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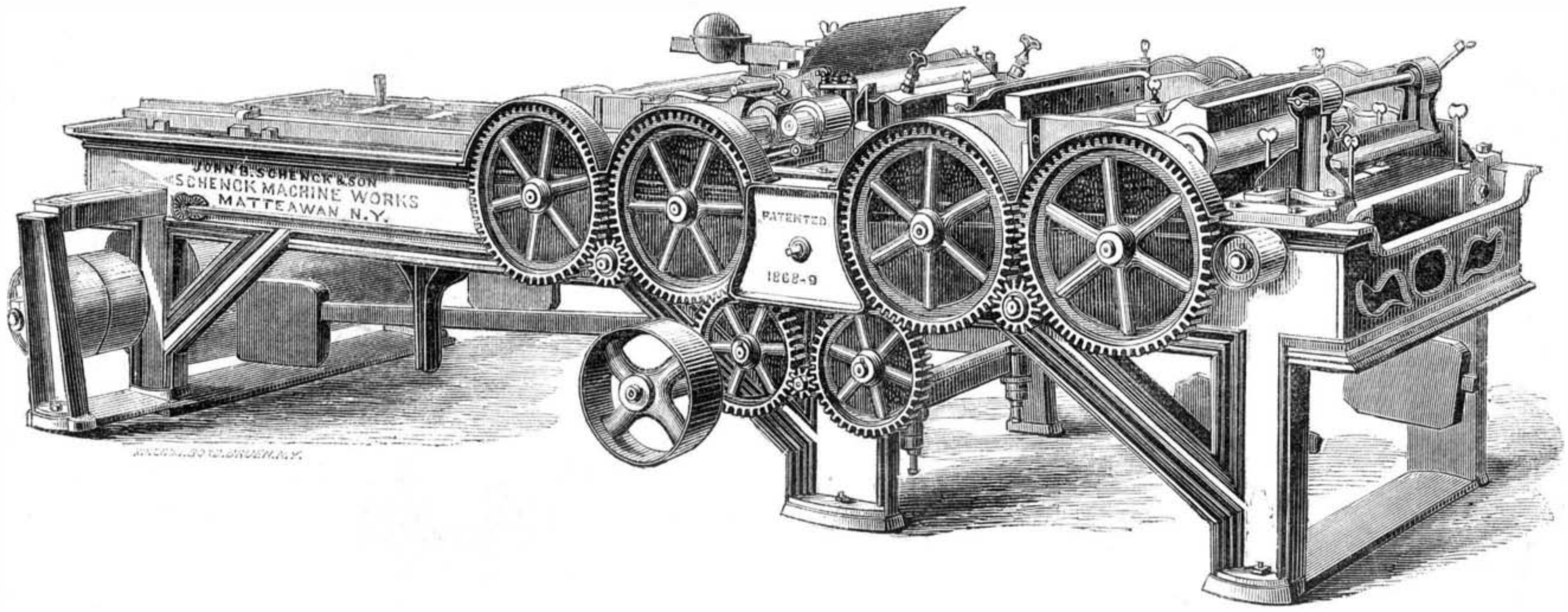
Improved Woodworth Planing Machine.

The Woodworth planer for nearly forty years has been known and used in this country, and has made a name for itself in others. The Woodworth planer occupies the foremost rank among the many labor-saving machines produced by the inventors of the last half century. From the experience and skill it has developed, have sprung the molding and tenoning machines, so important among the labor-saving machines used in the building art.



THE IMPROVED SCHENCK-WOODWORTH PLANER.

The Schenck Machine Works, founded in 1832, were the first establishment which made the manufacturing of the Woodworth planer a specialty. The senior of the present proprietors, after an experience of many years in the construction of what has been so long known as the "Schenck-Woodworth planer," has made many valuable improvements in them, for which letters patent have been secured through the agency of the SCIENTIFIC AMERICAN.

The engraving represents their extra No. 1 planer, with eight feed rollers, and an under cutter, so that it planes both sides and matches both edges at one operation.

