

were forced either to retreat or disappear with the forests or to adapt themselves to the new order of existence, which the ancestors of the horse did. Along with the disappearance of the side-toes in the evolution of the horse there was a considerable increase in the proportionate length of limbs and feet, thereby giving the animal greater speed. The increase in length of limb rendered it necessary that the head and neck of a grazing animal should likewise become extended, in order to enable the mouth to reach the ground. The character of the teeth likewise underwent a marked change from short-crowned to long-crowned, thereby enabling the animal to feed on the hard and somewhat innutritious grasses on the dry plains, which required more thorough mastication than did the soft foodstuffs of the earlier ages. In the first part of the Quaternary period wild species of horse were found in every continent except Australia. For some unknown cause, all these horses became extinct in North and South America. The small, short-legged and shaggy-haired wild horse of Europe was contemporary with primitive man. The latest proof of this is the series of animal drawings and etchings recently found cut deep in the rock sides of the Combarelles Cave in France. Hitherto the small, big-headed horse found on bone and flint in other caves was supposed to be purely a food animal, and never used to carry men, but in the Combarelles drawings there is depicted another horse with small head, finer nose and delicate form. What is more important is the fact that some are shown with a halter or cord attached to the head, which goes far to prove that the Cave Men had domesticated and used the horse as a beast of burden, as well as for food. This justifies the conclusion that the men who were contemporary with the mammoth rode horses, and may have employed them in hunting with their weapons of stone and bone this great hairy beast, possibly some two million years ago. The wild horse at present is limited to the Old World, and is found only on the desert plains of Central Asia and Africa. Two specimens, male and female, of the little known Przewalsky's horse of Asia have just been received at the New York Zoological Gardens, having been captured by agents for Carl Hagenbeck in the Desert of Gobi. These are the nearest approach to the present horse of civilization, and supply an important link hitherto missing in the chain of evolution, which reaches down from the three-toed horse to the domestic animal of to-day. Prior to the discovery of the numerous fossil types of America, it was generally believed that the horse originated in Europe, especially as the Indian tribes first encountered by the white men on this continent had no horses. Modern paleontological research, however, such as is now being carried on by Prof. Osborn and Profs. Marsh and Cope in the past, has demonstrated that North America possesses a far more complete series of developmental stages, and points to the fact that the cradle of the modern horse lies probably not in Europe, but in the New World. The writer acknowledges his indebtedness to Prof. Henry F. Osborn for the privilege of reproducing photographs, and to Dr. W. D. Matthew, Associate Curator, for certain data incorporated in this article.

#### The Turkish Earthquake.

News comes from Turkey that a terrific earthquake occurred on April 29 at Melazgerd in the vilayet of Van, eighty miles southeast of Erzerum. It is said that the entire town was destroyed, together with its population of 2,000, among whom were 700 Armenians and the garrison. About 500 houses in the neighboring villages are said likewise to have been destroyed. The town lies 40 leagues to the southeast of Erzerum, the capital of the vilayet. It is about 110 miles distant in a northeasterly direction from Mount Ararat and 700 from Constantinople.

Eight great monoliths are ready for erection in building the Cathedral of St. John the Divine. The eight columns cost \$250,000. Over a year was wasted in a vain attempt to turn out the columns whole, and a special \$50,000 lathe was built for the purpose, which, after three monoliths had been broken, proved useless. The rough shafts measure 64 x 8½ x 7 feet, and weigh 310 tons each. Only one other structure, St. Isaac's Cathedral at St. Petersburg, has columns approaching these in size.

A London liveryman of the name of Alington has designed a new vehicle which he has placed on the streets of the great metropolis, with the idea of displacing the hansom, so long in favor despite its many acknowledged shortcomings. In many respects the carriage resembles the hansom, but the doors instead of opening on hinges are semicircular and move on rollers, sliding across the front from either side. This gives a great deal more room and permits of easier entrance and exit, and at the same times makes the carriage more compact. Another innovation is that it is supplied with a brake, which will be the means of preventing a number of accidents.

