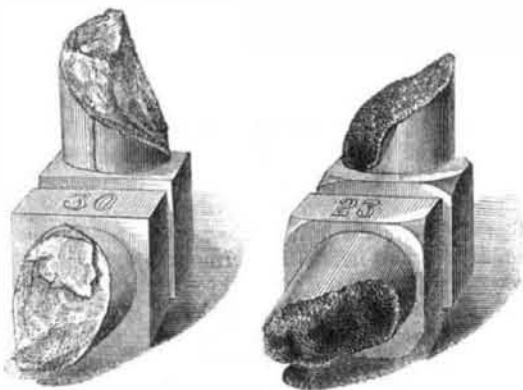
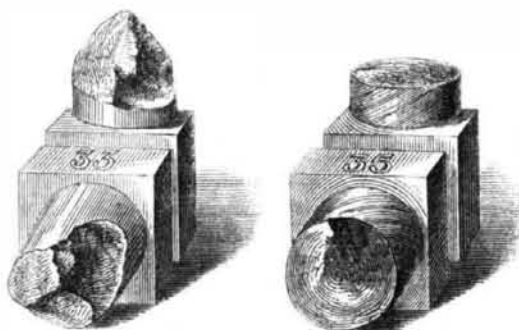


9. No. 68 is a specimen of low steel, and its peculiarities are those of "homogeneous" metal, or of steel made by either the Bessemer or the Siemens process. The test and an inspection of the fractured piece indicate its strength to be nearly double that of ordinary wrought iron, and prove its great ductility and resilience and its homogeneous character.

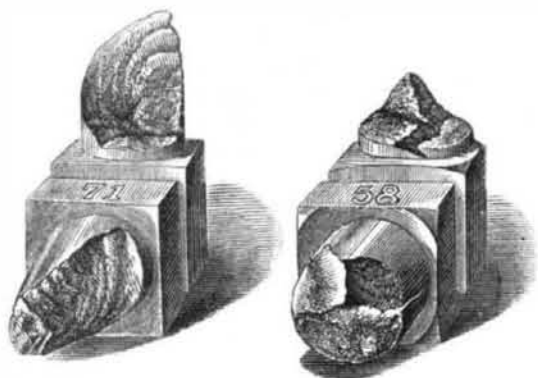


No. 71 is a piece of tool steel, having a strength twice as great as the best of iron, great elasticity, but a ductility only a fraction of that of good iron, excellent, in consequence of its strength and hardness, for tools and for resisting steady strain, but not so well adapted as steel of lower grade, or even as the better grades of iron, to meet shocks. Its jagged fracture and its fine even grain are evidence of the splendid quality of the metal and the perfect homogeneity of struc-



ture, which distinguish it from the fibrous wrought irons. The shear steels and the softer grades of tool steel usually exhibit an appearance very similar to 68, but are apt to crack along the side and through the neck, as is illustrated in No. 58.

10. Thus a little practice and careful observation will enable any good mechanic to test his materials even when he cannot afford to purchase a testing machine, and with a fair degree of confidence in the derived results, and at almost no expense.



A careful study of the accompanying illustrations, which the artist and engraver of the SCIENTIFIC AMERICAN have succeeded in making such perfect representations of these specimens placed before them, will assist greatly in the acquirement of this very valuable accomplishment.

Stevens Institute of Technology, Hoboken, N. J. December, 1873.

**The Vacuum Car Brake.**

The vacuum car brake consists of a brass globe or bulb about fourteen inches long and five inches in sectional diameter in the largest part, and in shape very much like a lamp globe. The neck of the globe is about eight inches long. The enlargement is made to allow steam to surround a smaller pipe, which conducts the exhausted air. This part of the air pipe is about six inches long and two in diameter, reaching nearly to the neck of the bulb, leaving a space all around about one eighth of an inch wide; this tube is fitted tightly into the bottom of the globe so that none of the steam may escape below. To the lower part of this globe the air pipe is nicely fitted. In an enlargement of the end of this pipe, there is an air valve arranged to prevent the refilling the vacuum, and just below this is a relief valve to allow the air to enter. These valves are conical, so that the greater the pressure the more tightly they fit. Beneath each car, and connected with this apparatus by tubes, made so as not to collapse, is a cylinder with solid ends and flexible sides, which are kept from entirely collapsing by iron rings. The ends of this cylinder are connected with the brakes, so that, when the atmospheric pressure forces the ends together, the brakes are put on. The steam, being introduced from the boiler, passes out around the end of the air tube and removes the atmospheric pressures, producing a vacuum. By enlarging the cylinders beneath the cars, the power may be increased at pleasure. —Polytechnic Bulletin.

