the fewer tools that he has occasion to carry the better, and for such emergencies combination tools are very convenient, and they are also, as Mrs. Toodles remarked, "handy things to have about a house." The special tool to which we wish to call attention is a combined screw-driver and wrench—light, convenient, and acting with the sureness of two separate tools. It is fully shown in our illustrations, Fig. 1 being a perspective view, and Fig. 2 a front elevation of the implement.

A is the handle, which is made in the usual manner, and from it projects an iron bar, B, provided with a number of serrations, *b*, on its upper surface, B, at its end, is worked into a hammer head and wrench-jaw, D. There is a socket in the head, D, in which the screw-driver or any other tool can be fitted. The sliding jaw, C, is secured in any position on B to accommodate itself to any sized nut by a serrated wedge-shaped piece or button, F, that by a screw, *a*, works in a slot in C, and pressing down upon B the serrations or ridges on the under surface of F press into the depressions of *b*, and so hold the wrench fast on the nut which is to be turned.

This simple device is the invention of John McKenzie, of Troy, N. Y., who will be happy to furnish any further information that may be desired. It was patented May 11, 1858.

Important India-Rubber Decision.

On Friday morning last, in the United States Circuit Court, an important opinion was delivered by Judge Ingersoll in the cases of Horace H. Day *vs.* Carey, Howard & Sawyer, and others, against whom he had sued for injunctions to restrain them from making, using or selling elastic woven india-rubber goods. The Court denied the motions, and decided, among other things, that Day, himself, had no right whatever to make, use, sell, or apply Goodyear's invention of vulcanized rubber for the manufacture of elastic woven goods, or other elastic goods, or to grant licenses for the same, except "shirred or corrugated goods," made according to the patent issued to Charles Goodyear, dated March 9, 1844, as granted to said Day by agreements of October 29, Nov. 5, and Dec. 5, 1846. The exclusive right to all elastic goods, except such shirred goods, is vested, as we are informed, in William Judson, Esq., the attorney and counsel of Chas. Goodyear, except as relates to suspenders, the exclusive right to which is vested in the Nashawannuck Company, Mass.

In order that our readers may understand the nature of the invention in controversy, we present the following information in regard to it:—

These goods are formed by cutting sheet india-rubber into very narrow strips, or threads, say of one-eighth or one-sixteenth of an inch in width, and usually of the thickness of a card. These strips are then stretched upon a suitable board or table, in such a manner as that they may pass back and forth parallel to each other, say at the distance apart of one-fourth of an inch, more or less. The table or board is provided with pins, or notches, at each end, and round these pins, or through the notches, the threads are to be stretched as they pass back and forth; the stretching of these strips may amount to twice their quiescent length. Whilst so stretched, two lamina of cloth or other suitable material, of the requisite width and length, which are covered on one side with moist india-rubber cement, are to be placed one on each side of the stretched threads, the cemented sides being towards said threads; these lamina are to be brought into contact with each other between the threads, which may be readily done by passing a smooth piece of metal, ivory, or other article along the side of each of the threads.

The claim is to the forming of such goods by the stretching of strips, or threads, of india-rubber to such extent as may be desired, and the covering the said strips or threads on opposite sides with lamina of cloth, leather, or other suitable material, which lamina are to be united to each other, and to the threads, or strips, by means of india-rubber cement, the same being effected so as to produce a manufactured article substantially as described.

Heating Railroad Cars.

MESSRS. EDITORS—The common method of heating railroad cars with stoves is very defective, and is an annoyance to every traveler. The heat from a stove is mostly concentrated in a very small space, and is not diffused equally, as is required in long cars. I believe that steam might be conveniently employed as a far superior heating agent in the trains of every railroad in our country. The waste steam escaping through the smoke stack of the locomotive could be made use of economically for this purpose. The plan I propose is as follows:—Secure a flaring pipe at the end of each car, as the main conductor, and from this let several branch pipes of smaller size run through the car inside. The several cars of a train may have their steam pipes connected by flexible india-rubber joints, easily attached and detached, and the whole of these connected with the boiler of the locomotive.

Such an arrangement would heat railroad cars in a very safe, superior, and economical manner to that of stoves. As each car has its own independent connection, any one can be taken off at a station if not required, or more cars may be added to a train without the least difficulty. H. O. H.

New York, February, 1859.

[The heating of railroad cars by steam from the locomotive boiler has been proposed to us several times, and it is admitted that this would be the most convenient method of heating cars, but no really practical arrangement for this purpose has yet been applied. If railroad cars were to be heated by steam, the capacity of the locomotive boiler would require to be greatly increased, because it would take a very great amount of steam for this purpose. The exhaust steam could not be well applied, as it is required to produce the draft. Another point to be looked at in this connection, is the inability to heat the cars before they start on a trip.

It has also been proposed to heat cars with hot air, by pipes running through the fire-box of the locomotive, and extending by flexible connections through all the cars. Such an arrangement was illustrated in Vol. II, SCIENTIFIC AMERICAN; but it never was applied, so far as we know, on any railroad. It appears to be as good a system as heating cars with steam; but we think it will be very difficult to get either of these methods introduced. Some improvement over the present mode of heating cars is demanded, and the foregoing deserves the attention of all who take an interest in the welfare of the traveling community; and who does not, in this great *wide-awake* republic?

ECONOMICAL LOCOMOTIVES.—The locomotives of a new railroad line in Scotland are constructed to consume only seven pounds of coke per mile, or about one-fifth of the consumption of locomotives annually.

ACKNOWLEDGEMENT.—We have to thank the Hon. John Cochrane, Member of Congress for this city, for a generous supply of garden seeds, pamphlets, &c., of interest in a newspaper office.