difficult or impossible to perform in front of a concave mirror are rendered perfectly convenient. The reflector may be so mounted as to enable the operator to keep its axis directed towards the sun, and thus to maintain a complete focus for a considerable space of time; and means may also be devised for separating the solar rays by filtration through proper absorbing media. Any good physicist will know, without being furnished with a diagram, how to construct the instrument, which may, indeed, be done in somewhat different ways, it being necessary only to give to the concentric rings or segments (which might best be made by depositing copper upon moulds of wood, covered with plaster and correctly shaped on a lathe) such a curvature and position that the parallel rays, striking them at various angles of incidence, be reflected to the same point. There can be no doubt that, with a large reflector of this kind, it will be possible to produce calorific effects of which we have at present no conception; and the instrument may not only become an important aid to Science, but may also find some useful applications in the arts. By the Balestrieri reflector, which consists of concentric conical rings or segments, the solar rays can naturally not be brought to a focus, but only be collected in an axial line. Its proper purpose is to cast the light of a focal flame in a certain direction into space, and it must answer that purpose quite well. A. PARTZ.

Paris, France.

Plant Vigorous Young Trees.

To the Editor of the Scientific American :

On page 70 of your current volume, you advise farmers and fruit growers to buy small trees rather than large ones. In a general sense you are perhaps correct; but practical pomologists know that to judge rightly of the value of a tree by its rings alone is quite impossible, there being other conditions of growth quite as important, and even more so, than the relative size and height of its trunk and branches. Having a pretty extensive experience in the planting and growth of young fruit trees especially, I have found the roots to be the most important consideration, and the best indication of vigor and quality; and were I compelled to purchase trees without seeing them, roots and all, I should much prefer seeing the roots than the trees proper; and indeed, with such evidence of their quality, I could not be greatly deceived. A tree with a fine mass of fibrous surface roots of a healthy, vigorous color, and thin, small, rather than thick, broken main roots, is sure to grow and thrive with any sort of fair treatment, and in almost any soil; but without such fibrous roots, and having only two or three large mutilated horns or prongs, and a heavy stub for a tap root, which must from necessity have been broken and skinned in removal from the nursery row, the tree were better thrown on the brush heap than given space and trouble in the orchard. In view of the fact that most of our nurserymen work their trees upon seedling root stock and leave them standing in the rows where first planted, it is easy to understand why so large a percentage fails to grow and thrive when removed to our gardens and orchards, and why in some cases, with the utmost care and attention, so many years of doubt and uncertainty must intervene before the fruit appears. In the deep fertile soil of the nursery, they send down long tap roots which, if left undisturbed, grow to the exclusion of anything in the shape of fibrous roots; and when the trees are finally removed for sale, this long tap root must of course be cut or broken off, and it is thus somewhat miraculous if the tree lives at all.

To buy only small trees will not entirely obviate the difficulty, although it is in every way poor policy to purchase or plant very large trees of any kind. But in procuring small trees, it is very important to know various other attending conditions: whether they are small simply from a stunted condition of growth and general lack of constitutional vigor, or because they are young, which of course is the only admissible condition. I have trees of three years which far surpass in vigor and size others of ten. I would certainly prefer even large trees, if vigorous, to small, stunted trees of like age. So it will be seen it is not safe to rely upon small trees altogether. A better rule would be perhaps to buy young trees rather than small, if, indeed, the matter can be narrowed down to one short invariable rule, which I very much doubt. Show me the roots of a tree, and I'll tell you how it looks above ground. Look at the roots first, then the wood and bark; do not care about the size so much, and you need not inquire very particularly about the age after having made the examination indicated. All reliable nurserymen are well acquainted with these facts, and should not mislead their customers in their catalogue classifications. The real, true quality of a fruit tree exists in its degree of vigor and thrift; and it is with reference to this, together with age, that the various grades and prices should be arranged.

Kingston, N. Y. H. HENDRICKS.

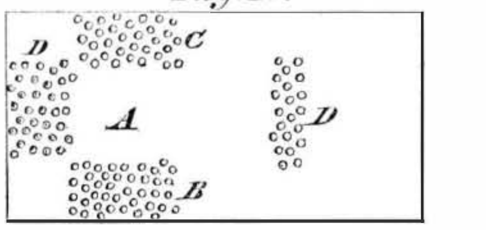
STRAIGHTENING WROUGHT METAL PLATES.

No. II.

As an example, let us take a plate, say 18 inches by 24, as in Fig. 10. The first thing to do is to ascertain where it is out of straight, which is done as follows: If it is a thin plate, say of 19 gauge, we rest one end of it on the block and support the other end in the left hand, as shown in Fig. 11; then with the right hand we exert a sudden pressure in the middle of the plate; and quickly releasing this pressure, we watch where its bending movement takes place. If it occurs most at the outer edges, it proves that the plate is contracted in the middle; while, if the center of the plate moves the most, it demonstrates that it is expanded in the middle. And the same rule applies to any part of the plate. This way of testing may be implicitly relied upon for all plates or sheets thin enough to be sprung by hand pressure.

Another plan, applicable for either thick or thin plates, and used conjointly with the first named, is to stand the plate on edge with the light in front of us, but not overhead, as in Fig. 12; we then cast one eye along the face of the plate upon which the light falls, and any unevenness will be made plainly visible by the shadows upon the surface of the plate. The eye should also be cast along the edges to note any twist or locate any kinks. Perhaps our trial by these tests, employed either singly or in conjunction, demonstrates the plate to have the bulge in it, denoted in Figs. 10 and 11 by the inclosure within the line, A. This bulge is called a loose place; and if the plate is bent or springs back and forth a little, this spot will be found to move the most. The plate is, in fact, edge-bound, as it might aptly be termed; and hence, to straighten it, we do not attempt to batter the bulge down by placing the plate on a large block and hammering away at the convex side; but we place it on a small block and proceed to stretch the plate at and near the edges, and so remove the bulge or loose place without hammering it at all. The method of attack is to first hammer the plate, letting the first series of

Fig. 10.