**Ramming the Mold.**

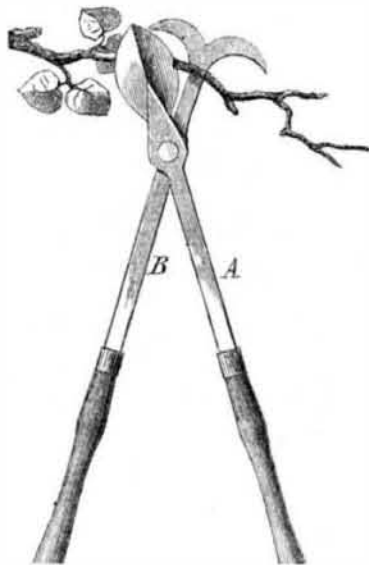
B. W. says: "In your number of November 22, 1873, you say that "ramming the mold is not a complicated performance, nor does it require the ability of a very skilled artisan." I have for many years been a close observer of losses in foundries, and I have found that about six tenths of the wastrels are on account of imperfect ramming, the latter being either too hard, causing the mold to blow and scale: or too soft, allowing it to strain as long as the metal retains its liquidity, and, when turned out, is too large to fit where it was intended. Hence the casting is condemned, in either case, on account of bad ramming. Any person posted in figures can calculate the pressure of fluids; but it requires the experience of years to know how much ramming is required to resist that pressure. He can only become skillful in the science of ramming by observing closely the result of every day's work, not only of his own, but of other molders also, so that he can ascertain the cause of any defect he may see on a casting, and thereby prevent the re-occurrence of the same. Ramming is a most complicated and important process; it amounts to but a very small portion of the cost of other work required to complete the job; but too hard, too soft, or irregular ramming, will cause all the work done on the job to be lost. The causes of the loss of the other four tenths are numerous, such as: Sand too wet, or too dry, inability of the molder to secure his mold before casting, lack of judgment in venting, lack of judgment in locating his gate to prevent warping and cracking in cooling, lack of judgment in stripping the casting so as to allow all parts of the casting to contract together, as that part of the casting that is allowed to contract last puts a great strain on a certain other part of the casting, and is likely to break it as soon as it is put to use. I hope the science of ramming will be further and more ably discussed in your valuable paper, and that you will be the means of getting molders to become more skillful with the ram, in which most valuable ability too many are lacking."

**IMPROVED PRUNING SHEARS.**

It is asserted that, to properly prune a tree, the limbs should be cut from the under side, and the blade should pass through them upon the outer side of the hook, resting upon the stump. In this way, horticulturists say, the end of the stump will not be splintered, and hence will be left in a better condition for rapid healing over.

Mr. Myron de Groodt, of Eaton, N. Y., has recently devised a pruning shears, acting on the above principle, by which the operator may cut off limbs upon opposite sides of the tree without shifting his position, on simply reversing the instrument.

The handle, A, connected with the blade, is grasped by the right hand, the handle, B, communicating with the anchor like hook with the left. In applying the shears, one of the arms of the hook is brought over the limb, and the handle, B, is held in a vertical position, while the other handle is elevated to open the jaws to a required distance. The blade then cuts through the limb from the under side and in an upward direction, with the hook bearing against the stump. To operate from the opposite side of the tree, it is only necessary to reverse the shears by simply moving the



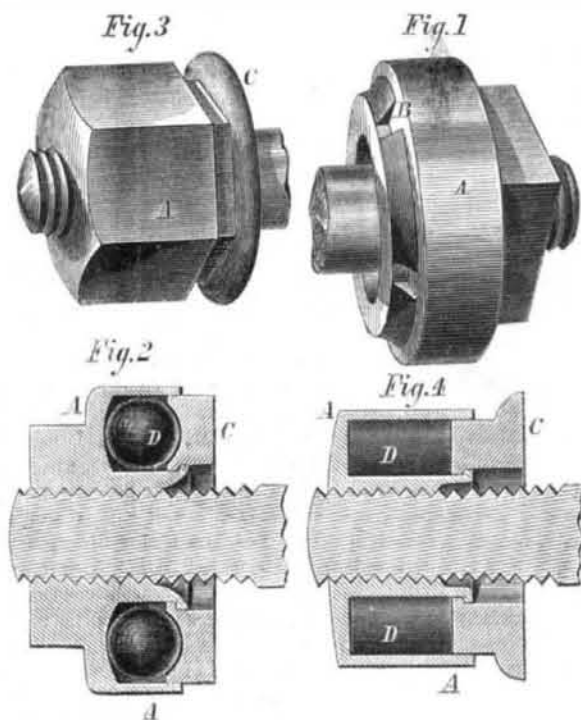
handles past each other without changing the hand, when the other edge of the blade acts with the hook precisely as before. In this way, the inventor says, a person may remain in one position and prune a tree nearly all around.

