

ALL WROUGHT STEEL PULLEYS.

The illustration represents the construction of pulleys entirely of what is generally known as mild steel, no castings or forgings of any kind being used. The various parts of the pulley are cut from the material in sheet form, and then pressed into the required shapes and assembled into the finished pulley, all being accomplished by machinery of special design and which, though of great original cost and variety, is most efficient and economical in its operation, producing without turning, boring, grinding, or other machine shop practice and without hand labor, a true running pulley of perfect balance. The high tensile resistance and ductility of the steel used enables the construction of a pulley about one-third the weight of one made of cast iron, and, in fact, the steel pulley is lighter in average weight than the wood pulley commonly used. The pulley shown is what is ordinarily known as a split pulley, clamping firmly on the shaft with sufficient



A WROUGHT STEEL BELT PULLEY.

compression to transmit as much power as is possible to carry with the heaviest belt practicable, and its construction permits of the use of keys when required in special cases. Fig. 1 shows the pulley in side view and Fig. 2 is an interior view of one-half of the pulley, the other half being removed.

This improvement has been patented in the United States and foreign countries by Thomas Corseadon, of New Britain, Conn., and is being introduced by the American Pulley Company, George V. Cresson president, Eighteenth and Hamilton Streets, Philadelphia, who have fitted their factory with the machinery and tools necessary for its manufacture.

The pulley consists of the rim portions rolled at outer edges, which are made round and smooth, avoiding cutting the belt or hands of the mechanic when throwing belts on or off. The middle portion of the rim is formed into a deep flange extending entirely around inner periphery of rim, and, with the rolled edges, making with a minimum thickness of metal an exceedingly strong and true rim. The double spoke arms are greatly stiffened with deep corrugations through their entire length, and in combination with the double arms make the spider of the pulley of great strength and rigidity. The spoke arms are of the same piece of metal with the hub portion thereof, and the hub clamps encircle the hub portion of the arms, binding them firmly to the hub shells which form the bearing for the pulley on the shaft, all being riveted strongly together and making a pulley of excessive strength for its weight and impossible to break accidentally or by running at high speed, certainly many times greater than is practicable or safe with the cast-iron pulley. The steel of which the pulley is made has a smooth surface and is rolled accurately to gage, the rim face being highly polished. The interior surfaces of the pulleys are well painted and rim face lacquered, preventing rust by accidental wetting in shipment or dampness in warehouse. By means of steel bushings the pulleys are made interchangeable to fit different diameters of shafts, and their light weight on warehouse floors and minimum of fire risk make them especially adapted to be carried in stock by dealers.

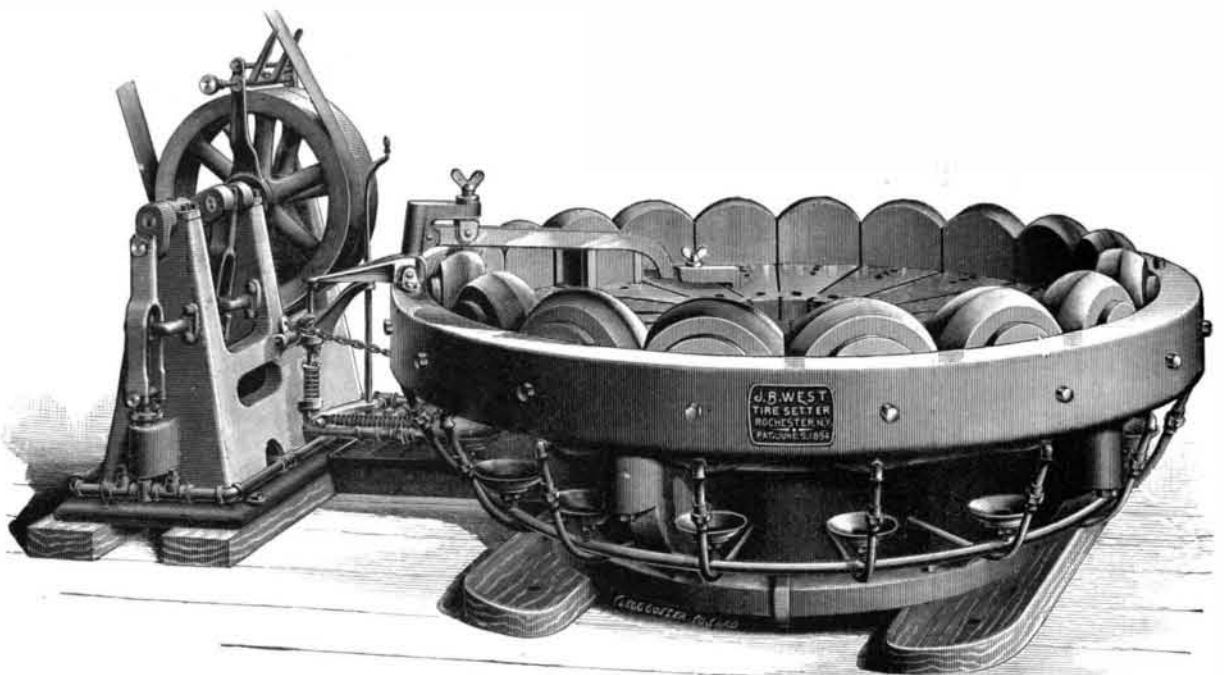
Hunting with a Mirror.