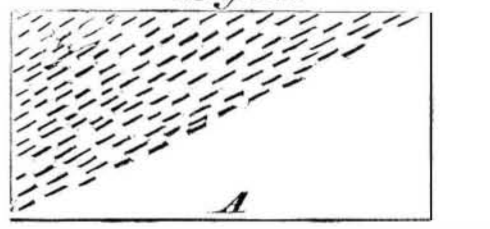


blows be delivered as denoted in Fig. 10 by the marks at B; and we then deliver the blows denoted by the marks at C and at D in the same figure. These blows will, if sufficient of them are delivered, remove the loose place. While giving these blows, the workman takes care to hold the plate so that his blows fall solid and do not " drum:" that is to say, if the spot where the hammer falls does not rest upon the anvil, the effect of the plate is similar to that produced by a drumstick upon a drum, producing no result save to jar the fingers holding the plate. And this jar is frequently sufficiently great to cause severe pain and sometimes injury

Fig. 11.

to the fingers. In removing the loose place, we shall find, in almost all cases, that we have induced contraction in the plate round about the spot marked D in Fig. 10; and this contraction we remove by a few blows, as denoted by the marks at D. In this operation, we have merely stretched the plate where it was necessary to release the loose place.

Fig. 11a.



Let us now suppose that our testing had shown the plate to be twisted. We then carefully note which edge of the plate is the straightest, and which is the one that is bent, and then place our plate upon the anvil, as shown in Fig. 11*a*, in which that part of the plate on the left hand side of the diagonal line is supposed to be the one that is bent, the bend lying downwards (the edge, A, being the straightest). We then attack the plate, if a thick one with the long cross face hammer, and if a thin one with the twist hammer; and in either case we deliver the blows denoted by the marks, the action of the hammer being to lift the plate in front of it. The blows at and towards the edges are always delivered first, the hammering being carried towards the middle, and being also wider apart as the middle of the plate is approached.

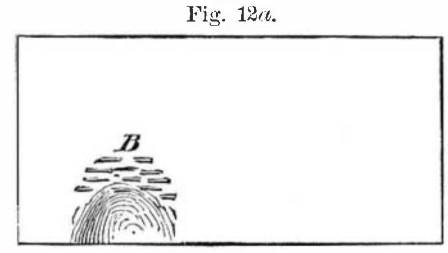
A plate is said to be contracted when the hand bending process shows the edges to move the most; and in this case all that is necessary to remove the contraction is to strike the plate a few blows about the contracted part, as we did to remove the contraction at D in Fig. 10. The blows in this case, however, may fall perpendicularly, and be delivered (for fine work) with a broader faced hammer.

To remove a kink or crooked place at or near the edge of a plate, we proceed as shown in Fig. 12, laying the plate with the convex side of the kink resting upon the anvil (the shaded part, A, representing the kink), and delivering the blows denoted by the marks at B, in Fig. 12*a*. We next turn the plate upside down, and strike the blows denoted by the marks or dashes at C, Fig. 13; and the kink will be removed.

Fig. 12.

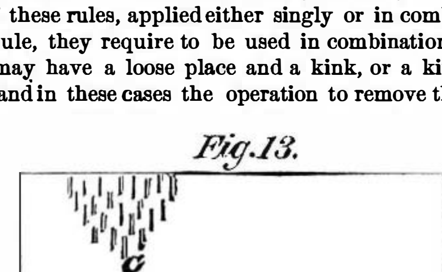
To straighten the plate shown in Fig. 9, we place it upon the anvil, as shown in Fig. 14, striking blows as denoted at A, and placing but a very small portion of the plate over the anvil at first; and as it is straightened, we pass it gradually further over the anvil, taking care that it is not, at any part of the process, placed so far over the anvil as to drum, which will always take place if the part of the plate struck does not bed, under the force of the blow, well upon the anvil.

Fig. 12*a*.



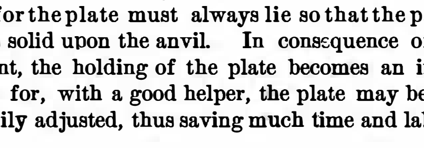
We have now explained all the principles involved in straightening wrought metal plates; and no matter in what shape a plate is bent, it can be straightened by the application of these rules, applied either singly or in combination. As a rule, they require to be used in combination: thus a plate may have a loose place and a kink, or a kink and a twist, and in these cases the operation to remove the one is

Fig. 13.



performed conjointly with that necessary to remove the other, either being slightly modified to suit the other operation. The anvil, it will be seen, must be small enough to permit of the plate being attacked in individual spots or places; for the plate must always lie so that the part being struck is solid upon the anvil. In consequence of this requirement, the holding of the plate becomes an important element; for, with a good helper, the plate may be quickly and readily adjusted, thus saving much time and labor.

Fig. 14.



A rude system of straightening is sometimes performed by the aid of a trip hammer, the finishing process being performed on a large iron block. This plan is crude, however, and is more productive of hammer marks than it is of true work. Very thick plates, those too thick to be readily affected by the blows of a sledge hammer, are made red hot and straightened upon iron blocks larger than the plates. For this operation large wooden mallets with very long handles are sometimes used. J. R.

OVER 13,000 applications for space have already been filed by the authorities of the French Exposition next year; 7,800 are from the city of Paris alone.