IRON COMBINATION BEAMS FOR BUILDINGS.

[Concluded from page 230.]

Mr. Fairbairn and other writers have given altogether too much prominence to frivolous and unimportant matter. Much of it is wholly irrelavent and inapplicable to this subject; while plain, practical truths of the highest importance have been overlooked. To expose all their errors and fallacies in detail would be an endless task; I will therefore leave them, and come to known facts and principles, and endeavor to show their practical value and applicability to the construction of floors and other structures of like character.

The advantages arising from a combination of cast and wrought iron in beams are greatest in structures of considerable extent; but to show its value in small spans, such as those for which solid wrought iron rolled beams are best adapted, it may be well to show their respective values, cost and adaptation to the requirements of the floor for the drill room referred to.

The room being 35 by 80 feet, having a wall (probably 12 inches thick) extending under the middle of the beam, their clear span will be 17 feet. And, as they require a bearing of six inches at each end, their length will be 18 feet. Placing them four feet apart, the entire floor will require 38 beams; total length, 684 feet. The 9-inch "I" beams, weighing 32 lbs. to the foot, will be 21,888 lbs. total weight. It is usual in such floors to make the brick arches and concrete about 13 inches in depth; as it is important to give to the beams as much vertical depth as the space occupied by the floor will admit of, the depth of the beams should also be 13 inches, instead of 9 inches, as proposed, as, by doing so, the strains in the chords of the beam will, for obvious reasans, be reduced in the same proportion as is 9 to 13. To illustrate this point, allow 75 lbs. to the square foot of surface as the whole weight of the floor, 66 lbs. as load, 34 lbs. to compensate for the effects of vibration= 175 lbs. to the square foot. Multiply this weight by 68, the number of square feet of floor surface due to each beam, and we have 12,900 lbs. for its load (its own weight included). This load on the 9-inch beams will produce strains in the chords equal to 36,550 lbs. And as the section of the chord is equal to 2 square inches, the strain to each inch will be 18,275 lbs. The web connecting the cords is not included in this calculation. Now, suppose this load to be placed on a beam of similar section in all respects, except being 13 inches in depth; then the strains in the chords will be only 25,304 lbs., equal to 12,652 lbs. to the inch. Difference in strain to the inch, 5,623 lbs.; total difference of strain in the chords, 11,246 lbs. Now, add to this great difference in the strains (and the consequent greater strength and stability of the 13-inch beam), the fact that when it is thus made of cast and wrought iron, in the manner and form proposed, with the upper chord curved downward from the middle towards the ends, it will weigh no more and eost no more than 9-inch beams, we have an array of real, obvious and practical advantages in favor of the compound beam that will bear down all the opposing theories advanced on this subject.

But to stop here would not be doing full justice to the questions connected with this floor. It is also necessary to call attention to the consequences that may result from the use of the 9-inch beams in a floor of 4 inches greater depth of brick and concrete, when the use of this floor is to be of an unusual character and peculiarly trying in its nature. The truth is, the 9-inch beams are too flexible for *any* such purpose; but to overcome this obvious defect, their makers recommend that they shall be propped up, and held in a cambered position while the arches are formed between them, and that they be thus held until the brickwork and the concrete are well *set*. This is usually done, and then the floor *seems* to have considerable solidity. But this apparent firmness is undoubtedly deceptive, owing, in part, to the inertia of the great mass of brickwork and concrete. It is also probable that this mass has the effect, to a considerable extent, of sustaining the pressure that ought to act in the upper chords of the beams, and would do so if the beams were as deep as the brick and concrete mass. But as the depth of the 9-inch beams is 4 inches less, they must, for this reason, act mainly as lower chords or ties to this mass. There is, then, this advantage of greater depth to be added to the inertia of the mass in accounting for the greater apparent solidity than is due to such flexible beams alone. This is a question of great importance, and ought to be well understood; for, however well such floors may answer for ordinary purposes, there can be no doubt that the strains and vibrations arising from the regular tramping in a drill room will soon fracture the concrete and shake the stability of the floor. With the other, the compound beam of 13 inches depth, with the strains less than 1-5th of its ultimate capacity, there need be no apprehension; and it will, of course, be understood that the strength of the compound beam may be increased to any extent desired by simply increasing the size or area of cross section. Their length may be made to span 30, 60 or even 100 feet; and, as the length and weight of them is increased, the cost per pound will be less than in light beams. In wrought iron, it is just the reverse of this; the larger cost most per pound. The arched form of the upper part of the combined beams will admit of the introduction of pipes for gas, water or any other purpose, to be imbedded in the concrete in all directions—across the ends of the beams, as well as parallel with and between them.

The object of these remarks is to show the proper application of *both* wrought and cast iron, and not to advocate the exclusive use of either the one or the other; wrought iron for all situations where the forces act tensively, and cast iron in *most* cases where they act compressively. But, notwithstanding the advantages possessed by cast iron to resist pressure, and in its easy molding to the forms required for such purposes, there are some uses of this kind to which it is not practical to apply it; such, for instance, as long and slender rafters, required to sustain light loads, there would necessarily be too slender to bear handling. They must therefore be made of wrought iron. But when the same length of rafters is required to bear heavy loads, and must therefore be made much stouter, then they should be made of cast iron. B. Severson.

Baltimore, Md., March 29, 1860.

STEAM PLOWING IN TEXAS.