A taxidermist at Northwood, N. Y., says the New York Sun, has been making experiments as to the effect of light reflected in a bird's eyes. A glass seven or eight inches in diameter has been found most serviceable. The antics of blue jays are remarkable when the light strikes them as they sit in the shadow of an

evergreen tree. They jump to another branch and try to look into the light, but they have to turn away, as the light dazzles them. Then they fly around the reflector, but after practice one is able to keep the light always on them, and the birds not infrequently come within reach of a man's hand. A ruffed grouse gives a startled look when the light strikes it. Then up it jumps, and away it goes. Hawks, too, are usually startled or annoyed so that they fly off. Woodpeckers don't seem to mind it at all. Rabbits blink and stare at a glass for a while, then go around a stump, and sit up again, as if waiting for the light to play tag with them.

SETTING NEW TIRES AND RESETTING LOOSE TIRES COLD WITHOUT TAKING OUT THE TIRE BOLTS.

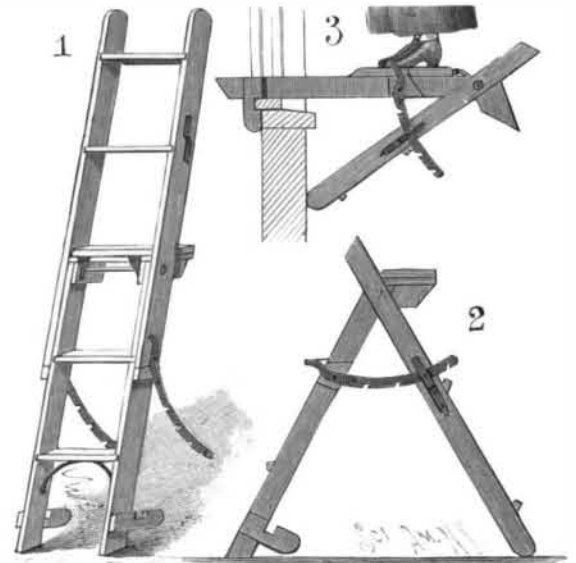
The inventor of the machine represented in the accompanying illustration first conceived the idea of setting tires "cold" in 1867, and his first patent therefor was issued in 1870. The machine had a pliable steel band drawn around the wheel by a screw, much like tightening a girth around a horse, and set light tires very well, many of the machines being still in use. They were manufactured by the Mowry Axle and Machine Co., Norwich, Conn. In 1888 a hub bander was put on the market, having twelve radially moving dies actuated by toggle joint levers and a steam cylinder, and a tire setter was then built on the same principle, which did well for light tires. The inventor, Mr. J. B. West, of Rochester, N. Y., then proceeded to develop the machine shown in the engraving, in which are eighteen hydraulic rams in a circle surrounded by a heavy weldless steel ring, with suitable bed casting, oil being used instead of water in the rams, and a three-throw pump giving a maximum pressure of a thousand tons. The rams act upon a corresponding series of segmental blocks of cast iron for smaller wheels, forcing them in radially as the pressure is applied, the wooden wheel being placed within the rams and the tire passed loosely over it. The pistons are set to work by simply opening a valve, and an automatic trip gage operated by the dishing of the wheel stops the machine when each wheel has just the right dish. A screw can be used to hold the hub down on old wheels that are inclined to dish too much. Hundreds of these machines have been sold, and nearly a dozen patents have been taken out by its inventor since 1890 on various improvements connected therewith, including one hand machine actuated by screws for light and one for heavier tires operated by a hand hydraulic pump. In 1894 permission was reluctantly given to set up a machine for trial in a wagon shop on Camberwell Road, London, England; but after one day's use the proprietors bought the machine, and the English patent was subsequently sold and a plant established to build the machines in London, since which the same syndicate has bought the patents for twenty-four countries. The machines have since been largely sold in most European countries and in South America. It is proved that more durable, truer and rounder wheels, with a stiffer, tougher and better tire, are made by this machine than is possible by any other method. The effects of the compression on Bessemer steel are indicated by two pieces from the same bar that were tested by Riehle Brothers, of Philadelphia, one that had been upset four per cent of its length by the tire setter proving to be about thirty-eight per cent stiffer and fourteen per cent superior in tensile strength to the piece that was not upset. The inventor has recently constructed a much heavier machine that has set steel tires on car wheels which has proved satisfactory on heavy wheels for steam roads. The machine weighs nearly twenty tons and is capable of exerting a maximum pressure of about ten thousand tons.