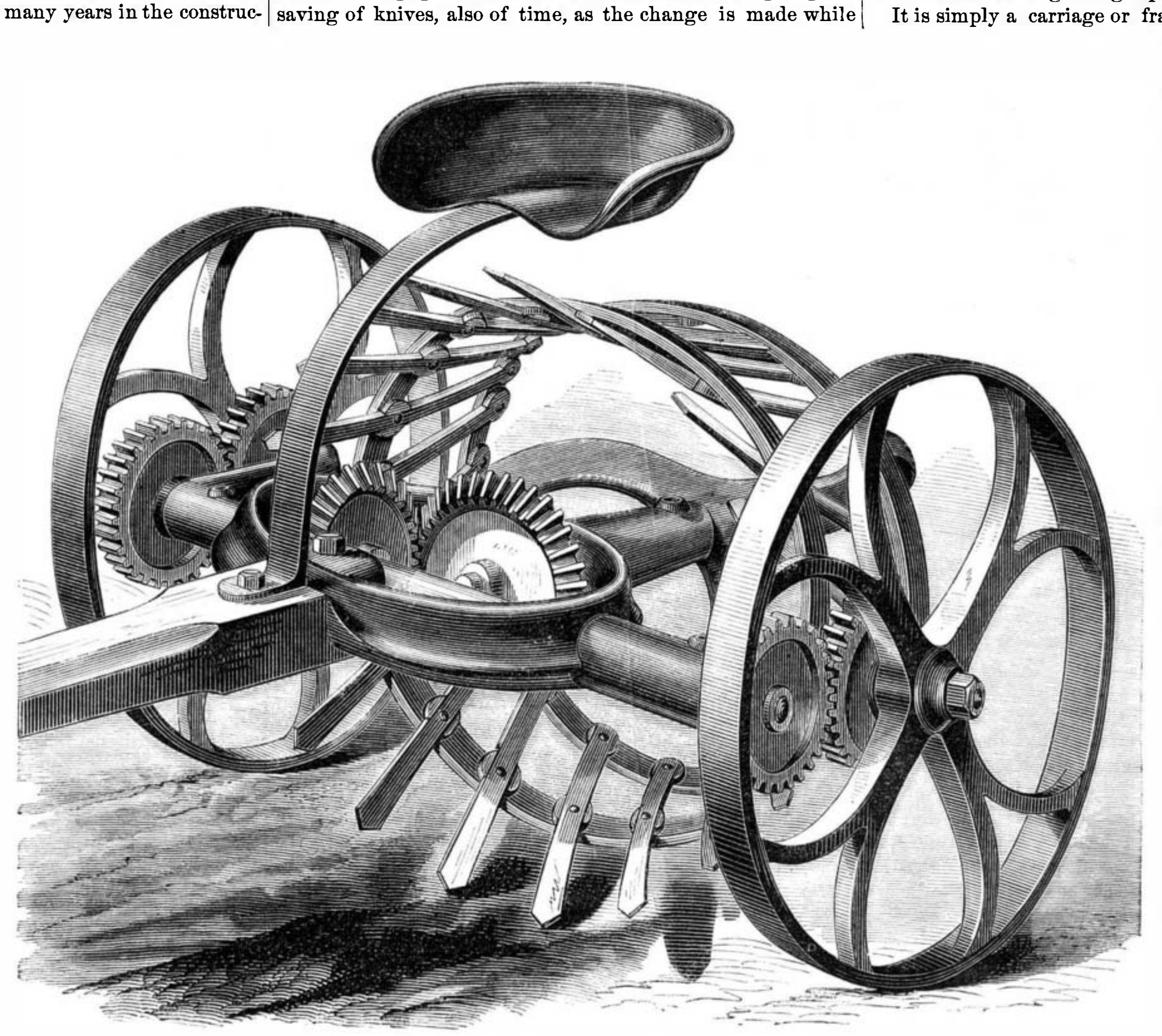
The improvements made by Mr. Schenck are as follows: A method of adjusting all the top feed rollers simultaneously, preserving their relative positions by means of one crank, by a very simple arrangement, requiring only one screw on each side of the machine; also adjusting the facing cylinder and the pressure bar on the delivering side, as well as the pressure roller on the entering side of it simultaneously, precluding the possibility of lowering the facing cylinder, so as to come in contact with the pressure bar and roller, or of raising the bar and roller so as to come in contact with the knives on the facing cylinder, thus rendering it perfectly safe to adjust the machine so as to receive stuff of any thickness desired while in operation, with no appreciable loss of time.

