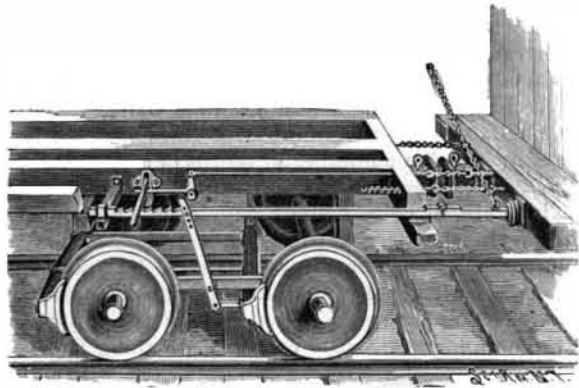


**AN IMPROVED CAR BRAKE.**

The illustration represents a brake attachment designed to apply the brakes when the cars of a train are brought together and made to engage one with the other, releasing them when the train moves forward



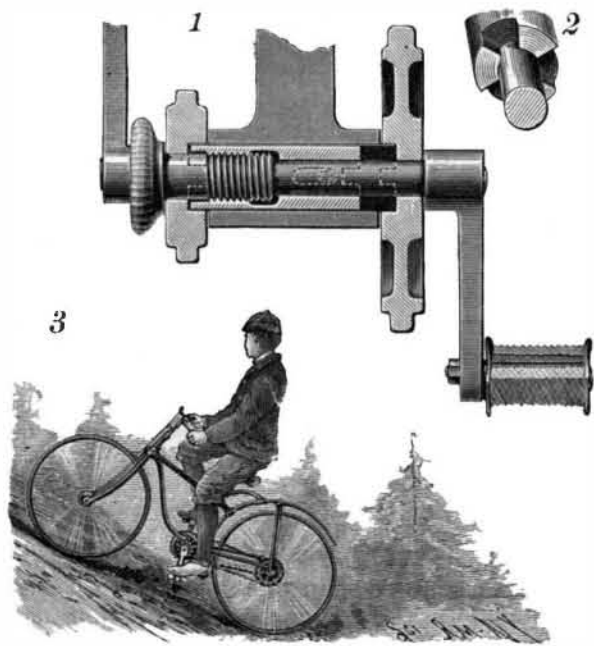
MAROLD'S CAR BRAKE.

or the cars are moved apart. It has been patented by Mr. John Marold, of New Decatur, Ala. At one side of the drawhead, and extending further outward, is a rack bar adapted to slide in the front sill and on a rear guide beam, the outer end of the bar consisting of a hinged section which may be lifted out of horizontal position when desired. The outer end of the hinged section has a flat head adapted to engage a wear plate of an opposed car, and the bar near its inner end has a series of teeth engaged by a dog pivoted at one end to one of the beams of the car bed, the dog being also connected with a lever fulcrumed on one of the beams, and connected to a rod which extends through an aperture in the front beam of the car, where it is attached to a length of chain connecting it by a hook with the sill of an opposing car. The rack bar is connected with a lever fulcrumed upon a beam of the truck, the lever being connected with the brake beams, and both the rack bar and the lever have a series of holes through which their connection is effected by a registering bolt, for the purpose of regulating the degree of tension to be exerted upon the brakes through the movement of the rack bar. When it is desired to apply the brakes, the coming together of the ends of the cars, pushing the rack bar inward, causes the lever connected with the latter to put on the brakes, which are held thus applied by the engagement of the dog with the rack bar until the cars are moved apart, when the dog is moved out of engagement by means of the rod and chain connecting it with the opposing car, and the release of the brakes is thus effected.

When the cars are to be shunted or backed, the hinged outer end of the rack bar is drawn up and held out of horizontal position by means of a short chain. As a provision against the breaking of the coupling pin, bolts are arranged to slide in the sills at each side of the drawhead, and each having a bearing against a spring cushion, the bolts of one car being connected by chains with corresponding bolts on another car. The chains are of sufficient length to slightly sag when the cars are coupled in the usual way.