WEST'S HYDRAULIC TIRE COMPRESSOR.

AN EXTENSION LADDER AND WINDOW JACK.

A device of simple construction which may be used interchangeably as an ordinary step ladder or extension ladder, or as a conveniently arranged bracket platform support, to facilitate cleaning the outside of windows, is shown in the accompanying illustration. The improvement has been patented by John M. Pugh, of Reno, Nevada, Fig. 1 showing it as an extension ladder, Fig. 2 as a step ladder, and Fig. 3 as a window bracket. At the upper end of the bottom



PUGH'S EXTENSION LADDER AND WINDOW JACK.

section is pivoted a brace section, which may be moved up in alignment with the first section to form an extension ladder, the upper section then resting on blocks on the outer faces of the side pieces of the lower section. On these blocks are also pivoted notched curved braces, the notches engaging pins in a guide-way on the brace section, whereby the sections may be adjusted as a step ladder or to form a window bracket. To adapt the ladder to the latter use, there are notched shoes, adapted to engage a window sill, near the lower ends of the lower side pieces, and the upper step is made in two hinged pieces, one folding on the other and pivotally connected by links with braces, whereby the two pieces of the step may be adjusted side by side on the side pieces of the bottom section to form a platform for a person to stand on, the curved braces being adjusted to hold the brace section in proper supporting position.

The Danger of Early Rising.