#### Austrian Prizes for Designs for Raising Canal-Boats.

In connection with the construction of the Danube-March-Oder Canal, a new problem of engineering presents itself for solution. It is how to raise and lower canalboats in crossing the watershed between Prerau (Moravia), the head of the March basin, and Altdorf, the head of the Oder basin. The elevation to be overcome is no less than 39.9 meters, or about 131 feet. It is, of course, desired to raise and lower the boats with the least possible consumption of water and at the smallest possible expense. The Austrian Minister of Commerce has offered prizes of 100,000, 75,000, and 50,000 crowns (\$20,300, \$15,225, and \$10,150) respectively for the three best designs to be submitted. The method of accomplishing the object is to be left entirely to the competitors, who are also at liberty to submit proposals for the construction of the works in accordance with their designs.

If the execution of the work is not intrusted to the person whose design is adopted, a premium of 200,000 crowns (\$40,600) will be given to him, in addition to the prize, when the successful operation of the contrivance has been demonstrated. Plans and drawings, together with a sealed envelope containing the name and address of the competitor, should be filed in the office of the Minister of Commerce not later than March 31, 1904. Any offer for constructing the works should be inclosed in the same envelope.

Copies of the minister's announcement, with full supplementary information for competitors, will be furnished gratis by the commissioner for the construction of waterways at Vienna and by the various provincial governors of the Empire; or in the United States, by the Austro-Hungarian embassy at Washington and the Austro-Hungarian consulates at New York, Philadelphia, Pittsburgh, Chicago, and San Francisco.

#### Official Awards of the Commercial Vehicle Test.

The Automobile Club of America has announced its awards in the commercial vehicle test held on May 20 and 21, 1903. In the first class, comprising vehicles carrying 750 pounds, a gold medal was awarded to the Mobile Company of America, Tarrytown, N. Y., for its steam delivery wagon. In the second class, comprising vehicles carrying 1,500 pounds, the Knox Automobile Company, of Springfield, Mass., was awarded gold and silver medals for the performance of its gasoline delivery wagons, and the International Motor Car Company, of Toledo, Ohio, was awarded a bronze medal for its Waverly electric delivery wagon. No award was made in the third class of vehicles to carry 3,500 pounds. In the fourth class, comprising vehicles carrying 6,000 pounds, a gold medal was awarded to the Morgan Motor Company, of Worcester, Mass., for a three-ton steam truck. In the fifth class, consisting of vehicles carrying 10,000 pounds, T. Coulthard & Co., of London, England, received a gold medal for their five-ton steam truck.

#### The Current Supplement.

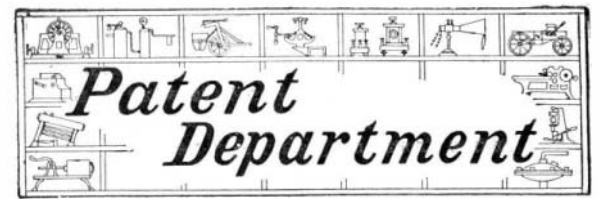
An article on the new power house recently completed at Niagara Falls begins the current SUPPLEMENT, No. 1432. The discussion of the Serpollet steam automobile is continued. John David Rees concludes his entertaining account of domestic life in India. By far the most important article which appears in the current SUPPLEMENT is the paper read before the National Academy of Sciences by Prof. Alexander Graham Bell on his newly discovered tetrahedral principle in kite structure. The paper is published in full, together with the essential illustrations. Sir Oliver Lodge continues his admirable dissertation on electrons, discussing in the present installment the determination of the mass of an electron. A paper by Lieut.-Col. R. M. Holden, possessing no little scholarly interest, tells something of the formation and tactics of an Elizabethan army. An excellent narrative describing the explorations of Dr. Sven Hedin in Central Asia should be read with interest. The usual Trade Notes and Recipes, Suggestions from United States Consuls and Selected Formulæ will be found in their accustomed places.

#### Death of Rear Admiral Smith.

On May 28 Rear-Admiral David Smith, U. S. N., retired, died at Washington at the age of seventy-two. He entered the navy in 1859 as an engineer. His career was most brilliant. Throughout the entire civil war he served at sea with distinction. Despite the fact that he was retired for age in 1896 he applied for duty during the Spanish-American war.