Messrs. Editors:—None of the readers of the Scientific American, except those who have seen the Eldorado of the South, can form anything like a correct idea of the natural beauty, charming climate, and great agricultural importance of the State of Texas. I have ust returned from a three months' tour through that country; and, from what I have seen, I am fully convinced that it is the most desirable country on this continent, possessing all the elements necessary to make it a mighty empire. Nature has designed one portion of the great State for the shepherd and the herders of cattle; another for the planter and the tiller of the soil; and still another for the manufacturer of iron. Western Texas is thus pointed out as the proper location for stock-raising, and it is carried on to an astonishing extent. But, owing to the drouths that annually visit that portion of the State, it cannot be said to be at all calculated for planting or farming. Northern or north-eastern Texas abounds with iron ore, which, I am informed, is of the very best quality, and the quantity is inexhaustible. Eastern Texas is most emphatically the place for agricultural purposes; the soil being of the very richest character and the seasons reliable.

While passing through the State I found there was a great degree of interest manifested in the steam plow invented by Col. Saladee, formerly of Columbus, Ohio; so much so, indeed, that I was informed that the State is to make a large donation of lands to the inventor for the successful introduction of his machinery within her territory. While in Galveston, I made the acquaintance of an intelligent gentleman, who gave me a very correct idea of this truly wonderful invention. Col. Saladee has reversed the principle adopted by all other inventors, namely, of contriving a machine which shall be able to propel itself and *drag* the plows; for he makes *the action of his plows to propel the machine*, and thus he overcomes all the difficulties which past experimenters have met with. Another remarkable feature in this invention is that there is no portable steam engine now in use better adapted to all kinds of farm work. And, in addition to this, it possesses the advantages of being readily converted into a ditching machine, which will cut ditches the required width and depth, and distribute the dirt on either or both sides, any required distance from the edge. A reaper and mower, of the most novel construction, is also to be connected, as well as the most simple arrangement for driving posts for the construction of fences on prairies. This, plow, also, is intended to sow the seed, roll and harrow the land at the same time it is plowing. In short, if any premiums are offered on steam plows for the greatest *variety* of work they will perform, Col. Saladee is certainly designed to take the lead.

Col. Saladee's "Pine Island Farm," situated in Jefferson county, on the line of the Texas and New Orleans Railroad, is one of the most beautiful I have seen in the State. Its general appearance to the eye of the traveler passing on the railroad, when compared with those around it, at once leads him to the conclusion that a man of genius and enterprise lives there. The work on the railroad above-named is progressing finely, and I presume by this time two rivers (the Nachez and Trinity) are connected. This road, when completed through to New Orleans, will be one of the greatest thoroughfares in the South. D. M. Richings.

Merata, Pa., April 2, 1860.

GLAZIERS' DIAMONDS FOR MILLSTONES.

Messrs. Editors:—Millstones are dressed for the following reasons: to keep their faces, when the flouring is done, perfectly plane and true; to keep the furrows deep enough to ventilate the stones, assist in carrying out the feed and cutting it up in small pieces; and, further, to sharpen the face. To perform this latter operation to the best advantage, we take the red staff with water paint on it, and run it over the face of the stone, which shows the high places and parts of the face, and these only are dressed, which makes them wear down and keep the face true. The usual practice is for the miller to take his picks, with their edges ground perfectly sharp, and dress all the red parts of the face in parallel lines, from 16 to 24 to the inch, leaving the smooth painted face clear and distinct between each line; and the lines are usually cut the same way the furrows are laid out in the stone; some fancy millers putting in 30, 40, or even 50 cracks to the inch, which, of course, makes very fine lines. It was this species of dressing that I talked about doing with a glazier's diamond; and I tell you it has been done. J. G.

Patriot, Ind., April 2, 1860.

HEAT IN PHOTOGRAPHY.

Messrs. Editors:—A few days ago, while experimenting with some photographic positive prints on paper prepared with ammonia-nitrate of silver, which had been fixed with hyposulphite of soda but not toned, I found, on pressing them with a hot iron, they re-assumed their purple or black tones according to the degree of intensity to which they had been pressed. Has this effect of heat been known before or is it new? I have not seen any account of this method of toning prints in any work on photography that I have read. By explaining the cause of this you will greatly oblige— W. J. T.

New York, April 9, 1860.

CAN WE SEE OUR OWN EYES?

Yes; for sight is effected by means of the rays of light that proceed from the visible object to the eye. In every instance the rays are turned, more or less, from their course. Whether this deflection be caused by refraction or reflection is immaterial; if the visual ray reaches the eye, the object is seen. We speak, indeed, of seeing an image in a mirror, but the image has no actual existence except in the mind. The mirror merely turns back the rays of light so that they reach the eye, and thus enables us to as truly see the object itself as when we look directly at the object through the air, glass, or other refracting medium. C.

Lobster Fishing.—The season for taking these crustacea (says the New Bedford *Mercury*) has just begun, and will continue till July. In the cold weather they strike off into deep water, where it is probably warmer than near the shore. As the warm weather approaches they leave their deep-sea retreats, and coming near the land, immense quantities are caught in traps made for the purpose, with a self-acting door, which opens as they pass through and immediately closes, leaving the lobsters in "durance vile." Lobsters are caught on the coast of North America, from the St. Lawrence river to the Gulf of Mexico. They have been known to live without any sustenance, after being caught, for six months. It is estimated that not less than 1,200,000 lobsters are carried into Boston during each season. They are sent from that place, boiled, to every part of the State.