

of a few hours' run with the steam pump. The amount saved over the old system is not less than \$35 per month.

The problem of economy so far, then, has been solved and that of efficiency practically demonstrated.

Moss on Grass Lawns.

It is generally thought that a damp, undrained bottom is the cause of moss on grass lawns, but by some it is regarded as proceeding in a great measure from poverty of the soil, for where grass grows freely this parasite is rarely if ever found. To effect a riddance of this pest there is nothing equal to fresh-slaked lime and wood ashes mixed—so writes a correspondent in *Land and Water*—which, he states, not only kill it and cause it to shrivel up, but have a most beneficial result on the lawn by stimulating the natural herbage. Where this is really poor and needs assistance I would strongly recommend the use of both the above named, together with the addition of soot and finely sifted soil, which mixture is far better than guano, nitrate of soda, or other patent manures, that force too much growth for a time, only to be succeeded by increased exhaustion soon after. The first proceeding, however, to cure a mossy grass path should be to scarify it well over with an iron toothed rake, followed by a good sweeping after with partly used-up brooms, which will make way for seeds to be sown, and these should be worked in by using the rake as before. This done, the soil mentioned and the ingredients with it will then come in for affording an additional covering, under which it will germinate, and, once through, make rapid progress.

Etna in Eruption.

At the beginning of the current month great anxiety prevailed with regard to the rapid increase in the volume of lava pouring out of the craters of Mount Etna. Craters had formed on two slopes, and a double eruption was in progress. On the night of May 28 a number of brilliant balls of fire were thrown to a great height and burst aloft like rockets, emitting a fiery shower.

Later, fresh craters opened, endangering Bianca Villa, Randazzo, and Castiglione. Clouds of ashes overhung Piedmont, which was in almost total darkness. The Aci Reale and Catania Road was blocked and considerable damage had been done.

By the 2d of June a considerable portion of the bed of the Alcantara River had been covered by the lava. The damage to agriculture was already very serious. The inhabitants had been forced to abandon the village of Majo. Many large and valuable estates had been destroyed. The four main craters continued to pour forth streams of lava, while many of the smaller ones had become inactive. The stream of lava which had interrupted the road at Passa Pescaro was half a mile wide and a hundred feet deep.

IMPROVED WINDOW CORNICE.

Any one who has had occasion to change his residence knows too well that what will do for one house will not answer for another. The furniture, carpets, and fixtures need remodeling to adapt them to their new situation. Not the least among annoyances is the variation in the width of windows, necessitating a change of shades and curtains and also of cornices, the latter being usually fully as expensive as either of the other items, and incapable of being adapted to a window narrower or wider than it was originally designed for.

To obviate these difficulties as well as to enable makers and dealers in window cornices to fit any kind of window without making a cornice especially for it, Mr. James W. Campbell, of No. 9 Baxter street, New York city, has devised the extension cornice shown in the accompanying engraving.

It consists of two thin mouldings, fitted one over the other, and arranged to slide and thereby lengthen or shorten the cornice to adapt it to any window. The vertical pieces or trusses are attached one to the inner end of each sliding piece, and they are split at their upper ends, and provided with a clamping screw, by means of which the parts may be fixed after they are properly adjusted. The trusses are lined with felt or flannel, as shown in Fig. 3, to prevent marring the face of the mouldings. Fig. 1 shows the cornice closed together. In Fig. 2 it is represented as extended.

These cornices are not restricted to any particular style of moulding or finish, and their form is always symmetrical. Further information may be obtained from the patentee, whose address is given above.

THE MEXICAN EXHIBITION IN DOUBT.—The work of preparation for the proposed Mexican Exhibition has been stopped, and it is believed that the Mexican Cabinet has determined to abandon the enterprise for lack of means.

NEW COMBINATION TOOL FOR MERCHANTS.

The accompanying illustration will scarcely need explanation, as the merits and usefulness of the article will readily be seen by those who have frequently to pack or open boxes or packages of merchandise. The tool combines in very simple form a hammer pincers, and wrench. When it is used as a nail extractor a driver, which is not shown in the engraving, is used for forcing the jaws into the wood.