#### The Ferris Wheel Sold.

The Ferris wheel, one of the attractions of the Chicago Exposition of 1893, was recently sold at public auction for \$1,800, engines, boilers, and all. Originally the contrivance cost \$362,000. It is said there are about \$300,000 worth of bonds outstanding against the owners of the wheel, as well as an indebtedness of \$100,000.



#### PETTY ECONOMY AT THE PATENT OFFICE.

If there is one department above any other of the government which can afford to conduct its financial operations on a generous and broad-minded scale, it is the Patent Office. Its business is enormous, averaging at the present something less than 800 patents, trademarks, etc., every week of the year, and it has a handsome surplus of over \$5,000,000 standing to its account in the Treasury. Yet, for some inscrutable reason the department is run on a scale of close-cut economy which is undoubtedly working a serious injury to the individual inventor and to the commercial and industrial interests of the country at large. One of the most unnecessary and irritating instances of this is to be found in the fact that the files of copies of patents at the Patent Office are kept in such a depleted condition that it is often impossible to get copies of patents without waiting to have them specially printed. Formerly, it was the custom of the office to keep the files well filled. Should the copies of a particular patent run out, a fresh series was immediately printed, and it was a rare occurrence for an application for copies to be made that could not at once or very shortly be filled. Of late, however, the conditions have changed, and patentees, manufacturers, and the public at large are suffering a great deal of vexatious and utterly unnecessary delay and inconvenience. Matters have reached such a pass that a patentee cannot obtain over ten copies of his patent at one application, the explanation given being that the appropriation from Congress has run out and the department is short of funds.

This is a matter of very vital importance both to the Patent Office and the general public. It is the aim and duty of the Patent Office to give the public every possible facility for examining and keeping in touch with the progress of invention in every department of industry, while the inventor, the manufacturer, and the merchant have many cogent reasons for wishing to be kept so informed. Whenever a new patent, especially if it is of radical and far-reaching import, is issued, it becomes a matter of solicitude to all inventors whose investigations cover the same or kindred fields, and to manufacturers and merchants the economic aspects of whose business may be vitally affected by the new invention. There is an immediate demand for copies, and much inconvenience and possibly no little loss may be experienced when it is found that such copies are not available, especially if reply is received from the Patent Office that it is doubtful whether any more copies will be immediately forthcoming. Not only are the patents allowed at present to remain out of print, but in many cases the applicant is required to give special reasons why he should be supplied, such, for instance, as that he requires the copies for use in a court; and it is only after receipt of such explanations that the Patent Office will undertake to furnish them. Another instance of this petty, and as we have shown, very harmful economy, is the law which permits the Patent Office to print the Official Gazette only in "numbers sufficient to supply all who may subscribe therefor at \$5.00 per annum" besides such as may be required for State and public libraries on the order of Members of Congress, etc., "with 100 additional copies." These 100 copies are for sale in single copies only, and if any one should wish for more copies, say half a dozen or a dozen, he will be politely refused. Here is another instance of that irritating and foolish parsimony which is causing endless irritation and, we believe, working no little injury in certain specified cases.

We commend the subject to the earnest attention of inventors and manufacturers throughout the country with the suggestion that they urge upon their representatives in Congress the necessity for a more generous and reasonable policy in dealing with the Patent Office. Appropriations for reprints should be greatly enlarged, and they should be accompanied with specific directions for keeping the files of copies of patents amply supplied and for immediate reprinting upon the expiration of copies.

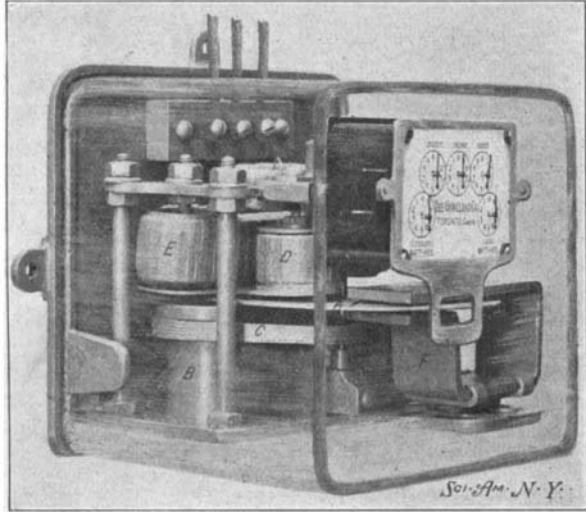
#### A Transparent Mirror.

