AMERICAN INDUSTRIES.—No. 44.

THE MANUFACTURE OF WESTON'S DIFFERENTIAL PULLEY BLOCKS, SAFETY HOISTS, ETC.

The invention of the differential pulley block by Mr. T. A. Weston, some years ago, was the accomplishment of a radical improvement in one of the oldest mechanical appli ances known to man. The ordinary tackle block, in more or less perfect form, is known to have been in use among the early Egyptians, and probably dates back to the earliest days of civilization. The device, like the art of sewing prior to the invention of the sewing machine, continued without essential change until Mr. Weston at a single stroke increased its efficiency thirty or forty fold, gave it its self-sustaining capacity, and added that quality of safety which gives to the differential block its greatest value. First introduced in England, the invention spread rapidly over the entire mechanical world, and has now long been recognized as an indispensable adjunct in mechanical operations of all kinds. Its greatest charm lies in its *absolute simplicity*, for it is the reduction of a mechanical problem to its simplest possible terms. To this fact may be attributed the extraordinarily rapid adoption of the device as soon as introduced, and the universal popularity and esteem in which it is held.

In the ordinary or "direct" style of block one man can lift from one thousand to two thousand pounds. By means of the recently added "geared" style of block the lifting capacity of each man is increased to from two thousand to five thousand pounds. With both styles the load is always self-sustained, and *cannot run down*. To effect lowering it is necessary to reverse the motion of the chains, by pulling on them, when the load will descend, but only so fast and so long as the chains are moved by hand. If at any time the chains be let go, either in hoisting or lowering, the load immediately comes to rest.

In the illustrations on the first page of this paper are shown the principal details of the manufacture, as well as some of the most important uses to which these hoisting devices are put. In the differential pulley, as is well known, the wheels in each block are made with sprockets, in which the links of an endless chain must lie smoothly and fit exactly. The chain passes around but one wheel in the lower block, but in the upper block are two wheels on the same shaft, one a small fraction larger than the other. In hoisting, the chain is taken up on the larger, and paid off from the smaller of these two wheels, while in lowering the reverse occurs, the effect on the load being due to the *difference* in the diameters of the wheels. This difference, as already stated, is very slight, and the differential effect that is obtained, therefore, gives the operator an immense leverage in handling the load. In making what is styled the "direct" differential pulley blocks, the loop in the chain which hangs loose and free from the upper pulley is used to pull upon in raising or lowering the load, and this loop is lengthened or shortened as the load goes up or down; but in the "geared" pulleys, which have been since introduced, an extra wheel is added to the upper block, from which an endless hand chain depends, the length of which does not change. By this simple addition to the "direct" differential pulley its power can be increased from three to five fold without making the blocks or apparatus any more cumbersome or complicated.

The prime essential in these pulleys, and the condition without which they would be worth little more than so much old iron, is to have the shape and pitch of the sprockets in the wheels exactly right, and then to make the chains so they will fit perfectly, without danger of stretching. When, therefore, the Yale Lock Manufacturing Company, about five years ago, purchased the patents of Thomas A. Weston on differential pulleys and other hoisting apparatus, they set themselves to making such improvements in the manufacture, and to the attainment of such exactness in workmanship as would leave nothing to be desired on this score. The company already had a wide reputation for the excellence of their locks, but in the new field they then commenced to work they achieved a success in every way commensurate with that they had won in the specialty with which they have been for so many years identified.