**IMPROVED NUT LOCK.**

The invention herewith illustrated is a new patent nut lock which, by the suitable combination with it of an elastic substance, is enabled to compensate for the longitudinal expansion and contraction of the bolt, thus preventing the nut from working loose under jars or shaking motions.

Our engravings represent two forms of the device as applied to railroad fish plates. In Figs. 1 and 2, which are perspective and sectional views between the two flanges, A, A, is provided a chamber containing inside radial projections, B, which fit into corresponding notches in a washer, C. These notches and projections serve to lock together the nut so far as rotary motion is concerned, compelling the different portions to turn together. Into the chamber, between the flanges, A, are inserted a number of rubber balls, D, which are also received in suitable concavities in washer, C, Fig. 2. When the nut and washer are screwed together, it is evident

that the balls are compressed and caused to spread until they fill nearly, if not entirely, the whole hollow space between the flanges, A. If the bolt becomes elongated by expansion, the balls take up the increase, through their own enlargement by elasticity, thus preventing the nut from working loose.

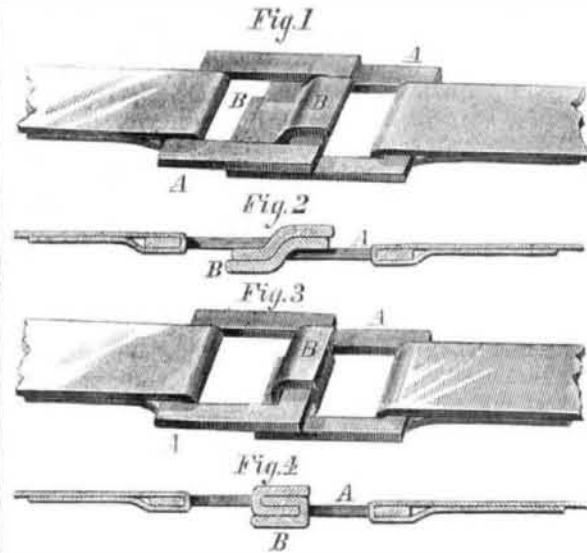


In Figs. 3 and 4, small cylinders of rubber are substituted for the balls, D, and the washer enters directly between the flanges. The tubular end of the nut is upset on the hole of the washer, in order to prevent separation of parts. The device appears simple and practical, and doubtless will meet with extended application upon railroads.

Patented November 25, 1873, by Casper Dittman. For further particulars address Dittman & Landis, Leacock P. O., Lancaster county, Pa.

**STARR'S COTTON BALE FASTENER.**

We illustrate herewith a very simple and ingenious device designed as a clasp or fastener for the bands which surround cotton bales. The invention is simply a square buckle of iron, A, having at its outer end a rigid tongue, B. Both sides



of the attachment are alike, so that, when the ends of the strap are brought together, the tongue of one buckle slips under that of the other, and interlocking takes place, as shown in Figs. 1 and 2. Figs. 3 and 4 are the same contrivance somewhat differently constructed, the tongue, B, being bent to form more of a hook. The device can be stamped or cut out of heavy sheet iron; and, if desired, a projection or stop may be combined with it to prevent the buckles slipping back after being once locked or hooked. The inventor states, however, that this latter precaution is entirely unnecessary, as a perfect double lock is afforded.

The mode of operating is as follows: After the bale is in the box, duly pressed, etc., the band is put on the top, hanging over in front with one of the buckles attached, hook out. The band is then brought under the bale, through the channel made for the purpose, and thence up to meet the attached buckle, when it is bent back on the inside. Over this bent end the second buckle is slipped, hook in. The two buckles are then brought together and locked as before described. The strap, it is stated, will not detach itself until the bale is put in the compress, when it can be easily manipulated.

For further particulars address the inventor, Mr. Henry D. Starr, Texana, Jackson county, Texas.

**WOMEN DENTISTS IN EGYPT.**—Dr. Edward Warren writes from Cairo, in Egypt, to a friend in Baltimore, that there is "a good opportunity for women dentists in Egypt, as the women are forbidden to consult with men." There are three or four English women practicing dentistry in Cairo already, according to Dr. Warren's letter. In all these eastern countries, there seems to be a wide field of usefulness and profit for woman doctors and dentists.