Mr. Richard Wilson, of 99 Fourth Avenue, New York city, N. Y., has recently invented a mirror which reflects images or is transparent according to the amount of light in the background, that is, when the background is darkened the glass is a perfect mirror reflecting objects in front of it, but when the background is lighted one can readily see objects through the glass. The mirror is silvered with a thin coating of transparent reflecting material. The inventor proposes to use the mirror for illusive stage effects or in show windows as an advertising medium. The darkened

background of the show window will be illuminated at intervals by automatic means acting upon an electric lamp, so that shoppers who stop at the window to gaze at their reflection in the mirror will be surprised to have their images suddenly disappear, and see in their stead the latest thing in Paris fashions or the like.

**NEW PREPAYMENT METER.**

During the last few years there has been a remarkable development in various devices of a prepayment type. We have had with us for some time now the



**RECORDING WATT-METER WITH NOVEL INDUCTION MOTOR.**

prepayment gas meter, which has met with phenomenal success.

We illustrate herewith a prepayment electric watt-meter, designed to cover the entire field where electricity is used for light and power. This meter is of novel design; it is strictly automatic in its action, there being no switches, handles, or other mechanism to operate. All that the person desirous of purchasing light has to do, is to place a coin of the denomination for which the machine is constructed in the receptacle provided for that purpose, and it will deliver the gas paid for automatically and with absolute accuracy, as required. On the front of the machine are the recording dials. The large hand shows at a glance the amount of electric light or power to the consumer's credit at all times. The smaller hands indicate the watt-hours consumed, as in an ordinary meter. There are many points in this meter that will appeal to the practical electrician. The absence of delicate construction and the simplicity of mechanism insure durability. The moving elements are mounted upon ball bearings. The prepayment device of this meter operates entirely by gravity, thereby entailing no cost to the seller or purchaser of the light for the operation of the prepayment mechanism.

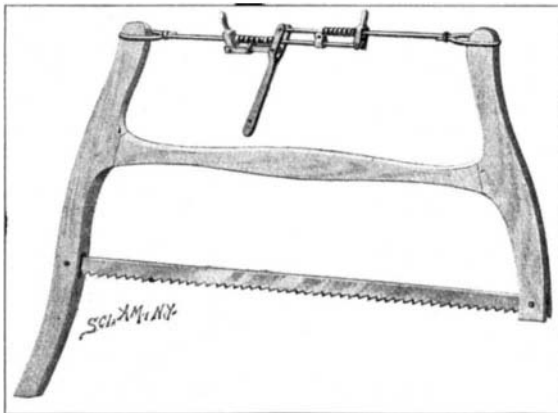
The prepayment mechanism will be readily understood by reference to the illustration. The coin is placed in slide *A*, and travels down by gravity on to the supplemental slide *B*. The latter is supported on the end of a lever, and is normally held in the position illustrated by the counterweight *E*. The additional weight of the coin, however, depresses the slide *B*, forcing the pins attached thereto into the cups *C*, which are filled with mercury. The motor is thereby connected with the electric circuit. At the same time a stop pin on the slide *B* is moved out of engagement with a notch in a disk *D*, permitting the mechanism to start up. The disk is directly connected with

the large hand referred to above. The train of gearing which connects this disk with the motor is so arranged as to permit the disk to make but one complete rotation while the motor makes the full number of turns paid for by the coin. The stop pin then engages the notch in the disk, permitting the slide *B* to rise, breaking the electric connection and bringing the parts to rest.