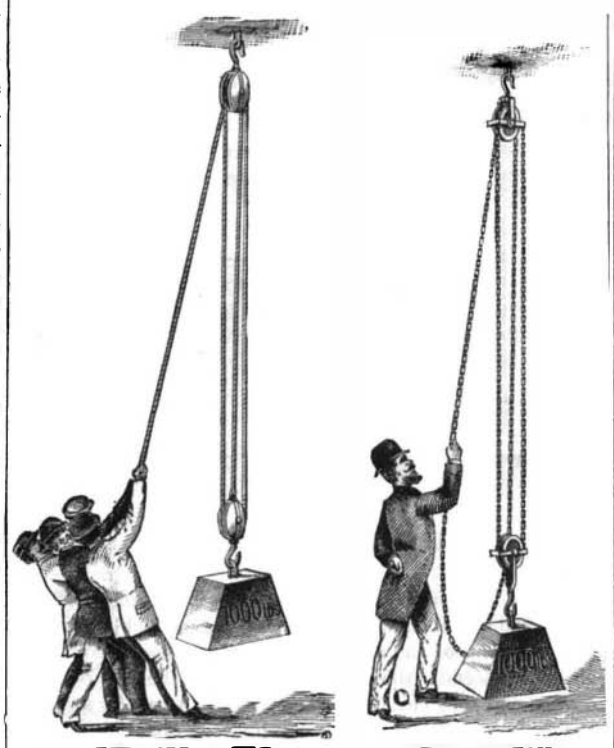
In our illustrations, the chain making, as shown to the left at the top of the page, is conducted in a blacksmith shop where are twenty-one forges. The chains for the differential pulleys are all made by hand, and Welsh and English workmen are found most competent in this specialty. They work very rapidly, each link of the chain being made of a piece of Norway rod iron cut off at an exact length, and made as true as it could be cut out with a die. In this department also is a steam hammer, and an apparatus especially designed by the company for bending the hooks for the wrought iron tackle blocks. These hooks are flattened a little to give them greater width through the point where the greatest strain comes, and it has been a matter of no little study and experiment with the company to determine exactly what shape was best for giving the greatest strength, so that the hook would not straighten out under the load, and in all parts, as well as with its joining with the block, the strength would be proportionate.

The machine shop, as shown in the other engraving at the top of the page, is fully fitted up with lathes, planing machines, etc., and all the requisite tools for finishing the various parts of the work, and in this department is also conducted the gauging of the chains and testing of the blocks, which are shown in separate views. The gauging of the chains is carried on according to a plan especially designed for this work, and every link of each length destined for use in the differential pulleys is here gauged. The links are first purposely made a little short of the length they are finally intended to be, the chain is then laid on a gauge which represents just the circumference of the sprocket wheel, and stretched until it fits exactly therein. This is intended to take out all the "stretch" which would occur in use, and to give the links just the shape at which the chain will endure the greatest strain. The chains tested here include those for one eighth ton pulleys, made of three sixteenths inch iron, up to those for ten ton pulleys, made of seven eighths inch iron. The testing of the blocks, shown in the adjoining view, explains itself. no hoisting apparatus is ever sent from the shop until it has all been put together and tested as to its capacity to lift, without stretching, the entire load which it is built to carry.

The "Light Traveler," for warehouse use, showing how these pulleys can be arranged to run on overhead rails, affords a good illustration of the advantages which can be secured by such an arrangement in stores where goods are to be stored in quantities, and yet give such convenience of access that cases may be readily taken, for inspection or removal, from any part of a large warehouse.

In the "Hoisting Crab and Derrick Winch," shown in another view, the Weston patent brake is used, so that the load is always self-sustained, and the handles may be at any time suddenly "let go" without the weight "running down" To lower the load the handles must be turned backward, but unless this is done the suspended weight remains stationary.

In the jib and traveling cranes, shown at the bottom of the page, the further application of the principles of this patent hoisting machinery for the moving of heavier bodies is represented. All the several motions for moving the load are made by direct pull, and, while the appliances are so simple that nothing can possibly get out of order, there is absolute safety against the load running down except by the positive action of the workmen having it in charge.



THE OLD STYLE. THE WESTON.

In the illustrations on this page one will be at once recognized as an apt portrayal of the difference between the hoisting of heavy weights by these improved differential pulleys and the doing of the same work in the old fashioned way. In the other is shown what is called the "double lift," for hoisting or letting down expeditiously only moderately heavy loads. It is extensively used in stores and factories, and consists of a chain, with hook on each end, passing over a sheave which can be rotated by a hand rope and wheel. It is provided with Weston's patent brake, so that if the rope is let go the load will remain suspended and can never run down. As one hook ascends the other descends, and is thus ready for the next load, one man being able to lift a full load at the rate of about twelve feet per minute, and lighter loads proportionately faster, while the speed for lowering may be regulated as desired.

By the improvements which the Yale Lock Manufacturing Company have introduced in the manufacture of these various devices for hoisting and managing heavy loads they not only have greatly increased efficiency, but absolute safety, as against the cumbrous and dangerous methods heretofore used, and their differential pulley blocks, safety hoists, traveling and jib cranes, etc., are now meeting with constantly widening demand for use in machine shops, factories, forges, mills, steamships, as well as in laying street mains, pulling stumps of trees, and in fact to a diversity of uses which it would require a catalogue to enumerate.