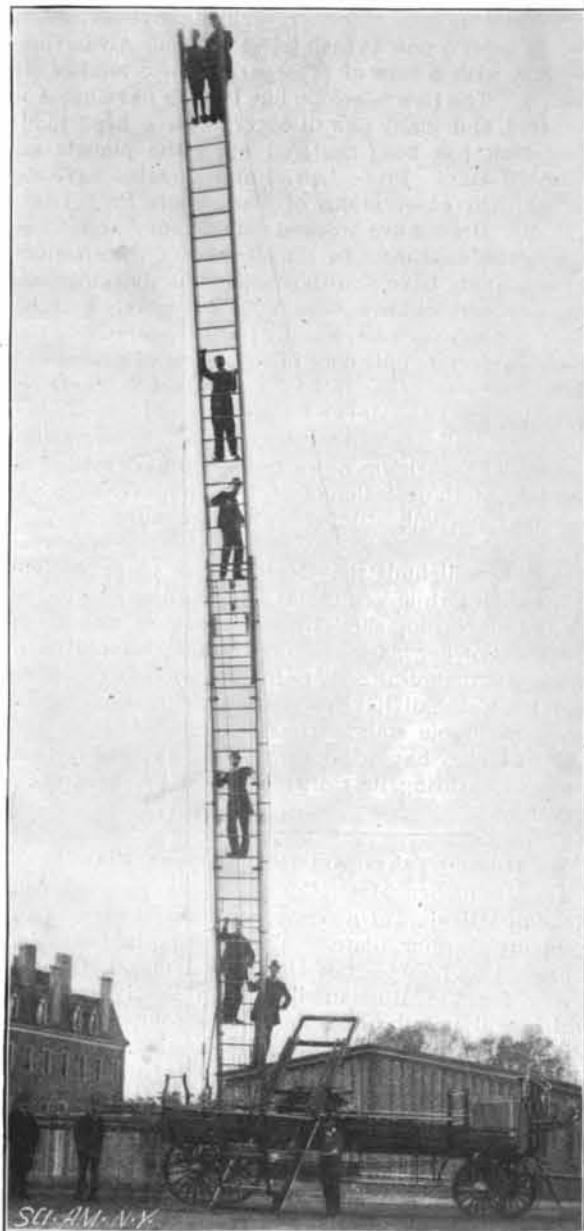
Yet another venerable superstition has met its doom at the hands of the irrepressible "scientist," says the London World. Until now people have been content to accept, if not to act upon, the theory that early rising—in conjunction, of course, with a correspondingly early habit of going to bed—is conducive not only to wealth and wisdom, but also to health. Indeed, a familiar rhymed adage protests as much in so many words. But, like many another primitive belief, it has been ruthlessly shattered by the scientific iconoclasts, one of whom now claims to have discovered that people who get up early go mad much more readily than others. In support of his theory he points to the undoubted prevalence of insanity among those engaged in agricultural pursuits. Though it is sad to see a time-honored doctrine thus exploded, one is disposed to favor the new opinion at the expense of the old. In any case, there can be no harm in being on the safe side, and, after all, it is so easy not to get up early.

Rapid Firing at Home and Abroad.

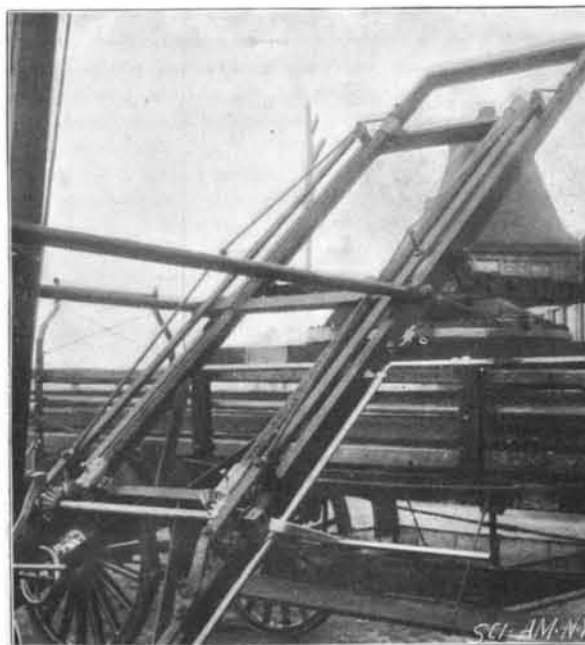
An English officer on Indian service, who recently spent his holiday in the Alps with the special object of reporting on the comparative efficiency of French and Italian batteries with regard to English, had no hesitation in deciding, says the Admiralty and Horse Guards Gazette, that in rapidity of fire and general smartness our men and mountain guns were ahead of both countries. There were some points of special excellence about both corps, and with regard to the Italians one fact may be noted. The men were trained and accustomed to carry the component parts of the gun themselves; but in accuracy of fire as well as rapidity, and with regard to the general smartness of the men themselves, he would have had no doubt in putting our own mountain batteries into competition with either French or Italian. But the high standard of merit attained with regard to accuracy relates exclusively to stationary objects, and it is felt that the results attained at the ranges might be easily falsified on the field of battle against moving objects, and especially against the rapid movements of cavalry. At the present moment there is no place in India where firing at moving objects can be practiced, and even in England it is only quite recently that the simple moving target on a pair of rails has been established at Okehampton. Even there the target is never moved at anything approaching the rate at which cavalry would charge, and, moreover, the object fired at moves across the horizon instead of toward the guns themselves, as would be the case with cavalry in real war.