**A DIFFERENTIAL GEAR FOR BICYCLES.**

A construction by means of which a bicycle gear may be quickly changed, so that the vehicle may be driven rapidly where the road is easy, or less speed with more power may be had where the road is loose or hilly, is shown in the accompanying illustration, and



BIGELOW'S BICYCLE.

forms the subject of a patent issued to Mr. Frank R. Bigelow, of Gloucester City, N. J. Fig. 1 shows the device in section applied to the treadle shaft of a bicycle, the bearing of the shaft being supported by an arm in the usual manner. Mounted loosely on opposite ends

of the shaft are different-sized sprocket wheels, each having on its inner side a series of sockets adapted to receive the teeth of a sleeve sliding on the shaft, the sleeve being of the length of the hub. Near the center of the sleeve, as shown in dotted lines, is a slot, through which extends a pin secured to the shaft, causing the sleeve to turn with the shaft. The sleeve has a series of recesses at each end, forming projecting teeth, as shown in Fig. 2, the teeth being adapted to fit the sockets on the inner side of each sprocket wheel, so that by sliding the sleeve one way or the other, either one of the sprocket wheels may be engaged and driven by the shaft. A hollow thumb-screw is mounted loosely on the shaft and extends through one of the sprocket wheels into the end of the sleeve, which is counterbored to receive it. The inner end of the screw is threaded to engage a threaded portion of the sleeve, and the outer end of the screw has a handle disk, by turning which the sleeve is moved to engage one of the sprocket wheels. In connecting this gear with a bicycle wheel, the latter is provided with two sprocket wheels, one on each side, and preferably of different sizes, the larger one connecting with the smaller sprocket wheel on the treadle shaft and the smaller one on the main wheel connecting with the larger of the treadle sprockets. By then shifting the sleeve, which serves as a clutch, either the larger or smaller of the treadle sprockets is engaged, according as the road is easy or difficult.

**A MINIATURE ELECTRIC MOTOR.**

An interesting little electric motor is the subject of our cut. It is of multipolar type, and by its construction secures a very even speed of rotation and good efficiency. It is a complete miniature of the practical everyday motor, and will, with a single cell of bichromate battery, run a 4 1/2 in. fan and do other light work. It is of interest as marking the tendency of electric toy makers to carry out the correct principles of electric engineering in their models. Other motors of larger size are made by the manufacturers, Messrs. Goodnow & Wightman, 63 Sudbury Street, Boston, Mass., one size being powerful enough to run a sewing machine.



**A VISIT TO A FAMILY IN ANNAM.**

A sojourn of two days gives the passengers on the Natal ample time to visit the city of Saignon. This European city is very attractive on account of the beautiful and well kept trees that border its streets like the lanes in a park, and the pretty little hotels which line its roads. Large and handsome gardens are within easy reach and add to the pleasure of a visit there.

Thanks to the kindness of some friends who acted as guides, I was able to visit the most curious section of the district, namely, Cholon, the Chinese section, where over 60,000 Chinese and Annamites reside. They live in little picturesque houses, and adorn their shops with various exotic plants full of interest to a stranger. Guided by my friends, we visited a very rich Annamite family, who lived in one of the prettiest streets in Cholon. Unfortunately the father was away and so were the sons, who were studying in Paris. We were, however, most hospitably received by the two eldest daughters. They were attractive-looking women with beautiful eyes, but their black teeth, which were lacquered, detracted somewhat from their beauty. They were clothed in long black trousers, and with a tunic of white Chinese crepe which entirely enveloped their figures. They wore gold collars and diamond bracelets, while their hair was held in position by a golden pin that clasps their locks in a knot. After the formal presentation, we were conducted through the principal apartments of the house. They were very simple in appearance, with bare white walls, but they were filled with beautiful furniture inlaid with mother-of-pearl, and we noticed some exquisite bric-a-brac, such as chiseled silver vases, jade ornaments, arms, and embroidered silks, worthy of the finest collections. The garden was charming, and the young ladies showed us with pride some ornamental plants that their father had procured for them from Canton.