Another important improvement consists in making the lever which weights the introducing pressure roller adjustable, so that it may be placed (as it always should be) over the middle of the board being planed. This causes the roller to bear evenly on the surface of the board, and prevents it from canting. This pressure roller is raised by, and with the introducing feed roller, always being one-eighth of an inch below it, so that the board, in passing under it, raises it only the one-eighth of an inch, whether much or little is to be planed off. The advantages of this arrangement will be apparent to all in the operation of the planing machine. The most important improvement, however, is the arrangement by which the matching guides and matching head are adjustable across the machine, all being moved by one crank, or the shank of the matcher hanger screw shown in the engraving; the guides being moved by the horizontal shaft, which, by means of the bevel gears, revolves the screw which carries the end of the long introducing guide, and simultaneously adjusts the guides and matcher head, preserving their relative positions to any desired point across the machine. By this improvement, the whole length of the knives is used when narrow stuff is being planed on a wide machine, effecting a great saving of knives, also of time, as the change is made while the machine is running, and with no loss of time. The advantages of this improvement are apparent to every operator. It is very simple and durable, and accomplishes the objects for which it was designed, with great accuracy.

The Messrs. Schenck build a great variety of smaller planers—some for surfacing only—but all combining the same principles of simultaneous adjustment, which are the leading characteristics of the improved Schenck-Woodworth planers. For descriptive circulars, address John B. Schenck & Son, Matteawan, N. Y.

Machine for Digging Potatoes.

The harvesting of that most valuable and popular escule the potato, is a labor so monotonous and exhausting, that though no one objects to the root, when it appears on the table, in whatever garb, digging potatoes is regarded as quite another thing. So, a machine that will dig the bulb, and save human arms and human endurance the labor, must be acceptable. Such is claimed, by the inventor, to be the machine which the engraving represents.



BAKER'S ROTARY POTATO DIGGER.

It is simply a carriage or frame supported on two driving wheels, and is drawn by a team of two horses, walking on each side of the drill or row of hills. Secured to the driving wheels, and revolving with them, are two gears, engaging with two other gears on a front shaft, carrying, at the center of the frame, a bevel gear that meshes with a similar gear on a shaft in line with the draft pole. This shaft turns in a sleeve forming a portion of the frame of the entire machine, and carries, on its rear end, a cylindrically-shaped frame, the rear of which is open, and the sides of which are spirally-arranged tines, pointed and flaring at the front end, and strengthened by hoops or cylindrical bands.

In operation this basket cylinder revolves, by the draft of the machine over the ground, in a direction with the spiral incline of the bars or tines. The points of these enter the ground to a depth sufficient to lift the roots, this depth being governed by the downward inclination of the tines at their forward or entering end. The forward and rotating movement of the arms of this cylinder, combined with their spiral arrangement, lifts the potatoes from their bed, sifts the clinging soil from them, and deposits them in a regular row. It does not dig the earth as do some other machines intended for the same purpose, but it lifts the tubers, sifts them from the earth, and leaves them clean on the surface of the ground, without plowing. Beside this, it acts somewhat as a plow, cultivator, or harrow, disintegrating the clods, and leaving the soil porous and open for a subsequent crop, or for the action of the frost, preparatory to the next spring's planting. But this preparation of the soil is only secondary to the primary object of the device, which is to lift the potatoes and separate them from the soil. It is intended as a potato digger and not a soil digger.

Letters for information should be ad- dressed to the inventor and patentee, T. Baker, Stillwater, Saratoga county, N. Y.

The Velocity of Insects' Wings During Flight.

The *Comptes Rendus* contains an interesting article, by E. J. Marey, containing the results of an attempt to submit to strict experiment the study of those motions which the eye cannot follow, and the form of which cannot, under ordinary circumstances be discussed, on account of their extreme rapidity. The points to be determined, and the questions to be answered, were:

What is the frequency of the movements of insects' wings? What are the different positions which the wing takes in the different phases of each of its revolutions? By what mechanism does the wing, taking the air for its fulcrum, produce the locomotion of insects?

The results attained have a direct bearing upon the construction of flying machines, and will be perused with interest by aeronauts and those aspiring to be aeronauts.