THE HORTON FIRE LADDER APPARATUS.

The accompanying illustrations represent a fire ladder apparatus designed to combine the advantages of the ordinary hand ladder truck, a main extension ladder useful at high buildings, and a substantial water tower, the entire apparatus being of much less weight than has been heretofore deemed feasible. It is claimed that the truck and an 85 foot ladder built on this plan will not weigh over 7,000 pounds, as against a weight of over 12,000 pounds for the same extension in the ladders hitherto most approved. In the improved ladder, also, the steering wheel may be dispensed with, as the distance between the hind and fore wheels is only about 14 feet. The improvement is the invention of William J. Horton, of Halifax, N. S., Canada, and is being introduced by the Horton Fire Ladder Company (Limited), of that city, patents having been obtained thereon in the United States, Canada, Great Britain, France and Germany. The ladder platform is connected to the main frame of the truck by a rocking yoke swiveled to swing horizontally, enabling the platform with its raised or partly raised ladder to be turned

**THE HORTON FIRE LADDER EXTENDED VERTICALLY.**

one-quarter around and then tilted to the ground on one side, the ground end of the tilted platform being then adjusted by side levers, as is also the lateral adjustment of the upper portion of the main ladder. By this means a solid foundation is obtained and the weight is taken off the truck, which then forms an anchor. The mechanism for raising and bracing the ladder comprises principally a pair of screws having nuts which are coupled by connecting rods to opposite sides of the pivoted ladder, as shown in one of the views, the ladder-raising screws being fitted in front thrust bearings held to the platform

**THE HORTON FIRE LADDER ELEVATING MECHANISM.**

sides and in rear metal plate bearings which form the back end of the ladder platform, large gear wheels engaging pinions fixed on the screws, and the gear wheels being rotated by a crank turned by the firemen on the rear step of the platform. The drum, wire rope and pulley mechanism, for extending the upper or fly ladder, is also operated from the platform, the upper ladder being extended as desired and safely held, or again lowered after use, by operating the drum. Sockets in the side bars of the ladder sections carry bracket forks in which the hose may be placed to assist or relieve firemen on the ladder, enabling them to direct the stream to the best advantage, and the hose may be raised as the ladder is raised to any required height. It is claimed that this ladder can be raised by four men in less time than other ladders can be raised by eight or ten men.

Method of Coating Paper with Emulsions.

A correspondent in Photography describes the following plan of coating paper with emulsions: The coating of paper with emulsion in a liquid state is attended with such difficulties as unequal expansion of the paper, and the too rapid solidification of the emulsion into lumps or waves. The following method (due to White) coats the paper with the cold and solidified emulsion, and then produces an even coating by application of a very gentle heat, just sufficient to melt the emulsion. The apparatus required is very simple: it consists of a zinc or tin reservoir of hot water, in section of quadrant shape. Two openings at the top allow of hot water being poured in. The back, sides, and bottom of the reservoir should be covered with felt. It is not necessary to keep a light burning underneath, for when once filled with hot water the apparatus suffices to prepare 300 to 400 feet of paper. To the upper part of the back of this apparatus is fixed a perfectly horizontal board, about 2 feet wide and 8 feet to 10 feet long, and to the lower end of the reservoir a similar board is attached. The lower board is used for applying the cold emulsion to the paper, and the upper board for smoothing and solidifying the same. The paper to be coated is generally 22 inches broad, and in lengths of 8 feet to 10 feet (these are convenient dimensions). Proceed now as follows: Lay one piece of paper on the lower board, take the emulsion, either in lumps or pressed through canvas, and by means of a stiff bristle brush (one about 8 inches broad, similar to the tool used by bookbinders) work the mess as a paper hanger does his paste. By skillful working of the brush a coating quite flat and free from lumps can be given. Now take one end and steadily and regularly (though fairly quickly) draw it over the central reservoir containing the hot water. The slightest contact with the warmed surface is sufficient to make the emulsion flow, and it naturally solidifies, the more quickly the less heat is employed. When it has reached the other board it is allowed to remain lying until the next piece is coated with emulsion. It can then be hung in a drying chamber to dry. It is important to note that just sufficient heat should be applied as will melt the emulsion. Delay or too long contact of the paper with