This tool seems to combine the advantages of the more costly implements for a similar purpose. It was recently

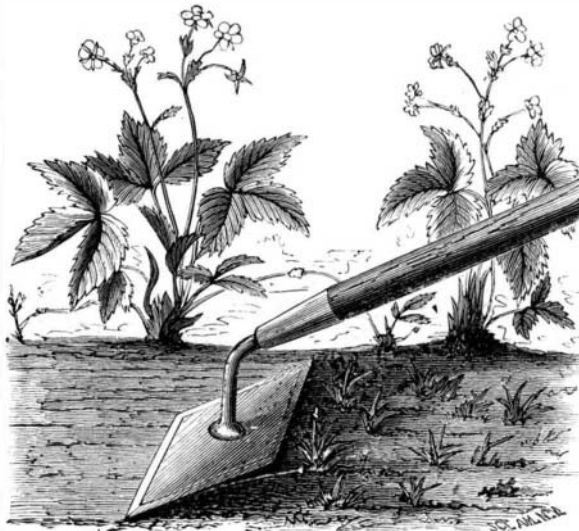


SMITH'S COMBINATION TOOL.

patented, and is being manufactured by Messrs. W. K. Smith & Co., of Kirckville, Mo.

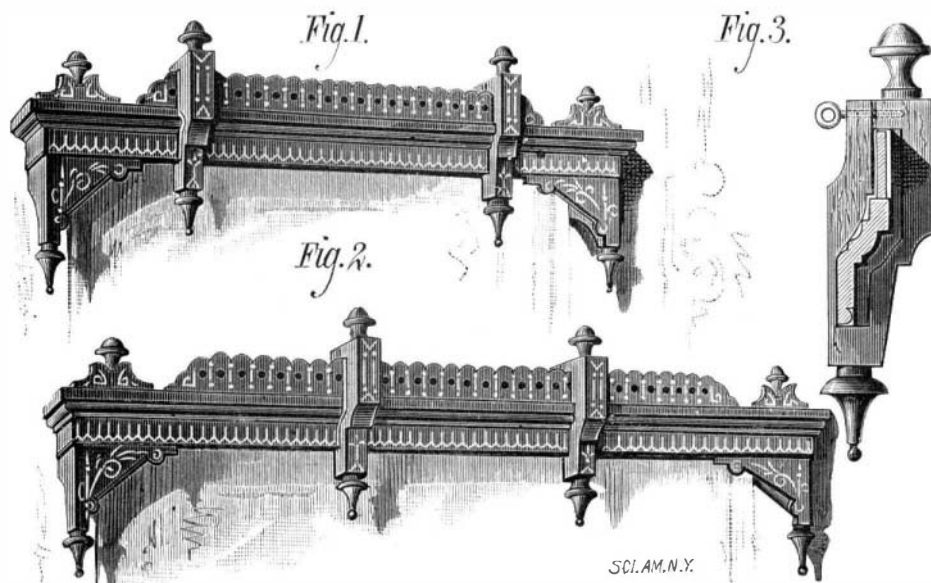
A NEW SCUFFLE HOE.

The improved implement shown in the accompanying engraving is designed to take the place of the ordinary hoe in various gardening operations, but it is more especially adapted to such work as the cultivation of the strawberry and other similar plants, and to weeding onions, etc.



MUNSON'S SCUFFLE HOE.

The implement has been used for a number of years by the inventor in his own market garden, where he has proved to his own satisfaction that the men who use it can accomplish three times the work possible with an ordinary hoe. It may be used as a subsoiler, as it will readily break up the soil to a depth of five inches without great exertion on the part of the user, and it is stated that it is not at all difficult to make, in ordinary soil, strokes of five feet. It answers an



CAMPBELL'S IMPROVED WINDOW CORNICE.

excellent purpose in weeding onions and other plants growing in drills or rows, as it completely uproots the weeds and renders unnecessary any work with the hands. As a strawberry hoe it may be pushed around and under the vines without injuring them, and by inverting the blade it forms an efficient runner cutter, and it may also be used to set runners to root.

The great advantages possessed by this implement over others of its class are that it may be used without bending the back, and much less force is required to work it.