One of these represented a peacock seated on its perch, another a tiger with enameled eyes. Perhaps the most curious of all were little dolls representing Chinese ladies and mandarins. The head, the hands, and the feet were of enameled porcelain, while the body was made of wire and covered with trailing vines. The vines are planted in such a way that they grow through the feet of the image. The vine grows

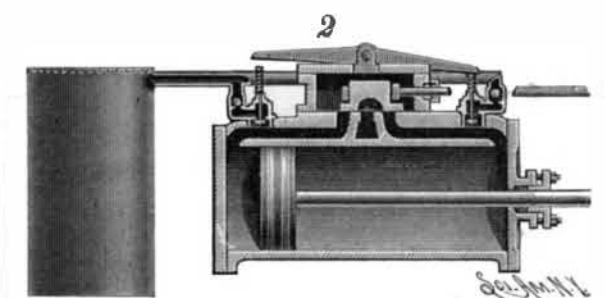
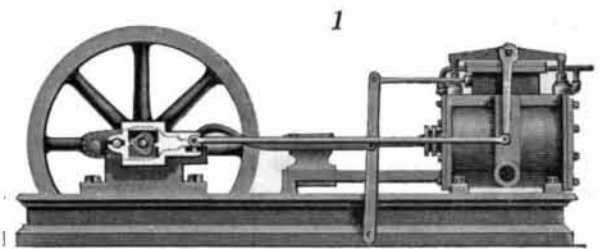
rapidly, and finally conceals the entire figure except the hands, feet, and head. When the figure is entirely clothed with the foliage, the effect is very fine.

In the middle of the garden and surrounded by pools of limpid water is a pagoda of carved wood. The pavement is laid in precious marble, and its columns are of carved wood, while the roof is richly ornamented. At the rear of the pavilion there are three altars, on which are three bronze vases and braziers, in front of large gilt statues of Buddha. Our hostesses invited us to rest in this pavilion. Their mother had erected it in honor of their father during his visit to the exposition at Paris, as a surprise for him upon his return.

After refreshments were served, at our request their servants brought their jewelry, and we had a chance to admire the fine gold work that they showed us, gold bracelets, carved ivory boxes, etc.—By Albert Tissandier, in *La Nature*.

**AN IMPROVED ENGINE.**

The engine shown in the illustration has a valve arranged at each end of the cylinder, opening previous to



CLARK'S ENGINE.

the opening of the ordinary exhaust and connected with a reservoir for the storage of exhaust steam, whereby it is designed to save a large amount of exhaust steam without causing back pressure on the piston in the cylinder. The valves at the ends of the cylinder are adapted to open inwardly, and in the valve bodies are check valves to prevent a return flow of the exhaust steam from the reservoir to the cylinder. The stems of these valves carry springs to hold the valves normally to their seats, as shown in Fig. 2, their opening being effected by the stems being alternately pressed on by the ends of a lever fulcrumed to the top plate of the steam chest. A depending arm from this lever, as shown in Fig. 1, is pivotally connected by a link with a plate sliding on the frame near the main shaft, the plate having an aperture in which travels a heart-shaped cam secured on the shaft, and adapted to strike on lugs secured on the plate and projecting into the opening. By this construction a quick motion is given to the lever which opens alternately the valves at the cylinder ends, at the time the piston is at or near the



CHINESE FIGURES FROM ANNAM, FORMED BY TRAILING VINES.

end of its stroke, and previous to the opening of the regular exhaust, the latter being effected by the ordinary slide valve operating over the usual inlet ports and the exhaust port. It is designed that the valves at the cylinder ends shall open in sufficient time to

permit a large quantity of steam to escape to the storage reservoir, an outlet pipe from the latter carrying off the saved exhaust steam to utilize for other purposes. If desired, also, these valves, instead of opening into the exhaust ports, may be arranged in the heads of the cylinder.

This improvement has been patented by Mr. Andrew J. Clark, of Dayton, Tenn.

#### THE ASSAYING OF GOLD AND SILVER ORES.

The process of assaying silver ores is based upon the following considerations: Any compound of silver exposed to high heat in the presence of metallic lead or of oxide of lead and of a reducing agent gives up its silver in a metallic state, and in practice an alloy of lead and silver containing all the precious metal of the sample of ore used is obtained.

