ing the different powers of absorption by gases and vapors of the radiant heat passing through them, the apparent difficulty was perfectly explained, and Leslie's aethrioscope became a direct measure for the amount of totally invisible vapor in the atmosphere in the inaccessible upper strata.

In order to make this clear, we will first notice that the heat, when accompanied by powerful light, will pass through many transparent substances which will not transmit this heat when radiating without this light. So the solar rays will radiate with most of the sun's heat through the glass panes of a hot house, while the heat without that light cannot return and be radiated upward; such glass acts thus as it were like a check valve, letting the solar heat in, but preventing its return in the opposite direction. Our atmosphere acts in a similar way; notwithstanding some of the heat and light is absorbed in passing through its strata, we are the gainers, as it prevents the return of the heat, by being a powerful check to the obscure radiation of the same. The intense cold prevailing high up on the tops of mountains, where the atmosphere is very rare, and higher up still on the moon, where, practically, there is no atmosphere at all, is partially due to this cause.

In the second place, it must be remarked that a perfectly dry atmosphere is quite transparent for obscure radiant heat; this explains several facts which otherwise would be difficult to understand; for instance, the nights in Persia and still more in the desert of Sahara are so cold, for the simple reason that the atmosphere is so dry and gives an easy egress to the obscure caloric rays which, during the night time, radiate upwards to the celestial space. This effect is still stronger in high regions where the air, besides being very dry, is more rarefied than it is lower down. So the accounts of our countryman, Mr. Squiers, who was sent by the United States Government to the high lands of Bolivia, South America, inform us that, after a burning hot sun during the day, night frosts devastate the vegetable kingdom to such a degree that only grasses fit for cattle can continue their existence, and no forests can keep alive; people live mostly on animal food, and use the droppings of the cattle for fuel to cook it. At the other hand, Louisiana, especially New Orleans and the country south of it, is always covered with such a moist atmosphere that night frosts are very rare, even in midwinter, and we find the most luxurious subtropical vegetation, for the double reason of a moist atmosphere being favorable to vegetable growth, by the continual supply of a kind of irrigation in the state of vapor, and the preservation of the surface heat during the night, the moist atmosphere covering the ground and preserving the heat like a blanket on a sleeping couch. The phenomenon of the dew, formerly so ill understood, is also easily explained by the radiation of obscure heat through a transparent cloudless atmosphere, which radiation cools the surface of the earth to such a degree that the air, in contact with that surface and cooled by it, loses its capacity for watery vapor, becomes foggy, and deposits water on the surface of the ground.

Several investigators have occupied themselves to determine the amount of absorption which different kinds of vapors and gases offer to radiant heat. Tyndall, in his late publication "On Radiation," gives a comparative table from which we extract the following:

| Name of gas or vapor. | Amount of absorption. |
|---|---|
| Dry air | 1 |
| Geranium vapor | 33 |
| Lavender " | 60 |
| Oil of laurel " | 80 |
| Oil of cassia " | 109 |
| Oil of aniseed " | 372 |

These figures have been found by passing the obscure radiant heat over a bibulous paper which was moistened with the perfume, and the intensity of these rays, on the surface of a thermo-electric pile, was measured by the amount of electricity generated, a method which we will explain in a future article.

If watery vapor is then a powerful absorber of obscure caloric rays, the amount of this absorption can be used as a measure for the amount of the absorber in the atmosphere, that is, for the amount of watery vapor; and this is exactly what is accomplished by means of the aethrioscope; a total absence of radiation from the bulb, or perhaps rather the perfect compensation of its loss by radiation, by the downward radiation or reflection of the heat absorbed by the watery vapor, is of course indicated by an absence of motion in the liquid column, *c*, of the instrument. This takes place as soon as the sky is commencing to be covered with a thin film of cloudy mist; but before this point of the beginning of the condensation is reached, the sky is clear, notwithstanding it is charged with a great deal of vapor; and there is an infinite graduation in the amount of this vapor, from the point of visible condensation mentioned to that of drying, which will all show itself by the amount of radiation toward the celestial space, and the consequent greater or less motion, of the column in the aethrioscope, taking place as soon as the surface of its reflector is uncovered, the same being directed towards that part of the upper atmosphere of which we wish to determine the amount of invisible moisture.

We need not say that, between the point of condensation when the vapor commences to be visible and that of actual rain, there is also a gradual increase of the amount of floating water particles and consequent density of the clouds, which finally will discharge their excess of liquefied vapor in the form of rain.

MEN are often capable of greater things than they perform. They are sent into the world with bills of credit, and seldom draw to their full extent.

# Correspondence.

*The Editors are not responsible for the opinions expressed by their Correspondents.*

## Steam Propulsion on the Canals.

*To the Editor of the Scientific American:*

Although more than a year has passed since the award was offered for a new motive power for the propulsion of boats upon the canals, no plan has as yet been submitted which is capable of superseding the old system in point of economy, a point which seems to have been generally overlooked, in consequence of the prevailing erroneous impression that the principal difficulty, to be overcome in the application of steam power for canal propulsion, is to prevent the washing of the banks by the commotion, created in the water by the propelling instrument, in connection with the increased rate of speed of the boat. It is a noticeable fact that the merits, of nearly all the new plans produced, are based upon the prevention or neutralization of the swells, which are claimed to work so much damage to the banks of the canals.