Physiologists have attempted to determine the frequency of the movements of the wing, from the sound produced by the insect during flight. They have been compelled to admit very high figures; six hundred vibrations a second, for the common fly; yet that number must be tripled in cases of very rapid flight. Other insects must produce a far greater number of beats. Naturalists, nevertheless, have been little agreed upon the cause which produces the sound we hear during the flight of insects. Some authors think the sound independent of the wing movements, produced by a special humming apparatus; it is due, according to others, to the alternate movements of the air, in escaping and entering the tracheal tubes.

In face of these discordances, the author sought for a mode of exhibiting, in an unmistakable manner, each of the beats of the wing of an insect, and the graphic method answers very well for determining their frequency.

He grasped, with a fine pair of nippers, the hind part of the abdomen of an insect, and when it sought to fly, directed one of its wings in such a way, that it rubbed by its point against the surface of a smoked cylinder, which revolved with a known velocity. The wing, at each of these revolutions, carried away a little of the black of the smoke which covered the cylinder, and left a trace of its passage. This experiment gives a diagram exhibiting the varied forms that are periodically reproduced with the same characteristics, and, consequently, correspond to one revolution of the wing. By means of a chronographic diapason, the exact number of the revolutions of the wing which are effected in a second were precisely determined. That which he used, gave a graphic delineation of five hundred simple vibrations per second.

A continual rubbing of the wing on the cylinder, presents a resistance to this organ, which retards its frequency; so in order to have the nearest approach to the truth, those drawings were selected in which the contact of the wing with the cylinder was at a minimum, so that the diagrams were reduced to a series of points.

The frequency of the movements diminishes, also, when the wing is loaded with a little weight. It diminishes equally by fatigue, and the action of cold. Everything occurs in this case, as in the rhythmic movements of the muscular system in different animals. Under equally favorable conditions for observation, the frequency of the beats which different species of insects produce, brings before us curious results. The numbers found for each second are as follows:

Common fly, 330; drone, 240; bee, 190; wasp, 110; hawk-moth, 72; dragon fly, 28; cabbage butterfly, 9.

A more complete study of a great number of well-determined species would, doubtless, furnish much higher figures, as the maximum frequency.

It should be added that the wing movements, in this sort of captivity, on account of the greater resistance, will be reduced in number. The above figures must, therefore, be below those representing vibrations in a free flight.

The graphic method does not answer very well to determine the course of the wing at each of its revolutions. The tracings which the point of the wing of an insect describes in space are inscribed on the surface of an ideal sphere, which has for its radius the length of the wing, and for its center the point at which this organ is implanted in the thorax of the insect. A spherical surface of this nature could only be tangential at one point to the surface of the registering cylinder, and every fuller contact risks deforming the drawing more or less, in reproducing the curvature of the wing. To obtain an exact notion of the course of the wing in space, Wheatstone's optical method was employed. It is well known that this celebrated English physicist terminates vibrating rods with bright metallic balls, whose gleam leaves upon the retina persistent impressions of the periodical movements they execute.

By fixing with varnish a little piece of gold leaf to the end of an insect's wing, and placing the animal in a ray of sunlight, a bright luminous image was obtained in the form of the figure 8, which indicates the different points in space traversed at each revolution, by the gilt spot.

Among different sorts of insects the experiments almost always met with the same form.

Resuming then the graphic method to verify this result, he succeeded in obtaining successively portions of the drawing, in some cases giving the upper loop of the 8, in others the lower, and in others the double point, where is the intersection of the two halves of the 8.

By way of further confirmation, he sought to register the contact of the wing with the cylinder, not only by its point, but by its anterior margin. The theory anticipates that under these conditions the figure 8 ought to disappear, and in its place one should obtain a double contact of the wing with the cylinder. One of these contacts took place at the instant the upper loop of the 8 was formed, and at the point where this loop presents its convexity to the cylinder. The other contact took place where the lower loop was formed under the same conditions.

The author concludes that this complex movement does not result from a series of periodic muscular acts executed by the insect, acts which would produce in one case a simple oscillation in a vertical direction, while in the horizontal direction, other muscles would produce, at the same time, two oscillations. In reality, the insect only executes one movement of lowering the wing, to which succeeds a movement of elevation, and if in consequence of these two contrary movements, the wing is not limited to oscillate in one plane, this results from the resistance of the air, which imposes upon the wing a deviation in each half of its course.