The works of the company are located at Stamford, Conn., and they have salesrooms of their own at 53 Chambers street, New York; 36 Pearl street, Boston, 506 Commerce street, Philadelphia; and 64 Lake street, Chicago. Their goods, as above described, are largely handled by all dealers in machinery, engineers' supplies, etc, and the company will be happy to furnish, on application, an illustrated catalogue of the goods of their manufacture.

Correspondence.

Cotton Size and Cotton Sizing.

To the Editor of the Scientific American:

With reference to the article in the SCIENTIFIC AMERICAN of February 7th last, describing the English practice of over-sizing cottons, and advising American manufacturers not to follow their example, I wish to bring to notice the fact that the people of this commercial part of the continent have begun to know that "not all that is white is cotton;" and it may be a surprise to the English manufacturers and traders to learn that the consumers now ask for American unbleached goods, in preference to the very white finished English cottons. The motive is this: practical experience has shown them that the former will become whiter after washing, and the weaving more compact, while the latter will be less white, the weaving more separated, and more than half of the weight of the goods will be lost in the first washing.

I am confident that this single yet forcible fact must be ufficient evidence in favor and encouragement of all kinds of honest manufacturing, whether in cottons or anything else.

The present fever for fraudulent adulterations, as now entered into by many of the manufacturers in England, in order to compete with cheap German and French manufactures, is simply ruinous to British commerce, and its evil effects will have to be borne directly or indirectly by the entire kingdom. To say that the cotton goods now introduced here from England are the same in quality to those of ten years ago, would be an absurdity. The English linen goods, which have stood unquestionably ahead of all others, are to-day so adulterated that some grades and trademarks, stamped "pure linen," "guaranteed all linen," etc., are, in fiber, half cotton, half linen, and in all cases heavily sized. But it is not only in all kinds of woven goods that England is suffering from great competition; in fancy goods and hardware she has a dangerous neighbor in the French Republic, which is in a good way to monopolize the trade of this country.

Adulterated manufactures will not last long anywhere to-day. People have time now to think, and a little to say in everything. Even the Indians in the vast Pampas readily know polished nickel from silver. Honesty and honest productions will, in the end, pay the best. In support of this assertion let us look at Messrs. Rogers & Son's cutlery. The steel used to-day in the different articles manufactured by this firm is as good if not better in quality than that furnished in their very first productions. For this and no other reason consumers here will pay two dollars gold for a Rogers & Son's three-blade penknife, and will not pay a half dollar for one of other makes, even should it have six blades.

Regarding art processes on the whole, one is led to believe that in England the idea still prevails that price is the primary and quality the secondary object with the consumer. In this case, I dare say, the adulterers will think it remarkably droll that the customer here should not pay better price for an article that furnishes him with more stuff.

In conclusion, let the Americans continue to manufacture honestly what they produce, disregarding other nations in the art of adulteration. The time will come when a common black cotton or linen necktie will bring a better price than a silk one, judging from the abominable black silks that are at present forced into public use.

P. DEL VALLE HALSEY.

Buenos Ayres, A. R., March 27, 1880.

Nerve Grafting.

Dr. J. Gluck, of Bucharest, lately brought before the ninth congress of the German Society of Surgery at Berlin some interesting results of experiments in nerve grafting. He cut out a portion of the sciatic nerve of a fowl, and then removed a similar portion of the same nerve from the leg of a rabbit, and placed this in the leg of the fowl, uniting the two ends by sutures. The nerve united, and the paralysis caused, of course, by the excision of the piece of nerve, was recovered from. He repeated the experiment, and exhibited the successful results, showing the fowls with full restoration of power. He was led to these experiments by the result of a case of nerve suture. Paralysis of the median had resulted from extensive destruction of the tissue of the arm by gangrene. Dr. Gluck cut down on the radial nerve and found that part of the nerve was destroyed. He united the two ends by sutures, and the man regained the power of motion, which he had entirely lost. Of course, the experiment in nerve grafting in animals, adds the *Lancet*, do not warrant the expectation that a similar result could be obtained in the case of the human subject. It is well known that the union and regeneration of nerves occur with greater facility in the case of the lower animals than in man.

Black Ants a Cure for Currant Worms.

A correspondent of the *Ohio Farmer* finds the common black ant an efficient protection against the plague of currant worms. He has several colonies of ants close to his currant bushes, and enjoys an abundance of currants, while his neighbors' bushes are overrun with worms. Formerly he took pains to destroy the ant colonies, but on witnessing their attacks upon the worms he has taken pains to protect and encourage them.