The report of the commission appointed by the act, also the report of the engineer of the commission, have just been published, and will no doubt place the matter in a clearer light, so that the object aimed at by the authorities can no longer be misunderstood.

Section third of the act requires a speed of not less than three miles per hour, as an average, "without injury to the canals or their structures." It was soon discovered that this phraseology was calculated to lead many inventors into serious errors, by which their time and money would be wasted. The commission, therefore, in August last, unanimously adopted a resolution whereby the subject was thoroughly explained. The principles involved in the ordinary systems of propulsion are also thoroughly explained in the engineer's report referred to. The writer of this article has made numerous experiments in steam propulsion, for the purpose of ascertaining the causes of the evident waste of power resulting from the use of even the most approved propelling instruments acting upon the water. The inferences drawn from these experiments are fully sustained by the engineer, so far as the points considered are identical.

One point in the report, with reference to those systems in which the water displaced at the bow is forced through a channel or flume under the boat, furnishes, in my opinion, the key to the whole mystery of the enormous waste of power in the use of paddle wheels or screws acting against the water. It is shown that the water driven back, by contact with the sides of the channel, produces the effect of seriously retarding the progress of the boat, and explains the very slow rate of speed attained by boats propelled in this manner. A similar action, although somewhat modified, undoubtedly exists with the wheel at any other part of the boat than the bow. When the wheel is at the stern, the water acted upon must recede at a rapid rate of speed and must also be replaced by that adjacent and ahead of the wheel, for the latter acts in two directions, namely, backward and centrifugally, and creates a suction ahead of the screw. The proof of this lies in the fact that when an ordinary tug boat drawing, say, six feet of water is placed upon the canal, having a depth of seven feet, upon the screw being set in motion a settling of the boat takes place, by reason of the water drawn out from under the hull—first, that adjoining the screw, followed by the whole volume under and at the sides some distance above the keel; and this forced receding of the water in contact with the boat also materially retards its progress. This is more noticeable upon canals and narrow streams than in the open sea; in fact, by reason of the great expanse of water, it is in the latter case additionally modified. The facility for comparison, between the work of a given number of horses in towing and steam of equivalent horse power as applied for propulsion, when applied to act against the water, is the chief cause of rendering the waste of power more noticeable, and of course it cannot be made available at sea. It would seem, therefore, that in order to apply steam power profitably for propulsion, an entire departure from all systems of acting against the water is required, and the latter should be employed for flotation only.

PRO BONO.

## Schoharie Court House—Hub and Spoke Factory. Schoharie Valley—Geological Features and Reminiscences.

*To the Editor of the Scientific American:*

Though not strictly a manufacturing village, Schoharie contains one establishment, at least, the special and peculiar character of which makes it interesting. I refer to the American Hub and Spoke Factory, which the proprietor, Mr. Treat Durand, kindly gave me an opportunity to inspect.

Into the hub department, are brought the logs of elm, white oak, and birch, which are first cut with circular saws into pieces of the proper length, which is determined by the diameter of the stick. These pieces are then bored by machinery, after which they are turned on self regulating power lathes, which are the characteristic features of the establishment. They were the invention of Mr. A. Richard of this place, and have been in use since 1859. The turning is done by means of knives which resemble plane irons, being somewhat shorter and stronger, the edge being shaped to correspond with the edge of a vertical section of a hub. These knives, four in number for each machine are fastened with bolts to the sides of a strong shaft about four inches square. Two straight edged knives cut the straight portion of the convex surface at the ends; two others of proper shape cut the curved and grooved central portion. This knife bearing shaft is made to revolve with great rapidity; while the block to be turned, after being fixed in a sliding frame or carriage (a strong bar driven through the hole in the center serving as a mandril), is drawn up to the cutting knives at the same time that it is made to revolve slowly by means of two spirally threaded shafts and corresponding cog wheels at one side which gear the cutting shaft with the carriage. The diameter of the hub is regulated by putting a pin into a hole in the frame on which the carriage moves. The lathes are of different sizes, each machine being adjustable to several sizes of hub. The smallest hubs made are six inches long and three in diameter, the largest, eighteen by twenty inches. Of the smaller sizes, one machine will turn four hundred hubs in a day; of the larger, from one hundred to one hundred and fifty. A few lathes were sold by the American Hub Company, the former owners of this establishment; but this is believed to be the only factory in the country where hubs are extensively manufactured by power lathes. On the order book, nearly all the States are represented, large shipments being made to the extreme West and South. After passing through the lathe, the hubs are painted and then laid away to season. Previous to shipment, they are mortised by machinery, according to directions given by purchasers. Spokes also are turned by automatic lathes, not peculiar to this establishment, the cutting gouges being fastened to the periphery of a wheel about ten inches diameter, which revolves rapidly while it moves slowly in the direction of the length of the spoke, which also revolves slowly, the frame which holds the spoke in the meantime moving back and forth so as to give the spoke an oval form. The spokes are smoothed on sand belts, and tenons are cut by machinery. The timber used for spokes is hickory and white oak.