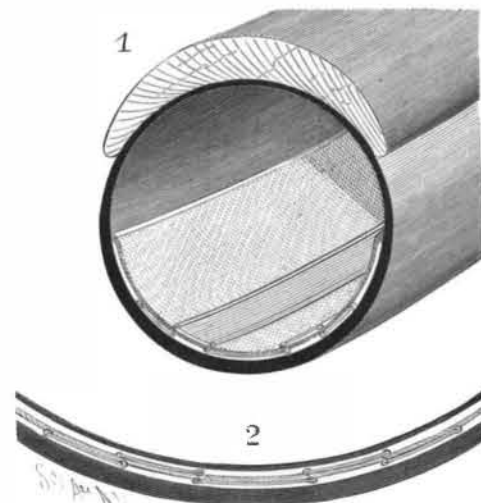
the hot zinc removes the solution partly from the paper, and causes undulating marks, such as are seen in badly prepared albumen papers.

Recent Discoveries in Palestine.

The Quarterly Statement of the Palestine Exploration Fund, in noticing some recent discoveries by the society's officers, says: "Dr. Bliss' excavations in the Tyropæon Valley have brought to light a very remarkable stone stairway, forming part of a road leading down from the city past the Pool of Siloam. This stairway is 24 feet broad, and on its eastern side is a parapet, apparently constructed to prevent passengers falling over the scarp which exists there. The steps are thirty-four in number, so far as discovered. They are about 7 inches in height, and are arranged in a system of wide and narrow treads alternately, the wide treads measuring between 4 feet and 5 feet in breadth, and the narrow ones about 1½ feet. The stones composing these stairs are well jointed and finely polished by footwear. It is impossible not to be reminded by this important discovery of the statement in Nehemiah iii, 15, that Shallun repaired the gate of the fountain, the wall of the Pool of Siloam, by the King's Garden. 'and unto the stairs that go down from the city of David.' It is not suggested that these newly discovered stairs are identical with those mentioned by Nehemiah, but possibly they may be on the same site. Also another paved roadway leading down from the city has been discovered near the top of the hill, a little east of David's Tomb, and apparently continuous with the long street which runs through the city from the Damascus Gate and traverses the present Jewish quarter. In its width, in its curb on either side, in the size and appearance of its slabs, and in its inclination, this street resembles the one found in the Tyropæon Valley. Students of Jerusalem topography have long been of opinion that such a roadway existed in this situation. 'The main thoroughfares of a city are apt to remain in the same spot from age to age, and it has always been thought probable that the great central street of the Holy City was continued further south than the present wall. Of quite special interest is the rock tomb near the Tombs of the Kings described by Mr. Dickie. It is the only rock tomb with a vertical shaft which has yet been discovered in South Palestine."

A NOVEL PNEUMATIC TIRE.

The illustration represents a tire having a novel form of protective shield, designed for application to a single or double tire, without in any manner detracting from its resiliency. Fig. 1 shows a section of a tire on which the improvement is applied, and Fig. 2 a portion of an outer and an inner tire and an enlarged section through the shield. A patent has been issued for this invention to Joseph F. Dolles, of Chester, Ill. The shield is placed next the inner face of the outer tire at its tread portion, and between this tire and the tread section of the inner tire when used with an inner tire, and consists practically of a diaphragm of canvas to which are attached a number of endless bands of very light spring steel. The bands are placed along the inner as well as the outer face of the body of the diaphragm, there being preferably a central wide band and two narrower bands near the side edges, the sides of the inner bands extending over upon the body portion of the

**DOLLES' BICYCLE TIRE.**

outer bands. Each of the bands has a rib along its sides, the ribs being bent over on the slightly convex outer faces of the bands, and the bands are so overlapped as to make it difficult for any sharp object piercing the outer tire to pass between the inner and outer bands where they connect. The diaphragm or shield is made air tight when used with a single tube tire, and may be secured to the sides of the outer tube in any approved manner, or the canvas may be woven in to form an integral portion of the outer tube. The improvement is designed to add but little to the weight of the tire and not to stiffen it or in any way mar its appearance.