Clocks and Clock Towers.

A correspondent of the *London Building News* writes to that journal some suggestions, both with regard to the construction of clock dials and their illumination by night. He thinks it possible to illuminate the hands alone by making them hollow: in fact, gas tubes with jets of gas close to each other along their entire length, after the manner of lighting to be seen in many places. There would be no difficulty in introducing the gas into the hands, which would by this means be seen as far as the clock tower itself allowed. The figures might be similarly illuminated if considered necessary, but they are really of very little use, the position of the hands alone being a sufficient guide. It may be objected that in an occasional high wind the light would be extinguished, but by having one jet properly protected in the center, the flame would immediately run along the hands, and relight them as often as the light might be extinguished.

Then, with regard to the construction of the towers, there can be no reason why they should all be after one pattern simply to provide room for the weights. In a church or public clock the weights attached to the striking portion of the machinery are (unlike those of domestic clocks) always the heaviest and the most difficult to provide for, but it is practicable to do away with them altogether by substituting an electro-magnet in their place. Electric batteries can now be made so constant and so comparatively inexpensive that the cost would not be so much as the payment for winding often amounts to. The smallest clock in the basement of the tower, or, indeed, in any part of the building, could be made to send the requisite currents both for the "going" and the "striking" parts of the machine. Unsteadiness of the tower would not at all interfere with the performance of the clock.

The suggestion of an oval dial, mooted in a previous issue, is, he thinks, hardly advisable, seeing that it would in effect reduce the diameter of the dial to that of its shorter axis, and as size is tantamount to visibility, the aim is generally to obtain the largest space consistent with the architectural details of the building.

There is a plan, however, which would allow considerable variation in the shape of the dial, and yet, with a smaller surface, be more distinct. It is to show the time in the same way as the day of the week and month are shown in some "date boxes," that is, by the figures being painted on linen, and stretched in an endless coil over rollers. By this means, if required, figures ten feet in hight could be made use of, the time being indicated every minute as given in railway time tables, "12.50," "12.51," etc., the hour figures being in an upper compartment, either immediately over or some distance away from the minute figures, as fancy might dictate. The mechanical apparatus for this purpose would be of the simplest possible description.

If such a scheme were adopted, illumination by night could be effected with the greatest facility. On some portion of the tower gas piping might be arranged, coil within coil, so that all the figures from 1 to 0 should be represented, and then, as each minute passed, by simply turning the proper tap, the requisite figure would be illuminated; one tap being turned on before the other was turned off, the flame would be communicated as required. It is almost needless to observe that the piping could be colored to any required tint to harmonize with the materials of the tower, and, moreover, might be so constructed as to be an ornamental addition.

A New Method of Carriage.

The *London Building News* says an invention of Mr. Hodgson, C.E., was tested lately at Bardon Hill and Markfield, which claims to provide a means for the cheap carriage of minerals, stones, and other substances, far surpassing the cumbrous land carriage system now in use. The inventor claims that, by this system, a way can be constructed very rapidly, that the necessity of leveling the ground, and of bridging over water courses or other obstacles is avoided, and that it costs much less than any other road, varying in price from £250 to £1,000 pounds per mile, to carry from 50 to 1,000 tuns per day over any country, which price includes steam power, rolling stock, and every requisite for work. The cost of transit also is very low, as compared with the expense of carrying on the axle. The system may be briefly defined as a continuous development of the plan now not unusual in India, Australia, and in some mining districts, of bridging over a river or ravine by a single wire, by which, carried in a bucket suspended by a pulley, the necessary loads are transmitted from one point to another. To accomplish (in the words of the inventor) the easy passing of the points of support necessary to carry out a continuous line of communication, and to provide for the distribution of the burden and the application of motive power, have been problems of no small difficulty; but experiments having demonstrated the practicability of this scheme, arrangements were entered into with the proprietors of the Markfield granite quarry.