In the vicinity of this factory are several localities and objects of scientific and historic interest. The beautiful valley of the Schoharie, with its rich alluvial soil to which General Washington looked for wheat for his armies, and which has ever since teemed with abundant harvests, is bordered with hills several feet high, which Nature has laid up in gigantic terraces, and of which the exposed rocky faces with their wealth of minerals and organic remains are a standing invitation to geologists and palæontologists to gather stores of trilobites, encrinites, minerals, and fossil shells, "butterflies," as they are frequently called. Mr. Albert Lintner, curator of the New York State geological rooms, and his predecessor, Mr. John Gebhard, acquired a large share of the scientific information, by which they were fitted for the office, by the exploration of these rocks and the careful study of their contents.

A short distance above the hub factory, there issues from a cave at the base of a limestone ledge, a clear cold fountain of sufficient capacity to supply the village with water. Near the spring stood the old Lutheran church, and Lawyer's tavern, the resort of the friends of freedom during the Revolution. A mile below is the "Old Stone Church," which was built in 1772, and served as a fort during the war; and which is now owned by the State and used as an arsenal.

C. H. DANN.

Schoharie, C. H., N. Y.

## Amalgamation of Gold Ores.

*To the Editor of the Scientific American:*

Within the past few months there have appeared, in your valuable journal, various articles upon the amalgamation of gold ores. Being engaged in gold mining in South Carolina, I have read these articles with great care; but I must confess that none of them have pointed out a satisfactory process whereby the gold, that is now lost by imperfect amalgamation, can be saved. The great want is something, or some way, that is rapid, simple, cheap, and efficient. At present, blankets, copper plates, either quicksilvered or silver plated, and the use of "quick" in the battery are the methods, mostly relied upon by miners, for saving the gold. But they know that from forty to sixty per cent of the gold is lost by the use of these means. They are, however, the best, cheapest, and most rapid of any means yet discovered for saving the gold in the ordinary class of ores.

In your issue of March 9th, there is an article calling attention to the process of Mr. Percival Stockman, and it is stated that "practical men" recommend it "to the mining world." The process, however, so far as the amalgamation of "free gold" is concerned, is simply a modification of Wyckoff's chloride of silver process, and I doubt if it is any great improvement upon it. The difficulties with both processes are slowness and expense.

A great majority of mines yielding free gold produce ores that will not work more than ten dollars per ton; and, of course, a large quantity must be worked to make it pay. Hence any process that is not rapid and cheap will not answer.

As to the working of sulphuretted or "rebellious" ores: Of the hundreds of patented and other processes, hardly one is worth a moment's consideration. It may be said, however, that many of the so called improved and newly discovered methods work well enough in the laboratory, but, when put to a practical test, are found to be worthless.

After many experiments, I have found the following process to be the best: I first roast the ore (though it is free gold ore) in large piles, thus rendering it very friable, and thoroughly drying all the dirt and clay. In every ton of the ore, there is about 300 pounds of fine rock and dirt, which I have screened out through wire sieves of about one quarter inch meshes, and this fine stuff I run through a common drag mill, and then through a "Georgia rocker," thus saving nearly all the gold. In fact, by this simple process I obtain nearly fifty dollars of gold per tun of dirt; whereas, when run through the stamp mill and over copper plates, I obtain only about ten dollars per tun. The rock I crush in one of the Wilson patent stamp mills, using quicksilver in the battery, and then running the crushed matter over the ordinary copper plates. The rock is worth fully ten dollars per tun, but I save only about half of this.

As to working tolerably high grade sulphuretted ores: The best way, if not too far from a shipping point, is to send them to Swansea, England. But if this cannot be done, then erect a common furnace, having the fire surfaces of good soapstone; then, to every 150 pounds of ore, put in one bushel of charcoal and ten per cent of salt. The ore will readily melt to a slag, and will be pretty well desulphurized. The slag can be drawn off, and when cold can be broken up and worked like free gold ore. A small trial furnace can be built of good fire brick, and an ordinary blacksmith's bellows will answer to blow the fire.

As the loss of gold, by the present process of amalgamation, is known to be very great and, in many cases, disastrous to those engaged in mining, it is important, it seems to me, that the different processes which have been found to work the best, by different miners, should be made known to the public. In this way much good may be done, and a great industry made more valuable than it is. And I am sure the SCIENTIFIC AMERICAN will do its part in giving all such information "to the mining world."

Philadelphia, Pa. CALIFORNIAN.

### Coating Cast Iron with Other Metals.

*To the Editor of the Scientific American:*

Thinking the importance of this subject will warrant a further consideration of it, I submit the following:

After tinning iron, as described in the SCIENTIFIC AMERICAN, page 212, another coating of brass, copper, silver, or gold may be laid on, as the nature of the case may require; this process being known in the arts as "plating."

Plating is done in various ways. Electro-plating has of late years become very popular, but, unfortunately for the art, is of inferior quality. Dry plating is also practised to some extent, and is also of inferior quality. I will therefore pass over these two methods, and consider others of more utility. Yet, respecting dry plating, I would invite artisans to try the experiment of subjecting dry plated articles to heat, since it is probable that by fusion the plating may be rendered more compact and serviceable; indeed, it is not at all certain that electro-plating cannot be improved in the same way.