The ore before being assayed is carefully sampled, so as to represent an exact average, as nearly as possible, of the mine, vein, or heap from which it is taken. It

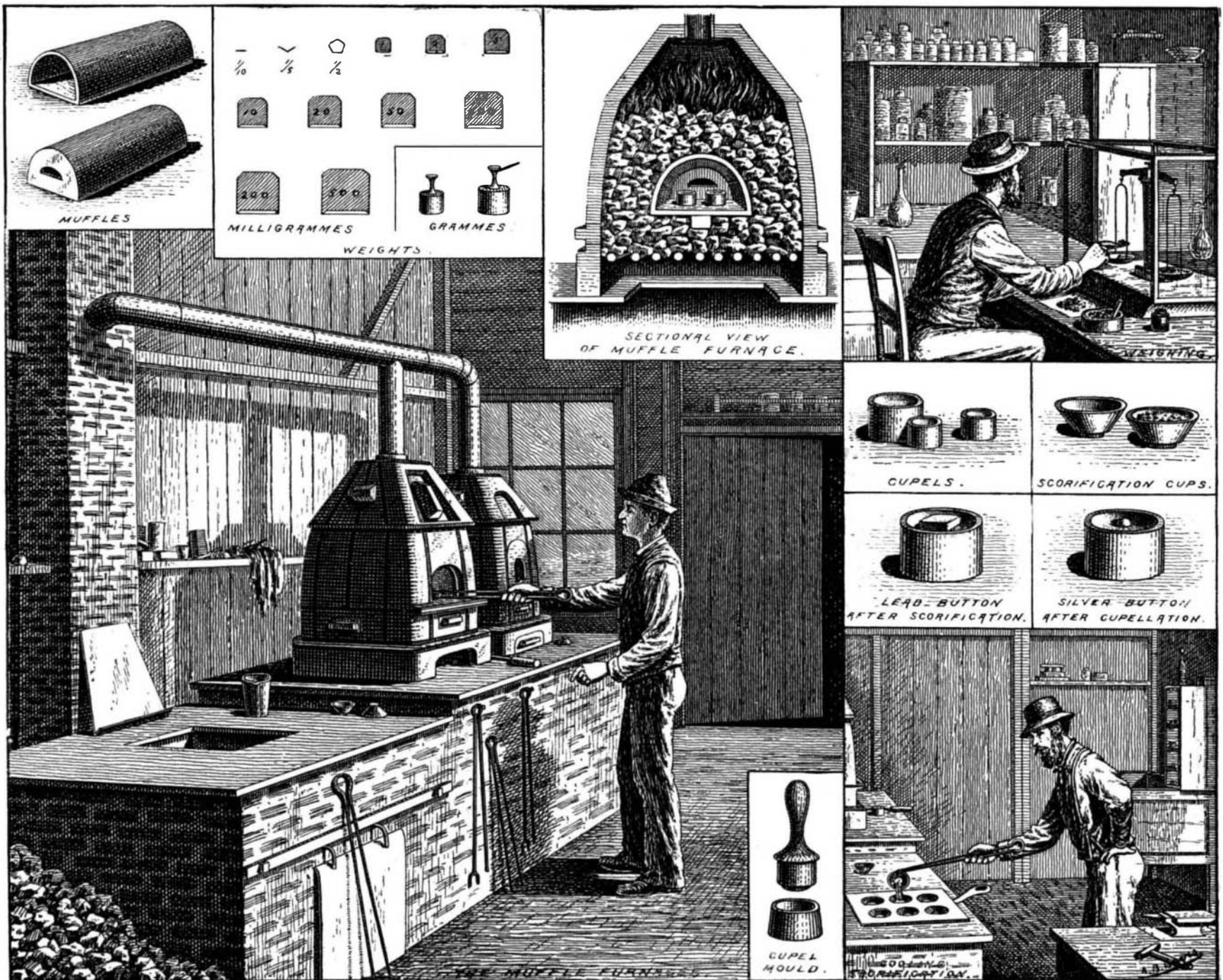
the scorifier melts and the ore floats on top of it, along with the melted borax glass. Gradually the ore disappears, its metallic constituents entering the lead and its earthy constituents forming with the borax glass a fusible slag. As a constant current of air is drawn through the muffle, the lead rapidly oxidizes and its oxide joins the slag, so that after a little while only a small circle of metallic lead appears in the center of the slag. This circle is gradually encroached upon, and eventually the slag covers over the button of metal, which at once sinks to the bottom and the scorifying is ended. After a little more heating the scorifier is withdrawn from the muffle and its melted charge is poured out into a hemispherical depression in an iron pan, in which it rapidly cools. When cold, a few blows of the hammer, the charge resting on an anvil, knocks the slag off. The spheroidal lead button is then pounded into a roughly rectangular shape, and is ready for cupellation.