The general appearance of the scuffle hoe is shown in the engraving. The blade is diamond-shaped, and is curved, having its convex surface uppermost. The edges are beveled or sharpened, and the curved shank which receives the handle is secured to the center of the blade.

This invention was recently patented by Mr. T. V. Munson, of Denison, Texas, from whom further information may be obtained.

ENGINEERING INVENTIONS.

Messrs. Philo A. and Ira S. Knapp, of Danbury, Conn., have invented an improved cut-off for steam engines in which the valve is arranged so that it will close the live steam port at one third, half, or two thirds of the stroke, while the exhaust port remains open to the end of the stroke.

An improved railroad gate has been patented by Messrs. Henry Hahn and Anderson L. Gaston, of Gainesville, Texas. It is intended to fill up the gaps in fences crossing the railway track. It is lowered by the pass-

ing trains from either side, and is raised as soon as the train has passed over it.

Mr. Henry Ruse, of Baltimore, Md., has patented an improvement in railway ties. In a track formed with these ties two permanent clamping lugs of any one tie project in the same direction, but are arranged upon opposite sides of the rail from the permanent lugs of the next tie. The inventor also provides a peculiar locking device, by which important advantages are secured.

An improved car coupling has been patented by Mr. Geo. W. Cushing, of Sedalia, Mo. The object of this invention is to furnish a more efficient and durable substitute for the plate springs and other devices that are now used on that class of draw hooks that require side pressure to retain them in position.

Color Blindness.

That the prevalence of color blindness among railway employes, and the consequent danger, were not overrated by us in our early articles on this subject, continues to receive abundant confirmation. Dr. Keyser, of Philadelphia, according to the *Railway Review*, has examined the eyes of the train hands of three Philadelphia railways, and finds that three and one half per cent are color blind. These cannot discern the difference between colors; and in addition there are eight and one half per cent who can distinguish colors, but cannot distinguish shades of the same color apart. There are thus twelve per cent who have not that quickness and accuracy of perception of colors which should be considered absolutely necessary in the railway service, as long as signaling is done by means of colored lights. It is fair to presume that general investigation would show about the same results.

A Great Russian Telescope Projected.

At a meeting of the Naval Institute in Washington, May 29, Professor Newcomb stated that he has received letters from Otto Struve, Director of the Pulkowa Observatory, announcing that the Russian Government has voted 250,000 rubles for the construction of the largest telescope that can be advantageously made, including the building in which to mount it. The object glass is intended to be between thirty inches and three feet in diameter, if the glass makers find it practicable to cast a disk of this size of the necessary evenness and purity.

It has not yet been decided who shall undertake the most difficult part of the work, the grinding of the glass; and before deciding it Strunc intends to visit this country in order to examine the Washington and other great telescopes made by Alvan Clark & Sons. He will probably arrive here for this purpose some time during the summer. Should his examination prove satisfactory he will be ready to open negotiations with the Clarks for the work if he is sure it will be done enough better to warrant the risk of sending the glass twice across the Atlantic.

Molecular Oscillations.

M. Raoul Pictet, of Geneva, one of the two chemists who not long ago were so brilliantly successful in liquefying hydrogen, has recently been engaged in researches which deal with some of the most delicate problems in molecular physics. He has endeavored to determine the length of the molecular oscillations of a body subjected to the action of heat. No explanation is given as to the method of calculation employed, but M. Pictet arrives at the remarkable result that the product of the length of molecular oscillation by the temperature of fusion is constant in all solid substances. He adds that the higher the

temperature, the shorter are the oscillations. Here are some of the figures: Selenium, 3.7, lead, 3.3, zinc, 3.5, silver, 3.8, copper, 3.4, gold, 3.4, iron, 3.3, platinum, 3.6. These numbers are evidently near enough together to warrant the statement that the law of constancy is here verified with conditions of exactness comparable to those which Dulong and Petit declared satisfactory in their researches on specific heats.

RECENT MECHANICAL INVENTIONS.

A machine for laying bands or stripes of color around broom handles, which does its work rapidly and neatly, has been patented by Mr. Solomon Lang, of Schenectady, N. Y. The machine is fitted to carry two handles and two sets of striping brushes, which act alternately, so that while one handle is being striped the other may be removed and replaced by another.