Iron articles, having been first tinned, may be plated with more precious metals by first reducing the latter to thin plates or foil; this is cut into small pieces and laid upon the parts to be plated, observing the rule of first washing the surface to be plated with muriatic acid or its equivalent in another form. Then rub over the foil with a soldering iron, sufficiently hot to fuse the tin; thus the tin coating, first laid on, becomes the solder to fasten the plating to the iron. If the articles to be plated are large or of uneven surface, the foil is to be bound on with binding wire and the articles submitted to a steady heat from burning charcoal until fusion takes place.

Another method is to apply the foil to the polished surface of iron (without the aid of tin or solder of any sort), the articles being heated until fusion takes place in the foil itself, which is rubbed down with a burnisher when hot; and the process is repeated until a sufficient thickness of plating is obtained. This is the most difficult and the most expensive way of coating iron with other metals, and is also the best, because it is wholly free from solder of any kind, which is easily melted off.

It seems to me that there is a chance for improvement here; that copper and other fine metals, reduced to powder with acids and laid on to the inside of iron pots, spiders, and other cooking utensils, and afterwards subjected to fusing heat, the process being repeated until a thorough coating is laid on, would produce a good and substantial lining to iron hollow ware. If a company of enterprising manufacturers were to act upon this hint, they might make a good thing for themselves and, at the same time, do the country a great service. CHARLES THOMPSON.

St. Albans, Vt.

### Balancing Saws, Cylinders, etc.

*To the Editor of the Scientific American:*

In your remarks upon my letter, published March 23, relating to the balancing of saws, you state that "the remarks of our correspondent relative to balancing cylinders or pulleys on straight edges, will be demurred to by some of our readers who have had experience in balancing cylinders destined to run with high velocities." An examination of my letter will show that the word "cylinder" does not occur, but that the words 'disk' and "pulley" are used, as being the only words to express my meaning; and though, mathematically speaking, a disk or pulley is a cylinder, still in the practical way of speaking it is not so called unless the width of face is equal to a large percentage of the diameter.

The principle to which you refer, regarding the balancing of long cylinders, is that the resultants of the balancing forces must rotate in the same plane; and this is shown in Fig. 5 of my last letter, where C and B are two weights on the disks, equidistant from the center of the crank pin F, and the effect is the same as if it were possible to combine the weights C and B at X, which rotates in the same plane with F. Again, in Fig. 8, the two weights, B and C, have their resultant in the plane of F; hence, as stated, two cranks are used, one on each side of F, because a single weight, at B or C, equal to A would tend to produce a tilting motion in the crank shaft. In conclusion, I would state that the practical way of balancing a long cylinder or drum after determining the weight and the distance at which it is to be placed from the axis when resting upon the leveled straight edges, is to revolve it on its journals, in boxes supported by springs, and to shift the weight lengthwise in accordance with the indications afforded by the vibration.

WM. H. HARRISON.

Philadelphia, Pa.

### The Right Kind of Windmill.

*To the Editor of the Scientific American:*

Some time ago I made some suggestions which you were kind enough to publish and to prefix the word "useful." This encourages me to add some more on another subject which, I think, is of great importance and commands too little attention; and that is, the proper construction and use of the oldest and most economical motor known, the windmill. It seems strange to me that this power is so little used, and passing strange that a man so sensible and acute as Captain Ericsson should spend his valuable time and highest, or at least most experienced, energies in attempting to utilize the sun's heat directly, when he might utilize the same force, correlated into a much more convenient and useful form, by the aid of this ancient device, and perhaps plan out something better than heretofore known.

I think that the main cause of the neglect of wind power arises from the general but wrong impression that regularity of motion is necessary in most mechanical operations, and this has led to a multitude of cumbrous and expensive regulating devices which are the patented parts of all modern wind machines. I believe that, although in all kinds of work the power to command regularity of motion is desirable, in most kinds it is far from necessary, and that one hundred revolutions per minute will frequently give as large a percentage of profit as one thousand, or *vice versâ*.

This, if true, leads at once to the conclusion that the best windmill is made in the simplest manner, say a short horizontal shaft set in boxes in a circular frame or head, which forms the top of the tower and is capable of revolving with the wind, so as to keep the rigid and unalterable arms, which are set at the best angle for efficiency, to the wind; on this shaft is set a miter or bevel gear, which imparts motion to a perpendicular shaft set in its center of horizontal rotation, and a vane to keep it "head on," and it is complete. The upright shaft has a gear to match on its upper end, and a pulley to drive whatever is driven—usually by a half twist belt on its lower end—and should be made adjustable up and down, so as to be thrown in and out of gear. Let everything be made as light as is consistent with proper strength; and the iron work of a machine of this kind, of two or three horse power in a stiff wind, need not weigh over three hundred pounds or cost over twenty-five dollars. All the wood work could be made by an ordinary farmer and on the spot. Perhaps if, instead of a set of arms on one end of the horizontal shaft and a fishtail vane to hold them to the wind at the other, two sets of arm vanes—one on each end of the shaft, and one larger than the other, or farther from the center, were constructed, it would be better. I think the end of keeping it to the wind might in this way be attained, and both sets be acted on by the air, so as to increase the power as well as to more perfectly balance the shaft. Now the objections that will be raised against this plan will be "no regulator" and "it will run away with itself in a gale." To the first I answer: if to do your work it is necessary to have a steady motion, get some other power; and to the second, let it flicker. The arms can turn in a gale as fast as they are driven, without danger if decently balanced, and even be much safer than if confined; and if the journals are properly oiled, they will never wear out. Let it run night and day; it will always be ready to yield the largest amount of power its surface will give.