The line consists of an endless wire rope, supported on a series of pulleys, carried by substantial posts fixed in the form of tripods (varying in hight from 14 feet to 40 feet), which are ordinarily about 150 feet apart, but where necessary much longer spans are taken, in one instance being nearly 600 feet. This rope passes at one of its ends round a drum worked by an ordinary movable steam engine of 16-horse power, and the rope is driven at a speed of about four miles an hour, although when the way is completed six miles and upwards will be attained. The boxes in which the stone is carried are hung on to the rope at the loading end, the attachment consisting of a pendant of groove-like shape, which maintains the load in perfect equilibrium during the whole course of the journey, whether it be traveling up or down the inclines, and at the same time enables it to pass the supporting pulleys freely; and it is a source of wonder to see the ease with which the loaded boxes travel up the inclines, although the gradient is sometimes as much as one foot in six. Each of the boxes carried one cwt., and the delivery will be at the rate of about 200 boxes per hour for the distance of three miles. The cost of the present way is £200, and the saving in the cost of traffic will be 33 per cent to the proprietors, Messrs. Ellis and Everard, in addition to the enormous saving in construction. The scheme is susceptible of extension to carry heavy traffic, the only difference being the providing of stronger gear. The The line was constructed by the Wire Tramway Company, of London, under the personal superintendence of Mr. Hodgson, and with the efficient co-operation and assistance of Mr. Ommanney. The cost of the rope is about 1s. 9d. a foot, and is manufactured at Warrington, being half an inch in diameter. The rent paid to owners of land over which the posts are fixed is 5s. per foot, the whole rent of the course being £25.

Reducing Aluminum from its Ores.

A Boston chemist has patented the following method of extracting aluminum. He mixes alumina with gas tar, resin, petroleum, or some such substance, making it it into a stiff paste, which is divided into pellets; and these pellets or balls are dried in a drying oven, then placed in a strong tube or retort, which is lined with a coating of plumbago. They are then exposed to a cherry-red heat. The retort must be sufficiently strong to stand a pressure of from twenty-five to thirty pounds on the square inch, and be so arranged that, by means of a safety valve or tube, the necessary amount of hydrocarbon gas can be introduced into the retort among the heated mixture, and the pressure of from twenty to thirty pounds on the inch be maintained. Hydrocarbon gas is generated and pumped into the retort, and as it is consumed the supply is maintained. By this process the alumina is reduced and the metallic aluminum remains as a spongy mass, mixed with carbon. This mixture is then remelted with metallic zinc, and when the aluminum has collected in the metallic state, the zinc is driven off by heat. The reduction is due to the action of the hydrocarbon under pressure. The time for reducing one hundred pounds of aluminous earth, cryolite, or other compounds of aluminum, should not be more than four hours; and when hydrocarbon gas can be obtained in a heated and compressed state, the reduction takes place in a still shorter period.

Safety Matches.

It is well known that a great number of serious accidents occur from fire, caused by persons carelessly throwing down matches which they believe to be harmless, because the flame has been extinguished, but which in reality are highly dangerous, and quite capable of communicating fire to any light dry material, in consequence of the wood splint being at a red heat, although not actually in a flame. It has been proposed, in order to prevent this, to saturate the splints (previously to their being dipped), with a solution of any chemical salt which has the property of preventing the wood from remaining at a red heat, after the flame has been extinguished, without being in any way detrimental to the inflammable nature of the splint; and thus to prevent the possibility of accident from the dropping of the match after the extinction of the flame, but while the splint is still at a red heat. The substance which he proposes to employ is alum; though other salts have this same property. The matches before being dipped are to be immersed in a strong solution of alum or other salt with similar action, until they are saturated—they are to be dried and dipped with the ordinary composition. Matches so treated are said to ignite and burn with flame as long, and as readily, as other matches, but the instant the flame is blown out, the match becomes black and perfectly harmless.

GOLD REFINING.—Mr. F. B. Miller, an assayer of New South Wales, has recently specified a patent which relates to the refining of gold. The title is "*An improved method of toughening British gold bullion, or refining alloyed gold, and separating therefrom any silver it may contain.*" In his specification, the patentee proposes to effect his desirable object by the employment of chlorine gas or hydrochloric acid gas, applied in such a manner that it shall rise up among and through the alloyed gold in a molten condition, by which means the chloride of silver, and the chlorides of any other metals of baser order which may be present, will be formed, and will rise to the surface of the melted mass, while the gold will remain beneath in a purified and tough condition. The author read a paper upon the subject, before the Chemical Society of London, a few months ago.