The cupels are shallow cups of bone ash, about  $1\frac{1}{2}$

its weight of pure silver. It is then rolled out into a thin sheet, and is treated with nitric acid. This dissolves the silver and leaves behind the gold and any platinum or similar metal which the ore may contain. This residue is weighed and is reported as gold.

The weights used, from the gramme upward, are usually made of brass, of the shape shown. From 500 milligrammes down to 10 milligrammes they are often made of platinum; the smaller weights are of aluminum, the fractions of a milligramme being made of wire bent so that the number of sides in each bent wires indicates the number of tenths of a milligramme which it represents.

There are, of course, many refinements and modifications in the process which it is not necessary to summarize here. The assayer acquires by practice so good a knowledge of ores that he can properly proportion his charge from the appearance of the ore alone. A large number of assays can be kept going at once, the scorifiers and cupels being marked with num-



THE ASSAYING OF GOLD AND SILVER ORES.

is next pounded in an iron mortar and the process continued until it is very finely pulverized. A sample is thus obtained which is given to the assayer.

The first operation is to weigh out the powder. This must be done upon a fairly delicate balance. The quantity used for an assay depends upon the richness of the ore; it is very usual to base the weighing upon what is known as the assay ton, a weight of 29.166 grammes. One milligramme bears the same proportion to the assay ton that one troy ounce does to a ton of 2,000 pounds. In weighing, duplicate portions are weighed out representing from a fraction of one to several assay tons, according to the richness of the ore, and the operations are carried on in duplicate throughout. Each sample is mixed with from 8 to 16 parts of very pure, finely granulated lead, called "test lead," and a little borax glass. The fusion is often done directly in a scorifier. These are shallow clay cups about 2 inches and  $2\frac{1}{4}$  inches in width. The weighed portion of ore with the borax glass and lead being placed in one of these cups, the whole is introduced into a hot clay retort known as a muffle, which is heated in a muffle furnace. Muffles and furnaces are shown in the cuts in sections and elevations. The heat is maintained at about 1,600 degrees. The lead in

in. in height,  $2\frac{1}{4}$  in. in width and  $\frac{3}{8}$  in. in depth. They are made by hammering in a mould, a hammer and piston being used to drive the material down into the cavity of the mould and compact it. The cupel is first heated in a muffle and the rectangular button is placed in it. It at once melts and begins to oxidize. As fast as the oxide of lead is formed, it melts and is absorbed by the porous bone ash of the cupel, as water is absorbed by a sponge. This operation goes on until little more than the silver is left. Just at this point, as the last of the oxide of lead disappears, a sudden flash of rainbow colors passes across the surface of the button, the "brightening" indicating the expulsion of the last of the lead. The silver button is now allowed to cool, is removed by a pair of pincers from the cupel, and when cleaned and brushed free of bone ash is weighed on an exceedingly sensitive balance. Each milligramme of weight represents an ounce or definite portion of an ounce per ton of ore if assay tons have been used. The balance used for this weighing is one of the most sensitive made, and can indicate the twentieth of a milligramme readily.

Should the ore contain gold, this is determined by "parting." The button is fused with one or two times

bers designating the sample for assaying which it is used.

#### American Copyright.

It is a great mistake to suppose that the copyright difficulty with America has been settled. The new American act comes into operation this day month, but we shall then be no better off than we are now. Before the British author can enjoy the benefits of the measure, such as they are, we are expected to give reciprocity to the American author, who is to be placed on exactly the same footing, as regards copyright, as the English writer. That would be fair enough were the conditions equal, but Congress has taken care that they shall be very far from equal. For an English book to obtain copyright in the United States it is essential that it should be printed there. Yet, in face of this, Mr. R. B. Marston appeals to Parliament to grant reciprocity to America. What Parliament ought to do is not to grant a ridiculously one-sided reciprocity, but to pass a measure of retaliation. Let us give copyright to the American author on precisely the same terms that America offers it to the Englishman. Nothing can be fairer than that.—*St. James's Gazette*.