Messrs. A. H. Simms, of Nixburg, and J. L. Porter, of Rockport, Ala., have patented an improved rope measuring machine. It consists in the arrangement of a measuring wheel provided with an alarm device for indicating its revolutions, and in a semicircular receptacle for containing the rope to be measured.

Mr. John G. Meeker, of Danbury, Conn., has patented an improved machine for filling and hardening hat bodies and other fabrics. The invention consists in forming ribs of hempen rope upon the opposite working faces of the filling roll and apron of a machine for fitting and hardening hat bodies.

American Hardware in British Colonies.

The *Ironmonger* continues to lecture the English manufacturers for their apathy in not bestirring themselves to prevent the introduction of American manufactures into the British colonies.

There would appear to be much reason, says the editor, for fearing that English manufacturers are not even yet fully alive to the extent and nature of the competition they have to meet and fight. Through our own columns, for instance, attention has repeatedly been called to the subject, and we have been careful to give, from time to time, the latest and most authentic information obtainable. It has been shown more than once that our colonists in Australia, New Zealand, the Cape, and elsewhere are rapidly developing an amount of business in American hardware which was not even contemplated half a dozen years ago. They are well and attentively served by the manufacturers of the United States, and appear to be disposed to transfer to them many of their commissions. They tell us directly, or indirectly, that they are more thoroughly satisfied by their new providers than by our own traders, and we cannot blame them, therefore, if they continue to divert their favors into transatlantic channels. They would, and do, prefer to have English made goods of all kinds, but they find that the patterns, finish, and packing of the Americans are frequently so superior that they are literally compelled to cease doing business with us. In not a few instances they still send their orders to England, but they specify American goods, and decline to be put off with any others. They are, as our correspondent tells us, often charged nothing for packages, and have everything so carefully wrapped up or boxed, marked, and labeled, that they find far less trouble in retailing the goods than those sent to them from this country. We have before remarked that there is not the slightest reason why this state of things should continue. We are able to compete successfully with the whole of the outside world, either as regards quality, quantity, or price, and it ought not to be publicly stated that we do not do so. We have every advantage on our side, and it is nothing less than a notorious scandal if we neglect our opportunities any longer. As a nation we are compelled to manufacture, and inasmuch as we produce immensely in excess of our internal consuming powers we must continue to export the surplus. It is, therefore, not merely our interest, but an absolute necessity, that we should consult the tastes and requirements of our customers, and by the exercise of enterprise, tact, and progressive tendencies, keep ourselves in that foremost position we have so long held. The time for apathy, indifference, and adherence to obsolete patterns or practices has gone by, never to return. The recognition and full appreciation of these facts ought to be sufficient to put our manufacturers and merchants on their mettle to such an extent as to render the continuance and repetition of these complaints impossible and unnecessary.

Copper and Iron Lightning Conductors.

What should be the relative sectional areas of lightning rods in order that neither metal should be more liable to fusion by the passage of an electrical discharge through it than the other? Mr. R. S. Brough (whose recent death in India we regret to announce) has answered this question in the May number of the *Philosophical Magazine*. The relation usually given—viz., that an iron rod should have four times the sectional area of the copper rod—is based on the fact that copper conducts electricity six times as well as iron, while the melting point of iron is about 50 per cent higher than that of copper, and $\frac{6}{1.5} = 4$. This simple treatment is incomplete, because it neglects the following important factors: (1) The influence of the rise of temperature in increasing the electrical resistance of the metal; (2) the difference between the specific heats of the copper and iron; and (3) the fact that

the iron rod being made several times more massive than the copper rod, it will require a proportionally greater quantity of heat to increase its temperature. Taking these considerations into account, Mr. Brough finds that the sectional area of an iron rod should be to the sectional area of a copper rod in the ratio of 8 to 3. For the same efficiency iron rods are therefore cheaper than copper rods.

PREVENTIVE FOR SLIPPING BELTS.