A novel form of induction motor is used in connection with this meter, which adapts it for use on alternating current circuits. The motor is best shown in our illustration of the recording wattmeter. An aluminium disk *A* is mounted on a vertical spindle which has worm and gear connection with the indicator clockwork of the meter. Below this disk is an electromagnet *B*, made of thin iron sheets and divided by a copper plate. The magnet is energized by a coil on one pole, the other pole being provided with a tongue-shaped flux-plate *C*, composed of copper laminæ. This flux-plate, it will be observed, lies parallel with the under surface of the aluminium disk and follows its periphery for a short distance. Mr. G. L. Gowlland, the inventor of the motor, has discovered that this non-magnetic pole-piece increases greatly the rotative effect on the disk. This effect is still further increased by a solenoid *D*, lying above the disk and over the end of flux-plate *C*. The coil is supported on a plate of copper projecting from the copper core of a large solenoid *E*. This plate constitutes a second flux-plate. The usual starting coil lies above the solenoid *E*. The magnet coils on being energized by the alternating current produce eddy currents in the copper flux-plates. These eddy currents creep toward the ends of the flux-plates, and acting indirectly on the aluminium disk, cause it to rotate. The sensitiveness of the instrument can be governed by adjusting the movable pole-piece of the solenoid *D* toward or from the disk. A permanent magnet *F* is used to produce a damping effect upon the disk, in order to prevent it from continuing its rotation by reason of its momentum when the current has been cut off. The patents for the prepayment mechanism and the induction motor are owned by the Gowlland Company, of Toronto, Canada.

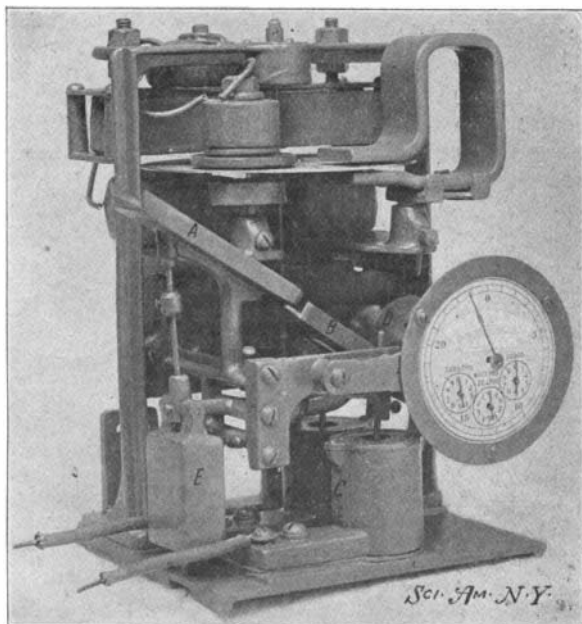
**A DURABLE SAW-TIGHTENER.**

Having experienced considerable annoyance with the ordinary type of saw-tightener for bucksaws, by



**A DURABLE SAW-TIGHTENER.**

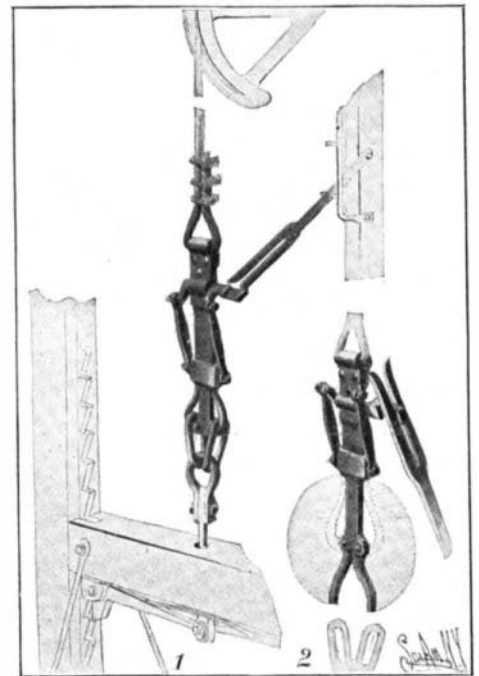
reason of its liability to wear out in a single winter of steady work, Messrs. A. H. South and J. C. Bostwick, of Orson, Iowa, recently directed their attention to the invention of a new device for tightening saw blades which would be very simple and durable. This they have succeeded in doing, as shown in the accompanying illustration. Their invention also embodies other important improvements which will be readily apparent from the following description of the construction. The tension rods extending from the upper ends of the saw frame overlap each other, but lie in different horizontal planes, being properly spaced apart at the center by a clip secured to the lower rod. A bifurcated lever hinged to the end of the upper rod is provided with an arm connecting with a sliding block on the lower tension rod. The block on the upper rod is hinged at its lower end to the lower rod. These blocks have apertures through which the rod extends, but the apertures are larger than the diameter of the rods so that the blocks may be swung out of the vertical to bind the rods. Now, by moving the lever back and forth the rods may be drawn inward toward each other with a ratchet movement, first one and then the other block gripping the rods to prevent them from slipping apart. When it is desired to loosen the saw blade the sliding blocks may be fed inward toward each other by gripping the handles formed on them, thus permitting the rods to move apart. The springs, it will be observed, tend to retain the parts of the device in frictional locking engagement when it is desired to have the same remain stationary, as when the saw is in use.