And here let me say that I have sought in vain for any table or statement of the amount of power yielded by a wind wheel per square foot of surface, or for any direction in regard to the best angle at which the arms can be set. I presume there are such tables published, and I would be obliged, as would be many others, no doubt, if you would hunt them up and republish. How many square feet of sail are required, in a twenty mile breeze, to a horse power, and at what angle with the direction of the wind should it be set? is the question I would like to have answered.

I hope that every machine shop in the country will get up the patterns for the castings of the "common sense windmill," and that hereafter no barn will be built without a tower to support one. C. B.

Memphis, Tenn.

### Spark Arrester.

*To the Editor of the Scientific American:*

In 1866, our saw mill at this place was burned by sparks from the smoke stack, igniting the roof of an adjacent building. Subsequently, after rebuilding, the sawdust in our mill yard was constantly taking fire from the same cause. Having occasion to repair the furnace in August, 1870, we adopted the plan of one of your contributors, since which the sawdust has never been fired, nor do we recollect having seen a spark coming out of the smoke pipe: and whereas previously a volume of dense black smoke was pouring out of the pipe nearly all the time, but little smoke has since been seen.

The furnace is for two 42 inch double flue boilers, 16 feet long. We cleaned out the inside of our furnace down to the level of the bottom of the ash pan, then put up the usual bridge wall, back of the grates, another just under the back end of the boilers, and another intermediate, just back of the first and a little below the top. We put in a 4 inch iron pipe passing through both sides of the furnace, open at both ends and perforated, inside the furnace, full of $\frac{1}{4}$ or $\frac{3}{8}$ inch holes. We have no doubt that, with a larger pipe and more and smaller holes, the smoke would be effectually and entirely consumed.

We can therefore, after 18 months trial, confidently recommend a similarly constructed furnace as in our judgment, better than all the screens and spark arresters ever constructed; besides, it costs nothing, except for the pipe.

Handsboro, Harrison County, Miss.

TAYLOR & MYERS.

[The plan referred to by our correspondents is, no doubt, that illustrated and described on page 129, volume XVII of the new series of the SCIENTIFIC AMERICAN. It was communicated by Mr. F. W. Bacon, M. E.—EDS.

### Counterbalancing Gang Saws.

*To the Editor of the Scientific American:*

E. F. J., in your issue of March 2d, says he has a great deal of trouble with his gang of forty saws, in trying to get it to run steadily. The gate, he says, weighs about 5,500 lbs., and he wants to find the point on which to put a counterbalance. As to this point, I do not wish to advise; but it appears to me that a gate weighing 5,500 lbs. is very much out of proportion for a gang of forty saws, and here I think lies the point of his trouble. He does not state what length of saw or crank he uses, or whether it saws boards or plank; but, from the experience I have had in running gangs of saws, he should reduce his gate in weight 2,000 or 3,000 lbs., instead of adding counterbalance. I have run, for more than ten years, two cast iron gates, each weighing 1,550 lbs. The space between the stiles or sides of gate was 3 feet 9 inches, in which I hung 28 saws, each $4\frac{1}{2}$ feet long, to cut $1\frac{1}{4}$ plank, and 35 for one inch boards. These gates are connected to a crank pin, 11 inches from center of water wheel shaft, by a pitman 18 feet long, the water wheels making 180 to 200 revolutions per minute without any counterbalance for gate or pitman. The crank and wrist pin are balanced, the whole being made to give as little resistance as possible in passing through the water. The counterbalance, so far as my experience goes, if the gate is proportional to the saws it contains, is a detriment instead of benefit. The weight of gate helps to force the saws through the logs, giving more uniform motion when the saws are cutting than with counterbalance. If E. F. J. has too much weight of gate for the saws, and does not reduce it, a counterbalance will help to equalize the motion; but it will only add useless weight and increase the friction. Now the point I would consider first is: Is it necessary to use a gate weighing 5,500 lbs. for a gang of forty saws? The great difference in the weight of your correspondent's gate and the ones I am using, the number of saws being nearly equal, induces me to make this statement; and he can now compare the relative condition of these gangs of saws.

Please allow me to say further that a less number of pounds of cast iron makes a better and stiffer gate than wrought iron, of which most gang gates are made.

J. N. WALTERS.

Gang Mills, Herkimer Co., N. Y.

### Exhaust of Slide Valve Engines.

*To the Editor of the Scientific American:*

One of your correspondents suggests that the exhaust of an engine should always open three inches before the stroke is completed. Any such arbitrary rule is an error, and will not work. A nine inch cylinder would have one third its stroke to complete, while one of forty-eight inch stroke would only have one sixteenth. An engine going slowly, with all it could do, would very probably not complete its stroke at all.

As you observe of turbine wheels, no invariable rule can be given for all sorts of steam engines. The work they have to do must cause them to differ, both in cut off, or expansion of steam in the cylinder, and letting the steam go when it is in. For pumping water, propelling a side wheel steamboat, or drawing heavy freight trains up steep grades, the steam should be forced into the cylinder till within a few inches of the end of the stroke, and it should be kept there so long as it can possibly do any good. For rapid motions, expansion of steam may be used to much better advantage, and the exhaust may be opened sooner when every part of the engine is under full headway.