Mechanical engineers and users of machinery know only too well that all belts slip more or less, thereby occasioning a loss of both power and motion as well as the wearing of the belt. Several remedies have been suggested and tried, such as the application of rosin and other adhesive substances to the belt or pulley, but none of them, so far as we are aware, with the exception of the device shown in the accompanying engraving, have proved of any practical value. In fact the application of adhesive substances is

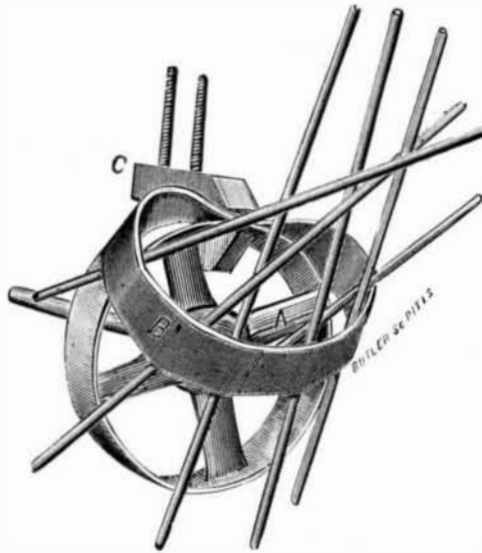


Fig. 1.—SUTTON'S PATENT PULLEY COVER.

productive of a direct loss of power, and injury to the belt. To secure the required amount of friction by tightening the belt brings greater pressure and consequent friction upon the journals and increases the strain and wear on the belt.

The pulley cover shown in the engravings is designed to obviate all of these difficulties and greatly increase the transmitting capacity of both belt and pulley. It is simply a flat endless band of elastic rubber and canvas, made about one inch to the foot shorter than the circumference of the pulley, with the inside face unvulcanized. It is stretched around the pulley and cemented fast.

The manner of applying the cover is shown in the engravings. After cleaning the pulley the cover is clamped to the upper part of the pulley by means of an ordinary hand screw, then a number of rods are inserted in the cover and placed against the rim of the pulley, as shown in Fig. 1. Three or more men, taking one rod in each hand, stretch the covering outward and place it on the pulley, as shown in Fig. 2; then all of the rods but one are removed, and the

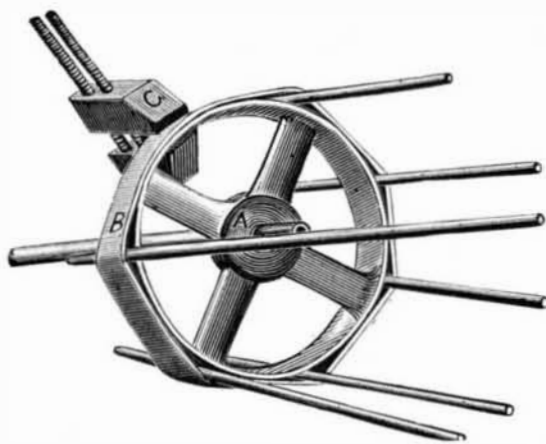


Fig. 2.—PULLEY COVER.

hand screw is taken off; cement is placed between the cover and the pulley as the remaining rod is rolled around the pulley under the cover. When all sides of the pulley have been cemented the rod is removed, and the cement is allowed to dry.

The manufacturers assert that this cover effects a great saving in power, and that a pulley having this cover applied has at least double the capacity of a plain pulley of the same dimensions.

Further particulars may be obtained from Joseph Woodward, room 11, 55 Liberty street, New York (P. O. box 3419).

The Nature of Plastic Substances.

At a recent meeting of the Philadelphia Academy of Natural Sciences, Dr. Koenig referred to a statement made by him some time ago when speaking of the composition of the so-called mountain soap of California, that the plastic

components thereof are not crystallized substances. As this was contrary to the opinion held by certain authorities on such matters, he had been led to give the subject further consideration, and he was now prepared to sustain his original assertion, although it was at first based simply upon analogy. He believed that in the inorganic, as in the organic kingdom, no plastic substance is crystallized. The substances pholerite and necrite, which have indeed the same quantitative and qualitative composition as the plastic kaolinite, are indeed crystalline, but these are simply cases of polymerism. In the course of his investigations on the nature of clays he had studied the sediment thrown down by slightly turbid river water. If portions of this substance be again dissolved and the redeposit examined under microscope, it will be found to present the appearance of starch. The granules are transparent, and may be examined by polarized light, when it will be found that they are not at all crystallized. Further investigations of the subject are promised.