**NEW PREPAYMENT WATT-METER.**

**CAGE AND CABLE RELEASE.**

A patent recently granted to Mr. Robert Le Roy, of Park City, Utah, covers the invention of an improved device for automatically releasing a cage in a gallows frame from the cable should the cage be moved too close to the sheave or above the desired point for discharging loaded cars raised from a mine. The releasing device is very simple in construction, and is not liable to get out of order. It comprises a body portion attached at its upper end to the cable, and provided at its lower end with a pair of keeper arms hinged thereto. The keeper arms pass through links attached to the draw-

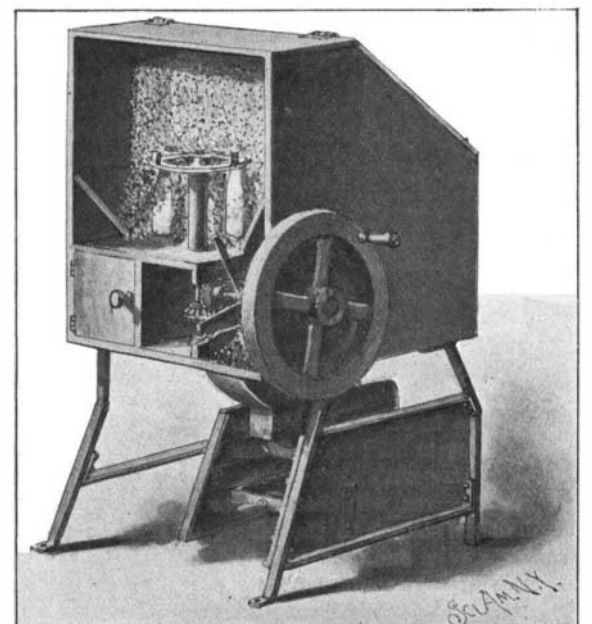


**AUTOMATIC RELEASE FOR MINE CAGES.**

rod of the cage, and their free ends are swung up and held against the body portion by a locking slide movable thereon. The locking slide is connected by links with a crank-shaft mounted at the upper end of the device, and from this crank-shaft a flattened piece projects, in such position as to be engaged by a forked lever, hinged to the gallows frame. This lever is placed at the point at which it is desired to stop the cage. Should the cage move above this point, the crank-shaft will be rotated by reason of its connection with the forked lever, and the locking slide will thus be drawn upward, releasing the keeper arms and permitting them to swing to the position illustrated at the right. The cage is thus released from its cable, and comes to a standstill, the ordinary safety catches being brought into action to prevent it from falling.

**SUGAR CABINET.**

In retail grocery establishments the cabinet illustrated herewith will be found very useful for holding sugar or other granular material. By its means a barrel of sugar may be stored in a closed receptacle and kept from exposure to dust and dirt of the store. At the same time the sugar may be readily dispensed in small quantities, and conveniently and quickly delivered to the purchaser. The cabinet comprises an upper compartment, in which the sugar is stored, and means for feeding the sugar out of this compartment through a lower compartment into any receptacle placed thereunder. The feeding mechanism consists of an agitator or wheel supported on a vertical shaft and rotated by suitable gearing connection with the hand-wheel at



**CONVENIENT SUGAR CABINET.**