Every engine should be specially arranged, both for induction and eduction of steam, to the special work it has to do, if the object is to get the full amount of its power out of it. B. T.

### Mechanic's Institute of San Francisco.

We are indebted to the Mechanics' Institute of San Francisco for a report of their proceedings for 1871, in which we find much interesting and valuable matter. The essay on "the Manufacturing Interests of the State" by Messrs. Morris and Bennett, is a very valuable paper. Dr. D. J. Macgowan contributes several essays upon curious Chinese arts and productions, from which we shall make extracts. The essays and illustrations of "Rope Railways" for transporting ores, by D. R. Smith, and upon the best systems of "Clearing and Cultivating Tide Lands," by A. J. Bigelow, are full of valuable information.

The Exhibition of the Institute in 1871 was a great success, and the reports of the various divisions present an encouraging and satisfactory view of the industrial resources of California.

RELIABLE RECIPES.—For corns, easy shoes; for bile, exercise; for rheumatism, new flannel and patience; for gout, toast and water; for the toothache, a dentist; for debt, industry; and for love, matrimony.

### Fireman's and Builder's Elevator.

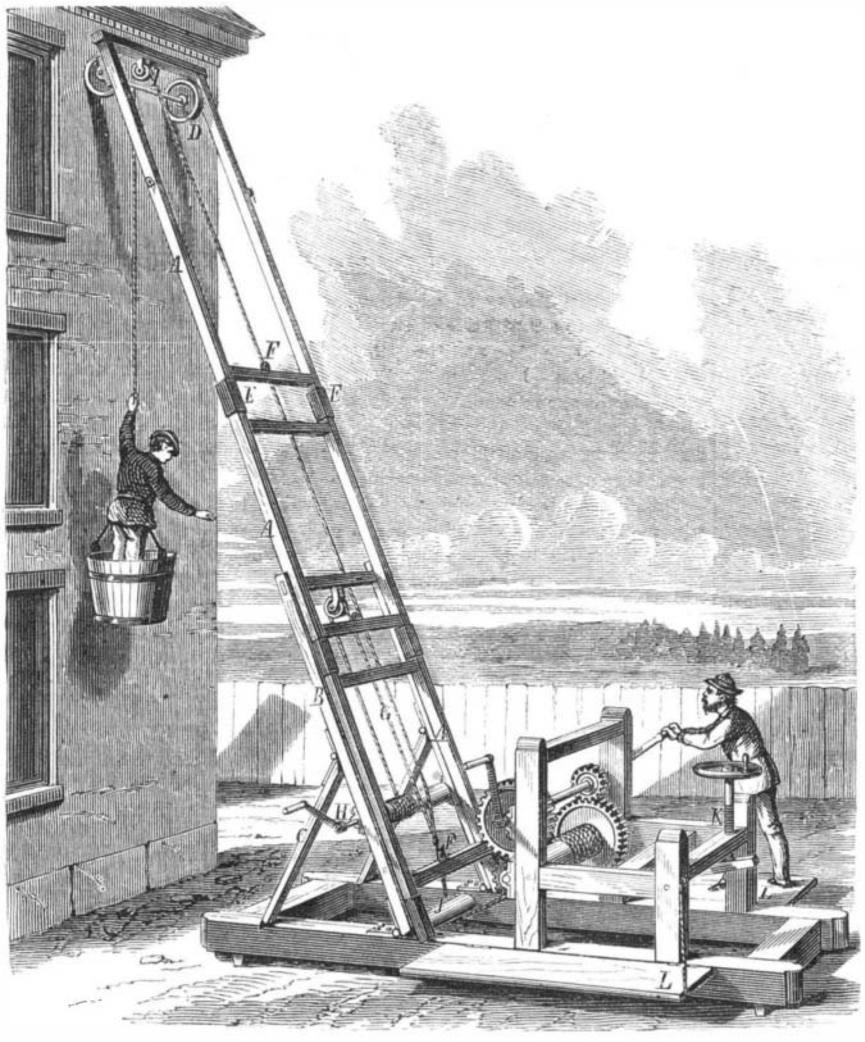
Our engraving illustrates a fireman's and builder's elevator, which can either be placed upon the ground, as shown, or attached to a truck to be drawn about by horses, and by which an elevation of any hight can be easily, rapidly, and safely attained.

In the engraving, A represents the different adjustable sections of the elevating frame, and B a fixed section which is hinged to the frame of the derrick. To the section, B, are pivoted braces, C, the lower ends of which are wedge pointed, to engage with the timber of the derrick frame and hold it at any angle during the elevation. The upper section, A, has attached to its upper end two wheels, D, as shown, which, during the extension of the frame, roll up along the side of the building. The sections, A, are joined, as shown, by metallic sleeves, E, the upper ends of each section entering the sleeves which are attached to the lower ends of the next section, and so on, as many sections being used as may be needed to secure the required elevation.