Emigration to the United States.

Probably from its comparative nearness, and the social and personal freedom it promises, as well as from the fact that so many of the working classes have "some friend or brother there," emigration to the Transatlantic Republic has always been much in excess of that to our own colonies, even to the adjacent Dominion. But for some years there has been a great commercial depression in the United States as in the United Kingdom, and during the past quinquennial period as much slackness in emigration as in everything else. The turn of the tide has, however, come at last, and it is doubtless a sign that a decided improvement has set in over the water. Both from the Clyde and Mersey, as well as from other less important havens, flocks of emigrants are leaving these shores. Nearly 11,000 persons left Liverpool to go into voluntary exile last month, of whom 8,931 were bound to the United States, 1,723 to British North America, and only 48 to Australia, 6,015 altogether over those of March, and 4,090 over the corresponding month of last year; while during the present May there is every prospect of numbers leaving several thousands in excess of the corresponding month for many years past. Of the April emigrants, 5,348 were English, 1,546 Irish, and only 58 Scotch.—*Iron*.

Phosphorescent Photographs.

To Mr. Woodbury's inventive ingenuity we owe this plan, which has been tested, and is a practical success. The method he employs is known as the "dusting-on" process. It consists in coating a plate with a preparation of dextrine, honey, and bichromate of ammonia, which, exposed under a negative, becomes hardened, where it is subjected to the action of light, through the transparent parts of the negative, remaining tacky where it is protected from the action of light by the denser parts of the negative. After exposure under a negative, the film, as it will be seen, is tacky in the lights of the picture, but hard and dry where light has acted on the shadows. The lights are therefore adhesive and tacky, retaining any fine powder which is dusted in or rubbed into the moist surface. At this point comes in the essential novelty. The powder to be used must be a phosphorescent substance. One of the best known and available is sulphide of calcium. A powder of this substance is applied to the image formed on the adhesive film, and sticks to it in due gradation of the tackiness, as regulated by the action of light which passed through the negative. An image of sulphide of calcium is thus formed, which, the powder being nearly white, is scarcely visible by daylight, but if the image be submitted for a time to sunlight, or bright daylight, or brilliant artificial light, and then taken into the dark, presents a luminous picture, somewhat startling, indeed, in the case of a portrait.

A variety of substances possess this phosphorescent quality: sulphides of barium, calcium, and strontium displaying it in the most marked degree; fluorspar, carbonate of lime, pearls, diamonds, phosphate of lime, arseniate of lime, and other substances, all showing in their degree this capacity of absorbing light and radiating it in the dark. The Bologna stone, consisting of sulphide of barium, displays this property in a marked degree. The old Italian cobbler to whom tradition assigns the discovery of the property of this stone, and its use to astonish his friends and neighbors, prepared it by heating red hot with charcoal a piece of sulphate of baryta, found plentifully in the neighborhood of Bologna. Sulphate of baryta made into a firm paste with gum, or with flour and water, and calcined, will produce the substance. It should be kept sealed in a stoppered bottle.

The phosphorescent property has been utilized in America for the production of luminous clock and watch faces, which readily show the hour in the dark. Professor Morton, in the *SCIENTIFIC AMERICAN*, points out the possibility of superseding gas or other incandescent substances as means of illumination by having the walls of a room treated with a phosphorescent substance, which might absorb sufficient light during the day to serve for illumination at night. Dr. Phipson points out that a whitewashed cottage exposed during the day to strong sunlight sometimes shines at night with a brilliant phosphorescent light; pure lime or a mixture of lime and nitrate of lime possessing the property in question. The substance used in preparing luminous clock faces is sulphide of calcium, sometimes known as Canton's phosphorus, Canton having prepared it by heating a mixture of three parts of calcined oyster shells with one part of sulphur to an intense heat for an hour. It may also be formed by heating