To the lower crossbar of each section is attached an eye, F, which is engaged by a hook attached to the cord, G, during the extension of the elevating frame. The cord, G, is wound up by the windlass, H. Thus suppose it was required to extend the frame from the position shown in the engraving. The windlass, H, being turned, the lower section, A, would be raised, sliding in ways on the section, B, till its lower ends reached the position now occupied by the lower ends of the second section, at the same time carrying upward the superposed sections. When this had been done another section would be inserted, which would hold the upper ones from descending.

To the upper section is attached a sheave, I, over which the rope from the elevating bucket passes, thence downward and under a roller, J, attached to the derrick frame, and thence to the drum of the derrick, which is operated in the usual way. A hand screw, K, operates a lever friction brake, to hold the bucket and its load at any required elevation. Folding platforms, L, afford a standing place for the operator on either side of the derrick, whether the latter be mounted on wheels or not.

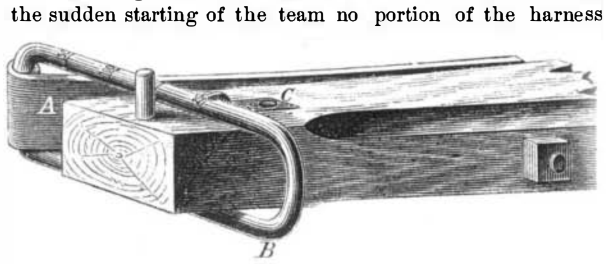
This invention was patented through the Scientific American Patent Agency, Feb. 13, 1872, by Andrew M. Patrick, of Long Lane, Mo., who may be addressed for further information. Patents are also pending, through the same source, in foreign countries.



**PATRICK'S FIREMAN'S AND BUILDER'S ELEVATOR.**

### GIBBS' WHIFFLETREE.

Our engraving shows a portion of an improved whiffletree, designed to subserve two useful ends. It is intended, first, to give greater elasticity to the whiffletree, so that by the sudden starting of the team no portion of the harness



shall be broken by the shock; and, second, to supply a means whereby the draft applied, to propelling vehicles, plows, mowing machines, etc., will be indicated with sufficient accuracy for comparison.

The improvement consists in applying to the back side of the ends of the whiffletree a strong strap spring, A. The traces are to be hooked to the graduated links, B. A pointer, C, in connection with the graduations on the link indicates the pressure of the draft in pounds.

This invention, with or without the graduations on the link and the pointer, would be an excellent thing for street cars, and would save much expense in repairs, besides making it much easier for the horses to start the cars. For general use, the improvement has also advantages that will be obvious to the reader. By its use, farmers will be able to see whether the draft of their reapers has increased unduly by the friction or binding of parts, and to make the proper adjustment in time to relieve their horses.

The spring may be composed of one or more leaves, as may be required; and, while not very expensive, is a valuable addition to the whiffletree where heavy work is required.

Messrs. George Gibbs and William Gibbs, of Canton, Ohio, are the inventors and joint patentees.

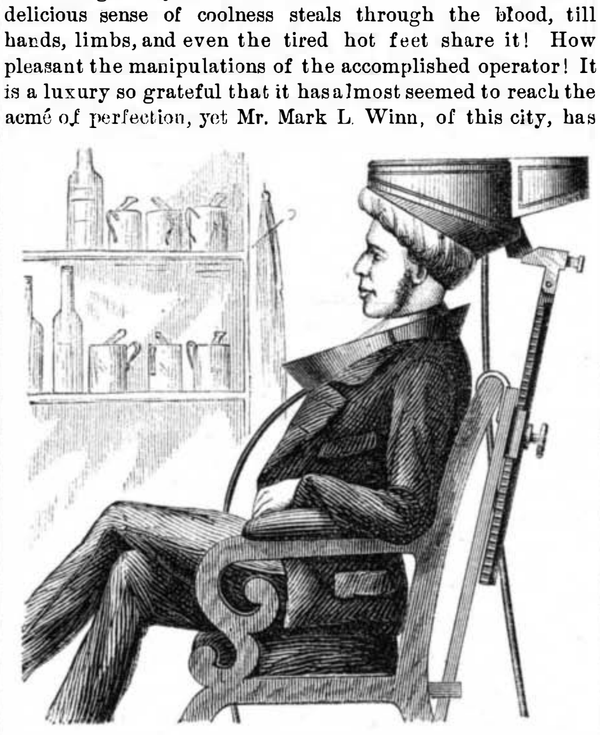
### The Dandelion or Taraxacum.

Taraxacum roots are used in a variety of ways in India; one useful form is that of a paste, which is made by pounding the fresh roots, putting the mass into tins or jars, and gently baking or heating in an oven; when cool, the paste is ready for use and can be kept for a long time. To prepare dandelion coffee, the roots are washed, dried in the sun and cut up into small pieces, after which they are roasted in a similar manner to true coffee; they are then ground, and to every nine ounces of coffee one ounce of pounded dandelion root may be added; these proportions make an excellent and useful beverage. The use of this coffee in India has been much recommended.

Lieutenant Pegson, in a communication to the Agri horticultural Society of India, advocating the more general cultivation and use of the dandelion, says: "Medical men admit the value of this preparation, and I know several gentlemen in India who are, by their own admission, kept alive by the daily use of taraxacum coffee. It is fairly entitled to be called a specific for the cure of torpid liver, a complaint from which the majority of Europeans suffer; the fact being made known when they proceed to a cool or hill climate and shiver and shake with cold while the thermometer is at 62° Fah. only. The sallow complexion of such men, women and children, their languid movements and their enjoyment of heat, all alike proclaim that they are suffering from sluggish action of the liver. The conserve of taraxacum may be made into sirup for use. Horses and valuable dogs, sheep and poultry, all suffer in India from disease of the liver. A bolus of taraxacum conserve to a horse, and a pill thereof to a fowl, would be most beneficial and act as a curative agent."

### WINN'S SHAMPOOING APPARATUS.

Of all the luxuries vouchsafed, in this civilized age, to heated, weary, head-achy mortals, a vigorous, cooling, cleansing shampoo deserves to take a place in the front rank. How delightfully it soothes the irritable nerves! What a delicious sense of coolness steals through the blood, till hands, limbs, and even the tired hot feet share it! How pleasant the manipulations of the accomplished operator! It is a luxury so grateful that it has almost seemed to reach the acmé of perfection, yet Mr. Mark L. Winn, of this city, has



won the fame of having perfected what seemed before perfect. Instead of now sitting with elbows upon knees and nose over a washbasin, while the cooling jets descend upon our willing pates, we discover that we need not even keep awake during the process, unless we wish to do so. We may almost recline, with elevated feet, on chairs cunningly devised and cushioned soft, and without the exertion of a muscle, receive passively that which has heretofore required some effort.

This desirable result is accomplished by, among other devices, a helmet of peculiar construction, which is supported by a suitable adjustable standard and bracket attached to the chair. In addition to the helmet, a safety trough and collar is employed to protect the person from the dripping, a flexible pipe, leading therefrom, carrying off the water which the trough collects.

The helmet has an expansible and adjustable bottom, with a sort of rubber packing, which fits the head. The trough also has a rubber collar, which fits the neck water tight.

A detachable sprinkler is employed to convey water to the head. A cushion or platform extends to the rear to support long and thick hair, like that of ladies, which, of late years, has grown to an unprecedented extent, and is at present generally very thick, especially at the back of the head.

A dryer, composed of a hollow sheet metal vessel, is used, and is provided with a cushioned metallic plate, upon which the hair is spread to dry, when the plate is heated by an alcohol lamp. This is considered a requisite for long and thick hair, which is slow in drying and is apt to become musty unless the moisture is thoroughly removed from it. The cushion alluded to is of non-conducting material, and is placed at the back of the head to protect the latter from the heat.

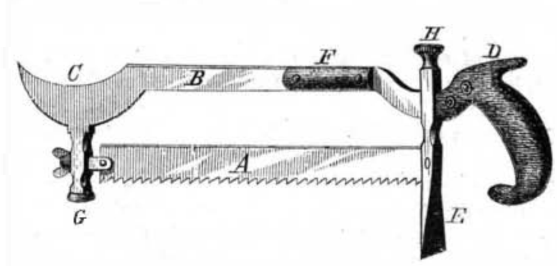
The arrangement of parts is such that any of these appliances may be attached or detached at will, as the circumstances of the case require. Thus, totally bald headed individuals will not require the dryer, which, of course, will not be used in their case. Young ladies (all ladies are young, we believe) will need a good deal of drying, and even chronically dry individuals of the male gender, whose hair happens to be luxuriant, may need the dryer after the use of the helmet.

At all events, all sorts of heads may find their requirements fully met in this invention, and the business of shampooing will doubtless be revolutionized by it.

### AN IMPROVED GRAFTING TOOL.

The season for grafting being now at hand, many of our readers will inspect with interest the accompanying engraving of a convenient grafting tool, the invention of Mr. John Maddy, of Clearfield, Pa.

The invention consists in the combination of a hack saw, A, a splitting knife, C, and a wedge, E. The instrument is used by taking hold of the handle, D, in the usual way to saw off the stock. The handle, F, is used to place the knife, C, properly, and the head, G, is struck to split the stock. The



stock being split the instrument is reversed, and the wedge is driven by striking the head, H. Thus all the tools used for grafting, except the mallet, are combined in a single tool, a great convenience where trees are to be climbed in the performance of this kind of work.

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AN old gentleman, traveling on the railway a few days ago discovered hanging on the side of the car what he took to be a time piece, but which was nothing more or less than a thermometer arranged with a dial and hands like a clock to easily denote the temperature of the coach. The old man eyed it very closely, finally adjusted his spectacles, then took out an old fashioned bull's eye watch, compared time, and with his key made the necessary correction. He said he expected to be on the railroad for several days, and he wanted the car time. We think he will have a lively time of it, if he attempts to keep his watch with the variable temperature of a railroad car.

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CURLED SOAP ROOT.—The curling of "soap root" as a substitute for hair for mattrasses is quite an industry in California. It employs a capital of nearly $50,000, with sixty men, and machinery and engine of 40 horse power. The value of the product is nearly $100,000 annually, and is steadily increasing. It grows in unlimited quantities in all the foot hill districts of the State.

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DETECTION OF AMMONIA.—*Lex* announces a new process for the detection of ammonia, not less sensitive than the Nessler test. The suspected liquid is mixed with phenol, and hypochlorite of lime is added. The ammonia shows itself by a green color, more or less intense, according to quantity.